DOLNÍ VĚSTONICE II
WESTERN SLOPE

Edited by Jiří Svoboda

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DOLNÍ VĚSTONICE II - WESTERN SLOPE

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ABSTRACT

During the Pavlovian, settlements larger than in the previous periods concentrate along the main Moravian rivers, in the direction of the SW-NE oriented communication axis through Moravia. Excavations of these sites evoke questions about stability of the settlement, contemporaneity of the various settlement units, and relationship to the mammoth-bone deposits.

The settlement agglomeration at the western slope of site Dolní Věstonice II, excavated in 1987, is divided into three settlement units. All of them provide central hearths, system of shallow holes and depressions, and concentrations of lithic industries; one of them included a male burial (DV XVI). These settlement units are analysed, dated by C 14 and compared.

Specialised reports on paleopedology, palynology, malacozoology and use wear analysis complete the volume.

SOUHRN

V průběhu pavlovienu vznikají sídliště větší než v předchozích dobách, soustřeďují se podél hlavních moravských řek a na komunikační ose směřující od JZ k SV. Odkryvy těchto sídlišť vyvolávají otázky o stabilitě osídlení, současnosti jednotlivých sídelních celků a vztahu ke skládkám mamutích kostí.

Sídelní aglomerace na západním svahu lokality Dolní Věstonice II, prozkoumaná v roce 1987, se člení do tří celků. Všechny zahrnují centrální ohniště, systém mělkých jamek a zahloubení a koncentrace štípané industrie; jeden z celků obsahoval mužský hrob (DV XVI). Tyto sídelní celky byly analyzovány, datovány metodou C14 a srovnány.

Specializované zprávy se týkají paleopedologie, palynologie, malakozoologie a traseologie.

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INTRODUCTION

One of remarkable cultural and adaptive phenomena of the Pavlovian is formation of larger settlements at strategic locations, controlling river valleys. Compared to the Aurignacian, the number of sites decreased, but their spatial extension and amount of archaeological material increased and suggest marked settlement concentration. The question becomes important wheather the whole settlement area has been settled at the same time, or wheather it accumulated by short-term stays during longer time-span. This kind of questions, and the problem of settlement stability, calls for detailed investigation of Pavlovian settlements.

Three geographic points gained importance during the Pavlovian: slopes of the Pavlovské Hills above the Dyje river (Dolní Věstonice, Pavlov), the SW (Předmostí) and NE (Petřkovice) entraces of the so-called Moravian Gate pass. All three points lie at the main communication axis through the Moravian plain. Further to the SW this route connected sites in Austrian Danube valley and to the NE are attached Gravettian sites of South Poland (Spadzista, Mamutowa Cave). By the same route, mass of lithic raw materials has been brought into Moravia and Austria.

Smaller sites are scattered along the Morava and Dyje rivers. Moravian caves have scarcely been settled and no direct stratigraphic evidence of Gravettian occupation is available (Pod hradem Cave, Kůlna Cave ?). Primary workshops at local lithic outcrops are missing as well, because most of the raw material was imported.

THE SITE DV II

A continuous bow-shaped chain of sites extends along the northern slopes of the Pavlovské Hills between Dolní Věstonice and Pavlov (Klíma 1986). Other sites (Milovice, Bulhary) are attached further to the SE. The site Dolní Věstonice II, located at the western edge of this site chain, was first evidenced by scattered surface finds in the vicinity (Klíma et al. 1962, Fig. 6). It is one of the loess elevations in altitude of about 240 m, raising above the Dyje river and sloping further to the Jurassic limestone outcrops of Pavlovské Hills (550 m). The loess deposit reaches maximal thickness at the foot of the elevation, where it has been exploited for brickmaking. The brickyard, opened at the eastern edge of the village, attracted attention of researches since the earliest times and it became subsequently one of the key sections of the Upper Pleistocene in Central Europe (Absolon et al. 1933; Klíma et al. 1962 with lit.; Demek-Kukla 1969; Havlíček-Kovanda 1985).

The basal parts of the brickyard section were detected by borings only. In the brickyard wall is visible the Last Interglacial parabraunerde (PK III), the complex of three chernozems (PK II), a brown soil (PK I) and the last loess interstrafified by gley horizons (Klíma et al. 1962). This

stratigraphic classification was confronted with radometric datings by H. de Vries and corrected by J.C. Vogel. A charcoal deposit with Pavlovian artifacts was for the first time detected in a solifluction-redeposited layer directly superposed over the brown soil (PK I); a second charcoal horizon, archaeologically sterile, lied in the subsoil. The largest industrial assemblage, very early in the Moravian context, comes from the western wall: 48 flint artifacts and 33 heavy-duty pieces of quartz, quartzite, crystaline schist, granulite and limestone.

In 1985, new industrial exploitation of loess by Ingstav, this time for damm constructions, was initiated above the ancient bricketery. This exploitation unearthed almost completely a Paleolithic site, and it yielded evidence of its inner structure (Fig. 1). The site is composed of three larger agglomerations, several isolated settlement units and an adjacent mammoth-bone deposit.

The first settlement agglomeration, excavated in 1986, is oval shaped, extended in N-S direction along the highest part of the site. In its southern part was located the triple burial DV XIII-DV XV (Klíma 1987a-d; 1990). The second agglomeration, excavated in 1987, is oval-shaped as well and it gradually slopes from E to W. The third agglomeration, excavated in 1987 and located at the western slope, makes the subject of this study. Hitherto only the burial DV XVI, found in its southern part, was published (Svoboda 1987a,b; 1989a; Svoboda-Vlček 1991).

Occupation traces at the northern slope are scarcer. Three isolated settlement units were located at the lower etage (A-C, Klíma 1987e) and somehow higher, close to the uppermost settlement agglomeration, lied another settlement unit (LP/1-4, Svoboda 1990). The mammoth-bone deposit extended about 150 m to the W from the western edge of settlement, in 210 m altitude. It was excavated in 1986 and 1988 (Svoboda 1989b, in press).

The settlement agglomeration at the western slope may be reconstructed as a circle with diameter of about 23-25 m. During leveling the exploitation floors in early spring 1987, a zone along the diameter of this agglomeration, with breadth of 10,5 m, has unfortunately been destroyed. This destructed area separated the excavation in two parts (Fig. 2). The salvage excavations started immediately in the smaller lower (western) part of the area (squares XYZ/4-22). Simultaneously we cleaned the section of the higher etage and excavated a belt of 1 m breadth along its foot (squares A/2-23). The male burial DV XVI was discovered at these places. After mechanical removal of the upper loess, realised by workers of Ingstav already under archaeological controll, we turned to systematic excavation of the upper (eastern) part of the agglomeration. This main area is of oblong shape, measuring 6 x 22 m (squares BG/2--23).

Definition of the settlement units within the excavated area is based on visible regular features such as central hearths, depressions and pits forming a system (Fig. 2). Spatial distribution of lithic industry (Fig. 3) and Dentalium

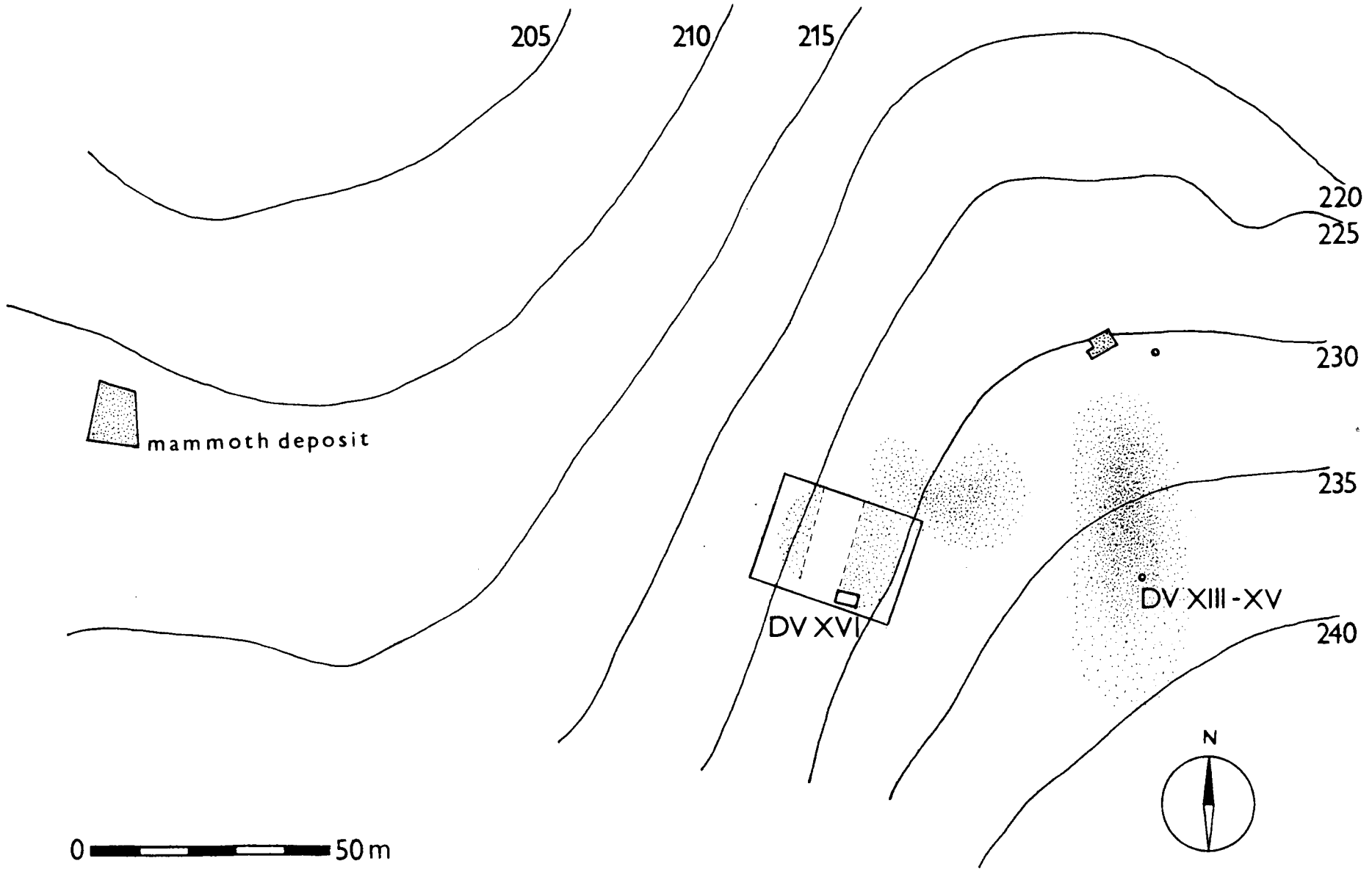


Fig. 1. Dolní Věstonice II, general plan of the settlement (dotted areas) and human burials.

shells (Fig. 23) well corresponds to location of these settlement units, while the pattern of bone industry and chipped bones distribution differs (Fig. 22).

The excavation continued to the north, in another oblong space measuring 7 x 14 m. Our excavation during the summer joined here the area studied by B. Klíma. This area forms lower part of the second settlement agglomeration, sloping from the top of the elevation, and its publication will make subject of another study. After the close of the salvage actions at the western slope, industrial exploitation destroyed the surface of the Pavlovian horizon completely.

STRATIGRAPHY

The key section at the western slope was formed by step of one of the etages, along the isohypse of 225 m above the sea level (squares A1 - A23). During further excavations several perpendicular sections completed the stratigraphic picture. Deeper exploitation revealed the subsoil, formed by a complicated sequence of slope sediments, limestone rubbish, loess, soils and soil sediments of Middle and possibly Lower Pleistocene age.

The section at the spot of the male burial (section No 5) has already been described (Svoboda 1989a, Fig. 1). After consultations with J. Kovanda, T. Czudek, P. Havlíček and other geologists we may summarize that the base (section No 3, Fig. 4) is formed by loess with partly corroded carbonate blocs (layer 9), followed by brown humic soil with charcoal (8) and by loess, including darker strips and lenses with charcoal (7). The cultural layer (6) is developed on this loess. Its base is sharp, with charcoal concentrations; at some places (not in the picture) is visible the upper, partly removed part of the layer, penetrating into the overlying loess. The thick upper loess layer (5-1) is separated by light ochreous and ochreous/light brown strips and lenses, comparable to the so-called gley horizons of B. Klíma (1958), and by irregular rusty smudges and stains with coagulated Fe-hydroxides.

In the squares A 18 - A 22, the cultural layer filled a shallow depression, where the Paleolithic burial (Fig. 5) was discovered on 28.04.1987. In this space (square A-20) two earth monolites were removed from the section No 5, located along the skeleton, and transmitted to L. Smolíková for paleopedological investigation. J. Kovanda and H. Svobodová sampled the section No 1 (squares A7 - A8) on 5.05.1987 for malacozoological and palynological analyses. Sample numerations after the various authors are correlated in tab. 1 and their reports are enclosed to this article.

Chemical composition of the underlying and overlying loess was investigated in search for possible material sources of the earliest ceramic production (Vandiver et al. 1989). The results demonstrate that 60 - 75 % is composed by SiO_2 and 10 - 21 % by Al_2O_3, while CaO, MgO, TiO_2, P_2O_5, FeO, Na_2O and

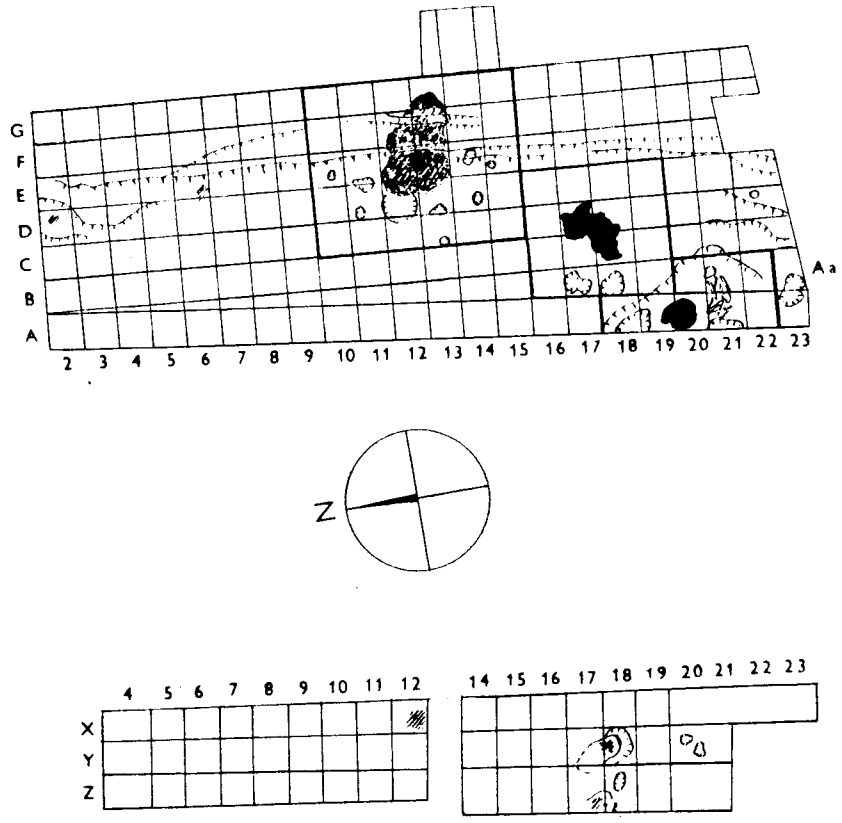
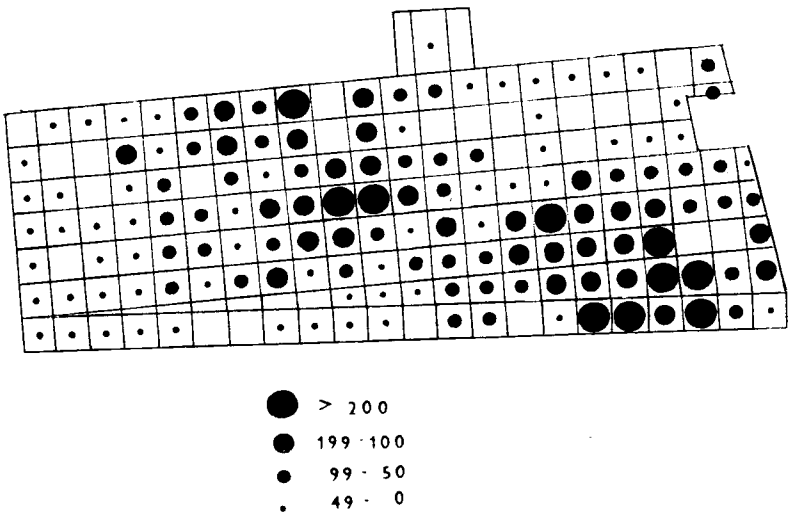


Fig. 2 (above). General plan of the settlement agglomeration at the western slope. From South to North the settlement units Nos 1, 2 and 3. - Fig. 3 (below). Spatial distribution of lithic artefacts.



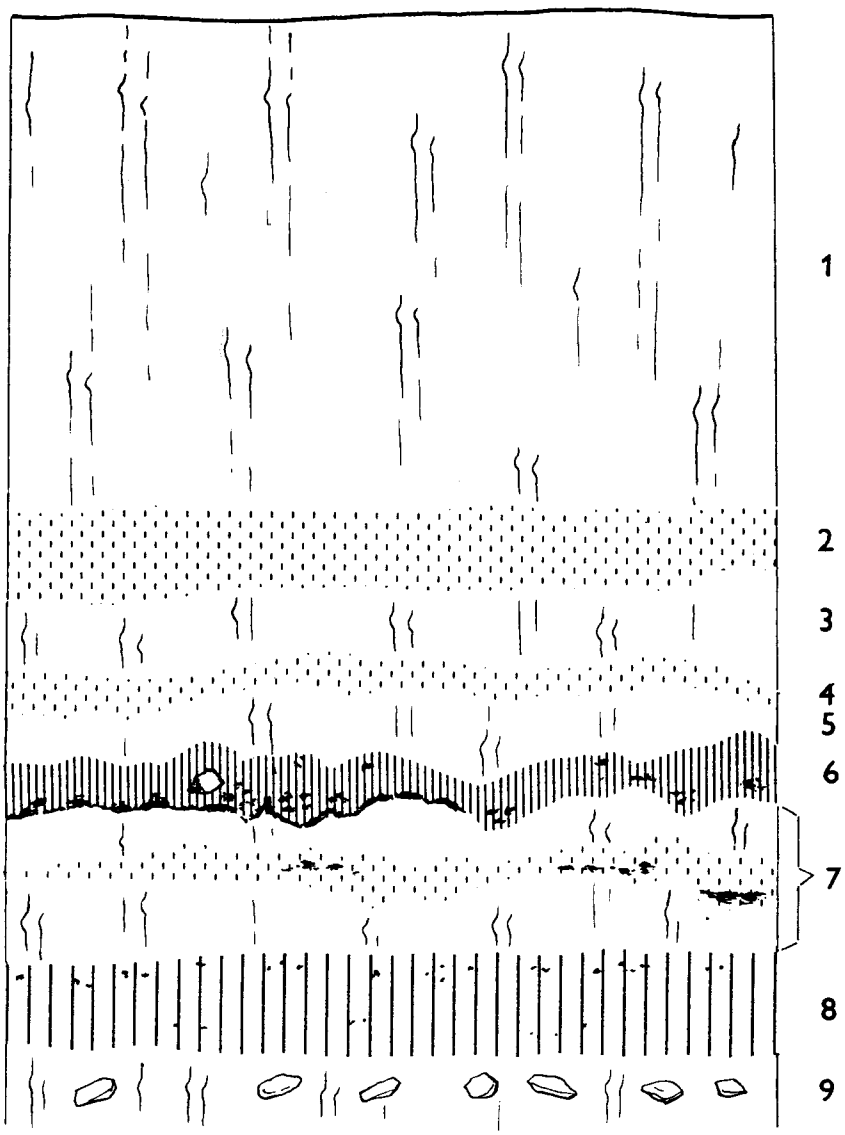
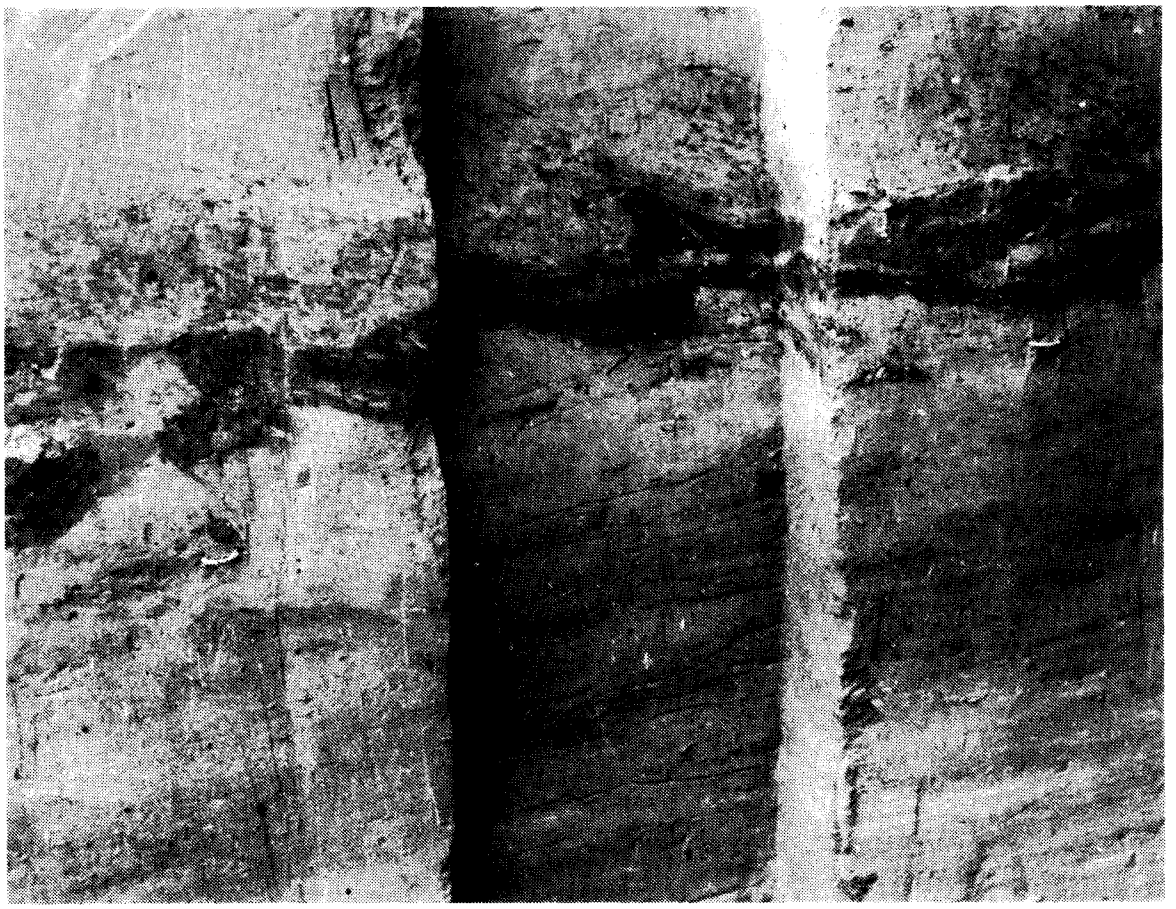


Fig. 4 (above). Section No 1 at the western slope. Stratigraphic description in text. - Fig. 5 (opposite). Section No 5, next to the skeleton DV XVI, layers 9-5.



Tab. 1. Numeration of samples after the various authors

Stratigraphy Fig. 3	Pedology L.Smolíková	Pollen analysis H.Svobodová	Molluscs J.Kovanda	Dating C14
1-loess	-	-	6,7	-
2-pseudogley	-	-	-	-
3-loess	-	8	5	-
4-pseudogley	7	7	-	-
4-pseudogley	6	-	-	-
5-loess	5	6	4	-
6-cult.layer	4	5	3	X
7-loess	-	4	2	-
7-grey lenses	-	3	-	-
7-loess	-	2	1	-
8-soil	3	1	0	X
9-loess	1,2	-	-	-

K_2O are represented by lower percentages.

RADIOMETRIC DATINGS

Samples for radiometric dating were taken from layers 8 and 6 (especially from hearths) and send to laboratories at Groningen (contribution by W.G. Mook), Prague (contribution by J. Šilar) and Illinois. The charcoal layers in the archaeologically sterile underlying soil (layer 8) yielded two data:

GrN 15280 27 900 ± 550 B.P.
CU 749 24 725 ± 2163 B.P.

The second date, gained by the Charles University Laboratory in Prague, is too recent. After J. Šilar, its high deviation is due to small amount of the sample and to its dilution. Only after adding double deviation we arive to a realistic value. In the brickyard section, a stratigraphically comparable soil was dated to 28 300 ± 300 B.P. (GrN 2092, Klíma et al. 1962). Corresponding soil was recently found by excavation at nearby Milovice; at this site it included atypical Aurignacian and it was dated to 29 200 ± 950 B.P. (GrN 14826, Oliva 1989).

Earliest data for the Pavlovian (29 000 - 28 000 B.P.) are provided from the brickyard section, where the brown soil 8 lies in direct contact with the above cultural layer 6 (Klíma et al. 1962). In the upper part of the site a more or less thick loess deposit 7 separates the two layers.

Numerous data from the cultural layer at the new excavations, including the mammoth-bone deposit, range between 28 000 - 22 000 B.P. (cf. Klíma 1990, Svoboda 1989 etc.). The series of data from the western slope agglomeration fits into this interval. The Groningen data, however, are usually earlier (27 500 - 25 000 B.P.), while the Prague data of the same features and settlement units are generally more recent (about 25 000 - 22 000 B.P.). This evidence is supplemented by two Illinois data: 26 390 ± 270 B.P. and 22 630 ± 420 B.P. Elaboration of a fine chronology on the basis of such a range of datings, therefore, seems impossible. We suppose that the cultural layer was formed during longer time-span and in changing environments. The settlement agglomeration would be the result of repeated settling of the same space.

The overlying loess deposit is dated in the brickyard section (Klíma et al. 1962) to 18 400 ± 700 B.P. (depth of 5,5 m) and to 15 350 ± 1 000 B.P. (depth of 4 m).

CHARACTERISTIC OF FORMATION PROCESSES OF THE SECTION

Studies by L. Smolíková, H. Svobodová and J. Kovanda enabled characterisation of formation processes of the section and its separation into three cycles: the subsoil of the cultural layer, the cultural layer, and the overlying deposit.

The lower cycle (layers 9-7). The time-span before the Pavlovian settlement covers sedimentation of the loess, its

redeposition and pseudogley formation during subsequent short cold and moist oscillation. A weakly developed pararendzine, mixed with relicts of earlier chernozem soils, evolved on this substrat during a short time interval, under cold and relatively dry climate. Following moister oscillations are responsible for further pseudogley formation. This soil complex is separated by loess of variing thickness from the cultural layer.

The pollen analysis confirms the supposed mixture of different soil materials. The results suggest a temperate and rather moist climate during the interval of pedogenesis, while the overlying loess witness a colder type of vegetation. Malaccozoological analysis of the soil indicates both cold steppic societies and climatically not pretendous or unexpressive species. Malaccofauna of the overlying loess impoverished. Chronologically this time-span, including an oscillation of interstadial character (Denekamp), corresponds to the phasis of the Interpleniglacial prior 28 000 years.

The cultural layer (6). The Pavlovian cultural layer is formed by a fossil soil sediment, with admixture of earlier redeposited components, developed under increased activity of edaphon and vegetation and undergoing subsequently slight pseudogley formation. The pollen spectrum includes, besides usual glacial trees, certain thermophile species (the same species reappear in samples from other parts of the cultural layer; Svobodová-Svoboda 1988; Svobodová in press). The malaccozoological analysis, on the other hand, proves definitely cold Columella fauna. We expect, therefore, that the cultural layer developed during a longer time-span, in the period of changing climatic oscillations in transition from the Würmian Interpleniglacial to the Upper Pleniglacial, and at the limit of various altitudinal zones. This climatical instability, or contact of various environments, is important for understanding the Upper Paleolithic adaptations during human occupation of the site.

The upper cycle (layers 5-1). In the loess overlying the cultural layer we observe the impact of shorter, moist and dry oscillations, reflected in weak pseudogley formations, recalcification and contribution of material. Especially two pseudogley horizons, both in the initial stage of development (layers 4, 2), are macroscopically well visible and stratigraphically comparable to a soil found in similar position at Milovice (Smolíková in press). These horizons correspond to raw soils of fully glacial intervals. The pollen spectrum suggests vegetation cover of cold and dry steppic character, with higher share of arboreal pollen in the lower pseudogley horizon. The molluscs are dominated by Pupilla fauna of the cold steppes, poor in species. This phase corresponds to the beginning of the Upper Würmian Pleniglacial.

