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# A settlement of the Early Eastern Linear Pottery Culture at Moravany (Eastern Slovakia)

## Introduction

Marcel Hamza, then a student of Prešov University, discovered the early Neolithic settlement at Moravany in 1998. The first trial excavations were undertaken in the same year. The results turned out to be very promising, therefore the decision was made to begin an interdisciplinary research project. The research has been conducted since 2000 within the framework of the tripartite agreement between the Institute of Archaeology, the Jagiellonian University in Kraków, the Institute of Archaeology, the Slovakian Academy of Sciences and the Philosophical Faculty of Prešov University. Together with field campaigns, a number of archaeological, palaeoenvironmental and palaeoeconomic analyses were executed (Kaczanowska *et al.* 2002; 2003; Kozłowski *et al.* 2003).

## Location and environmental setting

The study area is located in the Ondava river basin within the Eastern Slovakian Lowland on the border between its two components: the Eastern Slovakian Hills and the Eastern Slovakian Plain (Fig. 1).

The Moravany site is located on the western slope of the tectonic horst: the Pozdišovski Range with small scale uplift. This range of N-S direction is an elevation between two depressions: the Ondava Plain to the west and the Laborec Plain to tehe east. The Sarmatian (Kochanovce formation) and the Lower Pannonian (Sečovce formation) clays built this elevation. The Quaternary cover of slope deposits is irregular and very thin (Fig. 2). This is no surprise whereas radiocarbon datings from the deluvia (19980±460 BP) and buried soil (19890±120 BP) indicate that intensive slope movements occurred in the study area during the maximum of last glaciation (Kalicki *et al.* 2004). The deposits are very homogeneous

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silts (Mz=6.3-6.7φ), badly sorted (δ=1.6-1.7). Only the southern part of the Pozdišovski Range, 5 km southward from the site, is covered with loess. The Quaternary alluvia of the Ondava, Topla and Laborec rivers fill the depresions (Bañacký *et al.* 1987).

The Pozdišovsky Range (228 m a.s.l.), with a planation surface on the top (Kvitkovič 1980), is a moderately differentiated morphostructure without aggradation. Its western and eastern slopes (slope 2-6°) are morphologically distinct and developed on tectonic faults. The lowland hill relief of this part the of Eastern Slovakian Hills is medium dissected (Mazúr *et al.* 1980).

The Moravany site is situated on the altitude 170 m a.s.l., about 60 m above the Ondava flood plain. The site is delimited from the south by a small, dry valley of the Šarkan creek. This periglacial valley is cut in the basement (Kvitkovič 1980). Generally speaking, the excavated settlement has an atypical topographical position since early Neolithic sites concentrate in the lower part of the relief.

The climate of the region is warm (mean temperature of July 8-9 °C; 50 or more days with daily maximum air temperature above 25 °C annually on average), moderately dry (mean annual precipitation about 600 mm; Koncek's moisture index Iz = 0 to –20) with a cool winter (mean temperature of January below –3°) (Lapin *et al.* 2002). The study site is located in a type of mesoclimate (IIc), warm and dry on east and west exposed slopes with a favourable insolation, optimum temperature and air humidity conditions (Hess *et al.* 1975). The Ondava and Topla rivers have a rain-snow combined type of run-off regime with floods during March and minimum discharges during September (Šimo, Zaťko 2002).

Eutric to dystric planosols and (luvic-, albic-) stagnosols from colluvial deposits with very low content of humus in the topsoil occur on the Pozdišovski Range, whereas rich in humus (above 2.3%) eutric fluvisols associated with gleyic and arenic eutric fluvisols from non-carbonate fluvial sediments dominate on the surrounding plains (Bielek 2002; Šály, Šurina 2002).

As to potential vegetation, the highest sites of the Pozdišovsky Range were covered with oak forests with *Potentilla alba*, whereas the lowest slopes with lowland hygrophilous oak and hornbeam forests. Elm floodplain forests and willow and poplar floodplain forests along the river grew in the valley bottom of the Ondava and Topla rivers (Maglocký 2002).

**Studies of the archaeological site**

Nearly 1500 sq m of the site area have been excavated (Fig. 3). Moreover, in the vicinity of the site a dozen or so trial trenches were made in order to, first of all, obtain geological and geomorphological data.

In the archaeologically investigated section of the settlement, almost 40 anthropogenic features sunk into the ground were identified. Generally, they are characterised by the presence of greyblack clayey filling. In some of the pits the lower part of the filling had a more intensive sooty colour. The features could be seen at a level of 30–40 cm; and were sunk to maximum 110-120 cm from the ground surface.

In terms of shape and dimensions, four types of features can be distinguished:

1. A relatively large (about 1.5–5 m in diameter) trough-like features, circular or oval in outline were discerned (2/99A, 2/99B, 2/2000, 8/2000, 2/01, 8/01, 3/02, 4/02) (Fig. 4). An exceptional structure in this category is feature 1/01 because its formation is clearly multiphase, while its filling contained almost no material finds. Possibly, this part of the site was intentionally protected from dumping or leaving rubbish.

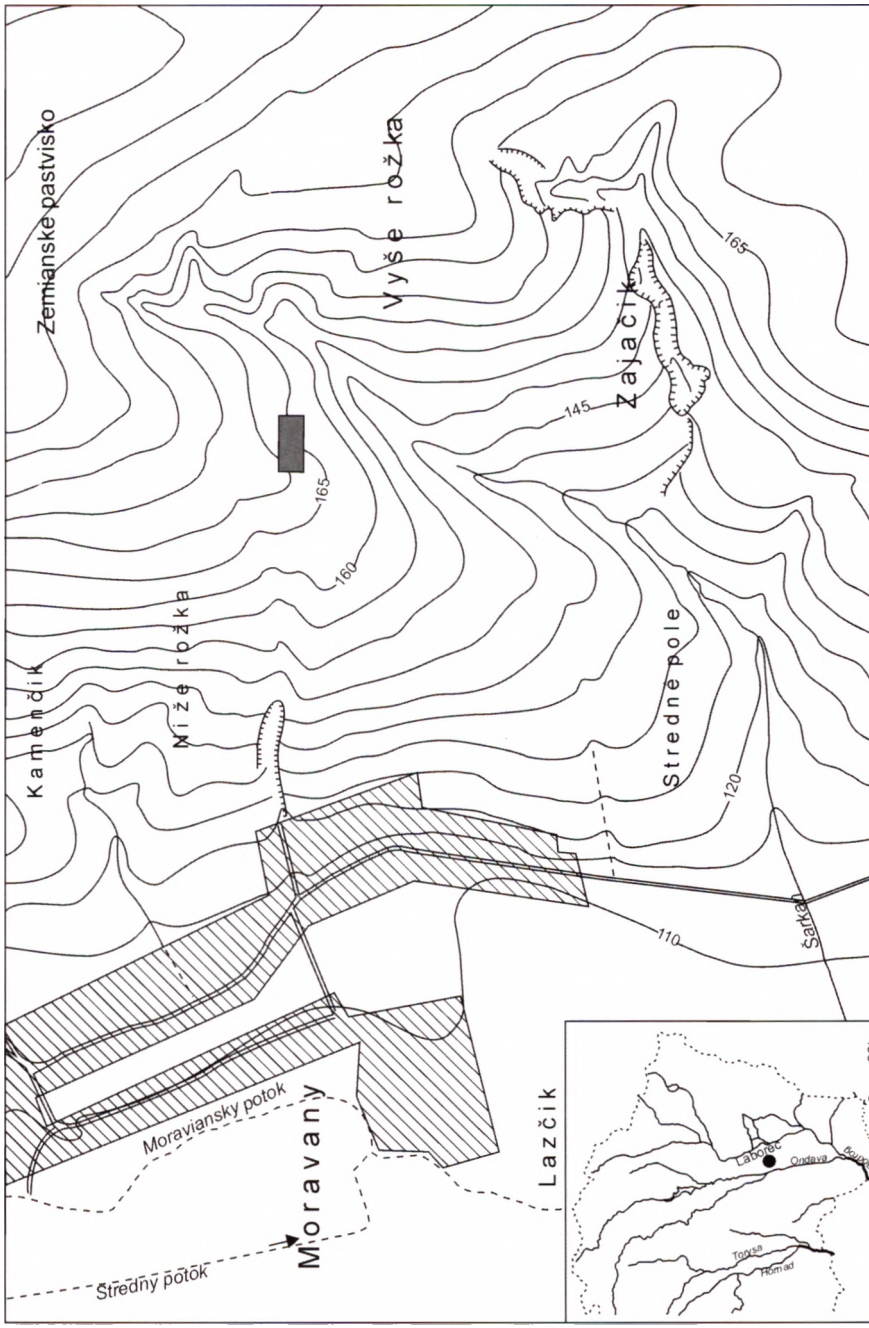



Fig. 1. Location of site at Moravany (gray rectangle).