The studied section illustrates gradual cooling of the climate in the time-span of Würmian Interpleniglacial and beginning Upper Pleniglacial. This trend is clearly visible, even if the various disciplines, especially palynology, were confronted with problems of repeated redeposition of earlier

sediments. It shows that the climate after Denekamp did not evolve continuously, but in a number of oscillations, and this process was interrupted by hiatuses. The consequences are disappearence of the large mammoth-bone deposits and retreat of the Pavlovian settlement, not only from the Dolní Věstonice area, but from Moravia in general.

CHRONOLOGICAL POSITION OF THE PAVLOVIAN

Sites of South Moravia are of key importance for understanding stratigraphy of the Pavlovian. Earliest are the lower parts of both stations DV I and DV II, where the cultural layer appears in direct contact over the underlying soils. Measurements from Dolní Věstonice and Stránská skála date these soils between 33 000 - 28 000 B.P. (Denekamp). The Pavlovian cultural layers in the above deposits, i.e. in soil sediments at the base of the upper loess cover, date until about 22 000 B.P.

In summer 1990 we opened a series of trenches along the site DV I. Two layers of charcoal deposits in the lower part of the site (trench 1/90) yielded earlier data:

29 300 $\pm^{750}_{690}$ B.P. (the lower layer, GrN 18187)

27 250 $\pm^{590}_{550}$ B.P. (the upper layer, GrN 18188).

Cultural layer in the upper part of the site (trench 10/90) is more recent:

25 950 $\pm^{630}_{580}$ B.P. (GrN 18 189).

Position of Pavlovian at Pavlov (27 000 - 25 000 B.P.) and Předmostí (26 870 ± 250 B.P.) is chronologically comparable to the mean datings of DV I and II, while at Stránská skála IIa we still found late Aurignacian in the corresponding stratigraphic level. The Gravettian settlement at Milovice seems to be slightly more recent (25 500 - 22 000 B.P.). Generally, the Pavlovian may be placed into longer time-span between 29 000 - 22 000 B.P.

Earlier phasis of the Moravian Pavlovian is contemporary with several Gravettian sites in the Carpathian Basin: Nemšová (28 570 ± 1 345 B.P.), Slaninova Cave (27 950 ± 270 B.P.) and Bodrogkeresztur - Henye (about 28 000 B.P.). In this eastern region, the Lower Gravettian horizons still may appear in chernozem soil (the Mende soil). In south Poland and in Austria, the sites of Spadzista C2-layer IV and the Willendorf sequence, beginning with layer 5, fall in this same period.

Later phase of the Gravettian saw rapid development of settlement in Austria and West Slovakia. Layer 9 at Willendorf II may be placed around 20 000 B.P. The cultural horizon at Nitra-Čermáň is dated to 22 860 ± 400 B.P. and the stratigraphic sequence at Trenčianské Bohuslavice falls around 23 700 B.P. (Bárta 1987). The data of East Slovakian Gravettian are even later (Cejkov: 19 600 ± 360 B.P. and 19 755 ± 240 B.P.).

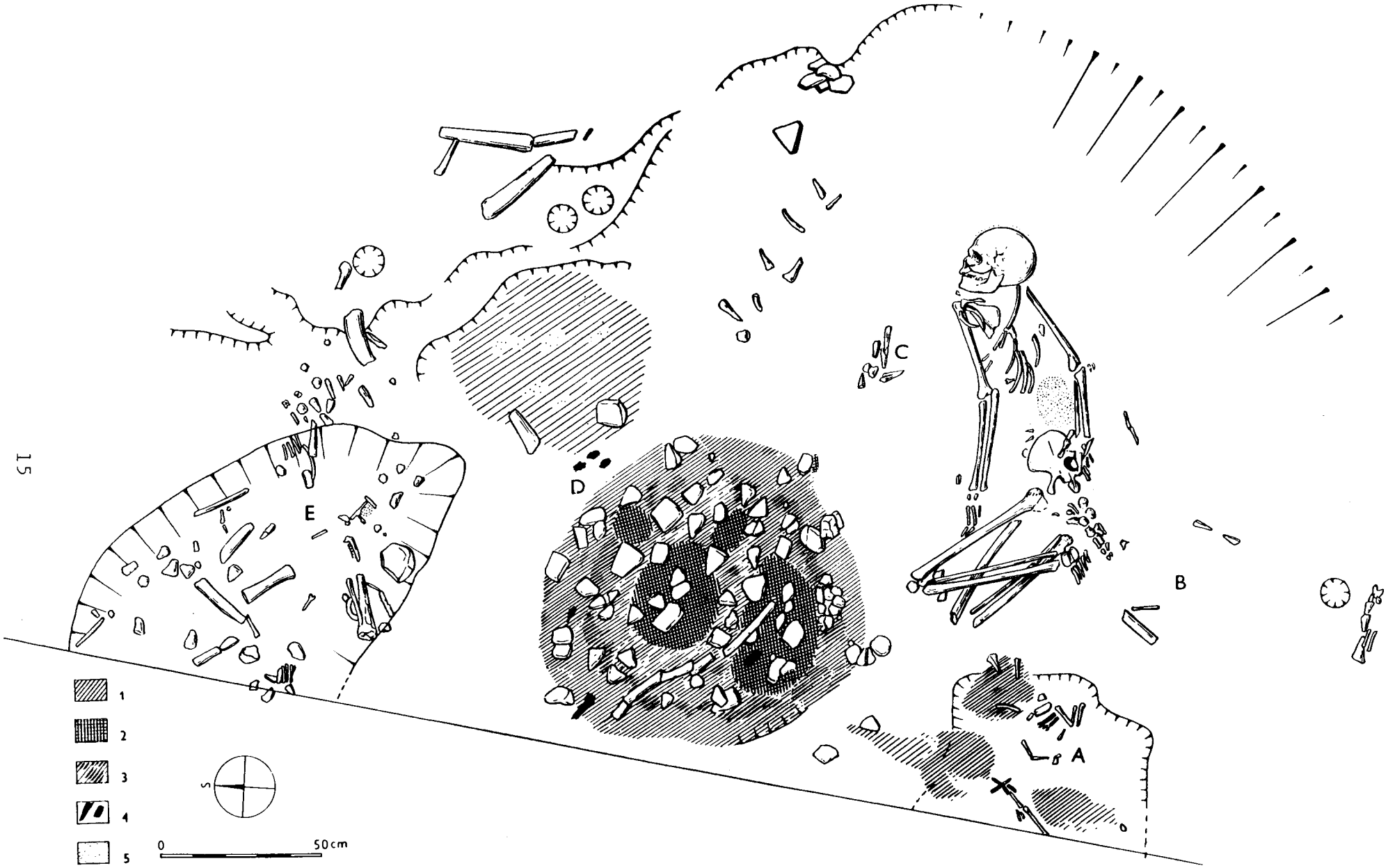


Fig. 6. 1st settlement unit, plan. 1: charcoal deposit, 2: red-burnt loess, 3: charcoal concentration, 4: wood, 5: ochre.

Fig. 7 (above). 1st settlement unit, upper part of the skeleton DV XVI. - Fig. 8 (below). Central hearth (D).

Further Epigravettian evolution may be followed at the neighbouring Hungarian sites. In Austria and Moravia around 18 000 B.P., both larger camps (Grubgraben) and temporary hunting sites (Stránská skála IV) appear sporadically.

THE FIRST SETTLEMENT UNIT (SQUARES A/18-22)

Preliminary description of the 1st settlement unit was published in context of the male burial DV XVI in its southern part (Svoboda 1989, 237-239, Fig. 2). During mechanical loess removal at the western slope it first appeared as large dark lens in the etage wall. Subsequent salvage excavation revealed a depression with maximal estimated length of 4,5 m and depth of 35 cm (Fig. 6). Filling of this depression may be divided in two levels, the lower one with no visible traces of movement, and the removed upper one, penetrating into the overlying loess. Margins are distinct at the NE side, bordering with the 2nd settlement unit, but gradual at the SE side. The western margins were destroyed. This unit includes central hearth, male burial, two depressions and other features.

The hearth. Hearth D is located in central part of the depression (Fig. 8). The shape is circular, with diameter of about 1 m. Base is bowl-shaped and shallow. The hearth layer is 35 cm thick and it is formed by alternating layers of charcoal and red-burned loess, with numerous limestone blocs (up to 15 cm). Across the hearth lied a large animal rib. Sediment of the hearth included 2 pointed backed microblades and 123 other artifacts, partly burnt in fire. Charcoal samples were dated at Groningen and Illinois with the following results:

GrN	15 277	25 740 ± 210 B.P.
ISGS	1 744	26 390 ± 270 B.P.

Burial. Male skeleton was placed in southern part of the depression, in crouched position on the right side, so that the knees were only placed 25 cm from the hearth and at the same level. Since the body lied horizontally, its trunk and head were sunk into pure loess in the sloping SE margin of the depression (Fig. 7). Lithic industry (123 pieces) and other objects found in immediate vicinity of the skeleton have already been published (Svoboda 1989a). Charcoal sample from this space has been dated in Groningen:

GrN 15 276 25 570 ± 280 B.P.

With respect to the deviation, the contemporaneity of the burial area and the hearth seems to be proved.

Depression A. Western part of this depression is destroyed and the preserved part (60 cm x 45 cm) is relatively shallow (5 - 10 cm). It contained charcoal, bones of smaller animals, two Dentalia shells inserted in each other and coloured by red ochre, and a small pellet of fired clay. Lithic industry is composed by 7 microliths (1 backed point, 1 microsaw, 5 microblades) and 241 other artifacts.

Depression E is the largest intentionally hollowed pit at DV II. It was cut at the western margin as well, but the original

shape may be reconstructed as an oval 90 cm wide, more than 1,20 m long and 40 - 50 cm deep. It contained bones of larger and smaller animals, limestone fragments, ochre, a polished bone spatula (Fig. 25:1), small pierced tooth (Fig. 24:3) and 6 Dentalia shells. The same pit yielded 6 pieces of fired clay: 5 small, 8-10 cm long pellets and a shaped and pierced fragment (Fig. 25:3). The lithic industry assemblage is very rich: 5 flint cores, 7 backed microblades (Fig. 9:14), 1 burin waste, 2 pointed blades (Fig. 9:16, 34), a partially retouched crest blade and 475 other artifacts.

Other features. Cleaning the bottom of the depression revealed circular fired area (F), 60-70 cm in diameter, located to NE of hearth D. Furthermore, a grinding plate with traces of ochre was found in easter part (Fig. 21:3) and two clusters of lithics and bones (B, C) in other parts of the depression. Cluster B is composed of a backed microblade, a microblade, a massive irregular blade and a Dentalium fragment. Cluster C included a crest blade, edge blade and a Dentalium shell.

Lithic industry. Compared to other parts of the excavated area the total number of artifacts (2087) increased in result of systematic floating, especially of all material from depressions and from other features. The floated material brought numerous small chips and some microblades. Even without regard to the floated material, however, we would still conclude that density of artifacts within the 1st settlement unit is higher than elsewhere (Fig. 3).

Most of the artifacts are made of different varieties of flint, only 2,5 % are of red radiolarite and 6,4 % of green radiolarite. Green radiolarite was concentrated in square A-19 and it is not excluded that this area coincides with the neighbouring 2nd settlement unit, where green radiolarite use was frequent.

Assemblage of the 1st settlement unit included 13 cores, mostly of flint, and only 2 pieces are of red radiolarite. A large piece of initially worked radiolarite material and 2 pre-cores (with lateral crests, with upright preparation) appeared as well. There were 2 cores of the Upper Paleolithic type, with prepared dorsal crest and with basal crest; one core is of the unipolar prismatic type. Three cores underwent changes of orientation and one core the rejuvenation of flaking platform. The core asemblage is completed by 2 residuals and 1 fragment.

The share of cortical flakes and blades (1 series) is low (2 %). The non-cortical flakes and blades dominate markedly and especially the microblades and blades reach maximal values (Ilam = 74.2 %). Some of the blades are pointed (Fig. 9:16, 34, 36), while the partially retouched blades are rare (Fig. 9:35). Different types of preparation and rejuvenation flakes and blades are numerous.

The share of tools (related to non-retouched artifacts excluding fragments and chips) reaches 11,3 %. All, with the

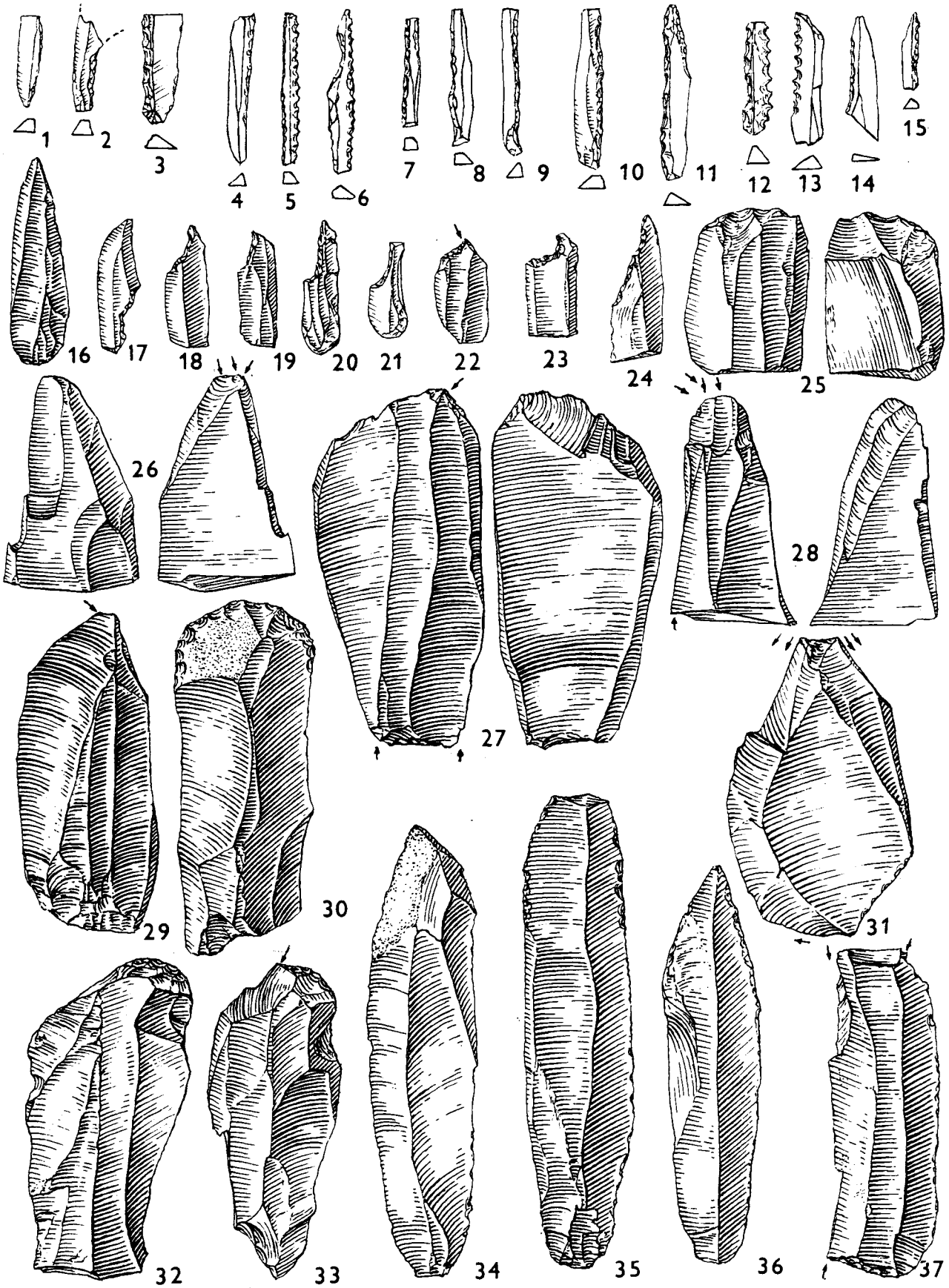


Fig. 9. 1st settlement unit, selected artefacts.

exception of 2 radiolarite backed microblades, are made of flint. Endscrapers, both typical and atypical, are mostly on blades (Fig. 9:30, 32). Of special interest is the combination of massive endscraper with burin blow at the head, opposite to oblique concave retouche (Fig. 9:33). Two burins are dihedral (Fig. 9:26, 31), both central and lateral, and further three burins are on non-retouched edge (Fig. 9:29). Relatively frequent are burins on concave truncations (Svoboda 1989a, Fig. 3:11), including a microburin (Fig. 9:22). The combinations of burins include the dihedral/truncated type (Fig. 9:27), dihedral/ broken edge type (Fig. 9:28), truncated/broken edge type (Fig. 9:37) and further two combinations of dihedral burins.

Microlithic tools are very frequent, especially the backed microblades (Fig. 9:1, 3-4, 7-11, 14-15), sometimes pointed, and microsaws (Fig. 9:5-6, 12-13). Morphologically important is a microlithic shouldered point (Fig. 9:17), accompanied by blades with basal (Fig. 6:2) and terminal notches (Fig. 9:19-21) and fine borers (Fig. 9:18, 23-24). The tool assemblage is completed by a splittered piece (Fig. 9:25).

Other objects. The bone industry includes, besides the spatula mentioned from pit E, a bone awl (Fig. 24:4). Altogether 12 Dentalia shells were found, two of them with intensively worn surfaces. Among the decorative objects there were 5 pierced animal teeth, 4 of them attached to the male skeleton (Fig. 24:3; Svoboda 1989a, Fig. 3:3-6). 18 pieces of ochre were dispersed in the area, and ochreous powder covered the head and pelvis of the male skeleton. Four fragments of stone plates were found, one of which, found near the skeleton (square Aa-20) and still covered by red ochre, certainly served as grinding stone (Fig. 21:3). The 1st settlement unit is unique at the western slope for the only finds of fired clay pieces.

THE SECOND SETTLEMENT UNIT (SQUARES AaD/16-19)

The space of the 2nd settlement unit has been delimited by a square of 4 x 4 m (Fig. 11) with central hearth and sorrounding concentration of lithic industries. The real outlines - with exception of the part cut by the neighbouring 1st settlement unit - are invisible. The space is crossed by an oblique fissure filled with fine white sediment.

The hearth. The hearth is of iregular shape, measuring about 2,5 x 1 m (Fig. 10). It is formed by continuous, 5-15 cm thick layer of charcoal, burnt loess and thin sandy microlayers, placed on flat surface of the loess. Few larger bones lied inside. Lithic industry was scarce and only a small part was burnt in fire. Charcoals from the hearth were dated in Groningen and Prague with the following results:

GrN	15 279	26 920 ± 250 B.P.
CU	748	22 570 ± 766 B.P.

The depressions. At the lower end of the hearth lied two bowl-shaped depressions. The first one (square Aa-18) was adjacent to the hearth; it is of circular shape with diameter

Fig. 10. 2nd settlement unit, view of the central hearth.

about 80 cm and depth about 30 cm. It contained few larger bone fragments, Dentalia shells and lithic industry with selected blades of flint and radiolarite (Fig. 12:18). Furthermore, the lithic included a burin on large truncated flake, an endscraper (Fig. 12:14), two backed microblades, two pointed blades, a large flake and 161 other artifacts, scarcely burnt in fire.

The left depression (squares Aa/16-17) is of about the same size, but of irregular shape, and located further from the hearth. It contained one larger limestone bloc, animal bones and lithic industry (an atypical endscraper, truncated microblade, backed microblade, a core and 153 other artifacts). Some of them, again, are burnt in fire.

Charcoal deposit. Between the two depressions (square Aa--17) lied thin charcoal layer of irregular shape, containing

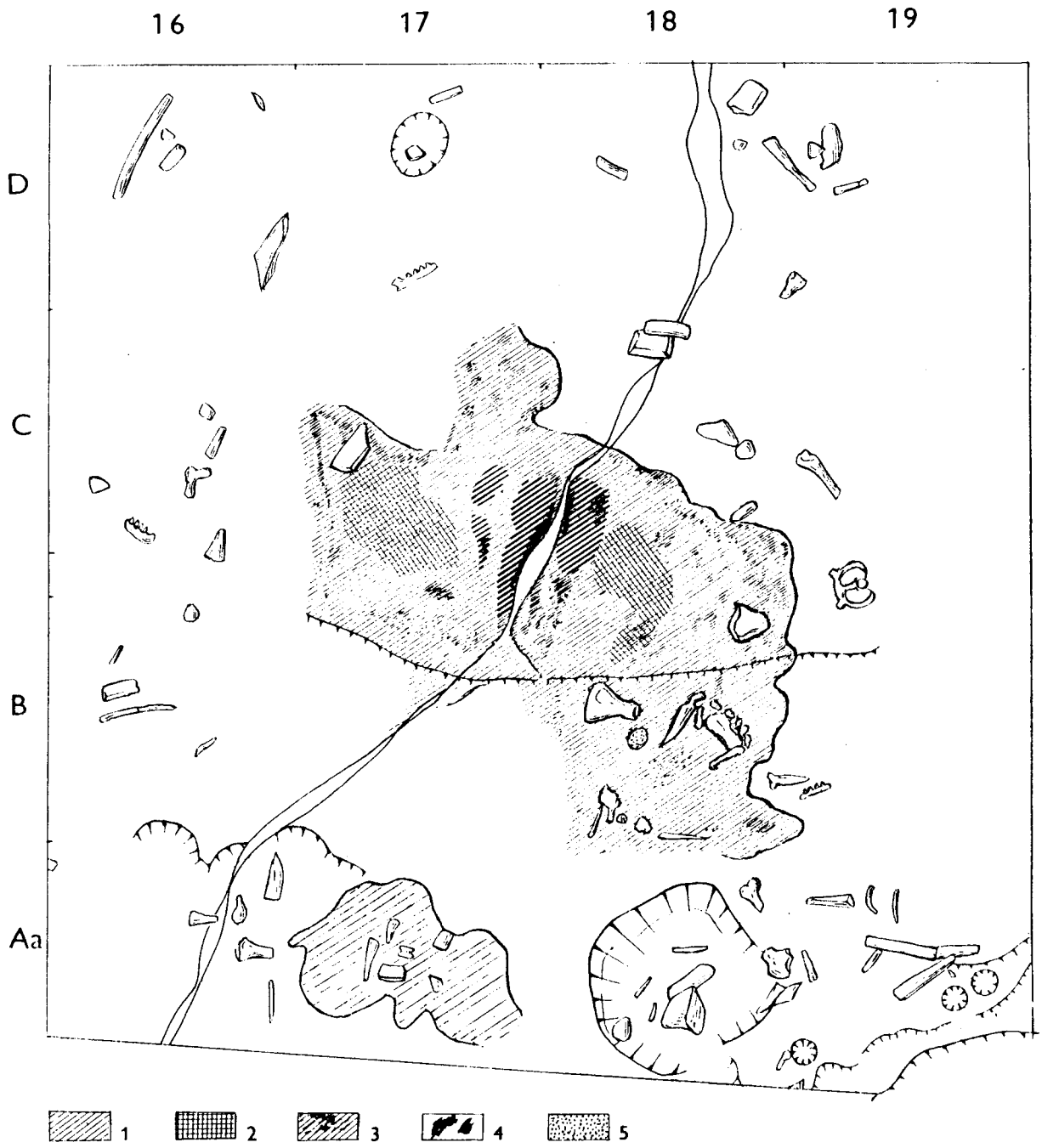


Fig. 11. 2nd settlement unit, plan. 1: charcoal deposit, 2: red-burnt loess, 3: charcoalconcentration, 4: wood, 5: ochre.

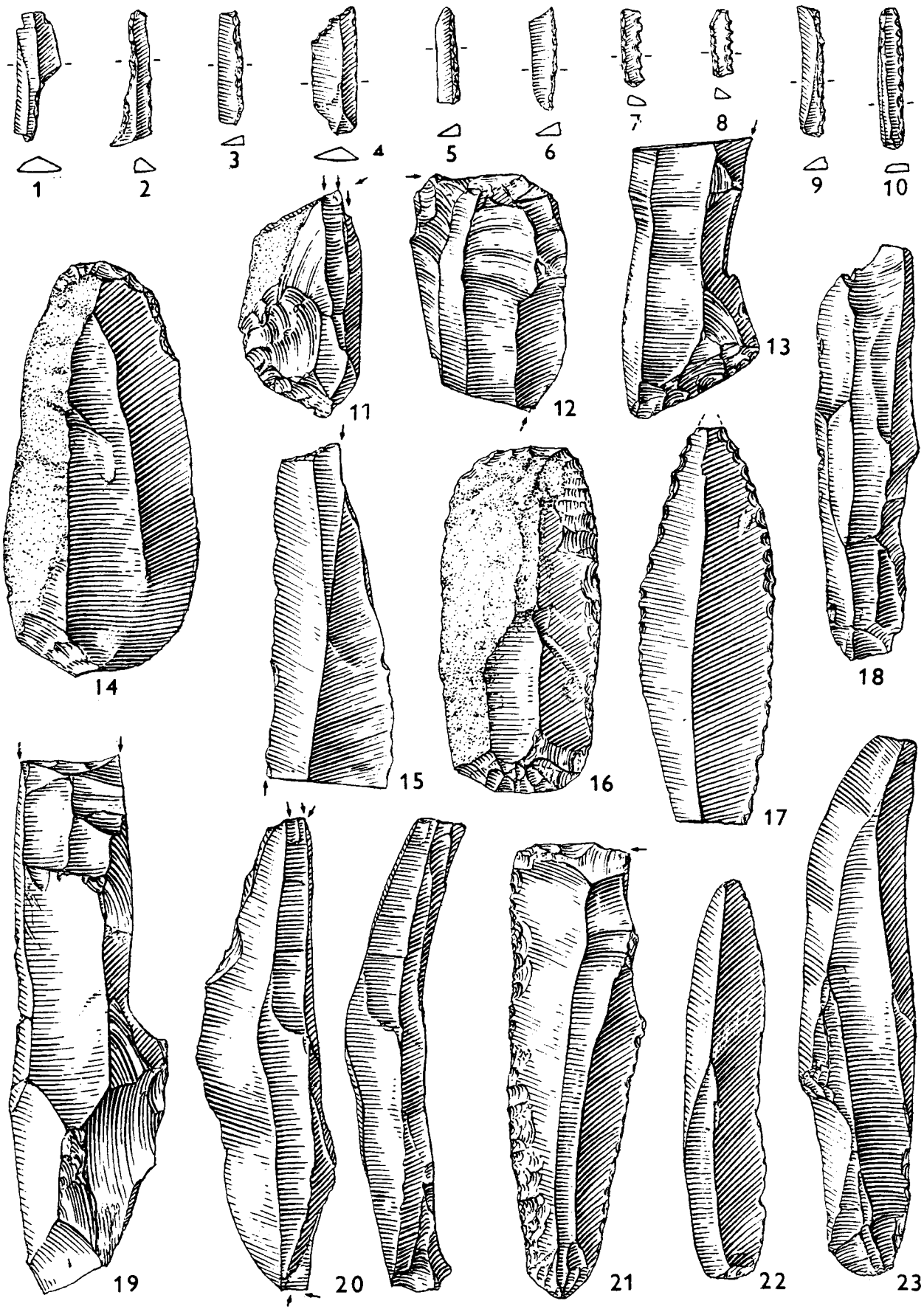


Fig. 12. 2nd settlement unit, selected artefacts.

some animal bones. This deposit accumulated most probably by ash clearing and removal downslope from the hearth.

Other objects. Several animal bones, larger bone fragments and three limestone blocks were found scattered around the hearth. In the upper area lied a shallow hole containing a smaller stone. These objects, however, formed no meaningfull pattern.

The lithic industry (2179 pieces) was distributed equally over the studied space (Fig. 3): the density is lower compared to the 1st unit, but higher compared to the sorrounding area. The share of red radiolarite (2,5 %) remains the same as in the 1st unit, but the share of green radiolarite increases markedly (14,7 %), especially within certain squares (C-16, C-17).

There were 12 cores, but only one of them made of radiolarite. Pre-cores are represented by a single piece with lateral crests. Upper Paleolithic core types, without dorsal preparation, prevail (4 pieces). Furthermore, there was a pyramidal core, a core with changed orientation and a core with rejuvenated flaking platform. The core assemblage is completed by 5 residuals (small prismatic shapes and flat shapes) and by a core fragment. Percentages of flakes and blades (Fig. 12:18, 22-23) are comparable to the 1st unit, but the share of microblades slightly dicreased.

Retouched tools make only 4,4 % of the artifacts (counted without fragments and chips). Within the total of 39 tools only 2 are made of red radiolarite and 2 of green radiolarite. The endscrapers are represented by 4 pieces (Fig. 12:14, 16). Three burins are on broken blades (Fig. 20:18) and four on concave truncations (Fig. 12:15, 19; Fig. 19:15). Outstanding are two transverse burins (Fig. 12:12, 21). Furthermore, there were dihedral burins (Fig. 12:11, 20), a massive combined burin, combination of burin on broken blade with truncation (Fig. 21:13) and two pieces of burin waste.

The most numerous, again, is the group of 11 backed microblades (Fig. 12:2-3, 5-6, 9-10), accompanied by 3 microsaws (Fig. 12:7-8). Further microliths are represented by 2 obliquely truncated microblades (Fig. 12:4; Fig. 20:17), and 2 microblades, with notches both at the basal end (Fig. 12:1) and distal end (Fig. 20:6). The assemblage is completed by a pointed retouched blade (Fig. 12:17), 2 notches and a small chissel.

Other finds. Bone industry is scarce: a handle cut of antler (Fig. 24:7), fragments of an ivory point (Fig. 24:8) and a bone awl (Fig. 24:13). Decorative objects are represented by 11 Dentalia shells and 3 Melanopsis shells (not pierced). Even if the ochre itself was rare (7 pieces), there were 4 fragments of sandstone plates, possibly for grinding.

THE THIRD SETTLEMENT UNIT (SQUARES CC/10-15)

This unit was limited by an oblong space, 6 m x 5 m, with

Fig. 13 (above). 3rd settlement unit, general view. - Fig. 14 (below). Detail of the depression with fox mandibles.

a large hearth in center sorrounded by system of depressions and holes (Figs. 13, 15).

The hearth is oval-shaped, extended along the slope, up to 3 m long and 2 m wide. The ashy deposit reached maximal thickness of 40 cm in the lower central part. In this area, its base filled an oblong pit of 130 cm x 80 cm, and several other irregularities of the surface. The pit contained ashy layer at the base, overlain by clay layer mixed with charcoal and red-burnt loess, and by two continuous ashy layers at the top (Fig. 15). In the higher (eastern) part of the hearth, a thin layer of charcoal and red-burnt loess was deposited on the flat surface and cut into steps by parallel dislocations. Smaller clusters of burnt limestone blocs were dispersed inside of the hearth; the largest piece reached 20 x 20 cm. Two mammoth ribs were placed on surface of the hearth near its northern margin. Most of the lithics found inside the hearth were burnt, and the burnt pieces reach higher percentage even in the vicinity. The charcoal, dated at Groningen, Prague and Illinois, yielded quite different results:

GrN	15 278	27 070 ± 300 B.P.
CU	747	24 513 ± 876 B.P.
ISGS	1 899	22 630 ± 420 B.P.

The depressions. Attached to the lower margin of the hearth (square D-12) lied a shallow bowl-shaped depression with 1 m in diameter. It contained 8 smaller stones and fragments of bones, including three fox jaws (Fig. 14). Lithic industry included 2 burins (Fig. 20:30), three short pointed blades, a core reutilised as splittered piece (Fig. 20:28) and 60 other artifacts. At the right border of the pit lied a piece of stone plate and a rib, and at the left border fragment of a pebble. The plate fits with another piece found at the other side of the hearth, and fragments of the same pebble were scattered around the hearth as well. These refittings, witnessing the unity of activities in this area, are indicated by the interrupted lines on Fig. 15.

Two irregular depressions with charcoal were located on both sides of the bowl-shaped depression, in the distance of 30 - 40 cm. The right one (square D-13) contained mainly a group of three vertebrae, and the left one (square D-11) yielded other animal bones and some ochre.

Charcoal deposit. A loave-shaped, thick ashy deposit lied near the left border of the central depression. It resulted probably from removal of ash from the hearth, similarly as in the 2nd unit, but it is more voluminous.

Holes. The lower half of the hearth is sorrounded, in the distance of 0,5 - 1,5 m, by an irregular semicircle of 6 kettle-shaped holes. The holes are about 20 - 40 cm wide and up to 40 cm deep. They contained smaller bones and few lithic artifacts, including some remarkable blades. M. Pawlikowski sampled the filling, the marginal zone and the subsoil of one of the holes for microscopic examination. He observed no thermal

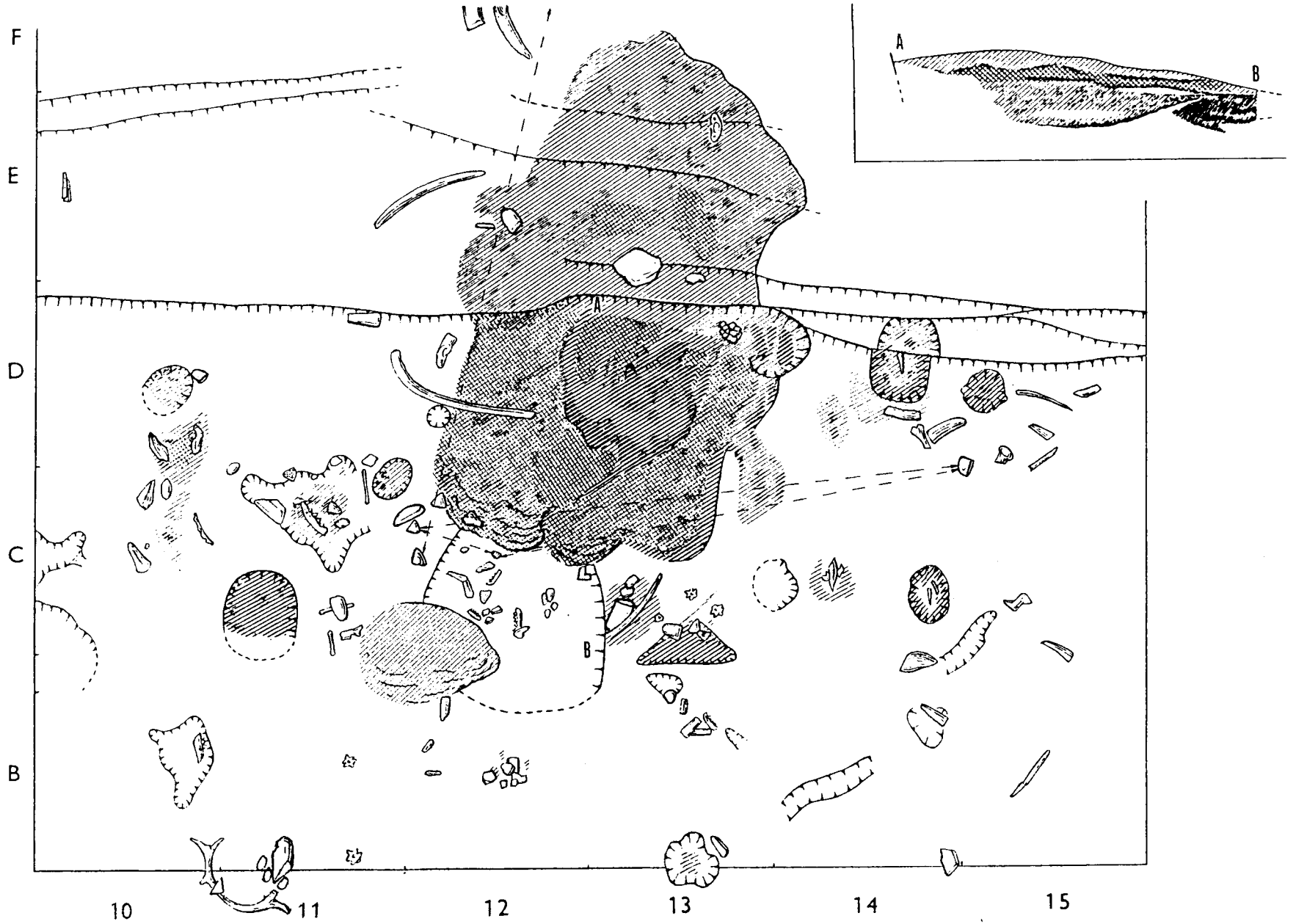


Fig. 15. 3rd settlement unit, plan and section of the central hearth (AB).

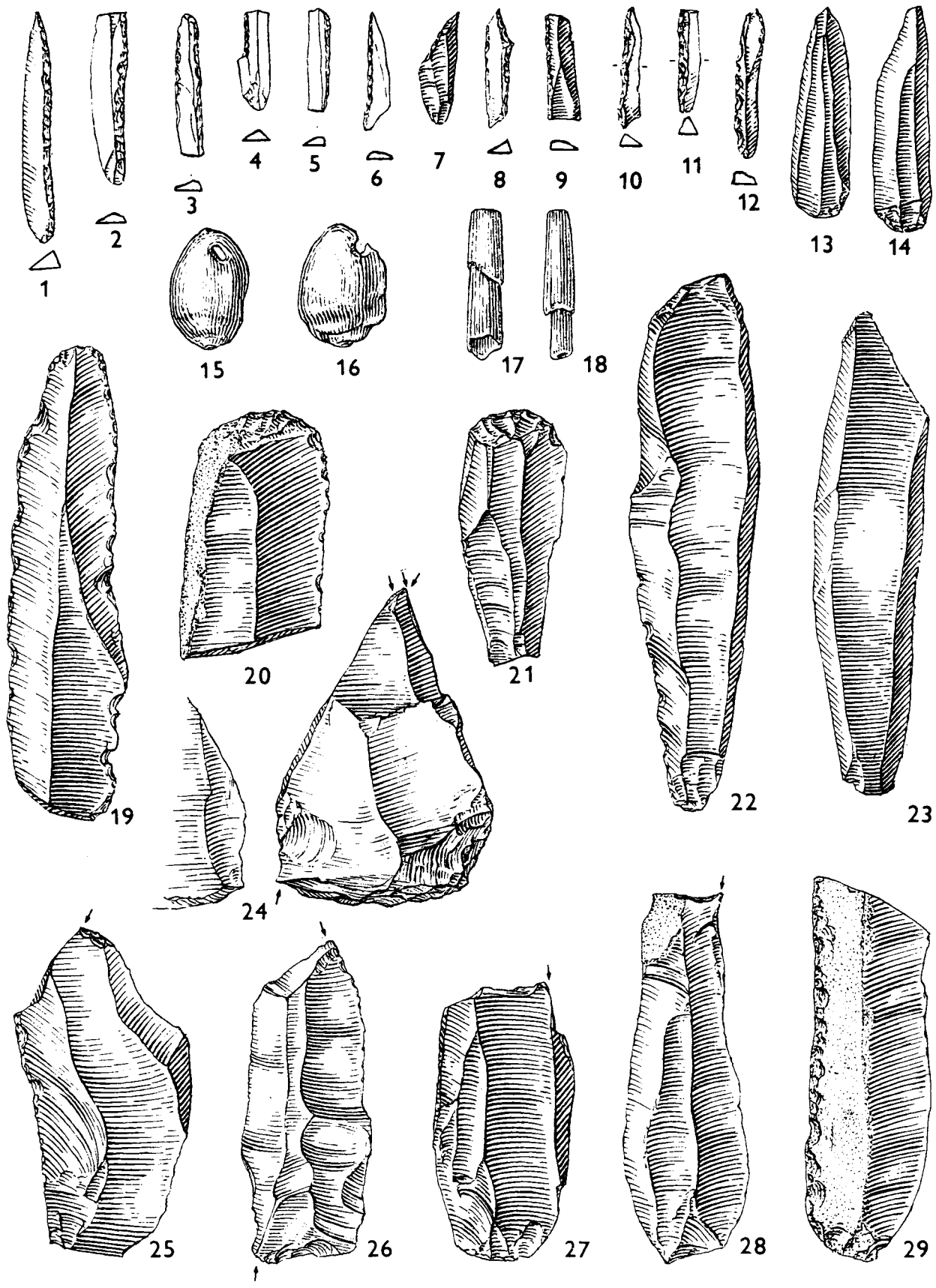


Fig. 16. 3rd settlement unit, selected artefacts.

changes in the subsoil and concluded that there has been no active fire inside the pits. The filling (charcoal, bone fragments, redeposited loess, burnt silices) is, after M. Pawlikowski, of allochtone origin.

The lithic industry (total of 2851 artifacts) was concentrated in the left (northern) part of the area of the unit mainly (Fig. 3). This cluster continues to the NW, outside the delimited area. We may expect intensive activities in this space, related to the shallow depressions at the hearth, and to possible entrance. It should be noted that in the NW direction opens the optimal view to the Dyje valley.

The silicites predominate totally. Compared to the 2nd unit, share of red radiolarite increased to 4,8 %, while share of green radiolarite reaches a mean value of 9,5 %. The both raw materials were distributed rather equally. The core assemblage is relatively numerous (25 pieces), but raw materials other than flint (red radiolarite) are solitary. There are three pre-cores (with lateral crests or with large parts of preserved natural surface). Among the cores under exploitation, the prismatical and cubical shapes, both uni- and bipolar (Fig. 17:6) are slightly more frequent compared to the other units (3 pieces). The most numerous (8 pieces) are nevertheless the Upper Paleolithic-type cores, mostly unipolar, without dorsal preparation (5 pieces), with dorsal crest (2 pieces) or basal crest (1 piece). The technological process is completed by 4 residuals of flat or small prismatic shapes, a flat core residual used as splittered piece (Fig. 18:28) and core fragments. Appearence of the various types of flakes and blades (Fig. 16:13, 14, 19, 22, 23; Fig. 18:11, 13) is identical with the 2nd unit.

The low share of retouched tools (4,9 %) may be compared with the 2nd unit as well. Out of 59 tools only 6 are of green radiolarite and 1 of red radiolarite, while the others are of various flints. Endscrapers are slightly more numerous than in the other units (3 blade types, Fig. 16:20-21, 1 unguiform) and some are combined with burins (3 pieces, Fig. 18:2, Fig. 19:9). The burin group is even larger and most of them are on broken blades (Fig. 16:27). Less frequent are burins on truncations, of convex (Fig. 16:25), straight, concave (Fig. 16:28) or double (Fig. 20:36) shapes. The dihedral burins are variable as well: symetrical (Fig. 20:30) and asymetrical, simple and double (Fig. 16:24). The burin group is completed by a combination of truncated/broken edge burin (Fig. 16:26), by two larger burins on a fragment and on a massive flake, mostly of dihedral type, and by 4 pieces of burin waste. Besides small points with straight back (Fig. 16:6), there was one larger La Gravette point (Fig. 16:1) and a small backed point with a gibbosity (Fig. 16:8). The group of backed implements is completed by 9 microblades (Fig. 16:2-3, 5, 9-12).

Larger blades are retouched unilaterally (2 pieces, Fig. 16:29) and bilaterally (1 piece). Truncations on blades are concave, convexe and oblique; an oblique retouche appears on

a microblade as well (fig. 16:7). Further 5 blades and 1 flake possess notches; a lateral notch, both at the basal and distal ends, was applied on microblades (Fig. 16:4). The tool assemblage is accompanied by a massive bec (Fig. 20:38) and by a splittered piece.

Other finds. The bone industry comprises fragments of an ivory point (Fig. 24:11) and of a bone awl. Compared to the other units the chipped mammoth bones become more frequent; two of them lied directly inside of the hearth. Some of these bone fragments are retouched (Fig. 25:4).

Alltogether 11 Dentalia shells were found, and in 2 cases two and two pieces have been inserted in each other (Fig. 16:17-18). These shells were distributed in the northern part mainly, similarly as the lithics. Three Melanopsis shells, all pierced (Fig. 16:15-16) were dispersed in the area, together with another Tertiary mollusc shell. The ochre was markedly numerous: besides a larger ochre plate there were 44 smaller pieces. Sandstone plates were frequent as well: 5 were sharp--edged fragments and 4 were oblong, with rounded edges, of a kind which is absent elsewhere. Some of them show traces of pounding along the edges (Fig. 21:3).

AREA OUTSIDE THE SETTLEMENT UNITS

Southern field. Southern end of the settled area is divided into steps by dislocations. An irregular depression with unclear margins lied on the lower step, near the 1st settlement unit (area of square Aa-23). It contained numerous bones of smaller animals and artifacts. Higher, in the area of square C-23, was found a small kettle-shaped hole with cummulation of bones and 2 limestone fragments around. Two large mammoth bones lied along the southern margin of the settled area and a carnivore skull at the eastern margins. This "centrifugal effect", i.e. location of larger objects in marginal parts of settlements, is repeatedly observed in certain Upper Paleolithic sites. At the same time, density of small lithic industry dicreases towards the margins, especially to the SE (Fig. 3).

Northern field. No remarkable features were observed in this area. At places (squares D-2, E-6) the charcoal and objects were cummulated; bones and stones were scattered; at the northern margin, again, some larger mammoth bones and heavier artifacts appeared, such as a siltstone core or a pebble with traces of utilization (Fig. 21:1). The density of lithics decreases in the direction to N (Fig. 2, Fig. 3).

Western field. A zone 3,6 m wide at the western margin of the etage, separated by disturbance 10,5 m wide, was investigated. Several depressions with charcoal seem to be due rather to irregularity of the original surface than to artifical features. Their outlines were not clear (cf. squares Y-18, Z-17). Animal bones lied scattered around the square Z-14, while lithics were most numerous in the zone of squares X-18 to X-21. Thus, no coincidence between the terrain features

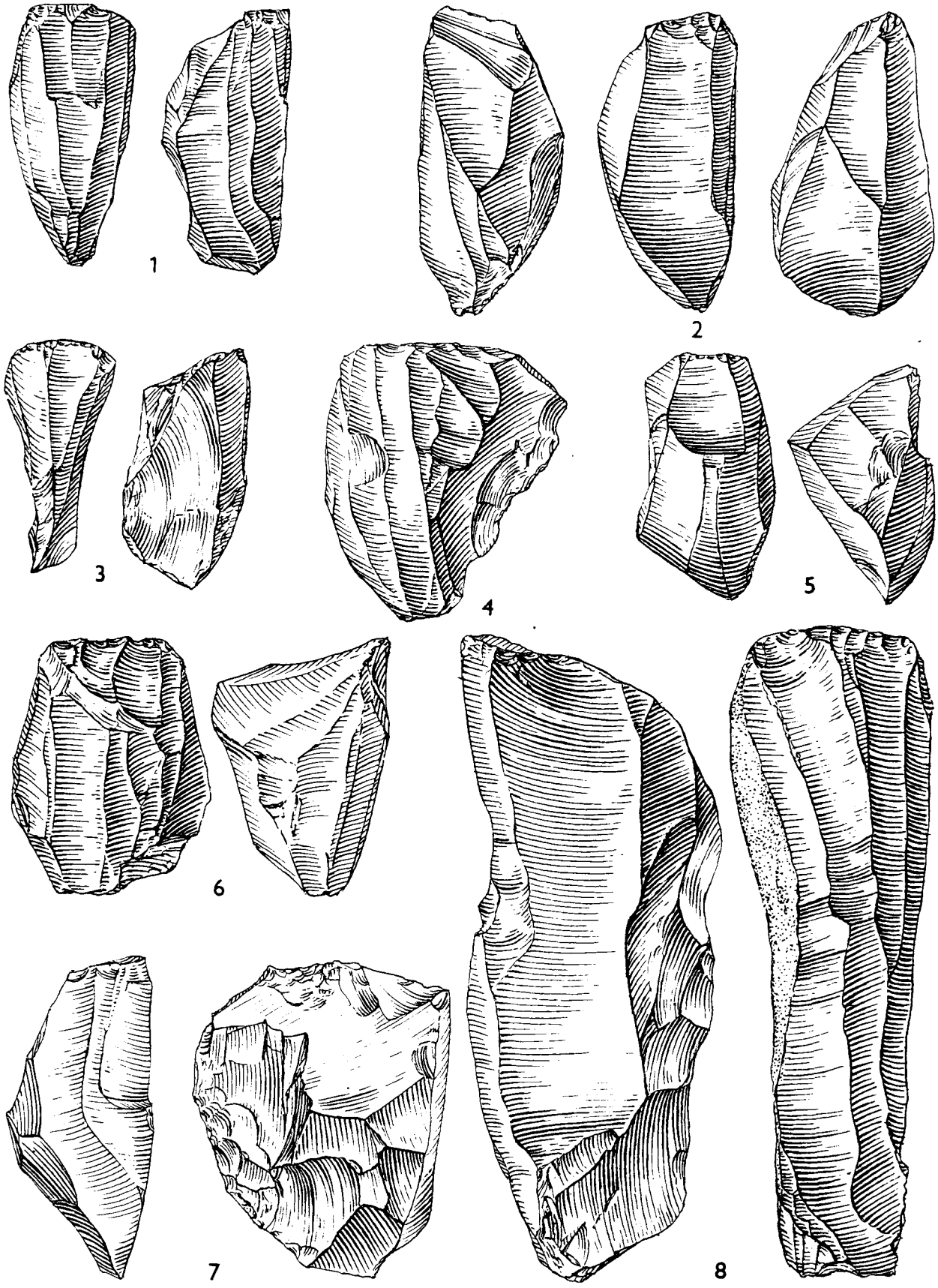


Fig. 17. Cores. Area outside the settlement units.

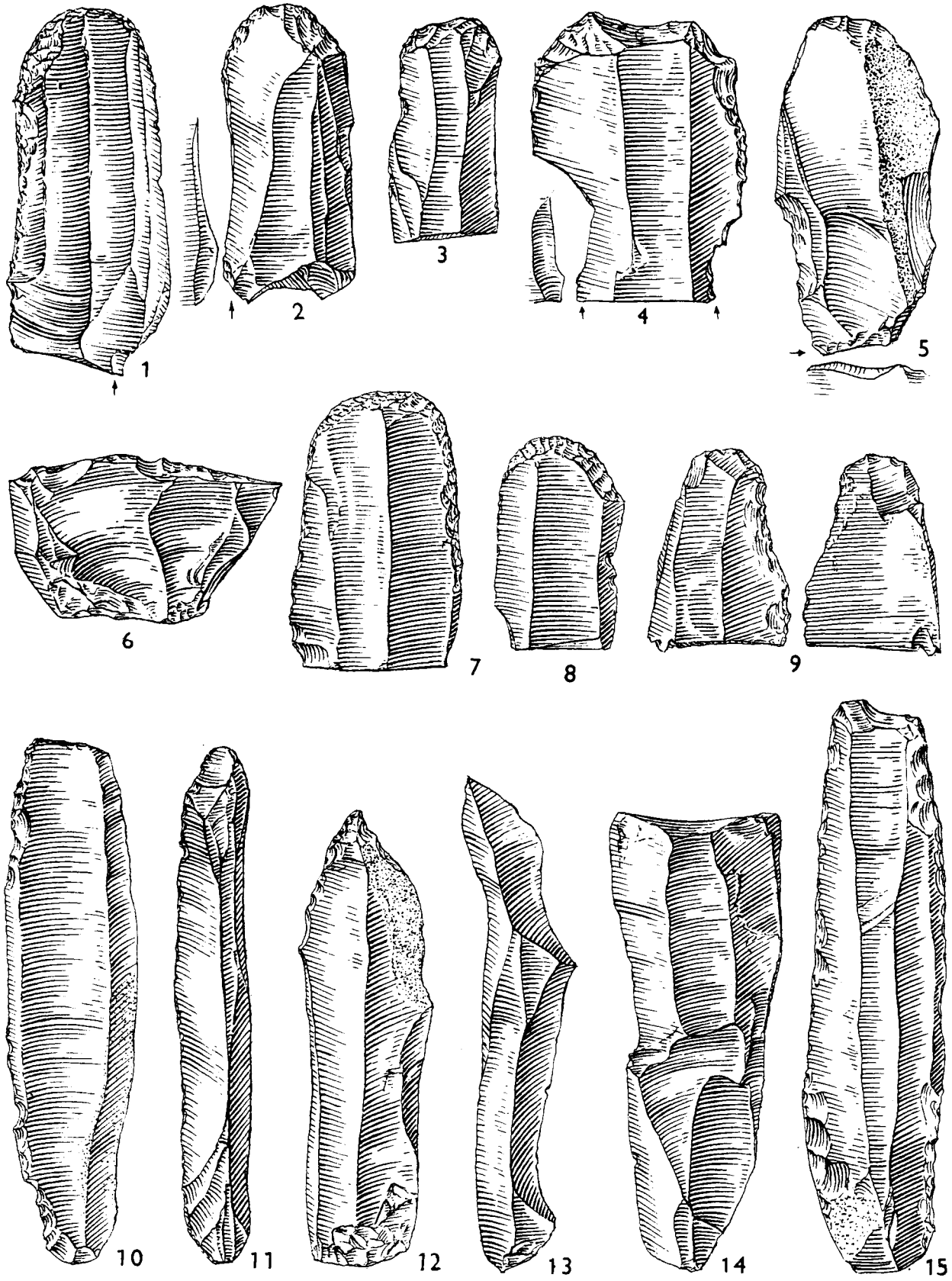


Fig. 18. End-scrapers, blades and other tools. 2, 11, 13: 3rd unit; others from free area.

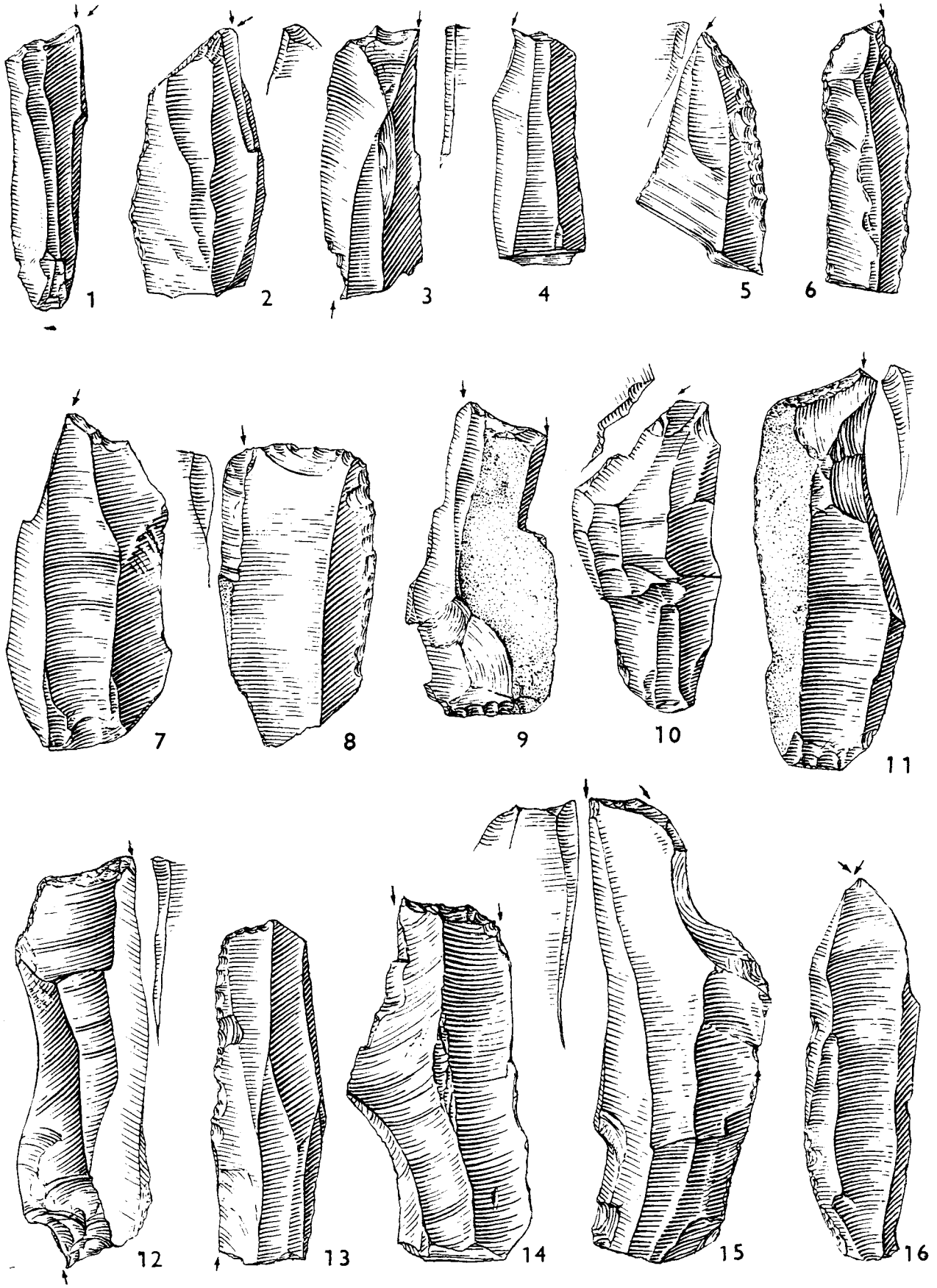


Fig. 19. Burins. 3: 3rd unit; 15: 2nd unit; others from free area.