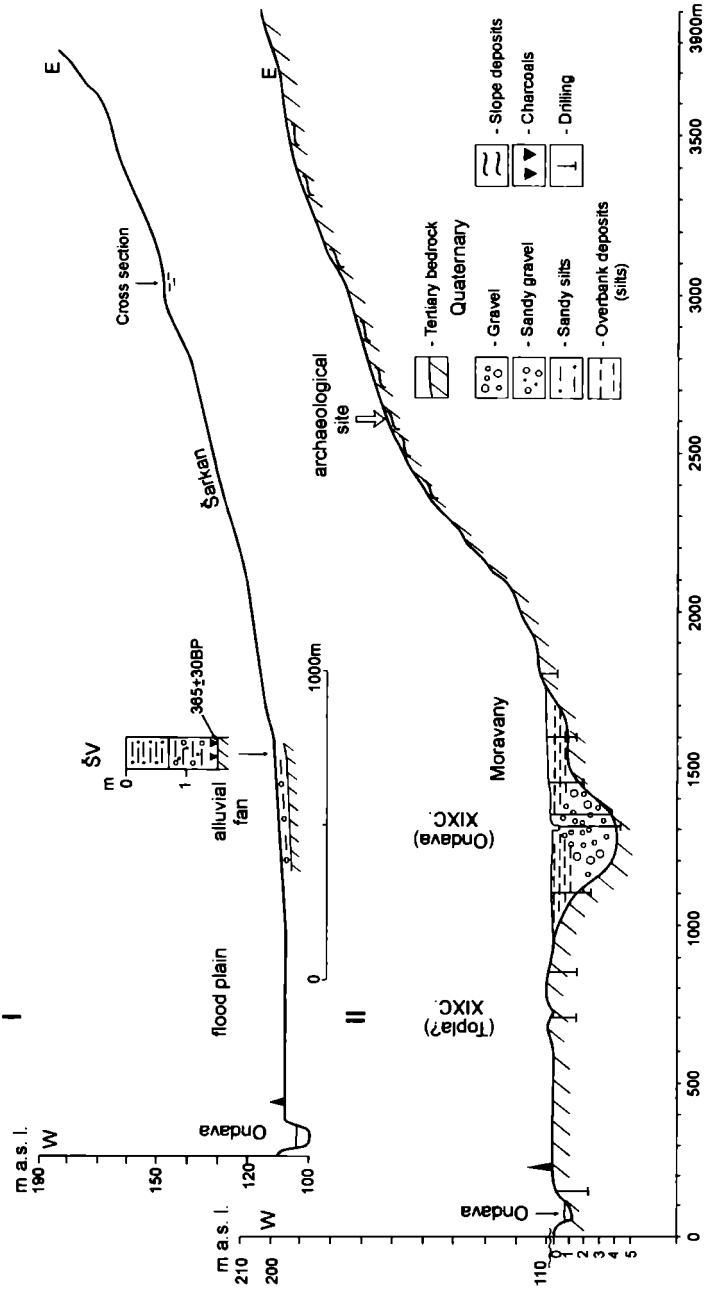



Fig. 2. Longitudinal profile of Sarkan valley (I) and section across Ondava river flood plain and slope with archaeological site (II).

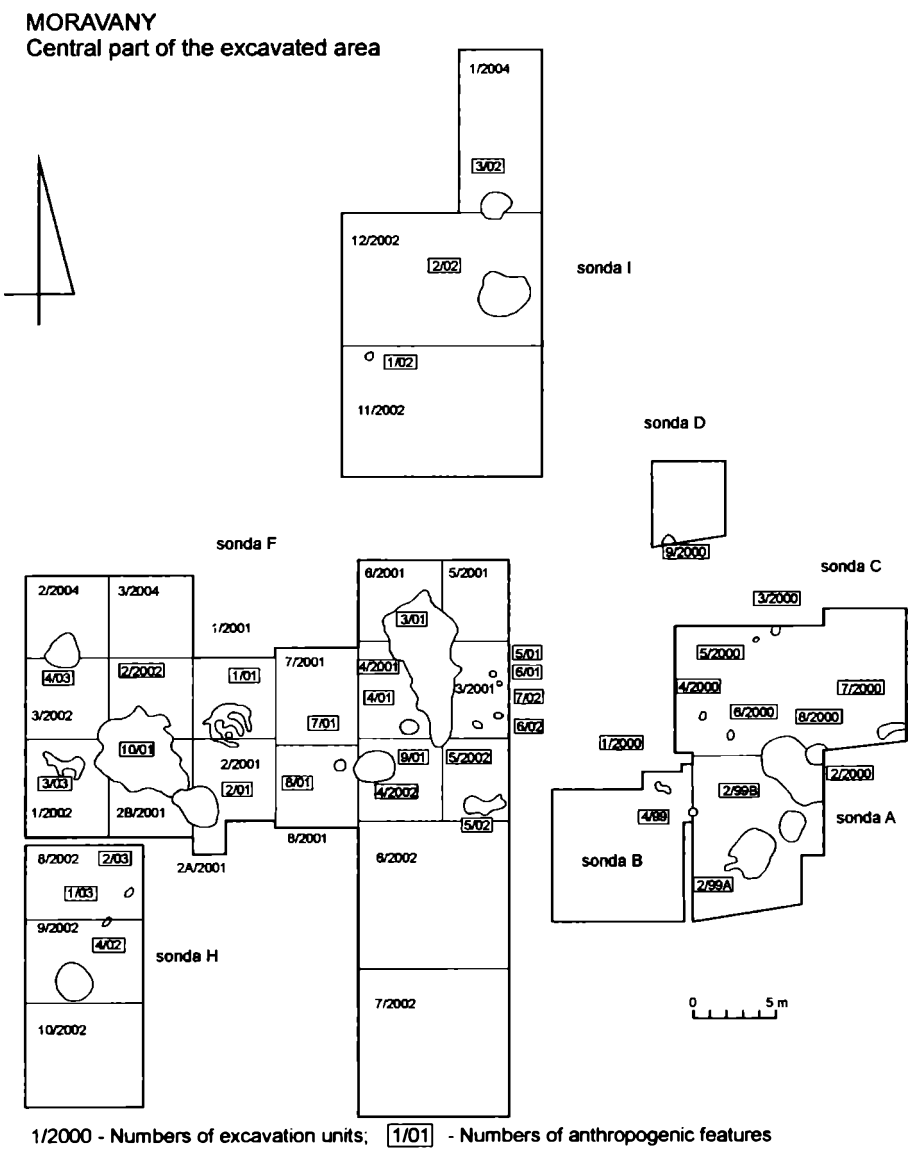



Fig. 3. Moravany. Distribution of excavation units and features of the central part of the settlement.

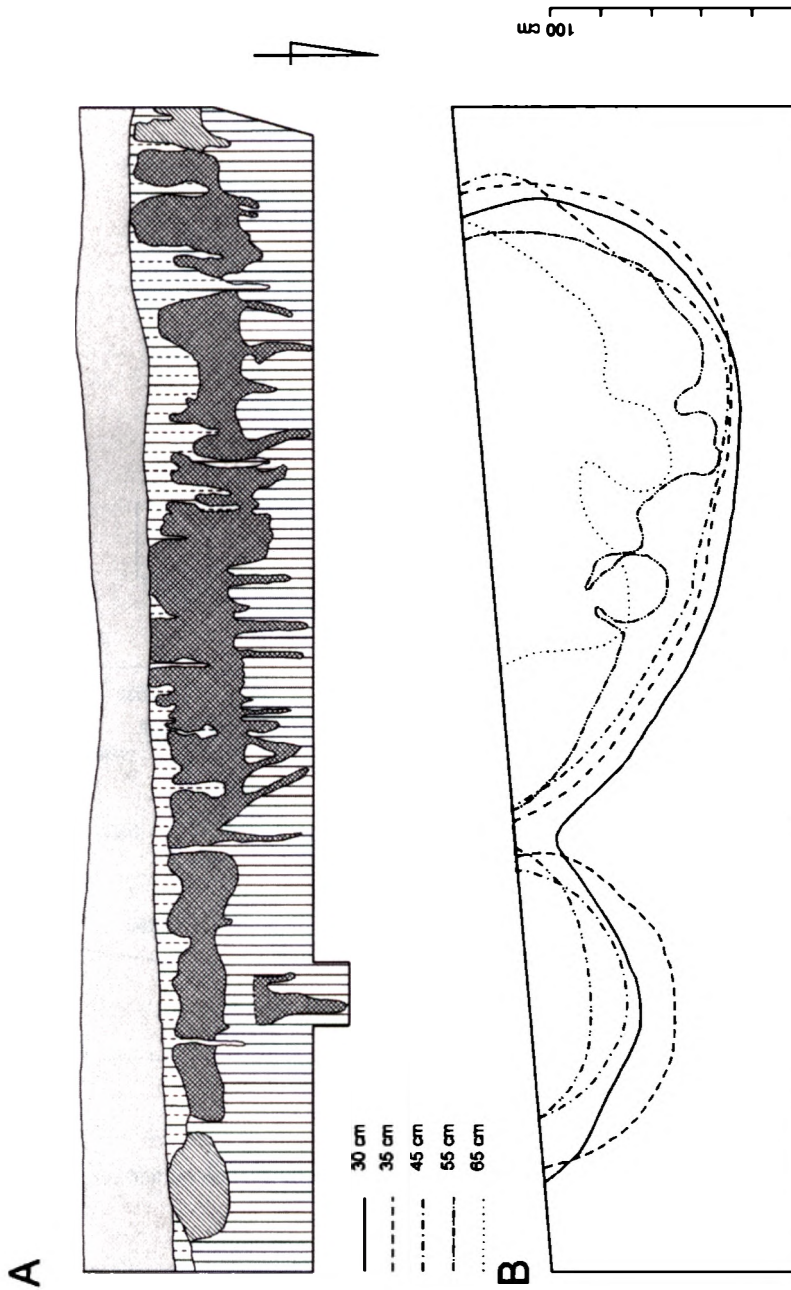



Fig. 4. Moravany. Cross-section of features 2/2000 and 8/2000 (A) and horizontal outlines of their northern parts (B); signatures of sediments as in Fig. 6.