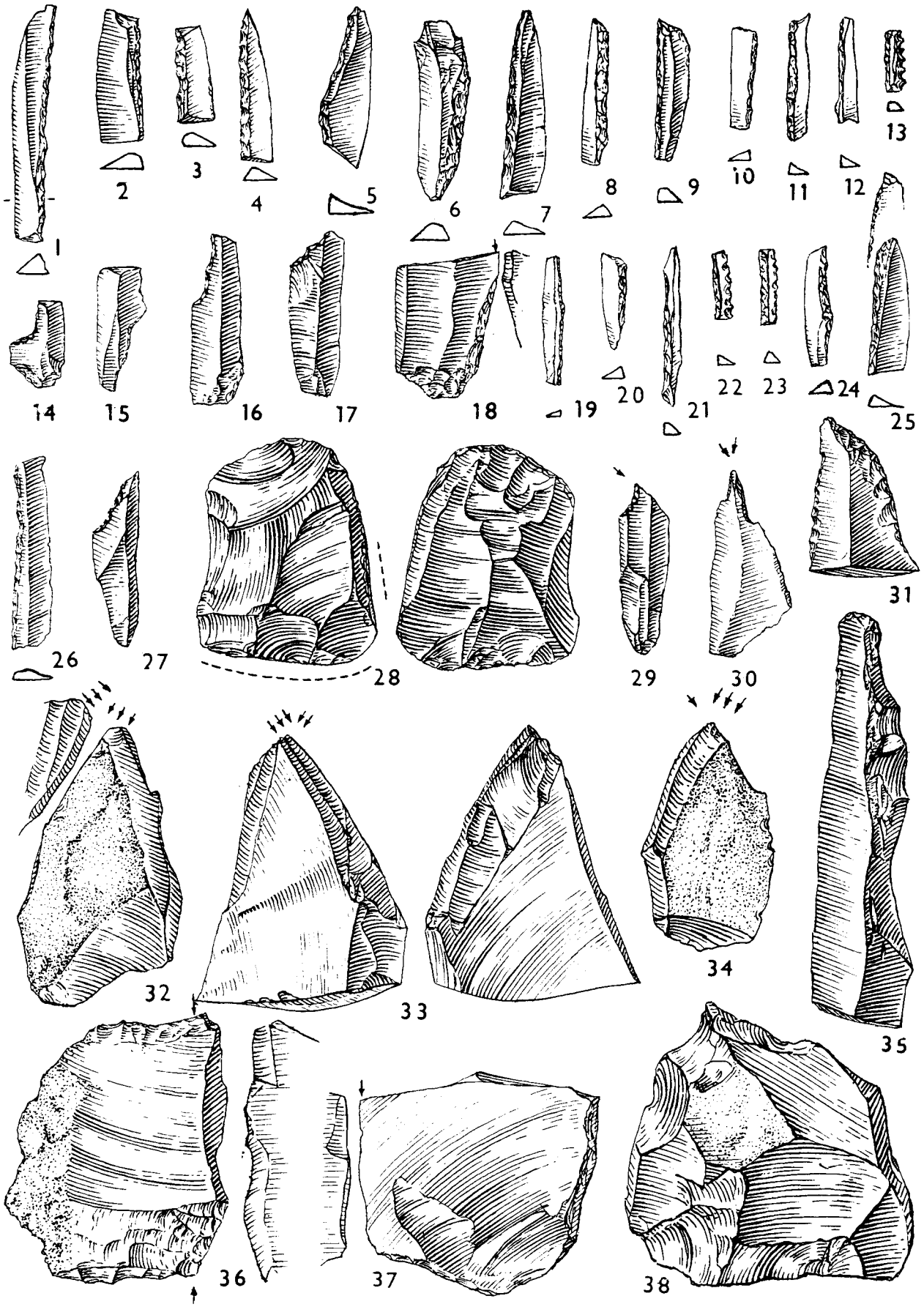


Fig. 20. Microliths and various tools. 16-18: 2nd unit; 28, 30, 36, 38: 3rd unit; others from free area.

and concentration of objects is observed. All finds disappear in the directions to N and S.

Lithic industry. Out of the total of 59 cores, 5 are made of red and 7 of green radiolarite; the large siltstone core has already been mentioned. With the exception of one pre-core, most of the cores are in the exploitation process, and usually of the Upper Paleolithic type (with dorsal crest - 11 pieces, Fig. 17:3-4, 7-8, or without dorsal preparation - 3 pieces, Fig. 17:2). Prismatic (10 pieces), cubical (2 pieces) and pyramidal cores (3 pieces - Fig. 17:1) occure as well. With exception of the largest core (Fig. 17:8), all are of standard dimensions. Bipolar cores dominate over the unipolar ones. Changes of orientation are frequently visible, expecially on cubical cores, where the new direction is usually perpendicular to the original one. Some cores get shortened by platform rejuvenation. Core residuals are both of flat and small prismatic shapes (Fig. 17:5).

Among the 165 retouched tools, 5 are of red radiolarite and 15 of green radiolarite. Endscrapers are mostly on blades (8 pieces, Fig. 18:3, 7-8), or broken endscraper heads only, atypical endscrapers (4 pieces) and 1 nosed microendscraper (Fig. 20:35). Combinations of endscrapers are with burins on broken blades or with a transverse burin (4 pieces, Fig. 18:1, 4-5).

The burins are the most frequent group (56 pieces), mostly on broken blades (26 pieces, Fig. 19:4, 6, 10, 13; Fig. 20:37). Dihedral burins (9 pieces) are rather symetrical (Fig. 19:16) than asymetrical (Fig. 19:1-2) and frequently rounded in section by parallel blows (Fig. 20:32-34). There are 11 burins on truncations of concave (Fig. 19:7, Fig. 18:29), straight (Fig. 19:11) and convexe (Fig. 19:5) shapes, and some of them are double (Fig. 19:4). Other burins are transverse, flat (Fig. 19:8), core burins on larger fragments and combinations of burins (e.g. - burin on truncation/burin on broken blade, Fig. 19:3, 12).

The backed implements (45 pieces) are usually microlithic. Again, most frequent are the backed microblades (27 pieces, Fig. 20:1-3, 6-8, 10-12, 19-21, 26), sometimes pointed (9 pieces). Microsaws are scarcer (Fig. 20:13, 22-23), and a La Gravette point (Fig. 20:4), a small point with a gibbosity (Fig. 20:24) and a ventral retouche applied on microblade (Fig. 20:25) are solitary. Among the other microliths we should note a small shouldered point, accompanied by blades with terminal (Fig. 20:14, 27) and basal (Fig. 20:15) notches. A single blade with oblique truncation (Fig. 20:9) completes this group.

Further repeatedly occurring tools are blades retouched unilateraly and bilateraly, some of them pointed symetrically (Fig. 18:12) and asymetrically (Fig. 20:31). Truncated blades are concave, oblique and straight (Fig. 18:10, 15). The last group form the notches; all other types (denticulate, becs, chissels - Fig. 18:9) are rather solitary.

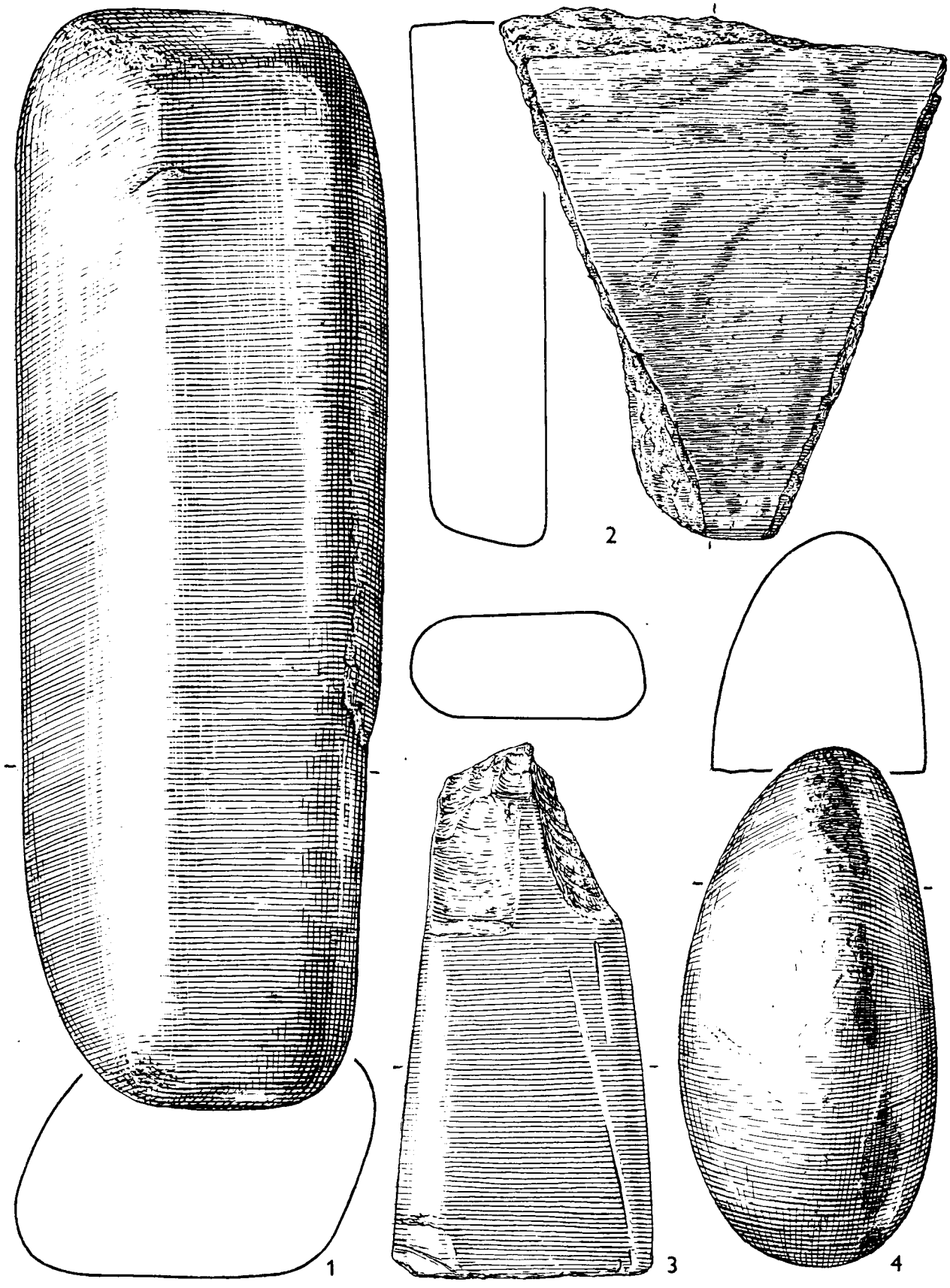


Fig. 21. Pebble tools and plates. 3: 1st unit; 4: 3rd unit; others from free area.

Other finds. The bone industry comprises three awls (Fig. 24:1-2, 6), fragment of a decorated ivory point (Fig. 24:12) and a polished spatula (Fig. 25:2). Chipped mammoth bones were scattered throughout the area, especially in its northern part (Fig. 22). Dentalia shells (21 pieces) and Melanopsis shells, rather non-pierced (8 pieces) than pierced (5 pieces) occurred, accompanied by two carnivore canines with traces of piercing. Among the special finds range an oblong and partly rounded sandstone plate and a longitudinal quartz pebble with traces of use on the edges (Fig. 21:1).

THE LITHIC INDUSTRY: GENERAL CHARACTERISTIC

Distribution. Spatial distribution of lithic industry corresponds roughly to the terrain features: the southern cluster coincides with the 1st and 2nd settlement units, and the northern cluster with the 3rd settlement unit (Fig. 3). Highest density of artifacts occurs within the 1st unit, but it rapidly decreases in direction to the S (behind the back of the skeleton). Neither in the 3rd unit is the coincidence accurate: the artifact cluster lies slightly more to the N, compared to the terrain features. Smaller isolated clusters were detected in squares Aa-B/23 (a solitary depression), G/8-10, X/20-21, etc. Some of the larger stone artifact appear in marginal areas, similary as large bones.

Distribution of the retouched tools reveals the same pattern as distribution of lithic industry in general. Therefore we excluded the graphic presentation from this report.

Raw materials. About 80-90 % of artifacts is made of various silicites from the glacial sediments of North Moravia and Silesia, from outcrops of the Kraków - Częstochowa Jurassic and possibly even from the Volhynia plateau. A detailed study of this group of raw materials, including definition of the various types of flints and determination of their origin, is still under preparation. With the present knowledge we may conclude that most of these materials come from the distance of several hundred km to the NE. The rest of the material form radiolarites, most probably from the White Carpathians. They are rather green than red (on certain pieces the two colours are passing to each other, so that one original outcrop for both sorts may be supposed). Percentages of these materials are rather standard, with the exception of the higher share of green radiolarite in the 2nd settlement unit. Other kinds of raw materials are very scarce.

The production dynamics. From the technological viewpoint, Dolní Věstonice II are to be classified as a secondary workshop site, where raw materials have been imported and thus intensively transformed. The first consequence of this is the low share of preserved pre-cores (6,3 % in assemblage of 111 cores), relatively small pieces, mostly in dimensions of usual exploited cores. Larger pieces have evidently been exhausted. Most of the pre-cores are found inside the settlement units.

Tab. 2. Survey of cores

	1.unit	2.unit	3.unit	free area
Initially worked material	1	0	0	1
Pre-cores	2	1	3	1
Exploited cores (total)	4	6	17	32
Upper Pal. cores	0	4	5	3
Upper Pal. cores with dorsal crest	1	0	2	11
Upper Pal. cores with basal crest	1	0	1	0
prismatic	1	0	2	10
cubical	0	0	1	2
pyramidal	0	1	0	3
fragments	1	1	6	3
change of core orientation	3	1	0	5
core rejuvenation	1	1	0	8
residuals	2	5	5	12
large core (siltstone)	0	0	0	1
Cores (total)	13	14	25	60

The cores under exploitation reach 43 %. Even this percentage is low, compared to the 17,1 % of re-worked cores (with change of orientation or platform rejuvenation) and to the core residuals making the remaining 21,6 %. These numbers illustrate the stress upon maximal use of the material by means of core reworking.

Similar effect of dynamic is reflected in flakes. The fully cortical flakes and blades (1. series), originating from the preparatory stages of production, reach only 2-3,4 %. Non-cortical or partly cortical flakes and blades (2. series), expecially the small blades and microblades, dominate markedly. Flakes of 2nd series are mostly from preparation, but only a small part possess distinctive characters (crest flakes, edge flakes). The rejuvenation flakes, both from flaking platforms and exploitation platforms, reach 3,4 - 5,2 %.

With the exception of the 1st settlement unit, the share of retouched tools is low (11,3 %; 4,4 %; 4,9 %). This observation and further arguments derived from the use wear analysis are discussed by S. Tomášková.

For comparison we may use data on production dynamic at primary workshops near raw material outcrops, gained by the same method (Svoboda 1987c). In Stránská skála exploitation area the share of initially worked material pieces (almost absent at DV II) reaches 3 - 17 % of the core assemblage; pre-cores increase to 17 - 22 %; exploited cores and reworked cores make 54 - 71 %; and the share of core residual decreases to 12 - 21 %. Flakes and blades of the 1 series make 5 - 18 %. The stress upon preparatory stages of production is clearly visible.

Technological characteristic. Technology is aimed to produce blades from specialized cores of the Upper Paleolithic type. These cores are narrow and long and may possess crests along the dorsal and basal edges. Other core shapes are prismatic, cubical and pyramidal: some of these, however, may not represent specific procedures, but advanced stages of exploitation of the Upper Paleolithic cores. Further core forms are due to rejuvenation or change of orientation. The flat cores, typical for some Early Upper Paleolithic industries, disappear completely.

The proportion of blades (Ilam), compared to the flakes, reaches 74,2 % in the 1st settlement unit, 67,4 % in the 2nd settlement unit and 67 % in the 3rd settlement unit. For comparison, Ilam in the unit LP/1-4 was 64 %. These values are relatively constant, and roughly double compared to Early Upper Paleolithic industries from the Stránská skála area. Another typical phenomenon is intensive production of microblades. They reach 25,3 % of the blade assemblage in the 1st unit, 17,6 % in the second unit and 19 % in the 3rd unit (in the unit LP/1-4 their proportion was very low).

No hammerstones were found within the studied area. The

large pebble with traces of use (Fig. 21:1) differs from usual hammerstones by dimensions and weight; another fragment of a pebble (Fig. 21:4) served, after the visible traces, for grinding ochre. We expect that for the lithic production, soft hammers of organic material have been prefered.

Typology. The Pavlovian tool assemblages may be divided in five typological groups: endsrapers, burins, backed implements, microlithic (not backed) and various. The combined tools are added to these groups after the first tool-type in the typological sequence. The aim was especially to express the proportion of endscrapers, including their combinations with burins. The total proportion of combined tools in this assemblage is low, so that the difference is not significative. The various Pavlovian assemblages differ in percentages of the main groups, or in presence/absence of single significative types.

One of the main characters of Pavlovian industries is the dominance of burins over endscrapers, double or even higher. Culturally, the determining implements are backed blades, frequent especially in South Moravian sites and reaching here microlithic dimensions. Simple microblades, microsaws and small backed points ("microgravettes") prevail over the normal-sized backed blades or La Gravette points. Further small artifacts are blades with basal or terminal notches and solitary shouldered points (comparable in shape to the Kostienki points). B. Klíma (1967) stressed the role of specific splittered pieces (Kostienki knives) for determination of the Pavlovian; at DV II, however, appearence of this type is scarce. The role of sidescrapers, denticulates or borers in Pavlovian generally, including DV II, is less important.

Comparison of the three settlement units and the sorrounding area from the above defined viewpoints shows general coincidence but also slight differences. The share of burins compared to endscrapers remains in all cases roughly triple. The 1st settlement unit is distinguished by high percentage of backed implements, making more than one half of the tools. This can only partly be explained by floating (in the floated material prevailed small chips and fragments). Furthermore, floating had no influence on presence of other types of microliths. In the 2nd unit the proportion of backed implements decreased to one third. In consequence we observe the increase of burins (about one third), endscrapers (roughly one tenth) and other tools (about one tenth). The proportion of non-backed microliths reaches its maximum (about one tenth as well). In the 3rd unit the same values of burins and endscrapers remain, while a further dicrease of backed implements and other microliths and a slight increase of retouched, truncated and notched blades is observed. Typological structure of the free area is comparable to the 3rd settlement unit.

Comparison of this typological structure with other Pavlovian assemblages shows that the closest parallels are the various industries from DV I and DV II (Klíma 1963; 1981; 1987e; Otte 1981, Fig. 28; Svoboda 1990). The proportion of endscrapers on the western slope, however, is lower (even if

Tab. 3. Flakes, blades and fragments

	1.unit	2.unit	3.unit
Flakes (total)	126	271	369
flakes of 1. series	8	16	31
flakes of 2. series	69	127	211
- with rest of cortex	15	70	65
- crest flakes	2	6	10
- edge flakes	6	9	12
flakes of 3. series (rejuvenation)	3	5	3
- from flaking platform	15	24	19
- from exploitation platform	5	10	9
partially ret. flakes	3	4	9
Blades (total)	363	561	749
blades of 1. series	2	5	7
blades of 2. series	188	324	400
- with rest of cortex	34	41	58
- microblades	92	99	142
- pointed blades	19	31	27
- crest blades	20	47	94
- rejuvenation blades	5	9	10
partially ret. blades	3	5	11
Fragments (total)	1534	1301	1663
silicite fragments	23	36	68
other materials	14	7	7
small fragments and chips	1481	1251	1572
burin waste	15	7	10
pebbles and their fragments	1	0	6

Tab. 4. Typology

	1.unit	2.unit	3.unit	free area
Endscrapers (total)	4	4	7	17
blade endscraper	2	2	3	8
blade endscraper - atyp.	1	1	0	4
unguiform	0	0	1	0
microendscraper	0	0	0	1
double endscraper	0	1	0	0
combined	1	0	3	4
Burins (total)	14	13	20	55
burin on broken blade	3	3	6	26
convexe truncation	0	0	1	3
concave truncation	4	3	1	4
straight truncation	0	0	1	2
truncated double	0	1	2	2
dihedral symetrical	1	0	2	6
dihedral asymetrical	1	1	3	2
dihedral double	0	1	1	1
transverse	0	2	0	3
flat burin	0	0	0	1
core burin	0	0	2	0
combined	5	2	1	5
Backed implements (total)	39	14	14	45
La Gravette point	0	0	1	1
backed blade	0	0	1	1
backed microblade	28	11	9	27
backed microblade pointed	5	0	3	9
pointed microblade "à gibbosité"	0	0	1	2

microsaw (denticulate)	6	3	0	3
Microliths total	5	4	3	8
shouldered point (microl.)	1	0	0	1
microblade with basal notch	1	1	1	1
microblade with term. notch	3	1	1	5
microblade with oblique truncation	0	2	1	1
Other tools	4	4	15	40
ret. blade unilateral	0	0	2	10
ret. blade bilateral	0	0	1	2
pointed ret. blade	0	1	0	3
blade with straight truncation	0	0	0	2
blade with conc. truncation	0	0	1	3
blade with conv. truncation	0	0	1	0
blade with oblique truncation	0	0	2	3
notch	0	2	6	8
denticulate	0	0	0	1
bec	0	0	1	1
borer	3	0	0	0
splittered piece	1	1	1	4
"raclette"	0	0	0	3
Tools (total)	66	39	59	165

	1.unit	2.unit	3.unit	free area
Endscrapers	6	10	12	10
Burins	21	33	34	33
Backed implements	59	36	24	27
Other microliths	8	10	5	5
Other tools	6	10	25	24
%	100	99	100	99

Tab. 5. Indices (in %) of the main typological groups

the endscraper combinations were added). The Předmostí, Petřkovice or Mladeč (Plavatisko) sites differ by very low number of small backed implements compared to burins and endscrapers. It is difficult to judge today how far this is due to excavation methods. It is evident, however, that the number of microblades is minimal at sites investigated non-systematically or by surface surveys only (Předmostí, Petřkovice-Moravian Museum collection, Mladeč; cf. Valoch 1981, Tab. on p. 280).

Culturally sensitive point-types seldom appear in the western slope collection. Typical La Gravette points are solitary (Fig. 16:1; Fig. 20:4), more numerous is only their microlithic variety ("microgravette" - 17 pieces). In few cases (3 pieces) the back projects to a gibbosity (Fig. 16:8; Fig. 20:24). Already K. Absolon (1938b, 47) noted these types as common in South Moravian sites.

Shouldered points (the Kostienki-type) are rare and appear as a microlithic derivation only (Fig. 9:17; Svoboda et al. 1991, Fig. 53:1-2), tied to technology of segmented backed blades production. More typical shouldered points occure in the Upper Gravettian of West Slovakia (Nitra - Čermáyn, Moravany n. Váhom), some appear at Willdendorf II (layer 9) or Kraków-Spadzista as well, and they concentrate as far as the Volga Basin (Kostienki, Avdeevo). These occurences demarcate a sort of cultural unit, slightly more recent compared to the Pavlovian, called the "Kostienkian" by J.K. Kozlowski. Nevertheless, few points of the same type appear at Moravian sites of Předmostí and Petřkovice, believed to be earlier.

No use-wear analysis of the shouldered points of Moravia has been presented. H. Plisson and J.M. Geneste (1989) who analysed comparable shapes (pointe à cran) in French Solutrean context (sites of Combe-Sannière, Placard, Furneau-du-Diable, Pech de la Boissière) concluded that they served as projectiles. Such assumption may be acceptable even for some small points from DV II.

Certain Pavlovian assemblages are accompanied by tool

types which, even if of "archaic" or "extraneous" appearence, should not necessarilly mean mechanical admixtures. In the large collections we sometimes observe an Aurignacoid end-scraper or even an Aurignacoid burin, but percentage of these tools may slightly increase only at sites believed to be earlier (lower areas at DV I and DV II) or contamined by foreign admixture (Předmostí).

The leaf-points appear at several sites as well (Předmostí, Petřkovice, Milovice), including surface sites (Mladeč, Borši-ce, Kyjov). Meaning of this originally Szeletian type, however, is not only "archaic": excavations in the Váh and Dniestr Basins prove a new wave of leaf-point production during rela-tively young Gravettian. The Font Yves points and points with ventroterminal retouche are typical for Pavlov I and Předmostí sites mainly. The Font Robert-points (in Moravia at Předmostí and Násedlovice), on the other hand, point to the Périgordian of West Europe; the nearest finds in Central Europe are from Bilzingsleben and Salching in Germany. All these significative point-types were absent at the western slope of site DV II.

THE BONE INDUSTRY

Another determining character of the Pavlovian culture compose industries of ivory, bone and antler: spear-points, simple awls, spatulae and other tool-types (Klíma 1963; 1987f).

Bone tools at the western slope of site DV II were scatte-red throughout the excavated area (Fig. 22). Ivory points with circular section are preserved in 5 longitudinaly splitted fragments, 3 of which could be refitted (Fig. 24:8). Two of them are decorated by pattern of short parallel incisions (Fig. 24:11-12). The same pattern is common throughout the Pavlovian sites (cf. Klíma 1987f). Awls were made of long bones by polishing the terminal part into a point and some of them preserve the ulna joint at the base. Five awls are comple-te (Fig. 24:1-2, 4-5, 13), the last is only a broken point. Carefully polished spatulae are typical for the Pavlovian as well; in the literature they were mostly called shovel-like or spoon-like tools. Two exemplars occure at the western slope (Fig. 25:1,2). As a solitary piece appears an antler handle with a lens-shaped hole for fixing a stone tool (Fig. 24:7); parallels have recently been found at Trenčianské Bohuslavice (Bárta 1988).

It is possible to postulate a hypothesis that fragments of the oblong sandstone plates with rounded edges (Fig. 21:3) served for polishing bone. However, no coincidence in spatial distribution between the plates (concentrated in the 3rd unit) and bone tools (widely dispersed - Fig. 22) is observed.

Splitted bones. More numerous than bone tools are the large, mostly mammoth bones, intentionally splitted and reshaped. We noted that if mammoth remains appear within the settlement, they were frequently modified. They concentrated rather outside the settlement units and only in the 3rd unit

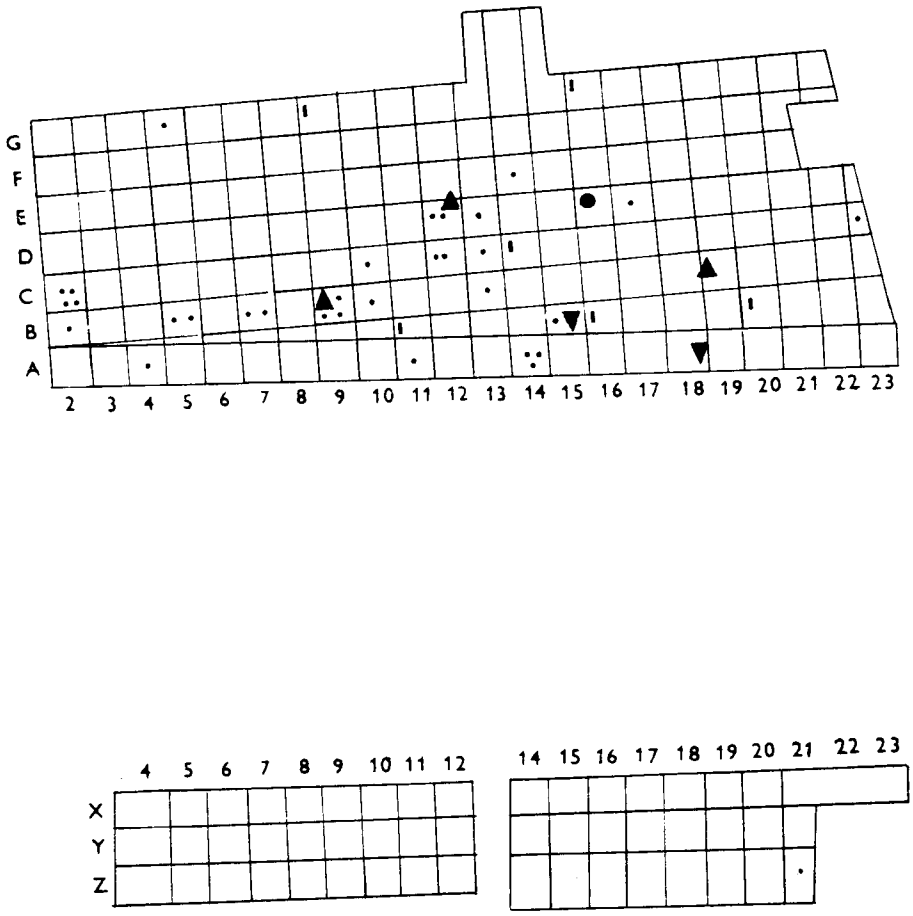


Fig. 22. Spatial distribution of bone industry.

Tab. 6. Survey of bone industry

	1.unit	2.unit	3.unit	free area
Point ▲	0	1	1	1
Awl ı	1	1	1	3
Spatula ▼	1	0	0	1
Handle ●	0	1	0	0
Chipped bones •	0	1	8	25

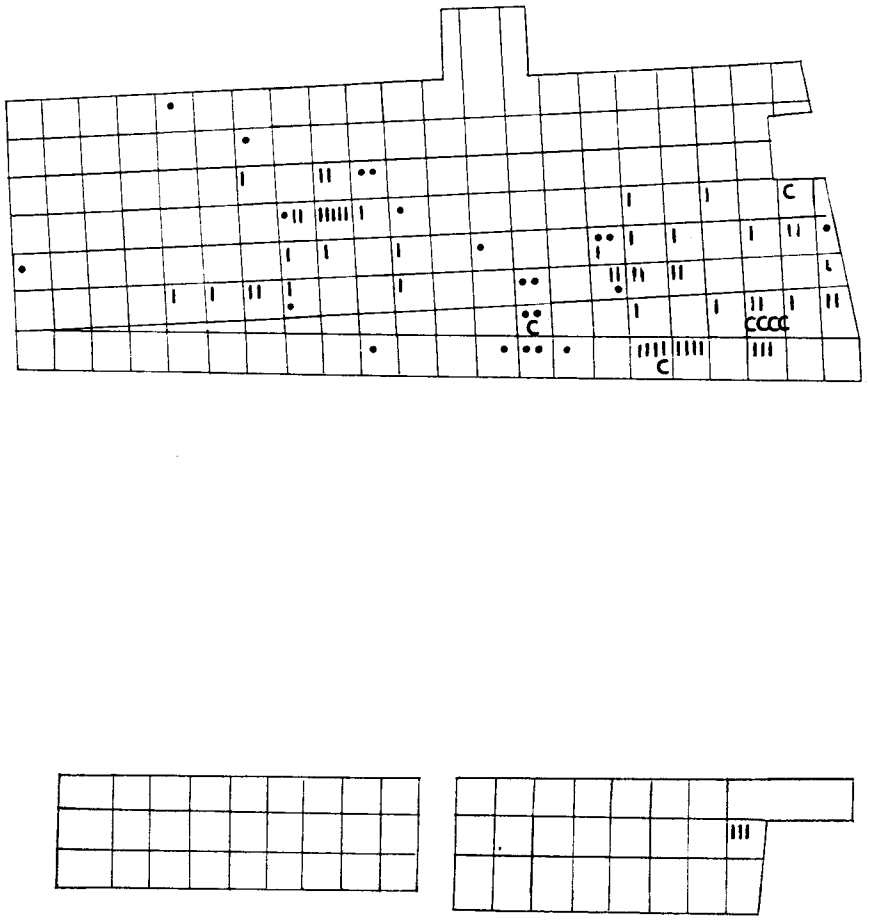


Fig. 23. Spatial distribution of decorative objects

Tab. 7. Survey of the other finds

	1.unit	2.unit	3.unit	free area
Dentalium shell I	12	11	11	21
Melanopsis shell non pierced •	0	3	0	8
Melanopsis shell pierced •	0	0	3	5
Other shell •	0	0	1	0
Pierced carnivore canine C	5	0	0	2
Fired clay (pellet)	6	0	0	0
Fired clay (shaped)	1	0	0	0
Ochre	18	7	45	n
Sandstone plate (fg.)	4	4	5	4
Schist plate (fg.)	0	0	0	3
Plate (other mat.)	0	0	0	1
Sandstone plate with rounded edges	0	0	4	1
Utilised pebble	0	0	0	2

their occurrence was more important. The largest pieces of splitted mammoth bones lied at the margins of the agglomeration (squares B-2, C-23). Such spatial distribution is inverse to that of lithic (cf. Fig. 3 and Fig. 22) and behavior related to these objects seems to have been different from real tools: they were treated rather as waste.

Most of these pieces are smaller chips (10-15 cm) or bone flakes (minimal dimension 5 cm). Some of them show traces of retouching, from the scraper-like retouches (Fig. 25:4) over various notches to splittered and dihedral edges, which originated during use. On some pieces we observe polish along the edges.

The question of splitted bone objects and of their interpretation has been frequently discussed in the literature, beginning with the Lower and Middle Paleolithic. They may result from bone breakage to obtain marrow, from direct use, or from intentional tool production. It seems, however, that in DV II the duration of their use was limited and they were rapidly removed from the settlement centers. The assemblage of splitted bones from this site will require a more detailed study of technology and use-wear, including osteological observations and comparison with other sites.

Utilised ribs. On two animal ribs from the pit E (1st unit) we observed flat polish of one face, of unknown purpose. In case of the ribs placed over hearths in the 1st and 3rd settlement units (Figs. 8 and 13) we may speculate that they have served for ash removal and clearance; naturally, traces of such activities are missing.

In general, bone tools from the western slope can be compared to the larger and more variable, but relative collection from DV I (Klíma 1963). They differ in more significative way from the bone industry from Předmostí, which is a typologically and morphologicaly outstanding collection with certain specific tool-types (Valoch 1982).

DECORATIVE OBJECTS

Natural objects, intentionally brought to the site (fossils) or pierced (fossils, canines of killed animals) are supposed to have served for personal decoration. A common kind in the South Moravian sites reppresent shells from nearby Neogene sediments of the Vienna Basin, mainly Dentalium badense Partsch (Fig. 16:17-18). Spatial distribution of the Dentalia shells (Fig. 23) is identical to that of lithic industry (Fig. 3): the shells concentrate within the three settlement units and some appear in direct contact with the male skeleton DV XVI.

The Melanopsis shells, with natural outcrops in the Kyjov and Hodonín areas (Klíma 1963) have been imported less frequently. Their dispersion in the settlement area is more sporadic, with a scatter in squares AB/14-16, outside the

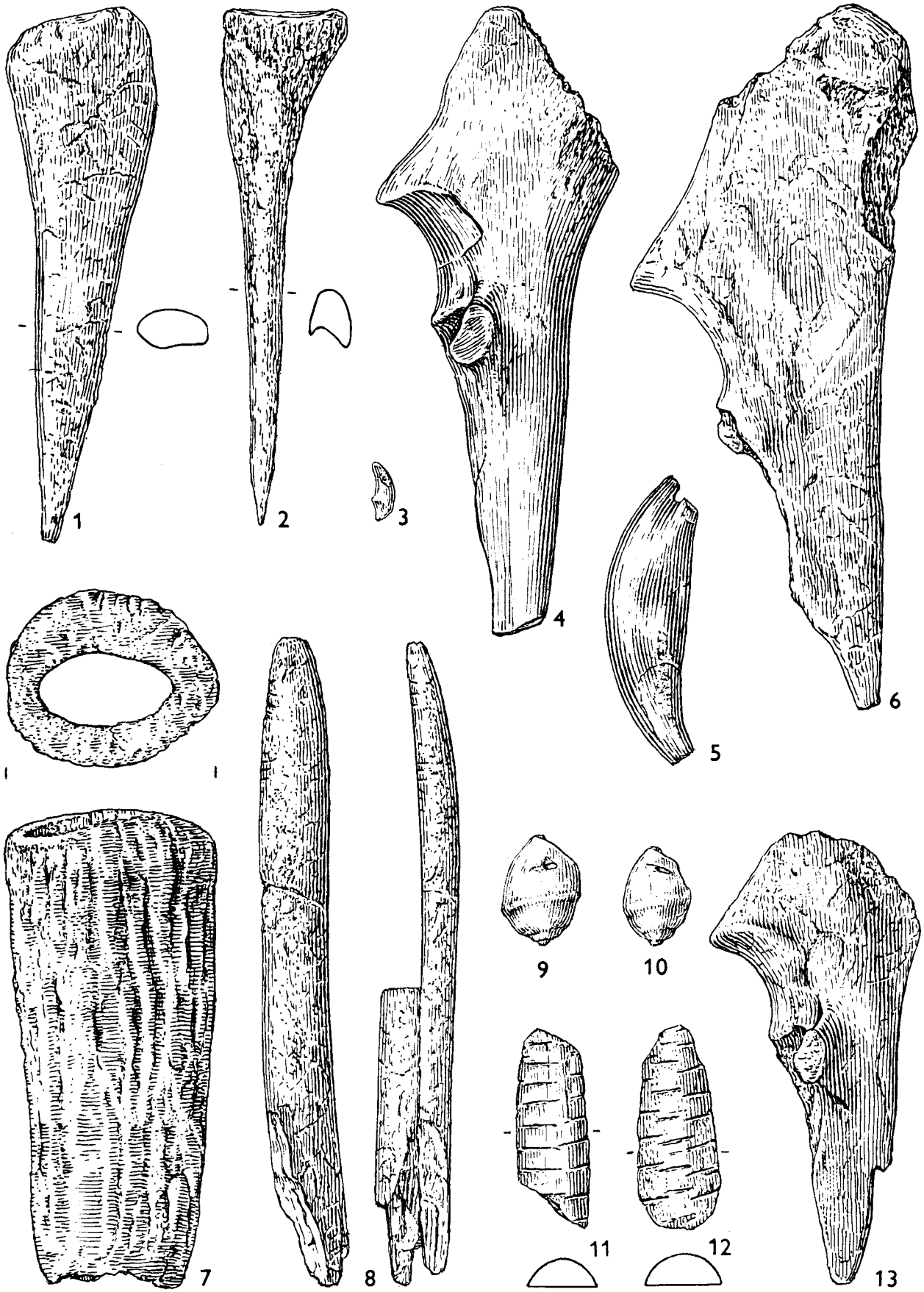


Fig. 24. Bone industry and decorative objects. 3, 4: 1st unit; 7, 8, 13: 2nd unit; 11: 3rd unit; others from free area.

settlement units. Some Melanopsis shells are perforated by parallel cuts thining gradually its wall (Fig. 16:15-16, Fig. 24:9-10). No traces of drilling are observed.

Pierced carnivore canines are seldom. They are very rare within the settled area (Fig. 24:3,5) but four were directly associated to the skeleton DV XVI (two at the left elbow and two above the pelvis; Svoboda 1989a, Fig. 3:3-6).

Only the four canines, therefore, support the hypothesis that such objects have served for personal decoration. In Moravia, the cluster of 600 Dentalia shells associated to human body in the burial Brno II (Makowsky 1892) still remains unique.

OCHRE

Small fragments of iron ores, interpreted as pigments, scattered throughout the investigated area. They do not concentrate in all of the settlement units: a scatter of 45 pieces, including a larger plate of red ochre, occured in the 3rd unit, while in the 2nd unit these pieces apear seldom (7 pieces). Ochre in powdered state covered the scull and pelvis area of skeleton DV XVI.

The usual type of ochre are earthy hematites of dark red colour, producing red trace on paper. Their outcrops are sought by B. Klíma (1963) in close vicinity of the site, within the variagated marls of the Ždánice Flysh.

Another type of hematite ochre represent the fragments of redbrown to steel-grey colour with heavy polish and red trace (Přichystal 1991). After the roentgen analysis the matter is an iron ore composed by hematite and quartz with slight admixture of pyrite. Its outcrops are sought at eastern margins of the Bohemian Massiv, most probably in the area where the Morava river runs out into the Upper Moravian Plain.

An ochre sample from the human skull DV XIV of the triple burial was analysed palynologically by H. Svobodová (1991). She estimated a higher proportion of water algae (Pediastrum integrum, P. boryanum). This suggests that during processing, the ochre could have been melted in water.

Sharp-edged fragments of sandstone plates of various thickness were scattered within the settlement units (about 4-5 pieces in each), while few schist plates lied dispersed in the free area. The hypothesis that similar plates served for grinding ochre is based on finds of plates still covered by red pigment from site DV I (Absolon 1938a, Fig. 54; 1938b, Fig. 137-139). In the site DV II, within the 1st settlement unit (square Aa-20 near the head of skeleton DV XVI) lied another plate still covered by red pigment on both faces (Fig. 21:2). In the square B-7 lied fragment of a pebble showing evident traces of pigment and use-wear in the exposed area (Fig. 21:4), serving probably as a grinding stone.

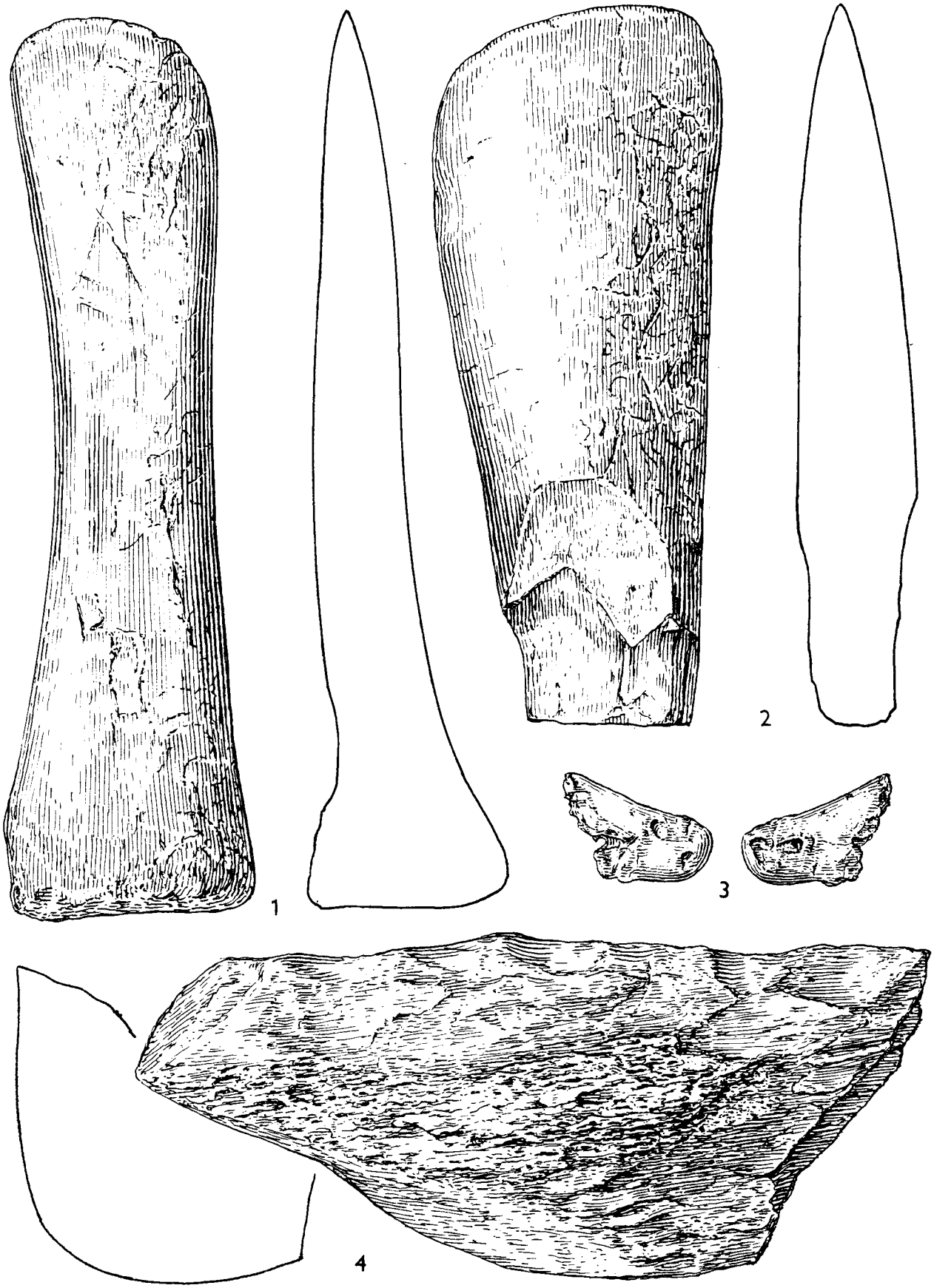


Fig. 25. Bone industry and object of burnt clay (3). 1, 3: 1st unit, 4: 3rd unit; 2: free area.

In general, the site DV II contributes an interesting evidence on ochre importation, its processing and one of the purposes: preparation of human body for burial.

FIRED CLAY

The evidence of earliest "ceramics" in DV II, compared to the sites DV I and Pavlov I, is scarce. On the western slope of this site its occurrence was limited to depressions inside the 1st settlement unit. Five small pellets were found in pit E and one pellet in depression A. Intentionally shaped fragment with traces of incisions lied in the pit E as well (Fig. 25:3). Naturally, interpretation of a fragment is difficult: it may have been, i.e., an animal nose, by its shape most probably of a reindeer. All the mentioned objects are related to the central hearth D.

Chemical analyses by P. Vandiver et al. (1989) estimated that local loess, providing suitable mechanical qualities for firing, served as the raw material (p. 8). In 1987 the authors analysed highest temperatures reached in the various hearths at DV II. Hearth D of the 1st unit ranges in the group with higher heating capacity (between 700 - 800^{o}C); in the second group of hearths the temperatures varied between 500 - 600^{o}C. Limestone blocks of hearth D were analysed as well. Development of about 1 mm thick lime plaster coating suggests heating up to 820 - 840^{o}C. We conclude that heating capacity of the hearth D has been high, even higher than in the kiln-like structure at DV I.

Another problem poses the fragmentary state of preservation of most of the clay representations from DV I. The shaped object from pit E is a fragment as well. P. Vandiver et al. (1989) explained this fragmentation by thermal shock, i.e. by placing wett objects inside the hearth, or by rapid cooling of the heated object in water. It is not excluded that the preserved terrain situations in vicinity of the hearths are due to accumulation of production waste. P. Vandiver et al., however, prefere the explanation that the thermal shock has not been accidental, but it required an intention, experience and skill. Association with ritual behavior around the hearths seems to be most plausible.

CHARACTER OF THE SETTLEMENT

Among the questions evoked by the excavations at DV II, the problem of settlement stability, contemporaneity of the various settlement units, and relationship to the mammoth bone deposit attract attention.

The subject of settlements and dwellings in Moravian Pavlovian has been frequently discussed in the literature (Sklenář 1976; Klíma 1984; Svoboda 1990). In the last mentioned article, four main types of dwellings, with diameter usually between 4-6 m, were defined (Fig.26). The most elabo-

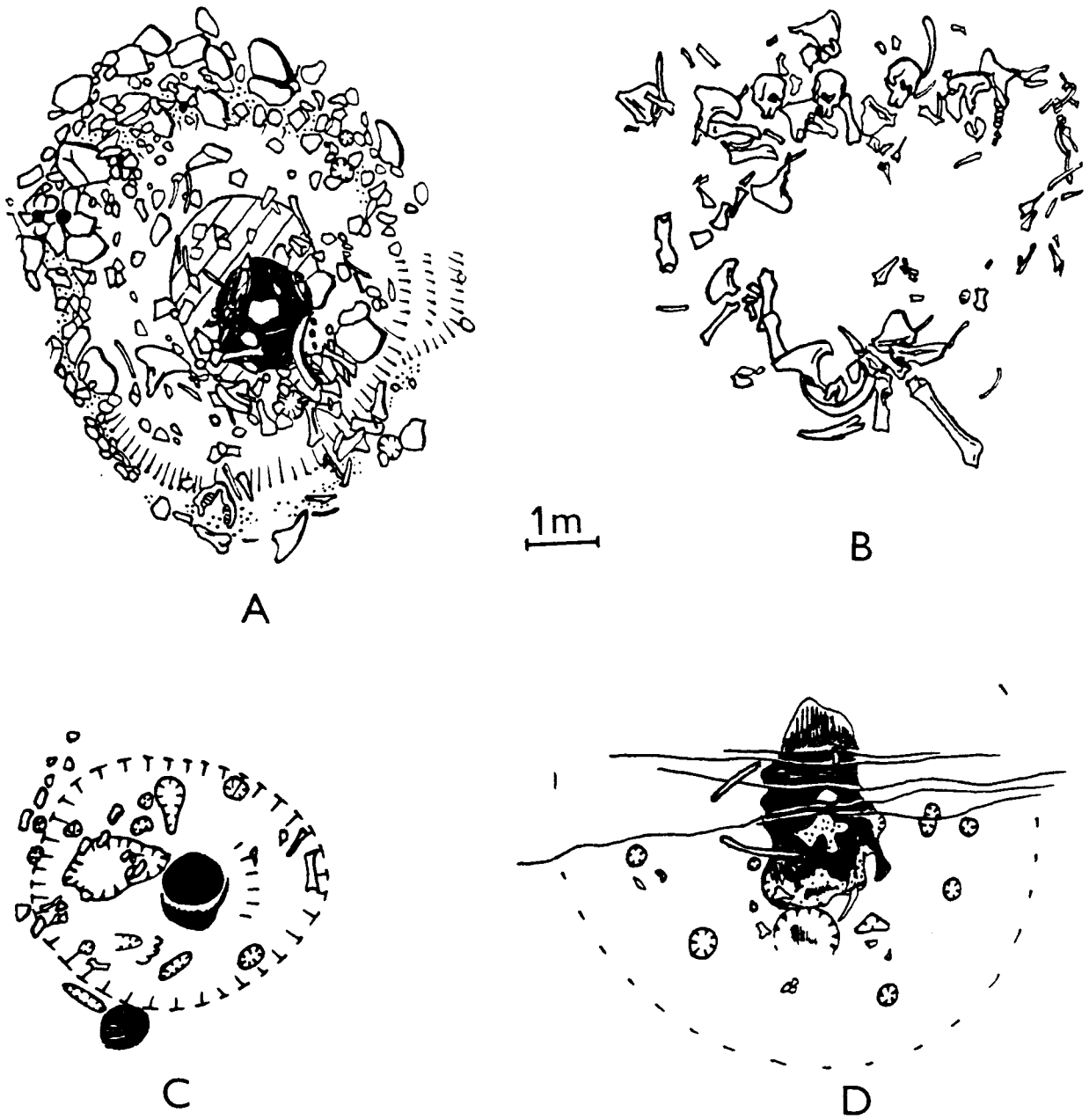


Fig. 26. Types of dwellings in the Pavlovian of South Moravia. A - Dolní Věstonice I, 2nd settlement unit (after B. Klíma), B - Milovice (after M. Oliva), C - Pavlov I, 5th settlement unit (after B. Klíma), D - Dolní Věstonice II, 3rd settlement unit.

rate and stabile structure (type A) was found at DV I: a shallow depression with a hearth in center, encircled by stones and with postholes. Second is a stabile structure on flat surface, limited by a circle of mammoth bones (type B), discovered at DV I and at Milovice. The third type, frequently found at Pavlov and Petřkovice, is a simple depression with central hearth or hearths (type C). Finally, there are hearths encircled by a regular system of depressions and holes (type D). We suppose that such area was protected, but traces of construction at the perimeter are missing. Compared to the other dwellings the type D seems to have been a light structure, less resistant to extreme climates. In the sense of this classification, the 1st settlement unit at DV II belongs to the type C, while the 3rd and the 2nd settlement units range to the type D.

Lithic material supply from distances longer than 100 km, probably with sort of regular rhytm, suggests rather mobile human groups. Furthermore, at both DV I and DV II we lack evidence of storage in pits (well documented in Eastern Europe) and Soffer (1989, 725) suggested rather portable kind of meat storage. Kettle holes around the hearts at DV II may have been boiling pits (certainly not postholes), while the bowl-shaped depressions could have served for ash clearing from the hearth and/or roasting meat. The present filling of holes and depressions, however, is possibly washed in secondarilly (cf. M. Pawlikowski´s results, p. 29).

Cut marks on bones of both herbivores and carnivores (wolfs) suggest meat filleting (Soffer 1989, 725). This evidence will be enlarged by future osteological investigation of the faunal material from DV II.

Contrary to DV I and Pavlov I, site DV II lacks representative art, and the production of fired clay was limited. In the sense of some theoric opinions (e.g., Weniger 1987), the Paleolithic art is connected mostly with long-term settlements. This corresponds well with the terrain situations at DV I, such as the extended and thick ashy deposits with concentrations of fired clay and decorative objects around (e.g., Klíma 1981, Fig. 4). The evidence from DV II, from this viewpoints, suggests rather shorter occupations.

Radiometric data from the western slope, due to their diversity and origin in different laboratories, are not sufficient clue for solution of contemporaneity in frame of the interval 28 000 - 22 000 B.P. The planigraphy shows that the 2nd and 3rd units respect each other spatially and their contemporaneity is not a priori excluded. Comparison of the two central hearths shows that the hearth of the 3rd unit is more voluminous, it contained more burnt artifacts, and was certainly active for a longer time.

The 1st settlement unit directly touches the 2nd unit, and in the border area the both units may overlap. The terrain situation suggests a more stable type of dwelling (C), and

Fig. 27. Plan of the mammoth bone deposit. Excavations 1986, 1988. 1 - artifact; 2 - charcoal.

differs by rich amount of material, presence of fired clay objects and by lithic typology. The three C 14 data are clustered in a relatively short time-span between 26 660 - 25 290 B.P. With high probability we may therefore assume that this dwelling, including the burial DV XVI, is not contemporary with the other two. Basing ourselves on the Groningen data only, we could conclude that this settlement unit is more recent.

THE MAMMOTH BONE DEPOSIT

In an ancient water-filled basin under the western slope, the site was accompanied by a mammoth bone deposit (Fig. 27). Two C 14 data from Groningen and Prague (26 100 ± 200 B.P.; 22 368 ± 749 B.P.) suggest contemporaneity with settlement of the western slope. The same is true for the scarce archaeological material: three backed blades, a retouched blade, a splittered piece, a core, a burin waste, a blade, six flakes, two chips and a pierced Melanopsis shell. Different is only the coarse industry made of various rocks, connected most probably with specific human activities at the mammoth deposit: a large, atypical chopper, a side-scraper and three flakes.

The deposit is composed by two crossing zones of mammoth bones. Most frequent were ribs and vertebrae, mean representation reach finger bones, long bones of extremities and teeth. Less numerous are bones of pelvis, shoulder-blades and bones of skull (Svoboda 1989b; in press). The bones are complete; splitted and modified bones, frequent in the settlement area, were absent in this deposit.

Disputes concerning explanation of such deposits have a long tradition in Moravia. Before the contemporaneity of humans with mammoths was definitively acknowledged, the arguments of J. Steenstrup (1890) have widely influenced understanding of this problem. In the sense of his theories, the bone deposits are due to natural extinctions and were later exploited by reindeer hunters as source of bone materials. K. Absolon (1938a, 35) who called these features "Kjökkenmöddings", i.e. man-made deposits, recognized their human origin. Further research, based on new excavations of mammoth accumulations, usually in wett environments or even water reservoirs (Klíma 1969, etc.), explained them as areas of storage and/or waste in optimal hygienic conditions: it is supposed that water prevented meat from carnivores and insects while ice prevented meat decompositon. Actually, the possibility that mammoth deposits are of natural origin was reopened to discussion, under the influence of L.R. Binford's studies (1981, etc.), of comparison with mammoth burial sites in the USSR (i.e. Soffer 1985) and other evidence.

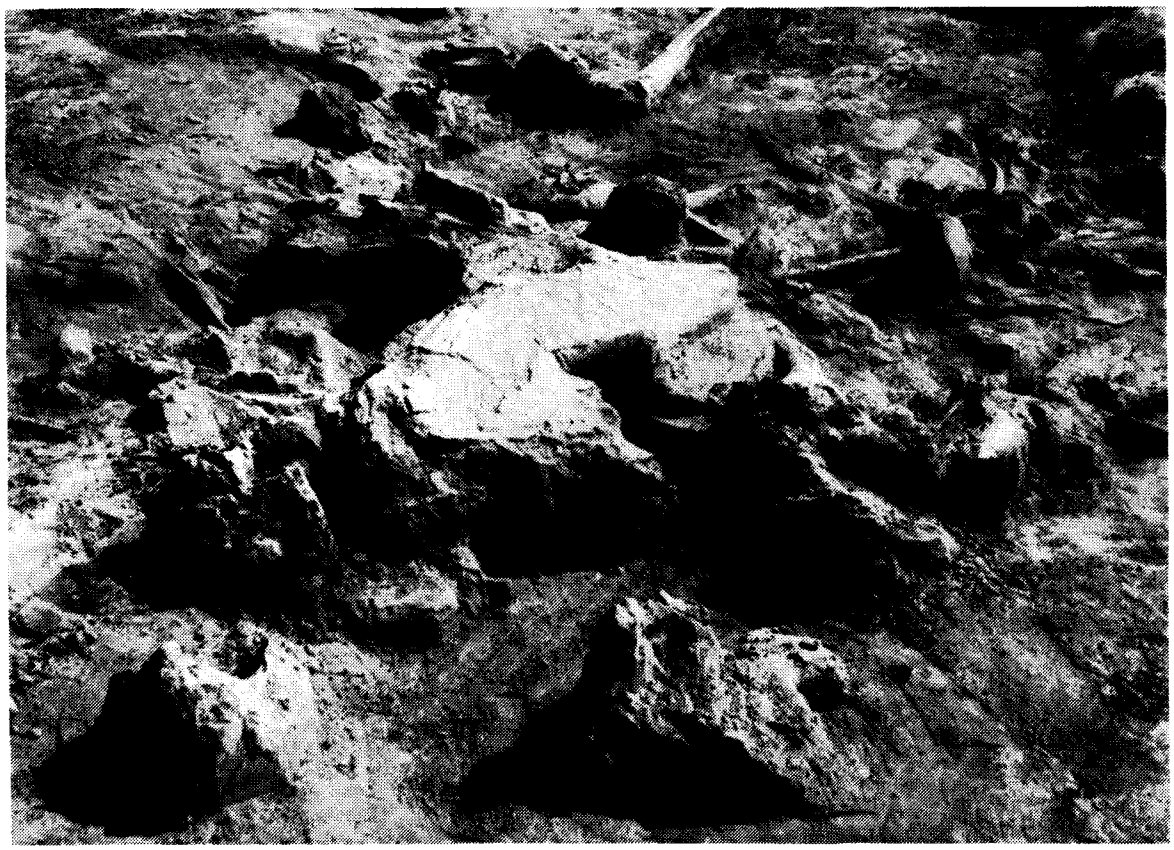


Fig. 28 (above). The mammoth bone deposit, part of the excavated area. - Fig. 29 (below). Water snails Lymnaea palustris (Müll.) filling one of the bones.