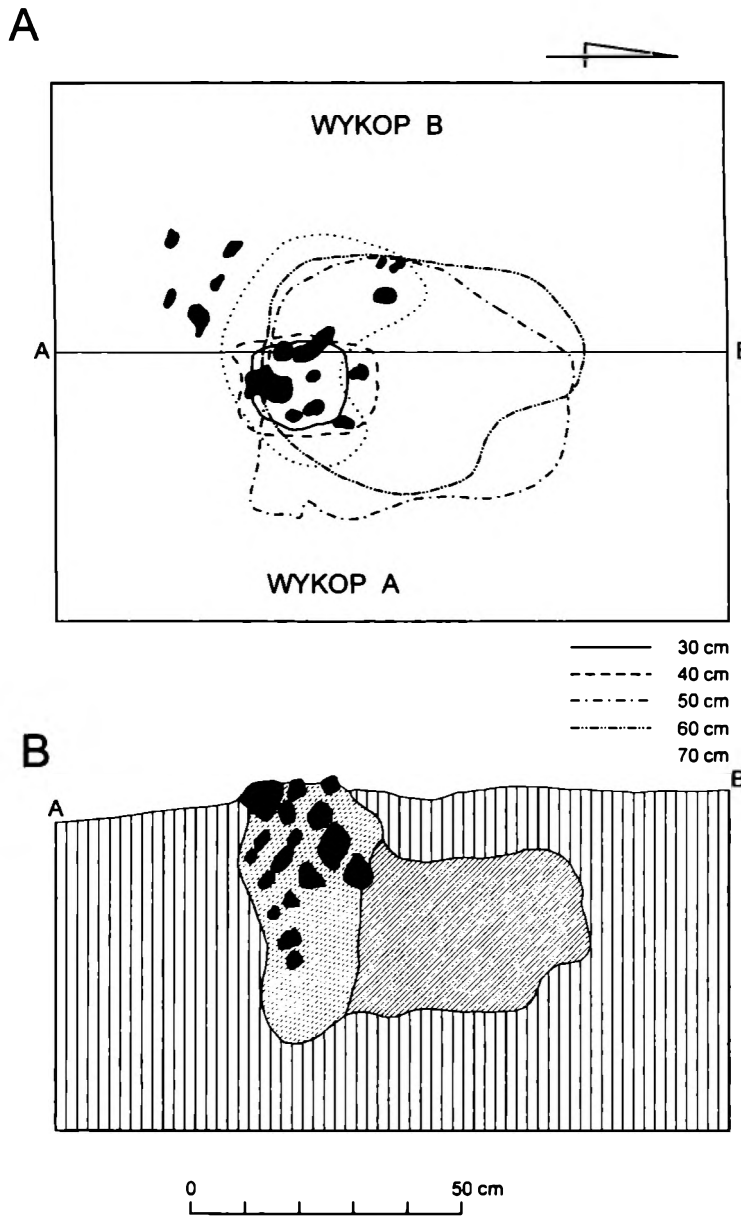



Fig. 5. Moravany. Horizontal outlines (A) and cross-section (B) of feature 4/99. Black patches denote daub barrels; signatures of sediments as in Fig. 6.

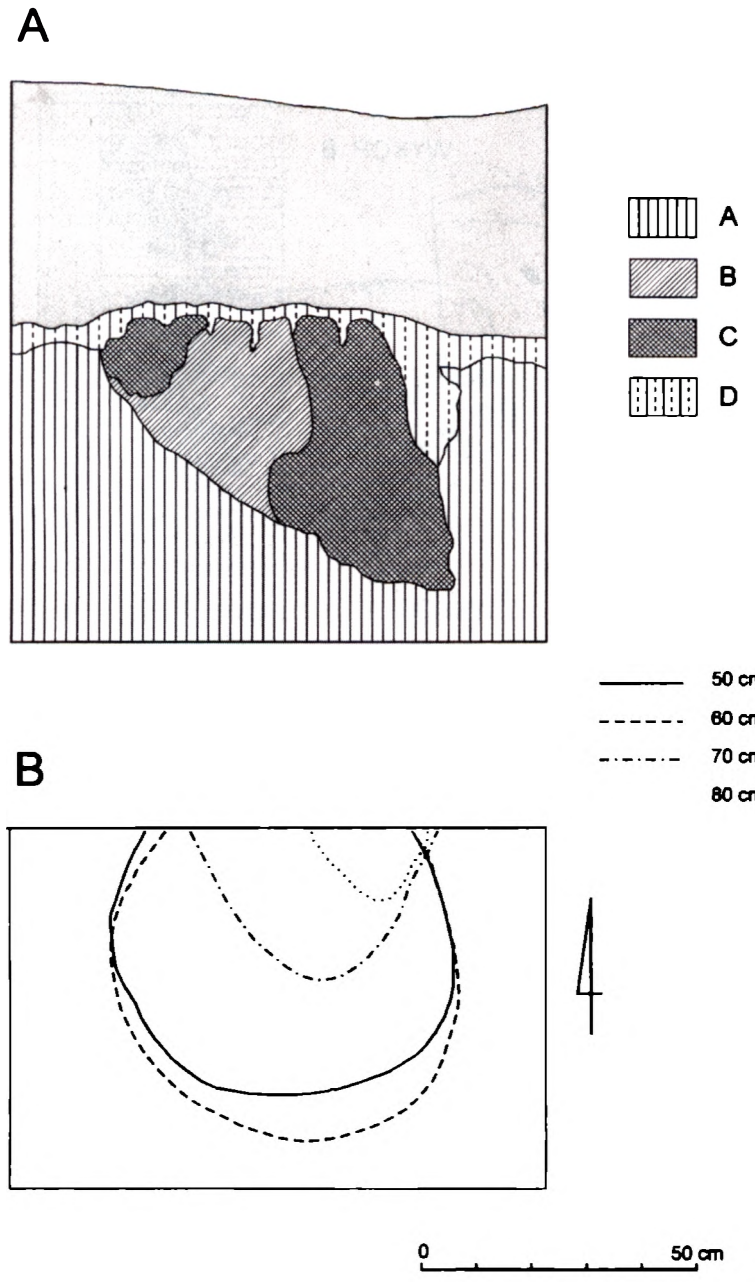



Fig. 6. Moravany. Cross-section (A) and horizontal outlines (B) of feature 3/2000.
A – dark-brown clay, B – light-black clayey sediment, C – black clayey sediment, D – yellow silty sediment.