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THE GRONINGEN RADIOCARBON DATING

W.G. Mook

All 5 samples consisted of charcoal which sieved before chemical treatment. The chemical treatment for removal of possible carbonate or organic humic contamination from more elevated layers consisted of:

1. Extraction with 4% HCl solution at 80°C during 24 hours.
2. Extraction with 1% NaOH solution at 25°C during 1 hour.
3. Extraction with 4% HCl solution at 80°C during 24 hours.

After rinsing with destilled water and drying, the samples were combusted in pure oxygen. The CO_2 was subsequently purified to remove electronegative contamination (Cl, SO_2, NO_x, O_2, H_2O).

The carbon percentages in the original charcoal appeared to vary from 65 to 69%, which is normal for this type of material.

The extremely pure CO_2 was analysed for ^{14}C activity in quartz proportional gas counters of various sizes, depending on the amount of sample available. The resulting ^{14}C ages are conventional ages, based on the NBS oxalic acid standard, on a ^{14}C half-life of 5568 years and normalized to a $\delta^{13}C$ value of $-25^{o}/_{oo}$, the latter to remove the influence of isotopic fractionation during photosynthesis of the original wood.

Tab. 8

Lab. code	Dolní Věstonice	$\delta^{13}C$ ($^{o}/_{oo}$)	conv. age ± σ
GrN-15276	Male burial	-23.72	25 570 ± 280 BP
GrN-15277	Hearth D	-24.15	25 740 ± 210 BP
GrN-15278	Hearth DE 12/13	-23.20	27 070 ± 300 BP
GrN-15279	Hearth CD 16/17	-24.70	26 920 ± 250 BP
GrN-15280	Under layer	-24.31	27 900 ± 550 BP

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THE PRAGUE RADIOCARBON DATING

Jan Šilar

All 3 samples were chemically treated in a standard way. Carbonates were removed by boiling in 2% HCl and washing until a neutral reaction. Humic acids were dissolved with a 2% NaOH solution at 80°C for 24 hours and precipitated from the solution with 2 % hydrochloric acid. The samples were finally washed in destilled water, dried and burnt in oxygen flow to carbon dioxide, purified and filled into a proportional detector in which their beta activity was measured and compared with the beta activity of a standard sample of oxalic acid NBS.

The quantity of the samples CD 16/17 and from the stratum below the cultural layer was smaller than the amount necessary for filling the proportional detector to the standard pressure 0.28 MPa. Hence the carbon dioxide was diluted by non-active carbon dioxide to reach the necessary working pressure. This dilution was high especially in the case of the sample from the stratum underlying the finding bed. The dilution was included in the calculation of radiocarbon age by means of a correction, so that the three radiocarbon data are directly comparable. Due to the dilution, however, the statistic deviation of the radiocarbon age of the sample from the stratum underlying the finding bed considerably increased so that the accuracy of the radiocarbon age of this sample is lower than that of the previous samples DE 12/13 and CD 16/17.

The results of measurements were calculated to radiocarbon ages according to standard procedure (Libby 1952), using the conventional half life of radiocarbon 5568 ± 30 years (Proceedings 1972). At the same time, the radiocarbon age according to the half life of radiocarbon 5730 ± 40 years (Godwin 1962) is given which may be considered more correct. The results are computerized, are expressed in years before present with their standard deviation, and are not rounded off in order to facilitate statistical processing and comparison.

The results of measurements as well as of radiocarbon dating are presented in the attached table with the accuracy of one standard deviation (1 σ). Considering this standard deviation, the real radiocarbon age is within the calculated range from - 1σ to + 1σ around the calculated radiocarbon age with a statistic probability 68 %.

The radiocarbon ages could not be dendrochronologically corrected because they are beyond the reach of the calibration curve.

The submitter remarks in the accompanying report that contamination with rootlets cannot be excluded in case of the samples DE 12/13 and CD 16/17. Hence it cannot be excluded that the results of dating are influenced by this contami-

Tab. 9

Labelling of the sample	Locality	Type of sample	Laboratory No. of sample	Code and No. of measurement	Radiocarbon activity of sample p.m.c. ± 1 6	Radiocarbon age of sample ± 1 in years B.P. for $T_{1/2}$ = 5568±30 years	Radiocarbon age of sample ± 1 in years B.P. for $T_{1/2}$ = 5730±40 years	Notice
1	2	3	4	5	6	7	8	9
Hearth DE12/13	Dolní Věstonice	charcoal	146	CU 747	5.17±10,83%	23799±870	24513±876	Sufficient amount of sample, not diluted
Hearth CD 16/17	Dolní Věstonice	charcoal	147	CU 748	6.53±9,25%	21920±743	22570±766	Insufficient amount of sample, dilluted to 94.7% of volume of filling gas
Underlayer	Dolní Věstonice	charcoal	148	CU 749	5.04±26.14%	24005±2100	24725±2163	Very insufficient amount of sample dilluted to 40.9% of volume of filling gas

nation and that the radiocarbon age seems lower than it really is.

The equality of radiocarbon ages of all the samples was tested using the 2σ criterion. According to this criterion, the radiocarbon age of the samples A and B can be considered equal if the difference of their radiocarbon ages Δt_{AB} is smaller than double standard deviation resulting from standard deviations of radiocarbon ages of both samples, i.e. if

$$\Delta t_{AB} < 2\sqrt{\sigma_{tA}^2 + \sigma_{tB}^2}$$

According to this criterion, the radiocarbon ages of all the three samples could be considered the same, i.e. referred to the same time interval. The sample from the stratum underlying the finding bed, however, may be attributed by its origin with a 95 % probability to the time interval from about 20 400 to 29 000 years B.P., so that its higher age cannot be excluded, as indicated by its stratigraphic position.

Acknowledgement

I wish to thank Jaroslava Melková and Pavel Jílek for processing and measuring the samples.

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SOIL MICROMORPHOLOGIC INVESTIGATION OF THE SECTION AT DOLNÍ VĚSTONICE II

Libuše Smolíková

Two undisturbed monolithic samples were taken from strata 4 - 9 of section 5 at burial place DV XVI for soil micromorphologic investigation (Tab. 1; Fig. 41). The lower monolith includes strata 9 and 8. Sample 3 comes from a humous horizon of its upper part (10 YR 2/2; examined in dry state); sample 2 from the humous horizon substrate (10 YR 5/4); sample 1 from the lower part of the lower monolith (10 YR 6/4). The upper monolith includes strata 6 to 4 and is represented by 4 samples. Sample 4 (5 Y 6/4; examined in wet state) was obtained from the cultural layer and sample 5 (2,5 Y 6/4) from the loess above; the latter was taken 20 cm above the upper limit of the cultural layer. Samples 6 (5 Y 6/3) and 7 (5 Y 5/4) were collected 10 cm above sample 5 and from the upper part of the monolith respectively.

Micromorphology

Sample 1: It is characterized by (a) matrix bedding with a sparse network of more-or-less parallel wide cracks of rough walls, (b) fine pseudogleyfication showing especially narrow "manganolimonite" coatings on supply channel walls, (c) a number of minute, well worn fragments of carbonates corresponding in grain size to medium to coarse-grained sand.

Sample 2: Pale ochreous flocculated matrix devoid of humous is marked by incoherent fabric with much carbonate. Grain size and mineralogico-petrological composition of the microskeleton are much like those of sample 3. - Fragments of material building up strongly humous soil occur sporadically. - Small fragmentary bones are numerous.

Sample 3: Pale ochreous-brown, weakly humous, completely flocculated matrix displays a fabric extremely abundant in open pores. Aggregation has not yet attained an advanced stage so that the fabric not uncommonly "inherits" typical loess composition. In addition to regularly distributed micropores in the groundmass proper, macropores occur abundantly as open spaces between aggregates and as calcareous tubes or a sparse network of wide cracks with faintly defined walls. - Soil microskeleton is represented expecially by silt finer rather than coarser in grain size; it consists chiefly of grains of quartz and plagioclase, biotite, muscovite, orthoclase, pyroxenes and amphibole; rocks are dominated by fragmentary limestone. - Traces left by fossil biogenic activities are indistinct, being only represented by sporadically preserved coprogenic elements of earthworms and by calcareous tubes; humification is weak and quite irregular. - Matrix nevertheless contains fragments of strongly humous soil material redeposited at a high rate; they are angular, not rounded, in most cases. - There are two types of charcoal fragments: those occurring

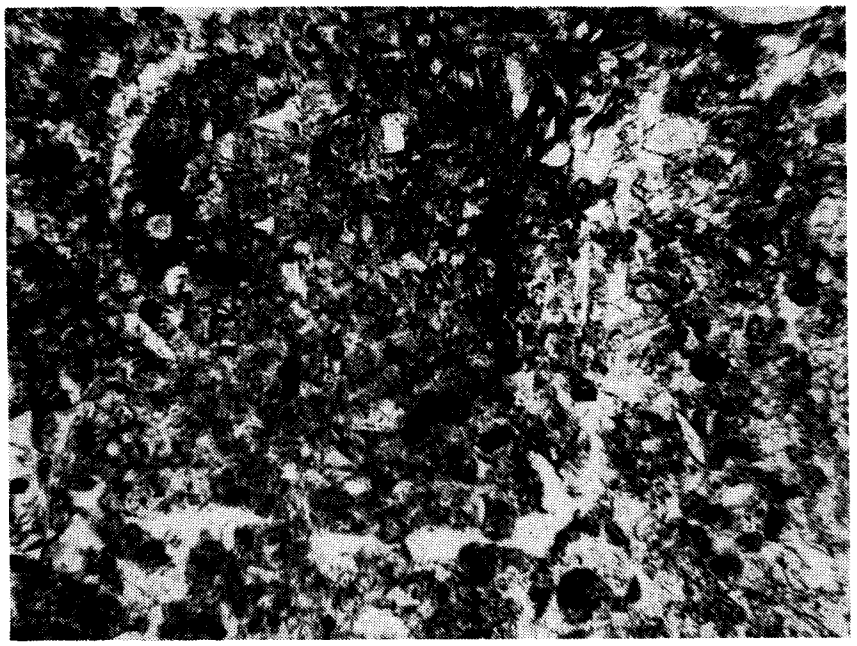

Fig. 30. Flocculated soil groundmass is concentrated in coprogenic earthworm element separated from surrounding, biogenically unaffected matrix by fine cracs. - Cultural bed, sample 4. x32.

Fig. 31. Weakly humous groundmass cut by wide cracks contains minute braunlehm nodules (middle). - Cultural bed, sample 4. x32.

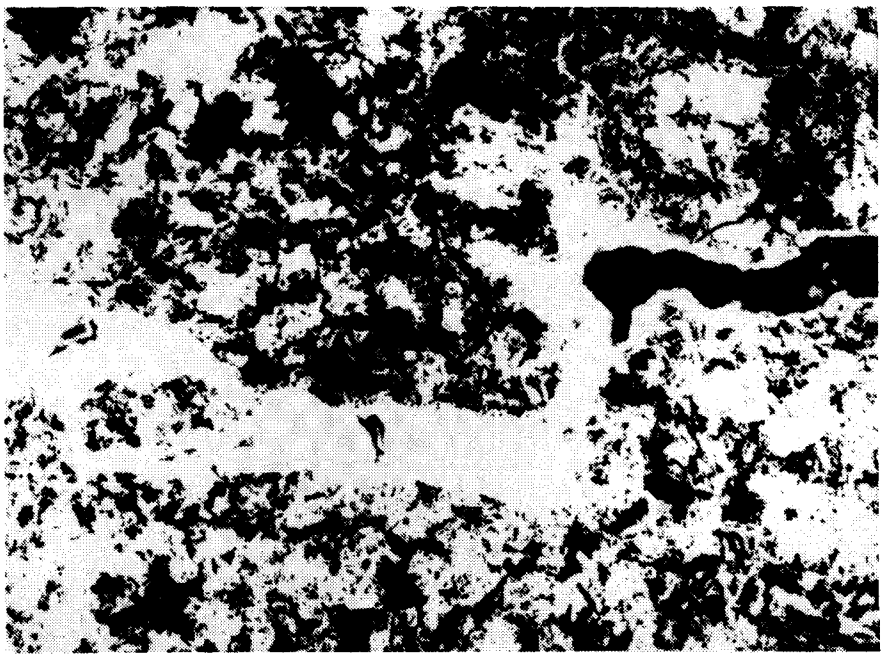

Fig. 32. Structural photogram (black: pores and mineral grains, white: fine soil substance showing redeposited material of humous soil containing a large number of pores. - Cultural bed, sample 4. x50.

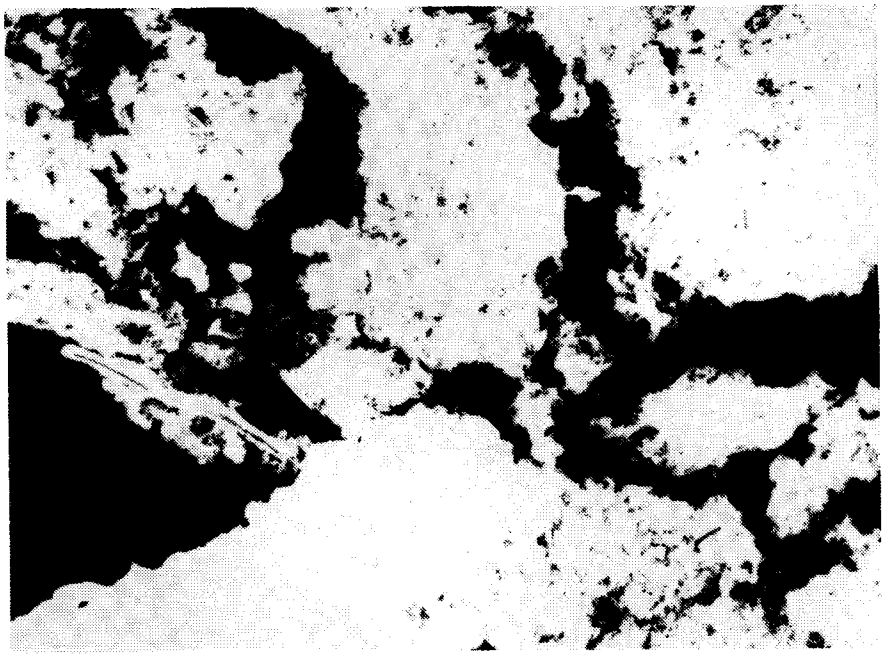

Fig. 33. Structural photogram showing soil substance consisting of braunlehm plasma containing a small number of pores. - Cultural bed, sample 4. x50.

in the matrix show completely preserved cellular structure, while those found frequently in strongly humous soil relics are decomposed and strongly damaged mechanically. - Small grains of opal phytoliths occur sporadically (cf. Smolíková 1988). - Pseudogleyfication effects are very slight, illustrated only by weakly developed and rare pseudogley nodules in the matrix. - Soil groundmass primarily consists of evenly distributed carbonate, as may be evidenced by an intimate compaction of primary components by amorphous calcite forms; coarser pores are filled with minute calcite spicules. Carbonate filling of supply channels suggests secondary calcification.

Sample 4: Weakly humous flocculated matrix tinted grey and brown. It incorporates numerous parts consisting of humous material (Fig. 31) and non-humous brown material containing a low amount of small- and medium-sized pores (Fig. 32). These two types of soil sediment are included in the matrix as clodded rounded forms and angular soil fragments. Some are composed of dark brown braunlehm plasma. - Traces of biogenic activities are left by rarely preserved coprogenic elements of earthworms (Lumbricidae - Fig. 30) and mites (Acari - Oribatei), calcareous tubes and burrows left by earthworms, etc; minute, angular and red excrements of mites are grouped in small burrows. Opal phytoliths occur sporadically, whereas charcoal fragments occur in large numbers, attain various sizes and show a various state of preservation; charcoal displays well developed cellular structure or even is completely disturbed. - Primary components are well sorted with predominant silt and are unweathered in appearance; quartz, plagioclase, orthoclase, biotite, muscovite, augite and amphibole are the main components, followed by glauconite and limestone fragments coarse in grain size corresponding to or larger than sand. - Matrix also contains small braunlehm nodules (Fig. 31), some of which are mechanically damaged. - Soil groundmass includes much carbonate; the fragments of carbonate (micro)skeleton mentioned above are accompanied by numerous epithelia of supply channels consisting of amorphous $CaCO_3$ forms; cement of primary components is also observed as finely crystalline (pelitomorphic) calcite. - Narrow red "manganolimonite" coatings on walls of some supply channels indicate slight pseudogleyfication.

Sample 5: Pale ochreous matrix is fully flocculated. Primary components of this sample are the same as those of sample 1 in both grain-size (dominant silt) and mineralogico-petrological composition; all components are perfectly unweathered and richly filled with calcite; calcite rhombohedrons occur in some wide open spaces. - Redeposited braunlehm nodules and rounded parts consisting of braunlehm plasma at places occur in this carbonate loess.

Sample 6: Pale ochreous flocculated matrix is finely but regularly cut by pseudogley nodules separated from the groundmass by slightly radial faces and showing coherent fabric (fig. 34). - Soil (micro)skeleton is much like that of samples 1 and 2 and also contains minute limestone fragments sporadi-

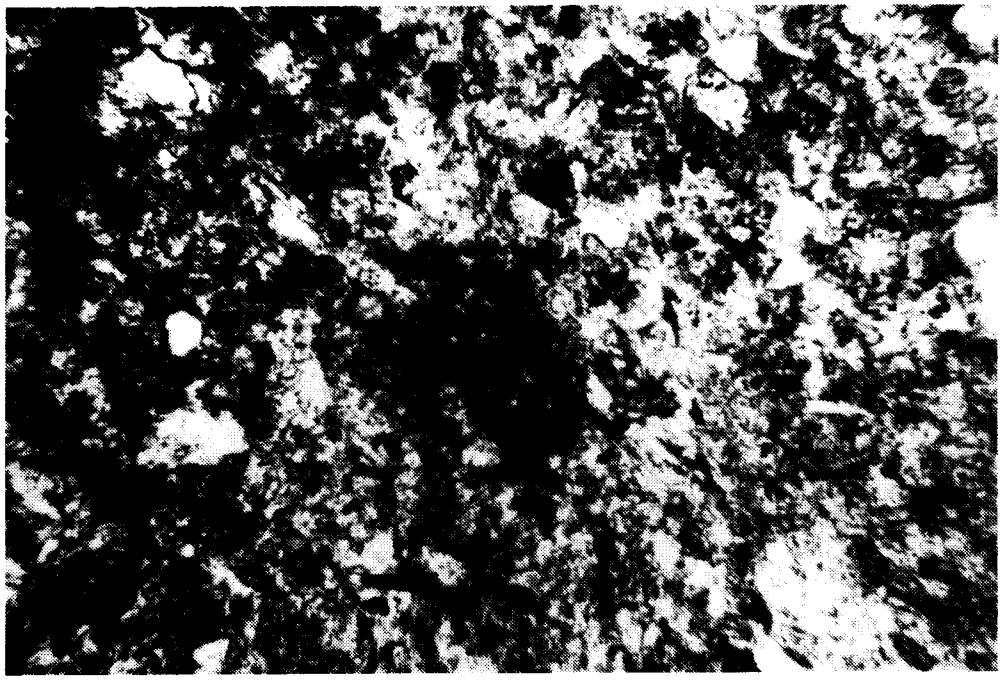

Fig. 34. Irregularly radial pseudogley nodule surrounded by slightly leached soil material. - Sample 6. x32.

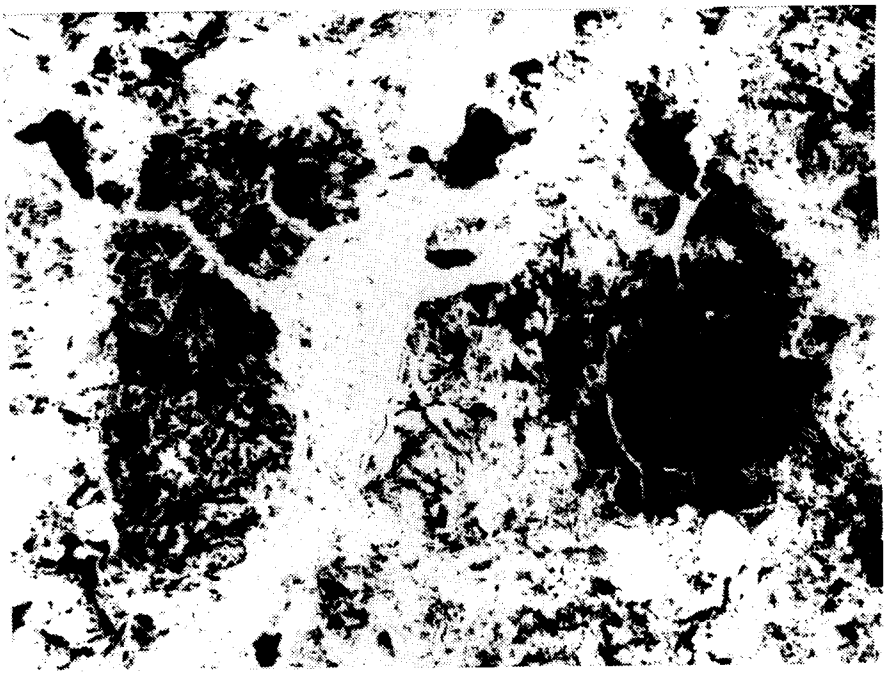

Fig. 35. Structural photogram exihibiting traces of weakly fossil biogenic activity. - Sample 6. x50.

cally accompanied by braunlehm nodules. - Groundmass shows signs of slight bedding and weak biogenic effects (i.e. calcareous tubes and earthworm burrows only, Fig. 35). These supply channels are at places rimmed or even filled with calcite rhombohedrons.

Sample 7: Irregularly greyish-brown, slightly humous flocculated matrix has less pores than observed in sample 3, as is reflected in its more compact but rather indistinct fabric (Figs. 36, 37); it cannot therefore be assigned to any of the four principal fabric forms as defined by D. Schroeder (1978). - Primary components of this sample are much like, if not identical with, those of samples 1 to 3 in mineralogico-petrological aspect, but are a little coarser-grained in size; evidence used in support of this observation is primarily the larger number of rounded, usually slightly corroded fragments of limestones. - Pseudogley nodules are sparsely but evenly distributed in the groundmass and are "explosive" in outline; soil material surrounding the nodules is slightly leached. - Biogenic effects are only documented by rare earthworm burrows and calcareous tubes with walls at places having fine rims consisting of "manganolimonite" coatings; generations of calcite rhombohedrons are also seen on the walls. This carbonate form and the worn limestone fragments described above are accompanied by the cement of soil (micro)skeleton represented by pelitomorphic calcite.

Genesis

The base of the section consists of redeposited loess (sample 1) mixed with small worn fragments of carbonate rocks and fossil soil sediments. A slight pseudogleyfication affected this horizon before it was covered by horizon 2, indicating a short-term, cool and humid oscillation. The humous soil substrate is represented by the overlying carbonate loess (sample 2) of a slightly slope wash nature.

The humous soil (sample 3) corresponds to weakly developed pararendzina. It developed over a short period of time, as is based on megascopic evidence of its small thickness; microscopically, it shows especially indistinct biogenic activities (i.e. sparse traces left by fossil edaphic activities, slight and uneven humification) and incoherent fabric still not differing remarkably from loess as a parent substrate. - The development of the soil was undoubtedly influenced by continuous deposition alternating with sediment transport. This is corroborated megascopically by its sharp boundary with underlying and, in particular, overlying strata; microscopic observations indicate soil bedding, e.g. wide cracks have not smooth walls and are not angular in outline, etc. so that they do not owe their origin to frost effects; moreover, numerous fragments of strongly humous soils are present; these fossil soil sediments were supplied at a high rate (e.g. their fragments were not worn during transport). Two kinds of soil material can therefore be distinguished: the autochthonous fossil soil corresponds to weakly developed pararendzina and the fossil soil sediments can be equated with redeposited material of chernosems (PK II or chernosem PK III). This observation is in

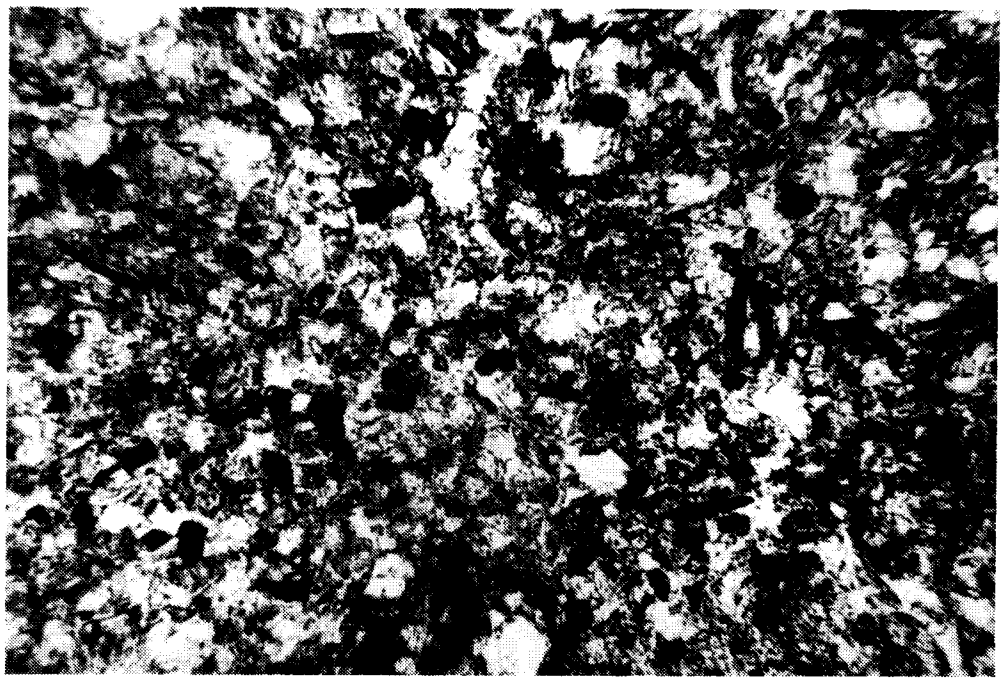

Fig. 36. Indistinct fabric of unevenly coloured and slightly humous flocculated groundmass. Sample 7. x32.

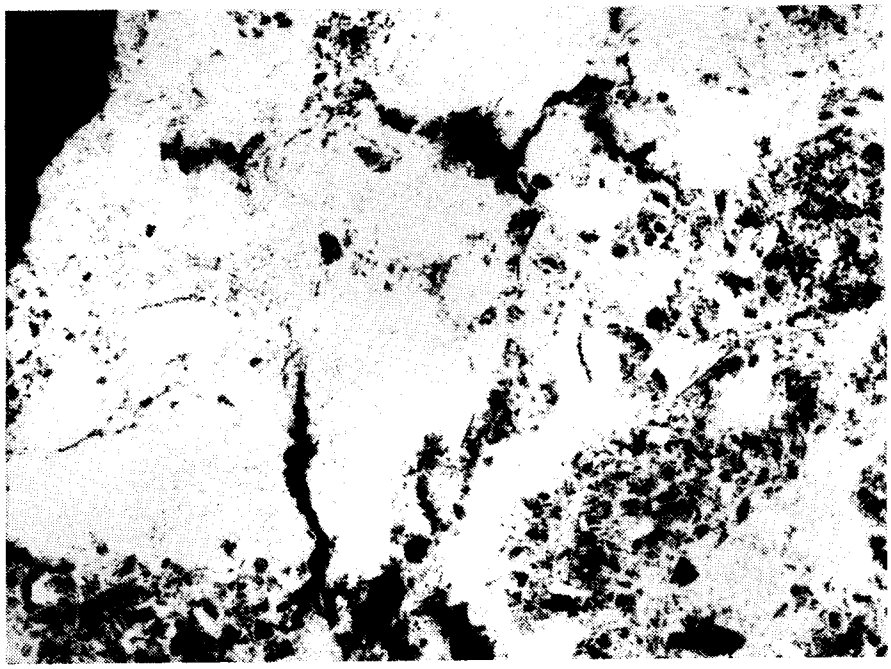

Fig. 37. Structural photogram of indistinct soil fabric. Sample 7. x50.

agreement with two generations of charcoal: charcoal relics in the pararendzina matrix show completely preserved cellular structures, while those occurring in redeposited material of earlier humous soils are strongly destroyed.

This weakly developed pararendzina was formed within a short time interval under cool and relatively dry climatic conditions accompanied by continuous deposition and sediment transport. The soil in question can be ranged (sensu W.L. Kubiena 1956) to the Arctic palaeopedological province including soils of initial development stage.

The soil was subsequently slightly pseudogleyed (wet climate) and ultimately recalcified (fully glacial climate).