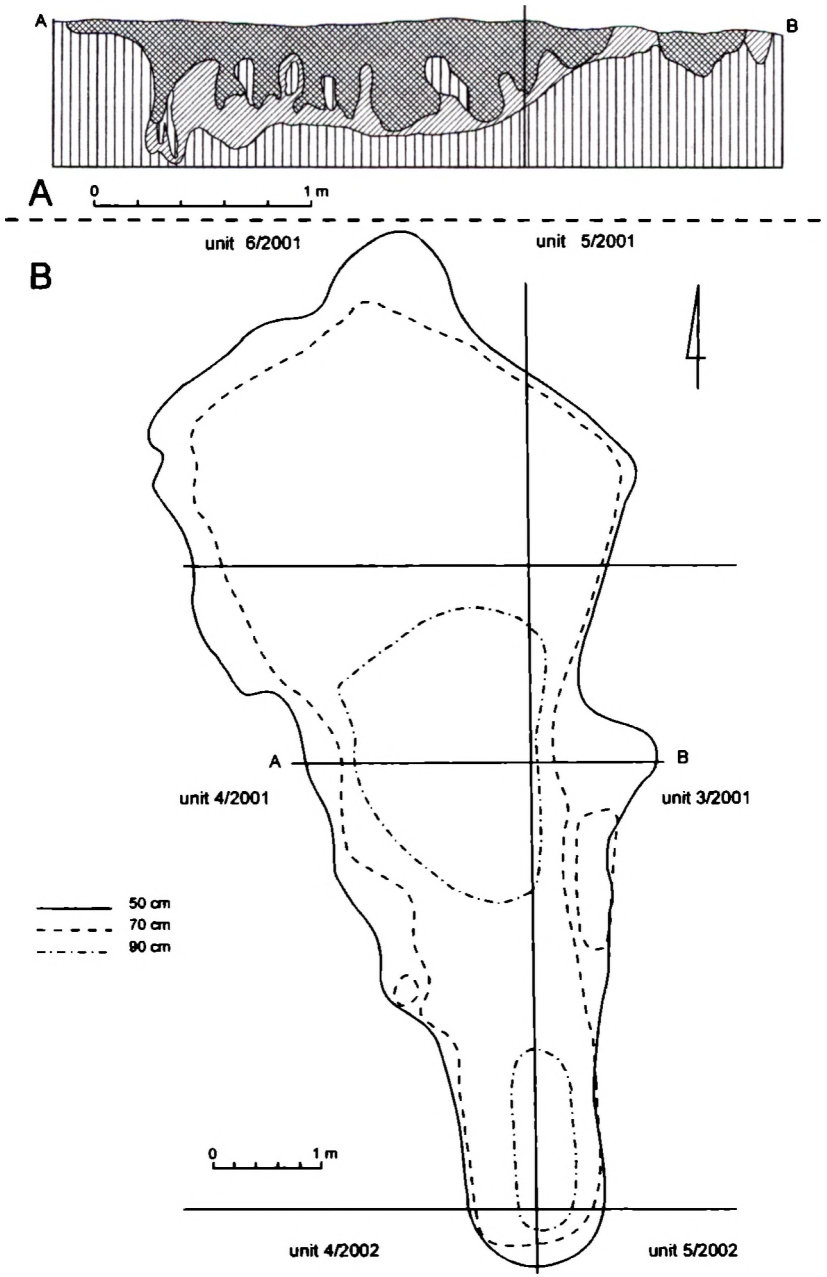



Fig. 7. Moravany. Cross-section (A) and horizontal outlines (B) of feature 3/01; signatures of sediments as in Fig. 6.

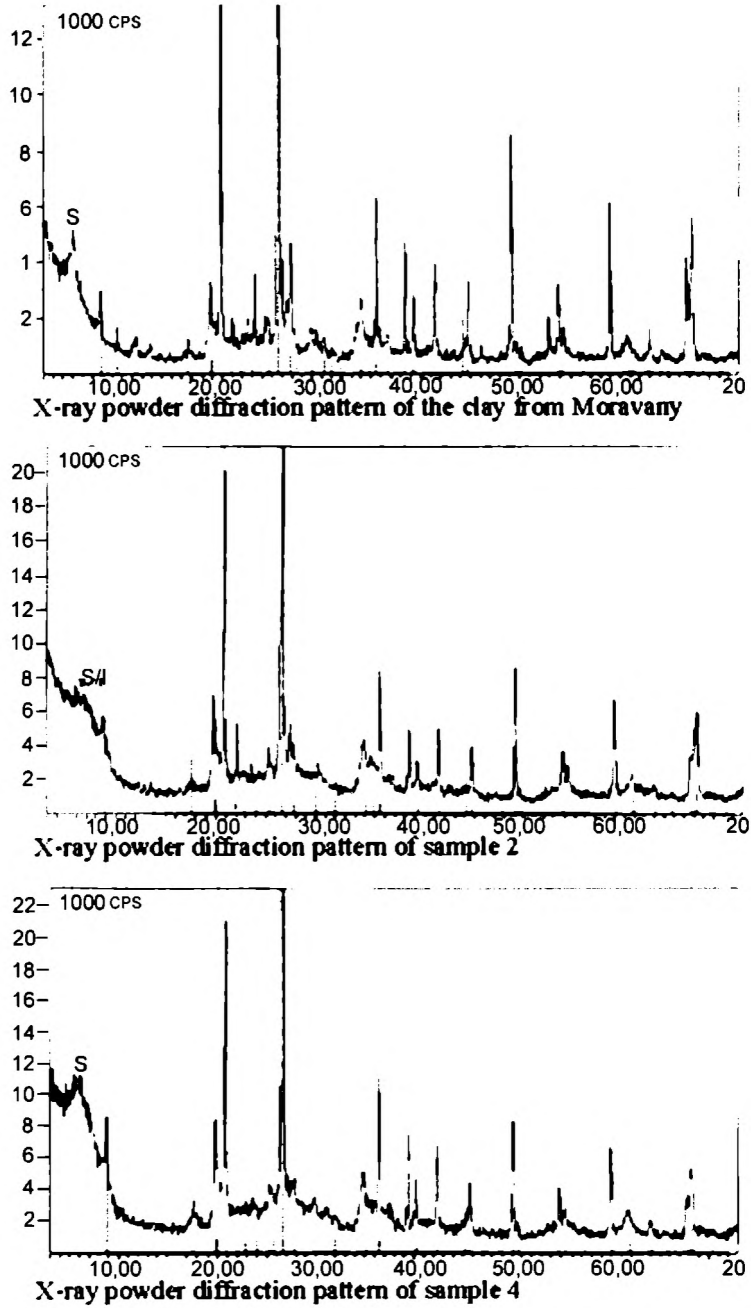
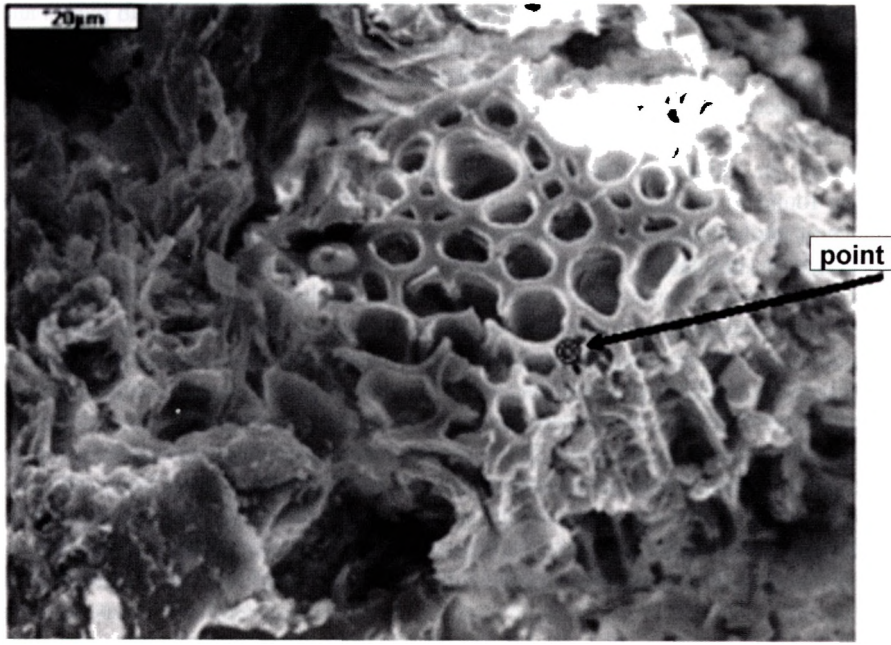



Fig. 8. Moravany. X-ray powder diffraction patterns of sample of clay from the site and of two samples of pottery.




Scanning electron microscopy of sample 1 showing a trabecular aggregate around point 1


Chemical composition of sample 1 (point 1)

Fig. 9. Moravany. Scanning electron microscopy (SEM) of one of the pottery samples and its chemical composition.

2. In the small features, 4/99, 1/2000, and 7/01, a large number of daub pieces and distinct traces of fire (reddish colour of the filling, charcoals and ashes) were discovered. It seems that feature 1/2000 can be interpreted as the remains of an oval, trough-shaped hearth, which was accompanied by a structure made of clay or lined with clay. Such an interpretation is further supported by the presence of a very hard, burnt layer of clay in the floor of the pit, which – in addition – was paved with sherds. However, it is difficult to explain the situation found in features 4/99 (Fig. 5) and 7/01. The layout of lumps of daub and the presence of undamaged and unburnt obsidian artefacts do not allow us to interpret the features as remains of hearths. Hypothetically, these might be remains of a construction (a wall, a fence, the roof of a dome oven?) faced with clay that slid or fell into the small pits.