The cultural layer (sample 4) is represented by a fossil soil sediment. It consists of humous and brown soils; the composition of the humous substance shows close relationships to humous soils Stillfried A (PK II, III) and the features of the brown material (braunlehm nodules, dark brown parts composed of braunlehm plasma, etc.) might be an equivalent of either the PK III basal soil or earlier pedocomplexes. These redeposited components were mixed in a rapid way since numerous soil fragments, similarly as the fragmentary limestone contained, are clearly angular. An increased activity of the edaphon and vegetation followed, as indicated by preserved coprogenic elements of soil meso- and macrofauna, earthworm burrows and calcareous tubes, opal phytoliths and a number of charcoal; in this case the opal phytoliths and charcoal must not be autochthonous. Turbulent conditions prevailing at the site are suggested, e.g., by mechanically damaged charcoal (in contrast to fragments showing well-preserved cellular structures and even broken braunlehm nodules). This mixture of secondarily renewed soil material was subject to slight pseudogleyfication and subsequently covered by loess.

Aeolian deposition was replaced by weak redeposition (limestone fragments, rounded particles consisting of braunlehm plasma, braunlehm nodules, bedding). This substrate produced a weakly developed pseudogley. Its main micromorphologic features are: pseudogley nodules sparsely but evenly distributed in soil matrix, narrow "manganolimonite" rims on supply channel walls, inconspicuous fabric and insignificant biogenic effects (cf. Kubiena 1956). Thisshort-term pseudogleyfication was interrupted by dry climatic effects resulting in recalcification; calcite rhombohedrons occur in broader open spaces. Next to it came another slightly renewed deposition producing, e.g., a higher number of coarser-grained components in the surface part (sample 4).

The sequence of above mentioned processes - weak pseugleyfication, recalcification and unweathered material supply - provides evidence of slight climatic oscillations (humidity, dryness, alternation of humic and dry climatic fluctuations). The whole development was terminated by the onset of a fully glacial climate to which the overlying loess accumulation can be attributed.

The weakly developed soil (samples 6, 7) overlying the cultural layer (sample 1) with intervening loess (sample 5)

shows close affinities to the soil lying in a similar position at Milovice (sample 4, cf. Smolíková, n.d.). These two soils correspond typologically to pseudogley in its initial development stage.

Features shared by both soils are the inconspicuous fabric forms and slight biogenic/chemical weathering effects. They differ from each other in that at Milovice the soil substrate is formed of mixed fossil soil sediments with loess, while at Dolní Věstonice the parent rock is represented by loess with rare braunlehm nodules and material from earlier, strongly weathered soils. Consequently, the formation of the soil at Milovice was preceded by strong transport and sedimentation leading to the exposure, disturbance and redeposition of soils varying in both origin and age. On the contrary, at Dolní Věstonice the formation of soil sediments at that time was controlled by aeolian deposition. Another difference lies in that, although both types of the substrate display bedding, the pseudogleyfication at Milovice did not obliterate original bedding, while that known from Dolní Věstonice did it somewhat obscure (see sample 6). This of course is not to provide evidence that the pseudogleyfication at Dolní Věstonice was more distinct compared to Milovice but that this process operates more easily on loess than it does on various heterogeneous substrates.

The typological soil identity at both localities, if coupled with uniform stratigraphy, bears testimony to a phenomenon occurring on a regional rather than local scale. Present-day work is tentative and requires continuation at other localities.

The fact that the soil at Dolní Věstonice is a little more advanced than that at Milovice can also be exemplified by case of the soil exposed from beneath the loess underlying the cultural layer; the last-mentioned soil sampled from Milovice corresponds to weakly developed pseudogley, while that from Dolní Věstonice is a pseudogleyed, weakly developed pararendzina. This insignificant difference is also due to various substrates, namely loess at Dolní Věstonice and mixed soil sediments at Milovice.

The soil developed from the loess overlying the cultural layer is attributed to completely glacial immature soils and hence to W.L. Kubiena´s (1956) Arctic paleopedological province. Typologically, it corresponds to pseudogley at initial development stage.

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THE POLLEN ANALYSIS OF DOLNÍ VĚSTONICE II, SECTION NO. 1

Helena Svobodová

During salvage excavations at the western slope, the section No. 1 has been sampled for palynological investigation (for stratigraphic correlation see Tab. 1).

The minerogenic sediment was treated by the method of mineral separation (Girard - Renault-Miskovsky 1969). Pollen spectra were usually observed on 10 slides (20 x 20 mm). The total sum includes all grains of arboreal (AP) and non-arboreal pollen (NAP). The numbers of sporomorphes are indicated in Tab. 10.

Description of the analysed samples

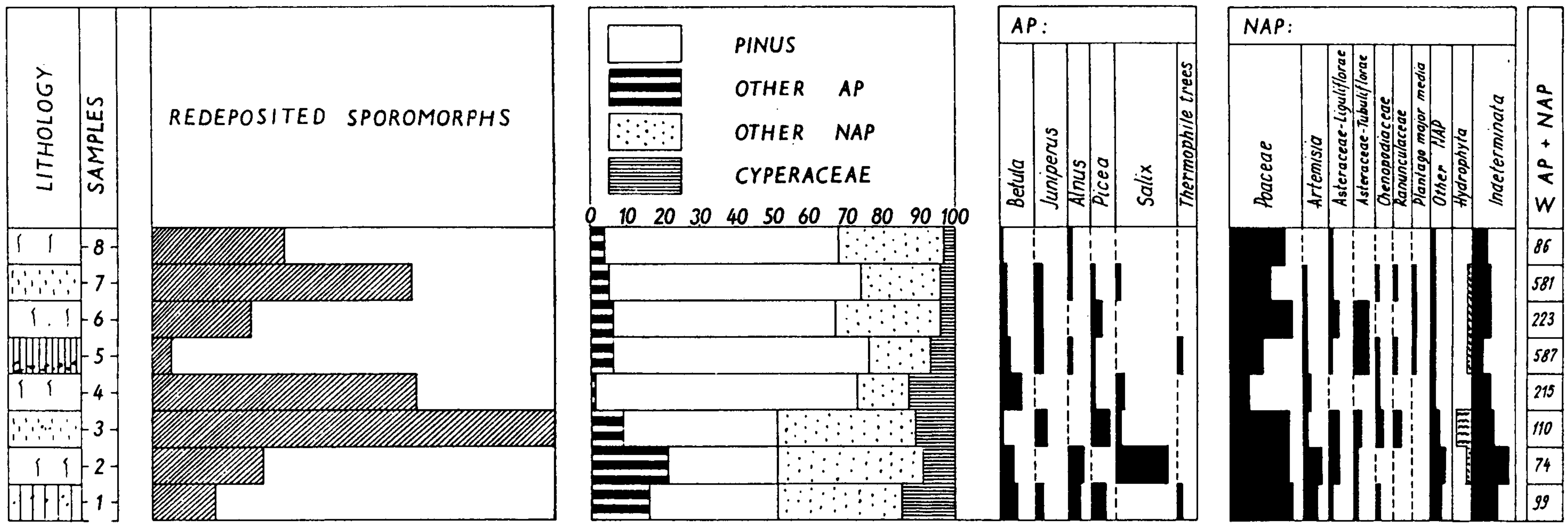
Sample No. 1. The pollen spectrum is composed by Pinus (34,5 %) and other arboreal species (Betula, Alnus, Picea, Juniperus, Corylus). Poaceae and Cyperaceae with approximatively equal percentages of pollen grains (17 %) dominate among the herbs, while Artemisia pollen reached 4 % of the total sum. The presence of Algae (Pediastrum sp.) is noted (4 % compared to the total sum). Among the spores of Pteridophyta, Botrychium was observed and divided into two types (Fig. 39:h,1). These sporomorphes were accompanied by redeposited sporomorphes of Tertiary and Upper Pleistocene origin and by number of objects with s-shaped opening, determined as water plancton by M. Konzalová.

Sample No. 2. In the pollen spectrum of this sample, Salix dominates by 13,5 % of the total sum. Pollen of Betula and Alnus are represented by equal percentages of 4 % of the total sum. The share of pollen of Artemisia and Asteraceae is higher compared to sample No. 1. An increase is observed in the number of Botrychium spores as well. Among Algae, the representants of Pediastrum integrum and Pediastrum boryanum var. boryanum are present. The spectrum of redeposited sporomorphes is enlarged by types such as Carya, Platycarya, Piceapollis sacculiferoides and others (Fig. 40).

Sample No. 3. The number of Picea and Juniperus grains is comparable with sample No. 2, while the number of Salix grains decreased. Heliophilous species of Asteraceae, Chenopodiaceae, Polygonaceae and Ranunculaceae dominated among herbaceous pollen. The water plancton and zygospores of Zygnemataceae were observed. Spores of Botrychium reached their maximum in this sample. Redeposited sporomorphes appeared in a high quantity as well (110 % compared to the total sum).

Sample No. 4. The pollen spectrum is relatively poor in species. The arboreal pollen are dominated by Pinus (70,7 % of total sum); share of Salix was higher compared to sample No. 3. Among the herbs the pollen of Cyperaceae and Artemisia prevailed.

Sample No. 5. This sample is important for its provenience from the cultural layer. In the arboreal pollen spectrum we


LITHOLOGY
SAMPLES
REDEPOSITED SPOROMORPHS
PINUS
OTHER AP
OTHER NAP
CYPERACEAE
0 10 20 30 40 50 60 70 80 90 100
AP:
Betula
Juniperus
Alnus
Picea
Salix
Thermophile trees
NAP:
Poaceae
Artemisia
Asteraceae-Liguliflorae
Asteraceae-Tubuliflorae
Chenopodiaceae
Ranunculaceae
Plantago major media
Other NAP
Hydrophyta
Indeterminata
W AP + NAP
8
7
6
5
4
3
2
1
86
581
223
587
215
110
74
99

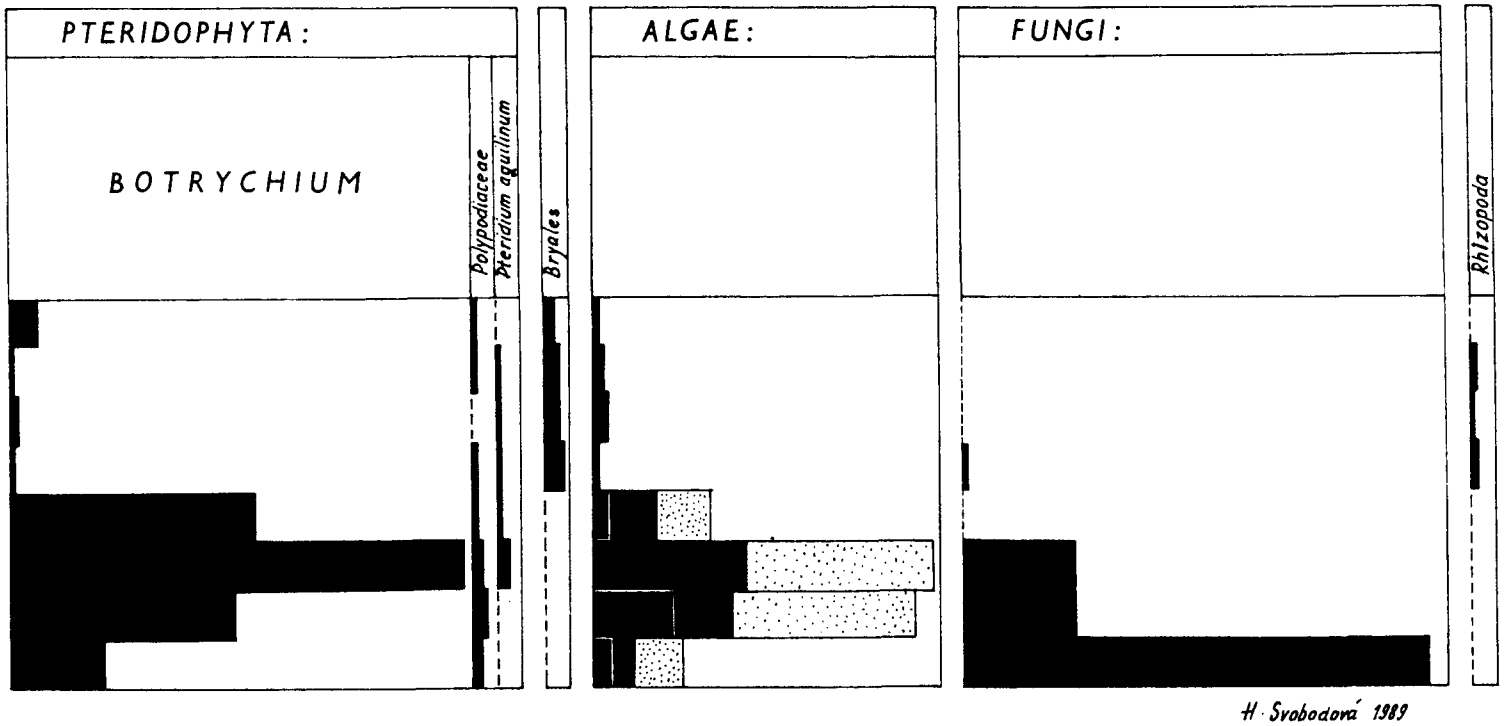


Fig. 38. Pollen diagram of Dolní Věstonice II, section 1.

Tab. 10. Dolní Věstonice - section 1. The sporomorphs table.

Sample No	1	2	3	4	5	6	7	8
AP:								
Alnus	3	3	-	-	3	-	7	1
Betula	5	3	1	-	6	3	2	1
Carpinus	-	-	-	-	1	-	-	-
Corylus	1	-	-	-	1	-	-	-
Juniperus	2	-	3	-	11	5	14	-
Larix (?)	-	-	-	-	-	-	-	1
Picea	4	-	5	1	5	6	4	-
Pinus	35	22	46	152	419	135	402	56
Tilia	-	-	-	-	1	-	-	-
Salix	-	10	1	4	-	-	5	-
Σ AP	50	38	56	157	447	149	434	59

Tab. 10. - cont.

NAP:								
Artemisia	4	4	1	5	4	1	8	-
t.Achillea	-	-	2	-	-	-	2	-
t.Cirsium	-	-	-	-	1	-	-	-
Asteraceae Liguliflorae	1	2	3	-	7	6	3	6
Asteraceae Tubiflorae undif.	1	1	-	-	4	3	-	1
Brassicaceae t.Barbarea	1	-	-	-	-	-	-	1
Chenopodiaceae	1	-	2	1	4	-	4	-
Cyperaceae	15	6	13	28	46	10	26	3
Daucaceae	-	1	-	1	-	-	-	-
Filipendula	-	1	-	1	-	-	-	-
Gentianella	-	-	1	-	-	-	-	-
Lamiaceae	-	-	-	-	-	2	-	-
t.Lythrum	-	-	-	-	-	1	-	-
Plantago major-media	-	-	-	-	1	1	4	-
Poaceae	17	12	18	11	54	38	66	13
Poaceae t.Glyceria	-	-	-	-	2	1	-	-
t.Ranunculus	-	-	2	-	2	-	3	-
Rumex acetosella	1	-	1	-	-	-	-	-
Silenaceae	1	-	-	-	-	-	-	-
Succisa	-	-	-	-	-	-	1	-
Valeriana	-	-	-	-	1	-	1	-
Indeterminata	7	8	7	11	15	10	27	3
Σ NAP+Hydrophyta	49	36	54	58	142	74	147	27
Σ AP + NAP	99	74	110	215	589	223	581	86

Tab. 10. - cont.

Hydrophyta:								
Myriophyllum spicatum	-	-	2	-	-	-	-	-
Nuphar	-	-	-	-	-	1	2	-
Sparganium-Typha angustifolia	-	1	2	-	-	-	-	-
Utricularia	-	-	-	-	1	-	-	-
Σ Hydrophyta	-	1	4	-	1	1	2	-
Pteridophyta:								
Botrychium type a	16	18	67	35	-	-	-	-
Botrychium type b	2	16	37	72	8	6	6	5
Equisetum	-	-	-	-	3	-	1	-
Lycopodium annotinum	-	3	-	6	-	-	-	-
Polypodiaceae	2	2	2	3	1	-	1	1
Pteridium aquilinum	-	-	3	1	2	1	1	-
Selaginella selaginoides	-	-	-	-	-	-	7	-
Σ Pteridophyta	20	39	109	117	14	7	16	6

Tab. 10. - cont.

Bryales	-	-	-	-	21	7	5	2
Algae:								
Desmidiaceae	-	-	-	12	-	-	1	1
Pediastrum boryanum var. boryanum	-	3	-	-	-	1	1	-
Pediastrum duplex	-	-	-	-	2	-	-	-
Pediastrum integrum	-	2	-	-	2	6	8	-
Pediastrum sp.	5	6	-	4	-	-	-	-
Zygnemataceae	3	10	35	11	-	-	-	-
Σ Algae	8	21	35	27	4	7	10	1
Plancton	10	27	44	24	-	present	-	-
Fungí:								
Microthyrium	-	-	-	-	2	-	2	-
Fungí	95	17	25	-	1	-	-	-
Rhizopoda	-	-	-	-	8	1	4	-

Tab. 10. - cont.

Redeposited sporomorphes:								
Carya	1	1	1	1	-	-	1	-
Engelhartia	-	-	-	-	-	-	2	-
Piceapollis sacculiferoides	-	2	3	1	-	-	1	-
Pinus	8	16	93	133	23	49	383	31
Pityopollenites	-	-	1	-	-	-	-	-
Platycarya	1	7	1	5	-	-	-	-
Pterocarya	-	-	-	-	1	-	-	-
Sciadopitys	-	-	-	-	-	-	2	-
Tilia	-	-	-	-	-	-	1	-
Indeterminata	-	3	-	2	4	5	13	-
Tertiary sporomorphes	-	-	-	1	1	7	16	-
Hystridospherideae	-	-	-	6	-	-	-	-

observed, apart from usual species such as Pinus, Picea, Betula, Alnus and Juniperus, certain termophilous deciduous trees (Tilia, Carpinus and Corylus). Herbaceous pollen spectrum was abundant and contained the heliophilous species of Asteraceae Tubiflorae, Asteraceae Liguliflorae, Chenopodiaceae and pollen types such as Artemisia, Cirsium, Ranunculus, Valeriana and Plantago major-media. Pollen grains of Poaceae and Cyperaceae were in aproximatively equal proportions (9 % of total sum). Spores of Botrychium appeared less frequently (about 2 % compared to the total sum); Rhizopoda and Algae were scarcely noticed. Evidence of redeposited sporomorphes, including types of Mesozoicum age (according to M. Konzalová), was rather scarce, about 5 % compared to the total sum.

Sample No. 6. Arboreal pollen are dominated by Pinus (60,6 %), accompanied by pollen grains of Picea, Betula and Juniperus. Herbaceous pollen spectrum was similar to sample No. 5. Pollen of Poaceae reaches 17 % of the total sum, pollen of Cyperaceae make only about 4 % and pollen of Asteraceae 6 %. The presence of pollen grains of Artemisia, Lamiaceae and Plantago major-media was noted. Spores of Pteridophyta, Bryophyta and Algae occured scarcely.

Sample No. 7. The arboreal pollen spectrum is characterized by continual presence of Pinus and re-appearence of Salix and Alnus. The herbaceous pollen spectrum is dominated by Poaceae, accompanied by a reduced number of Asteraceae, Ranunculaceae and Plantago major-media pollen and by a standard number of Chenopodiaceae pollen. Spores of Pteridophyta (Botrychium, Selaginella selaginoides, Equisetum) and Algae (Pediastrum sp.) are scarse.

Sample No. 8. Pollen spectrum was relatively poor in species. Pollen grains of Pinus, Betula and Alnus are observed. Herbs are represented by pollen of Poaceae, Asteraceae Liguliflorae and Brassicaceae. Spores of Botrychium make 6 % and redeposited sporomorphes reach 36 % related to the total sum.

Interpretation

Pollen analysis of minerogenic sediment have been subject of discussions for some years. At the beginning of 60´ies, B. Frenzel (1964) iniciated the method of their preparation, investigated the process of sedimentation of pollen grains in minerogenic sediments and cleared the possibilities of interpretation. Pollen analyses of Upper Pleistocene sediments from Dolní Věstonice I were presented by R. Schütrumpf (Brandtner 1956), M. Puchmajerová (1950) and H. Svobodová (Svobodová-Svoboda 1988; Svobodová 1991). Several years ago, B. Urban (1984) analysed the part of the section at Dolní Věstonice II - brickyard, including soil horizons of PK III and PK II. Together with R. Schütrumpf´s results, her investigations became starting point for interpretation of redeposited sporomorphes by later studies.

The redeposited Tertiary and Upper Pleistocene sporomorphes appeared throughout the sampled section (Fig. 38). The pollen of Platycarya, Carya, Engelhartia and Sciadopitys do not belong

to the Würm period. The Pinus grains, if corroded and dark yellow or brown (Fig. 40:d,f) and of smaller dimension (e.g. Pinus minutus - Fig. 40:b) origin from earlier strata as well. If the Pinus grains were redeposited from younger PK III and PK II horizons, the differentiating criteria are missing. These phenomena should be taken in account in interpretation of the Pinus presence throughout the section.

In the sample No. 1 termophilous trees are represented only by Corylus, while Alnus and Betula represent humid environment. Among the herbs dominate rather steppe species such as Artemisia, Poaceae, Polygonaceae, Chenopodiaceae and Brassicaceae. Spores of heliophilous fern Botrychium accompanied the steppe vegetation. Algae suggest the presence of possible water basins.

In the sample No. 2, the species Alnus and Betula prevail in arboreal pollen spectrum and the heliophilous species of Poaceae, Artemisia and Asteraceae dominate among the herbs. Botrychium witness an arid steppe vegetation. Pollen of Sparganium-Typha angustifolia, Algae, Zygnemataceae and water plancton suggest presence of water.

The dominance of spores of Botrychium and steppe species in the sample No. 3 indicate an arid steppe as well (without presence of termophilous deciduous trees). The same is true for sample No. 4.

High share of Pinus (71 % of the total sum) is striking in pollen spectrum of the cultural layer (sample No. 5). This sample may be compared to previous results concerning the same layer, from excavations 1985-86 (Svobodová 1991), where arboreal pollen sum range between 30 % and 50 % of the total sum. Another comparable evidence yielded the nearby section at Bulhary, dated to 25 675+2 750-2 045 B.P., where the total sum of arboreal pollen did not overpass 30 % as well (Rybníčková-Rybníček 1989). Pedological analysis documents the presence of earlier soils particles (Stillfried A: PK III and PK II, contribution by L. Smolíková), usually rich in Pinus (Urban 1984), in this level. Thus we are sceptical to the observed abundance of Pinus pollen in this sample. Furthermore, the intensity of Pinus pollen production in open steppe environment should be taken in account. For all these reasons, the high amount of Pinus pollen grains does not prove presence of a pine forest in the vicinity.

Samples from the archaeological excavations 1985-86 provide further evidence of termophilous deciduous trees (Quercus and Fagus) and coniferous trees (Larix). Among steppe species we observed pollen grain of Ephedra distachya. Spores of Botrychium reached 60 % compared to total sum and Algae (Pediastrum sp.) reached higher percentages as well.

Pollen spectra of all samples from the Pavlovian cultural layer of Dolní Věstonice II document steppe environment with heliophilous vegetation, with islands of termophilous deciduous (Quercus, Tilia, Carpinus, Fagus, Corylus) and coniferous (Pinus, Picea, Larix) trees. Juniperus appears as species of rather tundra - like landscape. Alnus, Salix, Populus and Betula indicate humid environment.

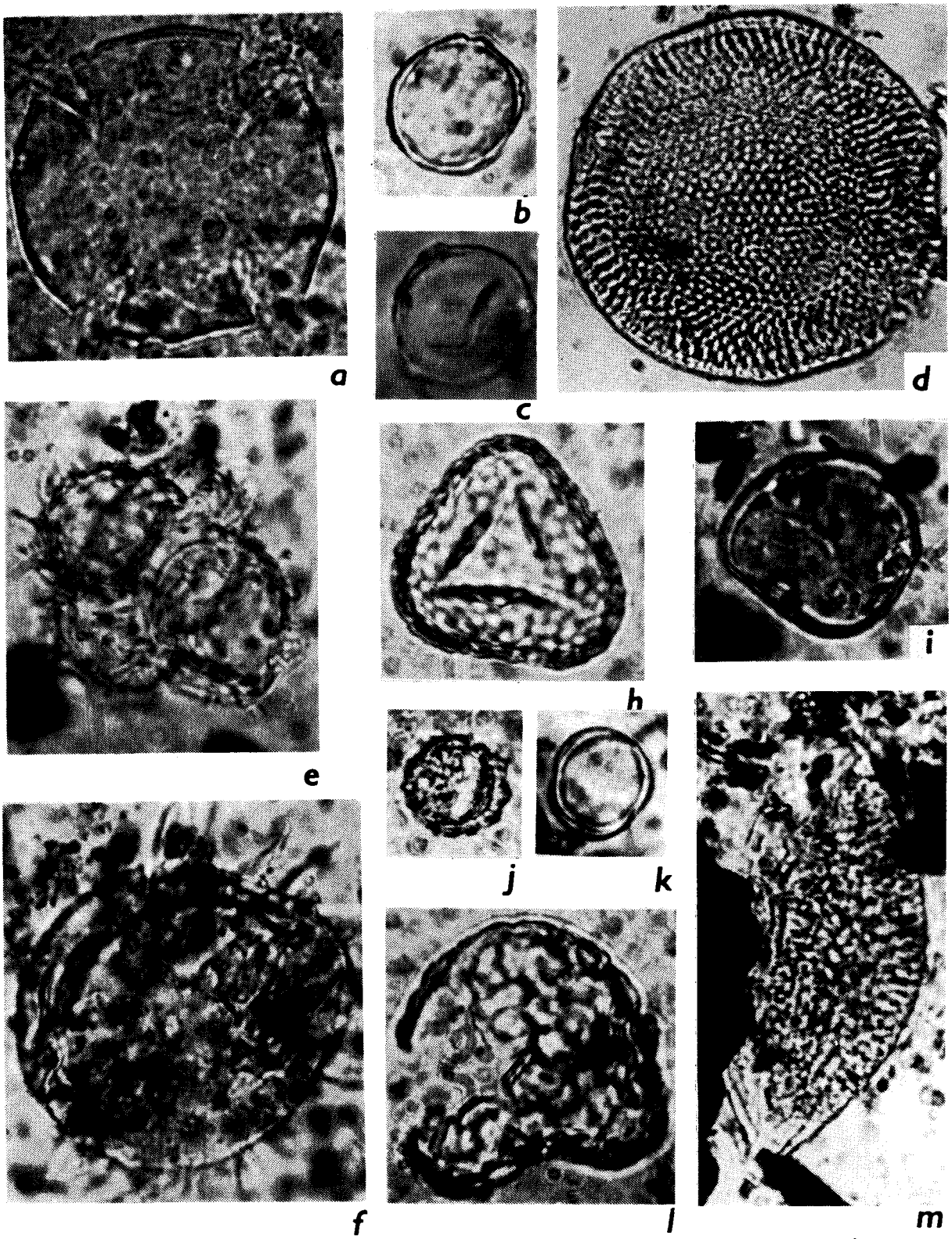


Fig. 39. Microphotographs of sporomorphs, a - Platycarya (layer 4), b - Plantago lanceolata (6), c - Betula (2), d - cf. Crassosphaera concinna (4), e - Selaginella selaginoides (3), f - Dinoflagellate cyst.? after van Geel et. al. (1989) t.-230 (1), h - Botrychium t.a (4), i - Tilia (2), j - Achillea t. (2), k - Artemisia (5), l - Botrychium t.b (4), m - Sciadopitys (3) x1 000.

The cool and dry type of vegetation prevailed in the overlying layer (sample No. 6). Pollen spectrum in the lower pseudogley (sample No. 7) suggests a tundra -forest vegetation with Juniperus, Salix and Pinus among the trees, and prevailing Poaceae and Cyperaceae representing the herbs. Among Pteridophyta we observed Selaginella selaginoides and Botrychium. The share of arboreal pollen is surprisingly high, about 74 % of the total sum.

The uppermost sample completes the sequence by a dry vegetation, poor in species.