3. Another category are pits which, in all likelihood, are spots where wooden posts were sunk (such features are described as post-holes). The most evident examples are features 3/2000 (Fig. 6) and 9/2000, possibly also 1/02. They are round in the horizontal and conical in the vertical cross-section. They were sunk to a depth of up to about 90-100 cm from today's ground surface, and measure about 50-60 cm in diameter. No finds were discovered in their filling. Micromorphological analyses carried out by K. Fechner from *Université Libré de Brusselles* showed that the edges of the pits had been rammed down. This confirms the hypothesis that the features are post-holes and their edges were beaten when the wooden posts were being driven into the ground. Small, circular, grayish areas, whose thickness is not very large (10-15 cm) registered in trench C (features 4, 5 and 6/2000) and in section 3/2001 in trench F (features 5/01, 6/01, 5/02, 6/02) could also constitute remains of wooden posts sunk into shallow holes. Even if the latter structures are taken into account, the lay-out of all the post-holes does not form any regular pattern.

4. In respect of size, exceptional structures are 3/01 (Fig. 7) and 10/01. In the horizontal outline, their shape approached an irregular trapezium. The filling was uniform, grey-black, with numerous sherds, obsidian finds, lumps of daub and charcoals – located mainly in the southern part of either pit. A functional interpretation of a feature of this type encounters obvious difficulties. Due to the considerable size, a tentative explanation is plausible, namely that we are dealing here with the remains of semi-dugout dwellings. Similar, large, trough-like features in the settlements of the Eastern Linear Culture are interpreted in precisely this way (e.g. Makkay 1982; Šiška 1989, 42-46). The supposition that the feature described above might be a habitation structure seems to be confirmed by the presence of protrusions spaced out regularly along the outline of feature 3/01. They can be viewed as post-holes arranged along the edges of the feature. On the other hand, the post-holes could constitute the remains of a dwelling (hut) situated next to the pit under discussion. Besides, the horizontal cross-section of feature 3/01 does not quite point to a habitation structure. Its outline is not regular, neither oval nor rectangular. Especially the narrowing of the feature in its southern part causes doubts; the feature seems to be too narrow for a house in this part. For these reasons we suggest that features 3/01 and 10/01 are the remains of a clay extraction pits, i.e. long, irregular pits for the extraction of clay which was used, first of all, for facing walls of post-houses. Pits of this type, located along longer walls of such houses occur frequently in the settlements of the Linear Band Pottery Culture (e.g. Lenneis 2001); recently such features have also been discovered in the Eastern Linear context (Domboróczki 2001). Although at Moravany we did not discover any evident traces of post-houses on either side of the aforementioned features, yet this does not totally disqualify the interpretation offered above; remains of such houses may have been completely removed by erosional processes.

It should be emphasised that there are no stratigraphical relations between the features. The only exceptions, besides aforementioned feature 1/01, are relations between features 2/2000 and 8/2000 (Fig. 4) as well as between features 2/01 and 10/01. However these features, also, overlap to a small extent, only at the edges. On the whole, this might suggest that the site at Moravany is a single-phase settlement.

**Pottery**

As erosional processes removed the culture layer associated with the Neolithic settlement, finds were preserved only in the filling of the pits and other depressions in the original ground surface of the site.

The group of ceramics obtained so far in the excavations comprises nearly 6,000 potsherds and several dozen of miscellaneous clay finds. The majority of potsherds (about 75%) come from only four features (2/99A, 3/01, 2/01, 4/01). The remaining features yielded only small quantities of ceramic fragments (from several to several dozen of items). Although not a single vessel has been wholly preserved, the degree of fragmentation is not considerable. Consequently, the index of diagnostic features of clay vessels should be estimated as relatively high.

The detailed mineralogical and technological analyses of the Neolithic pottery from Moravany and of the samples of clay collected on the site were conducted at the Faculty of Materials Science and Ceramics, University of Science and Technology in Kraków. The provided samples were examined as to their permeability and shrinkage as well as their phase composition with the use of x-ray diffraction analysis and scanning electron microscopy (SEM); at the same, time analyses of elements constituting the samples were performed. Additionally, thermal analyses were made with the use of derivatographic and dilatometric method, which, besides the information on the phase composition, can render data concerning the changes that occur in the samples when they are heated. Obviously none of these methods is universal, and each of them helps to find answers only to some of the posed questions. Nevertheless, based on the achieved results trough the use of various methods, one can infer the phase composition of the minerals and clays of which the vessels were made.

The results of the analyses concerning the permeability of the pottery samples (22-33%) testify to their high porosity that is to the low degree of firing of the clay out of which the analysed sherds were formed. Hence, one can surmise that the temperature of burning was not high. As could be expected, the samples of clay collected on the site are characterised by a much lower permeability than that typical of samples of pre-processed clay.

The phase composition of the analysed Neolithic sherds is similar in all the cases (Fig. 8). One can state that the prepared clay of which the vessels were made was composed of clay minerals represented, as evidenced by the tests, chiefly by illite. The detected non-clayey minerals are mainly quartz and, less frequently, feldspars and mineral ferric oxides. That the mineralogical composition of those clay samples that were collected in the immediate vicinity of our excavation sites is largely similar doesn't preclude the possibility that this clay could have been used to shape ceramic vessels in those remote times.

What is striking is the presence of higher concentrations of $P_2O_5$ in the sherds as compared to the raw clay (1.14–6.38% in ceramic samples and 0.31% in the clay). This fact is confirmed not only by chemical analyses but also by the analyses that were made on the minute sections of the fragments of the Neolithic sherds with the use of the SEM method. The higher proportion of phosphorus can be observed especially in those sherds in which

"tubular crystals", i.e. spongy structures, occur (Fig. 9). Such a structure may be typical of bone biomaterial (Baslé *et al.* 1998; Pawlikowski, Niedźwiedzki 2002). Yet it would be difficult to support the thesis that the samples of the majority of the sherds contain spongy structures that can be an expandant amount of bone tissue. Such a thesis would require further, detailed analyses on additional material collected from other archaeological sites. Just as well these structures can be remains of organic substances, for instance of organic temper that was added on purpose (and which, by the way, can be observed with the naked eye in some sherds) or traces of the ethnographically confirmed habit of mixing clay with organic matter such as excrement.

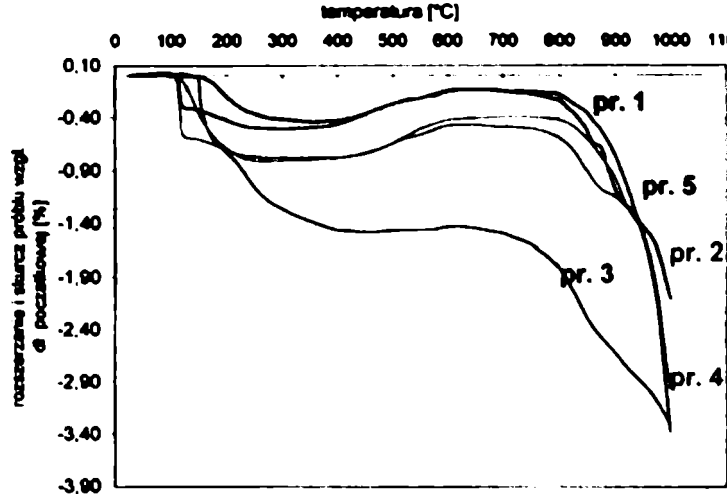
Regardless of organic temper, a unique technological feature of the Early Neolithic pottery from Moravany is the addition of crushed, often thick-grained, stones as temper; we have identified quartzite, menilithic hornstone and possibly obsidian. These raw materials were used in the settlement to make chipped tools. Such temper is contained without exception (the only one is the vase-like pot with a collar, described below, on p. 323) in all the sherds found on the site, both in thin- and in thick-walled fragments. Some sherds contained, admixture of broken sherds and aforementioned organic temper.

The dilatometric curves for the analysed sherds (Figs. 10, 11) clearly demonstrate that the nature of the changes is similar. If one was to establish the approximate temperature of burning similar vessels as proposed by Wirska-Parachoniak (1980), one may be surprised at how high the temperature may be (800-900 °C). Then it is interesting to observe the dilatometric curves for the clay samples that were burned in 600, 700, 800 and 900 °C (Fig. 11). On the basis of the curves one could suppose that the samples were burned at a similar temperature. All the three dilatometric curves break more or less at the same point, i.e. at about 850 °C. It is only in the case of sample 14, which was burned in 900 °C, that the dilatometric curve makes it possible to guess that in actuality the temperature of burning was about 900 °C. This experiment challenges the hypothesis put forward by Wirska-Parachoniak (*ibid.*): this hypothesis needs confirmation both for low and high temperatures of burning. *Ergo*, it remains an open question what was exactly the burning temperature for the pottery from Moravany.

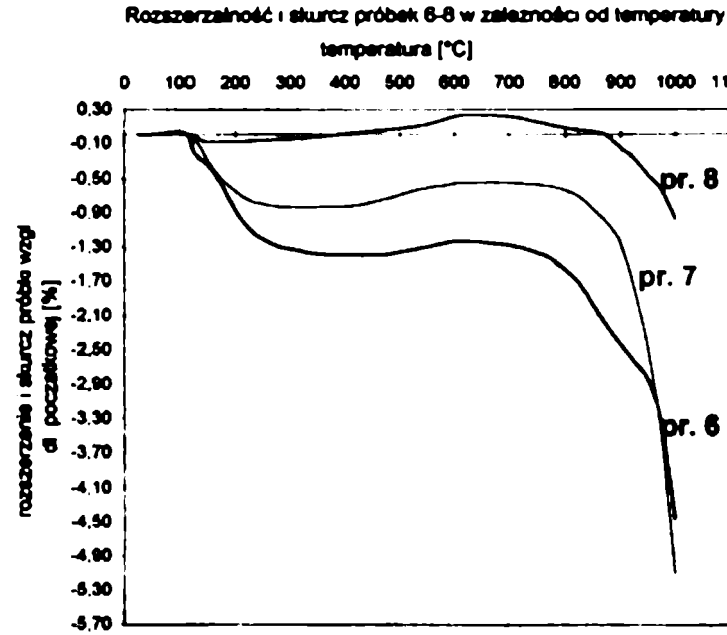
The pottery obtained so far from the site falls into seven basic morphological types (Kaczanowska *et al.* 2001; Šiška 1989).

*1. Hollow-pedestalled bowls*

The evidence of the presence of such bowls is thin-walled sherds of the part between the hollow pedestal and the bowl proper. The diameter of these parts of bowls is from 5 to 8 cm (Fig. 13:6; 15:7,9). Although the specimens under description have been preserved only as fragments, we can identify vessels with conical and slightly bell-shaped pedestals. The bowls are, mainly, characterised by the rectangular outline of the rims. It should be explained, however, that the fragments of rims from hollow-pedestalled bowls cannot always be distinguished from flat-based bowls with similar rims, conical bowls, or deep, globular bowls. The state of preservation of the outer surface of thin-walled pots does not allow to reconstruct – with few exceptions (Fig. 15:5) – their painted decorations. The ornament of thin incised parallel lines or a meander pattern (Fig. 14:4) is relatively frequent. A possibility that the thin incised ornaments were accompanied by black paint (which is typical for the early phase of the Eastern Linear Culture – e.g. Vizdal 1997, Fig. 11:1,2,3a,3b) cannot be excluded, but the black paint has not been preserved at Moravany.

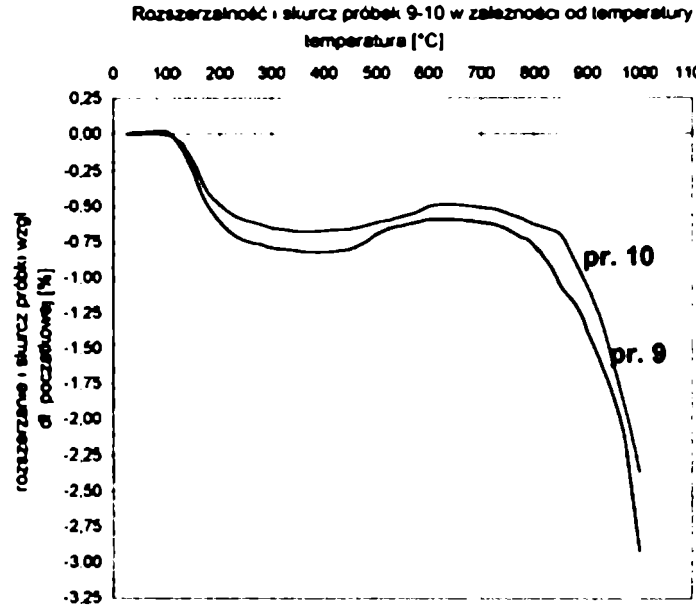



Dilatometric curves of samples 1 – 5 (thick-walled pottery)

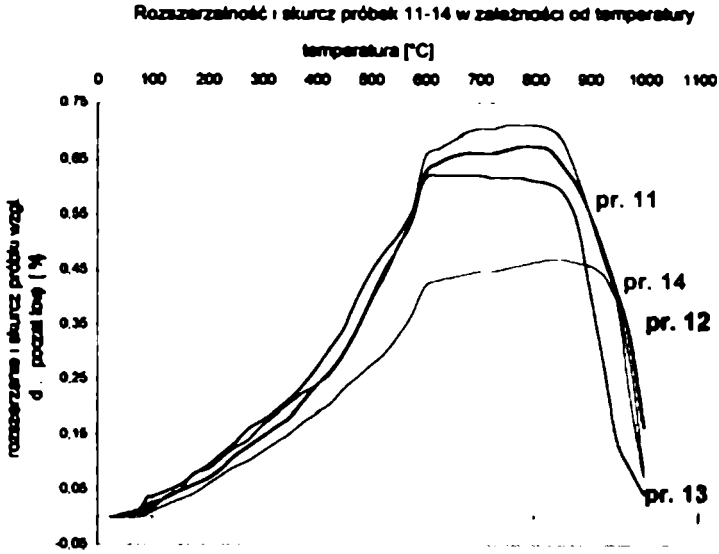



Dilatometric curves of samples 6 – 8 (medium-walled pottery)

Fig. 10. Moravany. Dilatometric curves of samples of thick- and medium-walled pottery.




**Dilatometric curves of samples 9 – 10 (thin-walled pottery)**




**Dilatometric curves of the clay from Moravany (samples 11 – 14 were fired in temperatures 600, 700, 800 and 900 °C respectively)**

Fig. 11. Moravany. Dilatometric curves of samples of thin-walled pottery and of clay from the site.

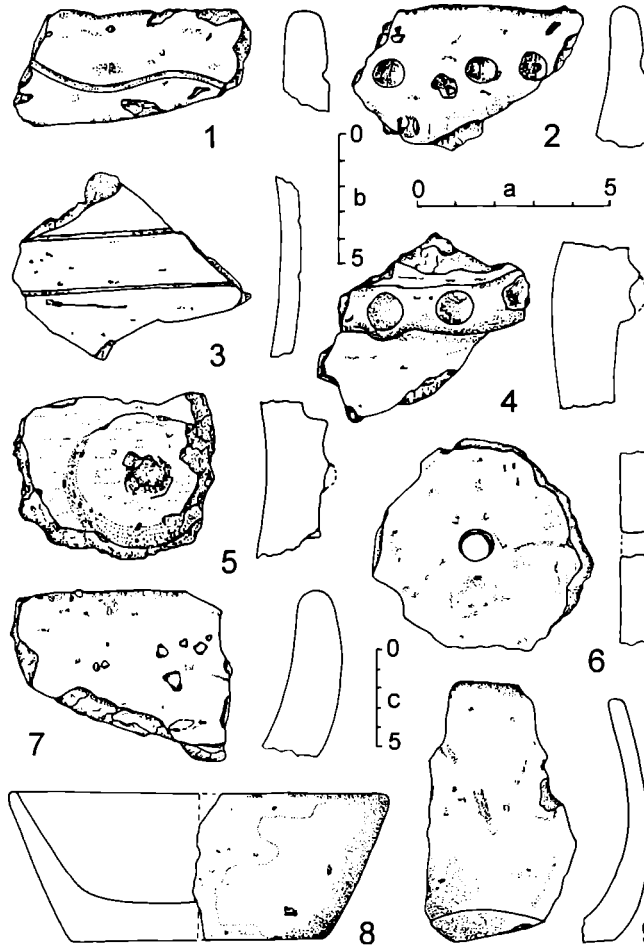



Fig. 12. Moravany. Selected pottery.
1, 3-5 – feature 1/1998; 2, 7-9 – feature 3/01; 6 – feature 2/01;
scale: a – 1-3, 6, 7, 9; b – 4, 5; c – 8.

*2. Conical bowls*

The identified sherds of this type of pots have rectangular rims. Only the smallest bowls in this group have round rims (Vizdal 1998, Fig. 4:1), Probably, the bowls varied a great deal in respect of height and diameter. Due to the "aggressive" soil conditions on the site the black paint that must have been present has not been preserved.