Acknowledgement

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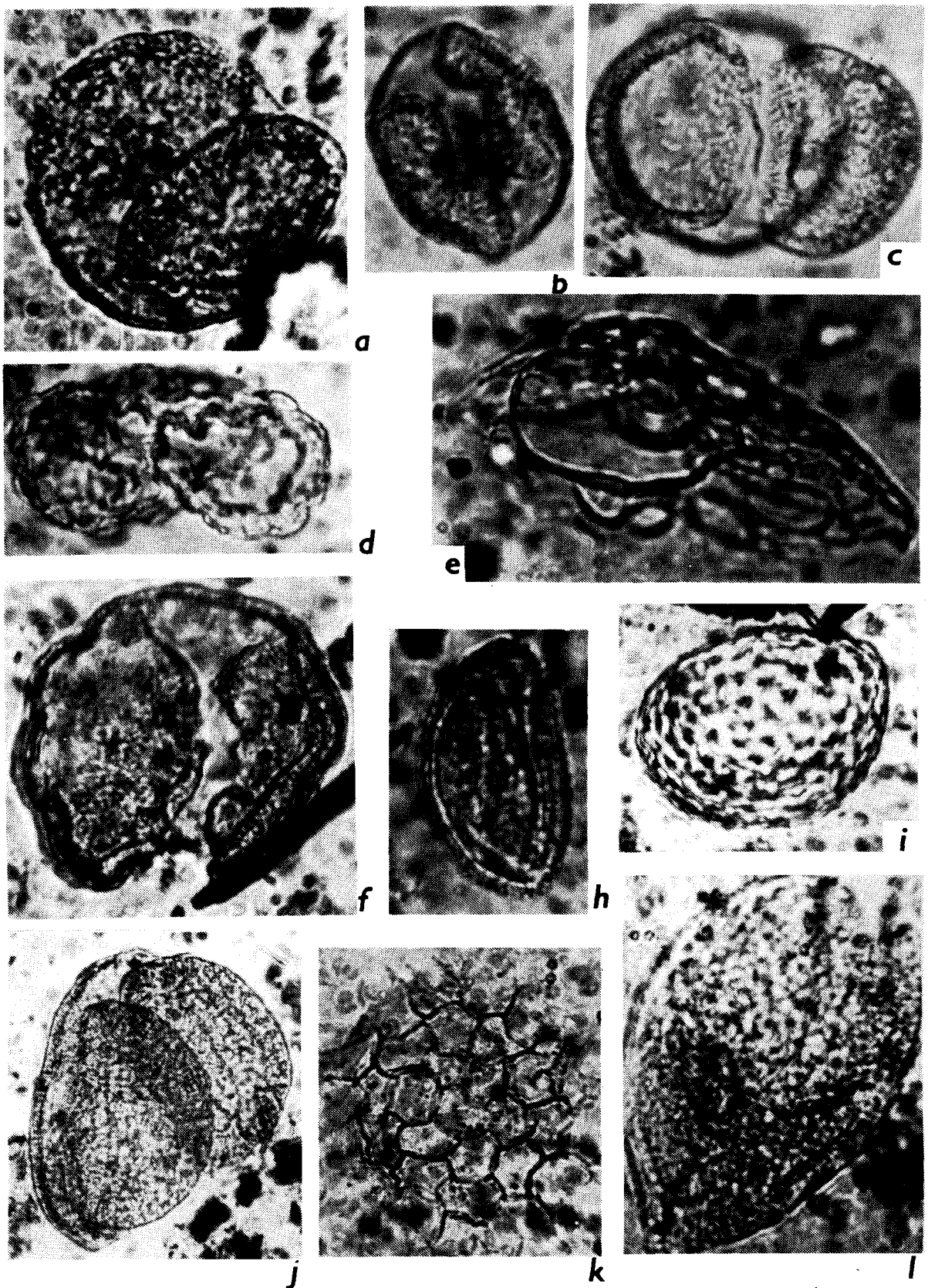

Fig. 40. Microphotographs of sporomorphs, a-d,f - Pinus (a: layer 4, b:5, c:3, d:4, f:3), e - Acari - Oribatei ? (5), h - Asteraceae Tub.undif. (1), i - Zygnemataceae after van Geel - van der Hammen (1978) t. 51 (3), j - Picea (1), k - Pediastrum boryanum (2), l - Piceapollis sacculiferoides (2). a-h,k x1000, i,j x500.

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MOLLUSCS FROM THE SECTION WITH THE SKELETON OF UPPER PALAEOLITHIC MAN AT DOLNÍ VĚSTONICE

Jiří Kovanda

At J. Svoboda´s excavations I surveyed, described and sampled a section of one of the upper etages of the loam pit at Dolní Věstonice on 5.05.1987. The pit was excavated by the Ingstav Corp. for the construction of an earth dam in the Dyje river valley (Nové mlýny III) and lay at the "Nad cihelnou" locality, above of the old brickyard at Dolní Věstonice. The section was sampled for both palaeomalacoanalysis and palynological processing (H. Svobodová, Tab. 1, Fig. 41) near the place where the skeleton of the Upper Palaeolithic man was recovered by J. Svoboda under the direction of a scientific commission. The site was left otherwise unaffected until my arrival four days later.

The section shows a cultural layer averaging 10 cm in thickness, soliflucted downslope and resembling a weakly developed soil sediment. It contains numerous charcoal and minute bone fragments. The cultural layer yielding finds of Pavlovian age, accompanied by the skeleton of man, is underlain by a loess sheet with a lenticular body rich in charcoal in its middle part. At the base of the section there lięs strongly and weakly weathered limestone debris with a dark brown humous soil containing minute charcoal on the surface of the limestone when moist. The cultural (and man-inhabited) bed is again overlain by loess with light ochreous and ochreous light brown interbeds and lenses probably representing gley horizons sensu Klíma (1958), as well as with curved rusty mottles and stains interpreted as ferric hydroxides precipitated by secondary pedogenetic processes.

A paper on the discovery of the skeleton and its section was published by J. Svoboda (1987). No doubt the cultural layer dealt with in this paper is a continuation of that containing a burial place with three additional skeletons exposed and studied by B. Klíma at the same site in the preceding year (1987). For this reason the cultural layer merits special attention and any information on natural environmental conditions is valuable in assessing in greater detail the mode of life of the Pavlovian people at the foot of Pálava, one of the most famous cultural sites in Europe.

Succession of strata: A brief description. A - small- and medium- sized fragmentary debris of Jurassic limestones filled with whitish-ochreous loam. Fragmentary limestones are strongly weathered on the surface, small fragments usually being completely weathered; B - humous or paraautochthonous soil dark brown (when moist), loamified, with numerous scattered pieces of charcoal; C_1 - light greyish-brown loess; C_2 - brownish-ochreous loess containing scattered charcoal; C_3 - light ochreous-brown loess with rusty spots; D - cultural (man-inhabited) bed consisting of distinctly displaced (soliflucted) greyish-brown soil or soil sediment locally ochreous in colour and dark brown spotted, with highly abundant charcoal;

E - I: succession of light ochreous-brown loess with curved rusty mottles and stains and of two interbeds of light-coloured, so called gley horizons (F, H). Figures in circles and squares indicate samples collected for palaeomalacoanalysis and palynological processing respectively. The section was surveyed on the stage face extending roughly north-southward and exposed westward.

Samples (0 - 7) taken for fossil molluscs roughly weighed 7.5 kg each. Numbers of individuals and species varied from one sample to other. Samples Nos. 6, 3, 4 and 0 yielded most abundant specimens, whereas Nos. 1, 7, 2 and 5 were the poorest in numbers. Largest numbers of species were obtained from samples Nos. 3 and 0; average numbers were recorded in Nos. 2, 4 and 6; and only two to three species are known from Nos. 3, 5 and 7 (Tab. 11). A striking difference therefore existed in the numbers of specimens and species as the succession of strata was being deposited. This is what makes the section highly attractive since it reflects changing environmental conditions at the site in time. This is one of the two aspects reviewed here. There are also considerable differences in the distribution of single species in the strata lying one upon the other. Thus, for instance, Succinea oblonga Drap. and S. o. elongata Sndb. together with Pupilla loessica Lžk. and possibly Vallonia tenuilabris (Br.) occur nearly throughout the succession, while the remaining species are either confined to a single stratum (e.g. Vallonia costata/Müll./, Carychium sp. and Helicopsis striata/Müll./ in sample No. 0 and Pupilla muscorum/L./ in sample No. 3) or are only present in samples Nos. 0 - 3 (Clausilia dubia Drap., Arianta arbustorum cf. alpicola /Fér./, Trichia hispida /L./, Pupilla triplicata /Stud./, Columella columella /Mart./, Vertigo pseudosubstriata Lžk. and V. parcedentata /Br./.

Similarly, largest numbers of shells belonging to one species vary throughout the succession of strata. Arianta arbustorum cf. alpicola (Fér.) achieves a peak in abundance in sample No. 3, Succinea oblonga Drap. and S. o. elongata Sndb in Nos. 0 and 3 and Pupilla loessica Lžk. in No. 0; a massive occurrence of the last-named species is only limited to samples Nos. 4 and 6. Vallonia tenuilabris (Br.) and Vertigo pseudosubstriata Lžk. are most abundant in sample Nos. 0 and 3 respectively. Additional evidence is thus provided of the diversified developmental history of the sequence in question.

It is a matter of greatest interest how far the molluscan assemblage from the cultural layer is related to the strata above and below it. In other words, an attempt must be made to find out whether the assemblage developed in a gradual manner, or sudden changes took place in its faunal content, and hence to give indirect evidence of a break in deposition of the sequence. A next step would be to establish the existence or non-existence of relationships between the lithofacies development and malacozoological content of the single strata, pointing the way to future work on the sediments of the section with special regard to their autochthonousness or allochthonousness.

From what has been said above it is clearly evident that four climatic-sedimentation cycles can be distinguished within

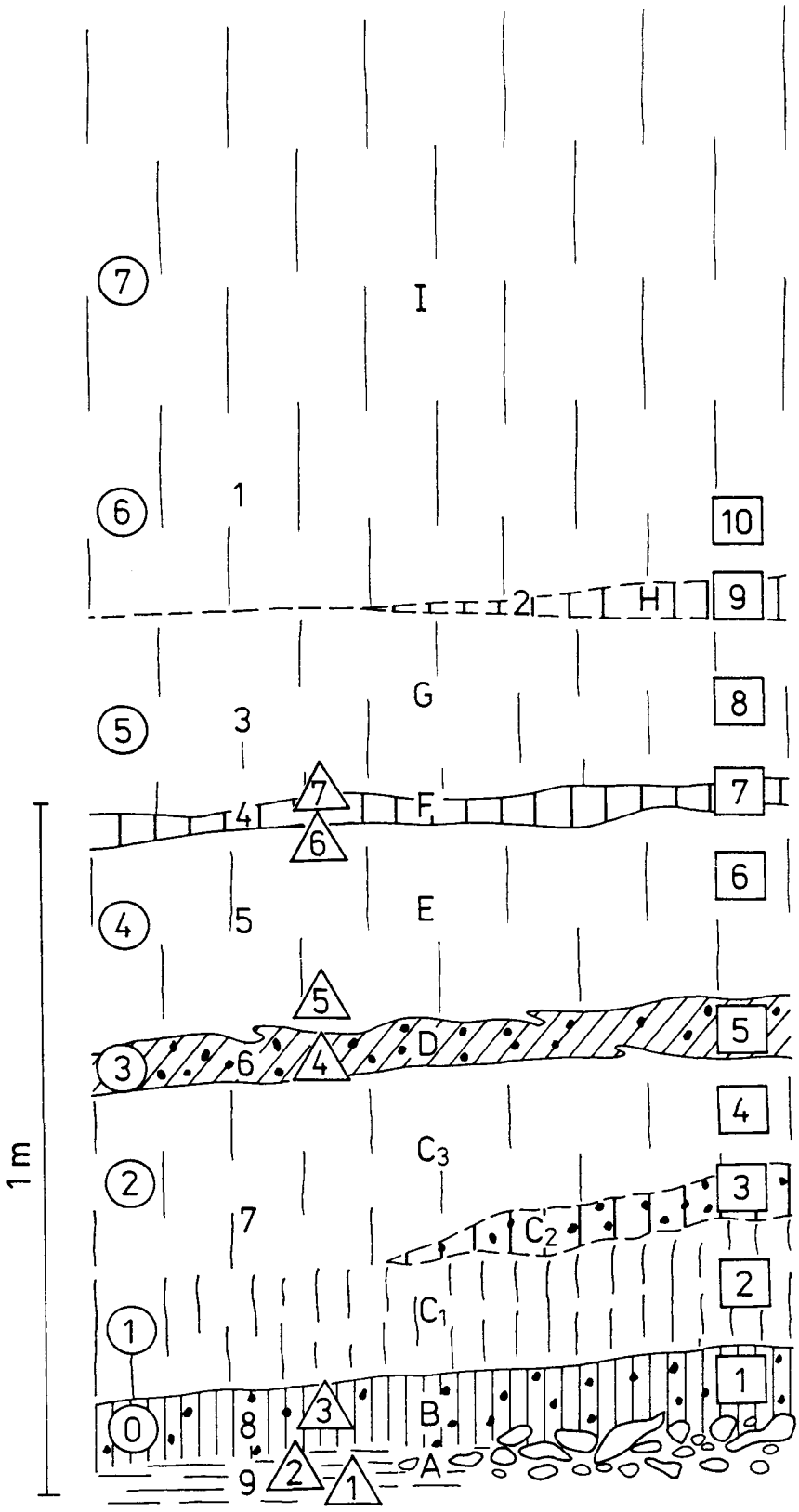

Fig. 41. Schematic representation of the section at the western slope. Samples for malacozoology are numerated in circles (0-7). Layer numbers (1-9) correspond to Fig. 4, numbers in triangles (1-7) indicate the position of paleopedological samples and numbers in squares (1-10) palynological samples. Capital letters A-I concern the sedimentation cycles. For sedimentological description see text.

the sequence under study, namely: a lower cycle represented by soil or soil sediment (sample No. 0), loess below the cultural layer (samples Nos. 1, 2), the cultural layer (sample No. 3) and the whole upper loess cover (samples Nos. 4 - 7).

The lower cycle contains abundant species of cool steppe assemblages such as Succinea oblonga elongata Sndb., Pupilla loessica Lžk. and Vallonia tenuilabris (Br.), but it is the only stratum in the section to include also climatically non-pretentious and inconspicuous species present in both loess and in "intermediate" (interstitial) faunas from glacial/interglacial or stadial/interstadial boundary periods, e.g. Vallonia costata(Müll.), Helicopsis striata (Müll.) and Pupilla triplicata (Stud.) (cf. Ložek, 1964). In our view, therefore, the malacozoological content of the stratum corresponds to the formation of a rather indistinct and thin fossil soil reflecting climatically improved site conditions. This means that loess was no longer deposited and a soil began to develop during an indistinct interstadial or in its final phase. Cool-loving species from here were left by an original loess subsequently giving rise to the soil, and since the soil is immature it was not able to dissolve and incorporate molluscan shells. The soil is separated from the cultural layer by the above-mentioned underlying loess (sample Nos. 1, 2). This soil is characterized by being strikingly poor in both individuals and species, due apparently to a break in deposition between the strata of soil and loess in litho/biostratigraphical respect. Following the uninterrupted soil development, the loess was deposited at a high rate accounting for a few malacozoological specimens obtained from samples Nos. 1 and 2.

The cultural layer is quite unique in respect of the developmental history of the section. There is no doubt that it shows anthropogenic effects indicating the occupation of the site. This accounts for the difference in the numbers of molluscs related to both overlying and underlying strata. Species of scientific value are dominated by Columella-faunas of Boreal-Alpine nature, such as Columella columella (Mart.), Vertigo pseudosubstriata Lžk., V. parcedentata (Br.), Vallonia tenuilabris (Br.) and Pupilla loessica Lžk., which give the assemblage quite unique features. The remainder of the species are only supplementary to the list of molluscs known earlier. The fauna available demonstrates environmental conditions prevailing at the site when it was occupied by the Pavlovian people. This situation can be interpreted as a cold subarctic tundra, which is fully in agreement with the discovery of bones of mammoths and reindeer in the same horizon. Species of molluscs found at this locality correspond with malacozoological specimens obtained from exposures previously known to contain the same cultural layer, though this refers to the purely terrestrial facies (cf. Kovanda, 1979). Other hydrophylous, even aquatic species are ubiquitous whenever the cultural layer appears in the palustrine facies (Kovanda, 1985; Svoboda, 1987).

Megascopic examination of the section is sufficient to observe the whole cultural (man-inhabited) layer slightly

Tab. 11

Species	Sample 0	1	2	3	4	5	6	7
Vallonia costata (Müll.)	/							
Carychium sp. juv.	/							
Helicopsis striata (Müll.)	/							
Clausilia dubia Drap.				/				
Clausiliidae sp. frgm.	/		/					
Arianta arbustorum alpicola (Fér.)	/	/	X	✳				
Trichia cf. hispida (L.)			(/)	X				
Pupilla triplicata (Stud.)	/			/				
Pupilla muscorum (L.)				/				
Succinea oblonga + elongata Sndb.	/	(/)	/	✳	X	X	X	X
Pupilla cf. madida (Gredl.)					(/)			
Pupilla loessica Lžk.	✳	X	(/)	/	0	X	0	X
Columella columella (Mart.)				/				
Vallonia tenuilabris (Br.)	✳		(/)	/	/		/	
Vertigo pseudosubstriata Lžk.				✳				
Vertigo parcedentata (Br.)				/				
Trichia aut Helicopsis frgm.							/	
Climatic-sedimentation cycle:	a		b	c		d		

Occurence: / single, X occasional, ✳ numerous,
0 mass, (/) uncertain determination

soilfluctеd downslope. This was noted already by B. Klíma (1987) and J. Svoboda (1987) - see their figures. Solifluction typically occurs at Dolní Věstonice since a similar, if not identical, cultural layer discovered by Klíma in his earlier exposures displayed the same pattern - landslipped and roof-tile-like blocks (e.g. Klíma, 1963, 1983a, b). It seems likely that at this locality landsliding did not occur over a great distance because the skeleton removed by J. Svoboda remained virtually nearly complete and the molluscan shells do not show signs of a more intense rupture compared to the adjacent strata.

Considering that the man-inhabited bed is not uniform in sediment lithology (irrespective of the presence of abundant charcoal), the loess sheet above reflects a change in the site conditions. Evidence exists of a break in deposition between the cultural layer and the loess above, particularly with regard to the molluscs contained. This overlying sheet shows various stains and "curved" mottles and contains typical light ochreous loess alternating with slightly clayey interbeds reminiscent of Klíma´s (1958) "gely horizons". It is dominated by the assemblage of the species-poor, psychrophylous, loess and steppe-like "Pupilla" faunas including extremely abundant species of Pupilla loessica Lžk and the ubiquitous species Succinea oblonga Drap. and S. o. elongata Sndb accompanied by Vallonia tenuilabris (Br.). Only 1.5 m of this overlying loess was present in the section of the stage under study. Possible younger strata were removed during excavation of the loam before the skeleton was discovered.

Conclusions

Megascopic examination of the section yielding the skeleton of Pavlovian man (described by Svoboda, 1987) and fossil molluscs above the brickyard at Dolní Věstonice has led to the following conclusions:

1. The soil overlying limestone debris at the base of the stage considered (sample No. 0) is virtually in situ. It was formed in a relatively short period of time, apparently in a closing phase of interstadial nature;
2. evidence exists of a short break in deposition between the above soil and loess below (samples Nos. 1, 2);
3. the cultural (man-inhabited) layer yielding the skeleton is a separate horizon largely formed by man´s activities. It dates from the coldest glacial phase; evidence used in support of this view is the presence of molluscs indicating, like bones of large mammals, that it originated in a Boreal-Alpine tundra environment;
4. the cultural layer is clearly soliflucted downslope, though not over great distance;
5. the cultural bed is separated from the loess above by a long break in deposition, as may be evidenced not only by lithologic data but especially by the presence of fossil molluscs;
6. the discovery of the malacofauna in the section under study is in full agreement with hitherto studied sequences showing the same cultural bed in old exposures and excavations made

not only at Dolní Věstonice and Pavlov but also at nearby Milovice; at the last-mentioned site archaeological investigations are now carried out by the Moravian Museum in Brno;

7. the cultural bed is unambiguously assigned stratigraphically to the beginning of the last stadial within the last (Würm) glacial, not to the last (former W2/3) interstadial (soil complex 1). This interstadial seems to have produced the soil overlying the debris at the base of our section and separated from the cultural layer by the underlying loess described above.

Postscript

The loess excavations resulted in the exposure of the basement of the section under study. It represents a complex sequence of colluvium, debris, loess, fossil soils and soil sediments, all preserved as intricate landslipped blocks and slices. They rest on fossiliferous calcareous clays terminating deposition of the 40 m sand-and gravel terrace of the Dyje river (Brčák, 1968) or lie directly upslope on the redeposited weathered sandy deposits of the Paleogene of the Ždánice tectonic unit.

Successions of the faces and stages then quarried were drawn and described; two sections were exposed (inclined) northward and one sections was exposed westward; nine sub-sections were selected to take samples for fossil molluscs, vertebrates, pollen analysis, paleopedological studies and, at least in part, paleomagnetic survey. This site contains a highly diversified fossiliferous complex of the Middle and perhaps Lower Pleistocene age, hitherto known only from two boreholes drilled into the basement of the brickyard at Dolní Věstonice (cf. Havlíček-Kovanda, 1985).

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REPORT ON THE RESULTS OF USE WEAR ANALYSIS OF LITHIC MATERIAL FROM DOLNÍ VĚSTONICE

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This report is the first part of the analysis of use-wear of the lithic material from the site Dolní Věstonice II, Czechoslovakia. Results presented here pertain mostly to the 1st settlement unit. This area consisted of a hearth, a human skeleton, numerous faunal remains, and a large collection of lithic materials.

During the summer 1990, I carried out an analysis of the lithics, in order to determine the extent, intensity, and the type of use wear that these may exhibit. I examined 1610 stone artefacts and 53 pieces that were identified as possible formal tools. This sample covers the greater part of the industry gained from the studied area. After a preliminary inspection, each specimen was carefully examined under a low power microscope with the magnification of 50 and 75x. Each piece that was determined as having some traces of use wear, was then judged in terms of the type of the traces: polish, striae, and heavy-impact damage. Intensity of use was identified as minimal, moderate, and heavy. Extent of the use wear was measured in terms of the portion of the stone piece that showed traces of use wear. This served as supporting information for determining the intensity with which the lithics may have been used.

The preliminary geological report shows that the majority of the raw material was imported. The exact location of the sources has yet to be established, but the areas from which the raw material originated have been determined. Most of the material comes from the North and Northeast (present Poland), and the East (present Western Slovakia). Other sources will be identified when the full geological report is available.

The artifacts recovered from the 1st settlement unit are predominantly made of hornstone and a small portion is from radiolarite. A few pieces from a local quarzite were recovered as well. It should be noted that raw material for stone tools is locally available in south Moravia and the sources were exploited in previous times as well as later during the Neolithic. Shortage of resources was not the reason for the import of the stone from distant areas.

The area selected for this study was excavated using a 1x1 meter grid and labeled A18 - A22. The contiguous squares to the east were labeled Aa18 to Aa22 (Fig. 2). Following is the account of the examined lithics from individual squares:

Square A18 rendered 143 pieces to examination, three were identified as formal tools but none of these showed traces of use wear. One stone flake had distinct traces of heavy damage caused by repeated hitting.

Another sample from the area of the squares A18 and A19 (A18/19) had 96 pieces, eight of which were identified as formal tools. Four of these tools showed traces of use wear. An additional two retouch flakes were used as well.

Square A19 rendered 287 pieces; six were identified as formal tools. Out of these, four had traces of use wear, and an additional four pieces of the total were used as well. These four pieces include: two used microblades that could be added to the total of formal tools identified in this square, one used retouch flake, and one resharpening flake. The resharpening flake is only one of two found among lithics of the studied assemblage. Both were found in areas adjacent to the hearth, the other one being in A20/21.

Square A20 was the location of the hearth D that was approximately 1m in diameter. It contained 123 pieces of lithics scattered around, none showed signs of use. An additional six pieces were identified as formal tools but five of them were shattered by the heat of the hearth and could not be observed for use wear. The remaining piece was covered by polish applied during cataloguing which prevented any observation of traces.

Square Aa20, adjacent to the east of the hearth, had 295 pieces of lithics, and 12 of them were identified as formal tools. Out of these, eight showed traces of use and one piece could not be observed due to postdepositional damage. An additional four flakes had traces of use. This square had the highest percentage of use wear from the entire site: 4.07% of the total, and 72.73% of the formal tools were used.

Another sample from the area of the squares Aa20 and Aa21 (Aa20/21) contained further 160 pieces of lithics, six of them identified as formal tools. One of these tools showed traces of use, and four of the flakes were utilized. These four flakes showed traces of variable use, with two damaged due to a heavy impact and repeated hitting. One was a resharpening flake and one was a utilized retouch flake. All four were larger than the average size (29x12.7 mm) of the used lithics in this occupation level.

Square A21 contained 288 pieces of lithics, ten of which were identified as formal tools. Five of the tools had traces of use wear and four additional pieces showed signs of utilization. Depression A, located about 25 cm west of the feet of the skeleton, contained charcoal, faunal remains, and lithic material. It held 241 of the total number of the pieces and five of the examined tools. Only one used formal tool and one used flake of the square A21 were from this depression.

Square Aa21 contained 184 examined pieces of lithics, two of which were identified as formal tools. These were both utilized, as well as four other flakes from this square. One of these flakes is a truncated blade and can be added to the list of the formal tools, the remaining three are retouch flakes that exhibit utilization.

Square A22 contained 88 examined pieces, none of which were used.

Tab. 12. Spatial distribution, percentage and numerical count of use wear traces

location	No.of lithics	No.wt use wear	No.of tools	No.wt use wear
A18	140	1	3	0
%	143	0.7%	3	0%
A18/19	88	2	8	4
%	96	6.25%	8	50%
A19	281	4	6	4
%	287	2.79%	6	66.66%
A20	123	0	6	-
%	0	0	0	0
Aa20	283	4	12	8
%	295	4.07%	11	72.73%
A21	278	4	10	5
%	288	3.13%	10	50%
depression A	241	1	5	1
%	246	0.8%	5	20%
Aa20/21	154	4	6	1
%	160	3.13%	5	20%
Aa21	182	4	2	2
%	184	3.26%	2	100%
A22	81	0	0	0
%	81	0	0	0

Interpretation

The large quantity of the debitage, used and unused flakes, indicates that the raw material was not treated in the most economical way. The stone was not used to its maximum and not every detached flake was turned into a formal tool. On average, the retouch flakes are significantly larger (29x12.7 mm) than the formal tools (17.4x5.2 mm). Economy of the raw material was not a major force behind the production of stone tools at this part of Dolní Věstonice II site.

Despite the fact that the material was brought from a fairly distant area, it was not treated in a fashion that would suggest its rarity and inaccessability. Large, detached flakes were not reworked into usable implements, and considering that most of the used tools were microliths, it would seem clear that a potential existed for a far greater number of tools than were actually produced. Therefore, I would suggest that the people who made the tools at Dolní Věstonice II may have migrated regularly over a fairly large area and were familiar with the landscape and its potential. It could also be suggested that they were in a regular contact with other groups and exchanged with them either information about the resources, or the materials themselves. The "wastefulness" with which they seem to have treated the "imported goods" may indicate either or both of the suggested scenarios.

Out of the 1610 pieces examined, only 23 (i.e. 1,43%) showed traces of use wear. Among the 23 utilized pieces, four could be identified as formal tools (three blades, one microblade), which reduces the percentage of retouch flakes that were used to 19 out of the total 1610 (1.18%). These flakes may be separated into three groups - retouch flakes that were used as tools (14), resharpening flakes (two), flakes removed as a result of heavy impact, possibly an activity resembling that of a hammer (three). Both resharpening flakes and the three flakes removed by heavy impact are from areas immediately adjacent to the hearth, the retouch flakes are not distributed in any specific pattern through the site to suggest a particular interpretation. The small size of the analysed area (5x2 m) does not lend itself to an elaborate spatial analysis with special activity areas. The formality of the finished tools that were utilized, in contrast with the small percentage of used retouch flakes, may suggest a special activity carried out at the site. However, the same artifacts may be a result of a very specific, culturally conditioned notion of material culture. They could also represent an intersection of these two possibilities.

A small number of the lithics (53) were identified as formal tools. Only 45 of these could be examined for use wear, as five pieces were shattered by the heat in the hearth, and three were damaged by the polish in the process of labelling. An additional four stone pieces from the collection of retouch flakes were identified as tools. Out of this total of 49 lithic tools, 28 had traces of use wear (57.1%). A majority of the tools is composed of microblades with the average size 17.4x

x5.2 mm. My observations did not show any significant correlation between the size of the tool and the intensity of utilization. All of the tools had either moderate or heavy traces of wear.

Four pieces showed clear signs of hafting, with some difference in the material into which they were inserted. One of the microblades had an entire edge covered with polish and lines parallel to the edge. This suggests hafting into a less abrasive, softer material, possibly wood. The three tools, that I identified as having signs of hafting, are all marked with fairly deep striae, perpendicular to the edge. They all show polish on the opposite edge to the striae. These microblades were inserted into a harder, more abrasive material, possibly a bone. The majority of the tools have traces of polish on the utilized edge. This indicates use on a non-abrasive material, plant or animal tissue.

The microliths generally display a high intensity of use, and some tools show signs of being almost worn out. A high negative correlation appears between truncation and the intensity of use wear. Those lithics that were truncated have fewer traces of use, than those that were not truncated. I suggest that the truncated microliths snapped in the process of being used and were discarded for that reason. The nontruncated microliths, on the other hand, were used to their maximum potential.

It seems plausible that the people who occupied the site at Dolní Věstonice II were not concerned about the availability of the raw material and did not treat it with a special sense of economy. However, I suggest that the work that was put into making the serated microblades was highly valued and these were used until they were considered non-functional - either snapped during use, or worn out. The additional labour that increased the value of the product came from hafting that required a certain amount of skill and time. It appears that the artifacts that were invested with the largest amount of work and/or skill showed the highest extent of use.

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