*3. Deep, globular bowls*

Pots ascribed to this group vary in size. The rims are rectangular with the exception of the smallest bowls. These bowls have mild S-shaped profiles. The lower part of the belly of these bowls was decorated with plastic knobs. They had, occasionally, a horizontal perforation (Fig. 13: 4) (but to describe the knobs as "handles" would be incorrect). The bowls were

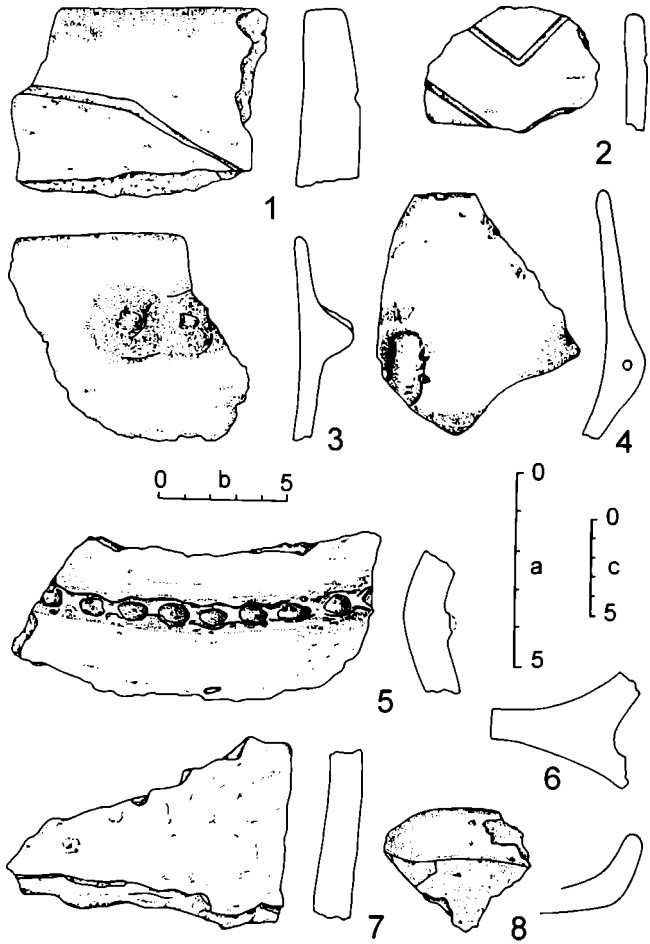



Fig. 13. Moravany. Selected pottery.
1 – feature 2/01; 2, 3 – feature 2/99A; 4, 6-8 – feature 3/01; 5 – feature 1/1998;
scale: a – 1, 4, 6, 8; b – 2, 3, 5; c – 7.

decorated with an incised ornament (Fig. 12: 3); sporadically traces of black paint have been preserved.

*4. Bowls with conspicuous collars*

This group is heterogeneous. One attribute unites vessels that are in fact different; however, this category has been commonly accepted in the literature (e.g. Šiška 1989, 68).

To this group are ascribed small vessels with collars (Fig. 14:1,7) and globular vases. Their common feature is the rectangular cross-section of the belly and a cylindrical collar. The shape of the belly was probably obtained by pushing the walls of the vessel outwards from the inside. The bellies are additionally marked by flat knobs. Small, looped handles also occur. On the outer surfaces of the vessels faint traces of black-painted ornaments have been preserved. Sherds of a small vessel are decorated with and atypical incised ornament

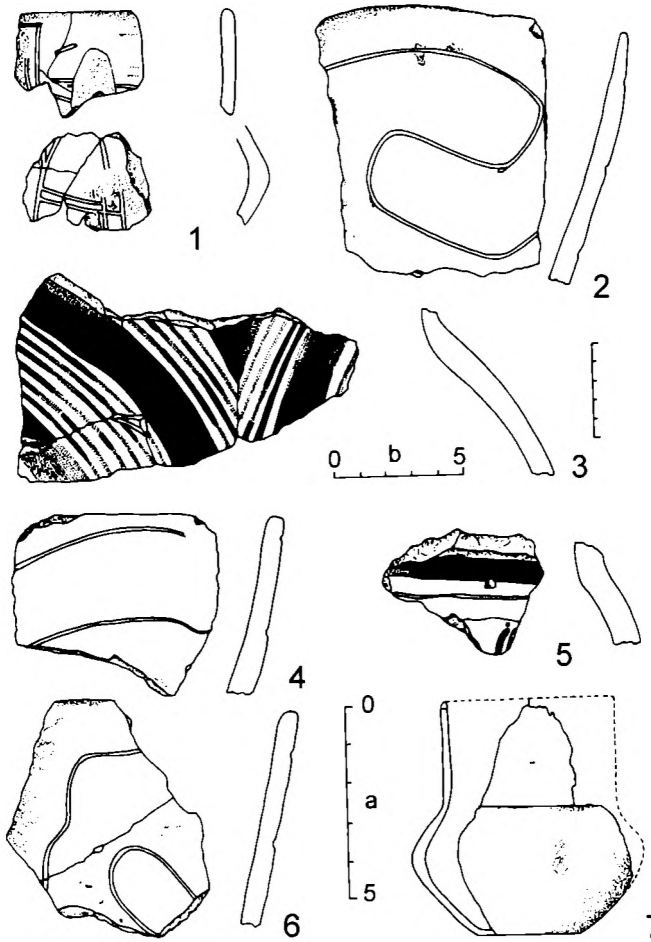



Fig. 14. Moravany. Selected pottery.
1, 3, 5 – feature 3/01; 2, 4 – feature 2/99A; 6, 7 – feature 2/01;
scale: a – 1, 5, 6; b – 2, 4; c – 3, 7.

(Fig. 14:1). Fragments of a large vase-like vessel show a very well-preserved black-painted ornament of broad, wavy bands and thin parallel lines (Fig. 14:3). This vessel was made of clay with almost no temper, which is exceptional at Moravany. We could even speak, tentatively, about an imported item in this circumstance.

*5. Barrel-shaped pots*

To this group belong medium- and thick-walled sherds of barrel-shaped pots distinguished by a very high content of mineral and organic temper. These sherds were discovered in features 1/1998 (in trench G, outside the area shown in Fig. 3), 2/99A, 3/01 and 2/01. The most common decoration are impressions (Fig. 12:2; 15:6) or a combination of impressions and incisions (Fig. 12:1; 15:4). A decoration of slanting, short, incised lines is also present

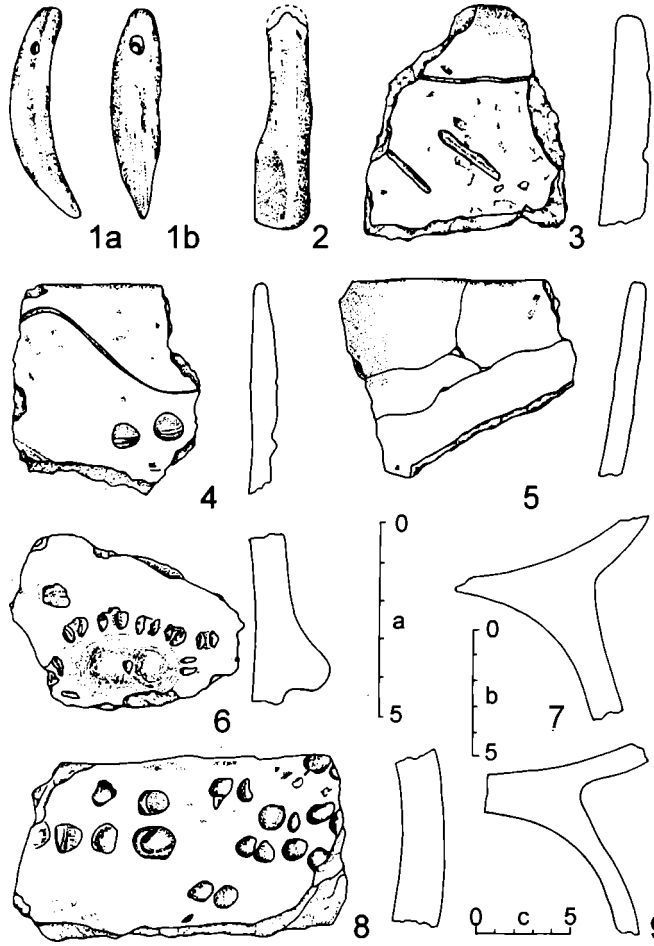



Fig. 15. Moravany. Selected pottery.
1a, 1b, 2, 5, 8 – feature 3/01; 3, 6 – feature 1/1998; 4 – feature 2/99A; 7, 9 – feature 2/01;
Scale: a – 1a, 1b, 2, 7, 9; b – 3, 4, 6; c – 5, 8.

(Fig. 15:3). Moreover, practically each vessel of this type had double, plastic knobs located in the upper part (Fig. 13:3).

*6. Storage vessels*

In features 1/1998 and 3/01, thick-walled sherds of storage vessels were discovered. In this group belong sherds with plastic bands, decorated with round or oval impressions (Fig. 12:4; 13:5), along with sherds with an ornament of sole finger-impressions (Fig. 15:8). The ceramics in feature 1/1998 had a decoration of flat, round plastic bosses with an additional, small boss in the centre (Fig. 12:5). The surface of these vessels was most likely intentionally roughened by using fingers (Fig. 13:7).

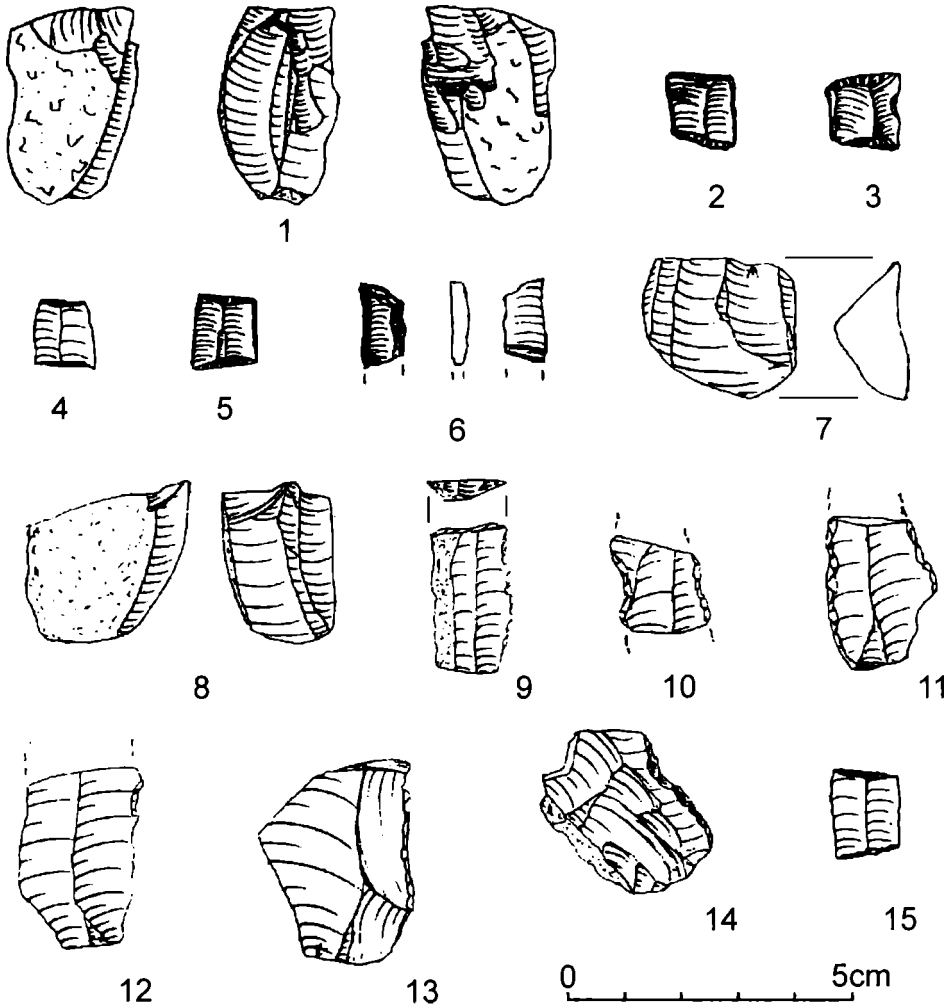


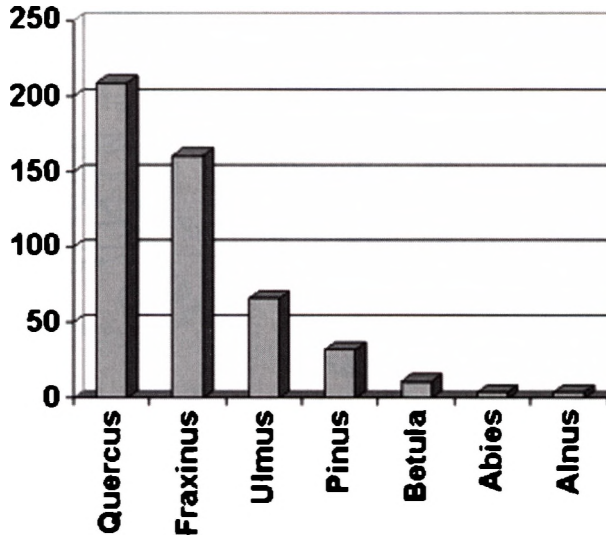

Fig. 16. Selected chipped stone artifacts. All obsidian except 12 (limnoquarzite) and 15 ("chocolate" flint). 1, 7, 8 – cores; 2-5, 15 – trapezes; 6 – angulated, becked bladelet; 9 – retouched truncation; 10, 11 – retouched blades; 12 – macroblade; 13, 14 – retouched flakes.

*7. Low, thick-walled bowls (roasting pans)*

Among bowls of this type there are conical, (Fig. 12:8) as well as slightly rounded forms (Fig. 12:7). A fragment of a vessel that can be ascribed to this group comes from a miniature bowlet (Fig. 13:8).

Small, miscellaneous clay artefacts are represented by items with a decorative function such as clay pendants of an almost round shape, pieces of a clay armlet, a pendant in the shape of a tooth (Fig. 15:1) and an awkwardly formed (?) object in the shape of a rod (?) (Fig. 15:2).

I




II

*Cerealia/Gramineae* – 268
*Cerealia* – 34
*Triticum dicoccon/monococcum* – 175
*Triticum dicoccon* – 27
*Triticum monococcum* – 4
*Hordeum vulgare* – 7
*Graminae* – 6
*Bromus sp.* – 2
*Quercus* – 1
*Alnus* - 1

III

*Triticum dicoccon* – 6
*Triticum monococcum* – 1
*Cerealia* – 2
*Chenopodium album* – 14
*Cenococcum* – 12
*Saponaria officinalis* – 9
*Graminae* – 7
*cf. Solanum nigrum* – 1
*Bromus sp.* – 1
*Stellaria graminea* – 1
*Viola sp.* - 1

Fig. 17. Moravany. Archaeobotanical analyses of charcoals (I), daub (II) and wet-sieved samples from anthropogenic features (III).

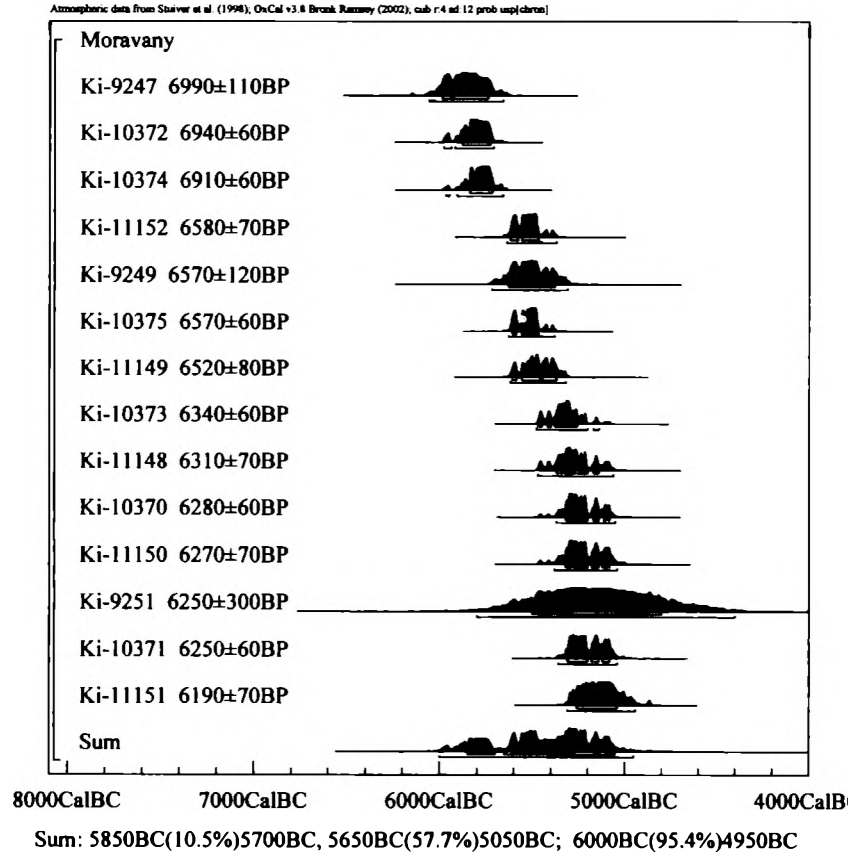



Fig. 18. Moravany. Radiocarbon datings.

The analysis of attributes of the pottery from Moravany shows that this pottery should be ascribed to the Early Neolithic, and more precisely to the early phase of the Eastern Linear Pottery Culture (Kalicz, Makkay 1977, 18-37; Šiška 1989, 58-74). At the moment the classical methods of seriation of ceramic finds do not permit to distinguish more than one evolutional phase within the inventory from Moravany. Certainly, among the ceramic finds, we can identify specimens with more archaic features (technological, morphological or ornamental) and with younger features. In such a situation there appears the risk of a subjective selection of certain features and an overestimation of features considered to be typical of one or another culture group. Our intention is not to question the methodology used so far for the distinguishing of taxonomic ("cultural") units and phases, but to point to "exceptions" which – after all – occur regularly and do not correspond to the accepted models. To sum up, in our opinion the ceramics from Moravany can be ascribed to the Kopčany group, more precisely to its early phase distinguished as the proto-Kopčany phase (Vizdal 1997, 44).

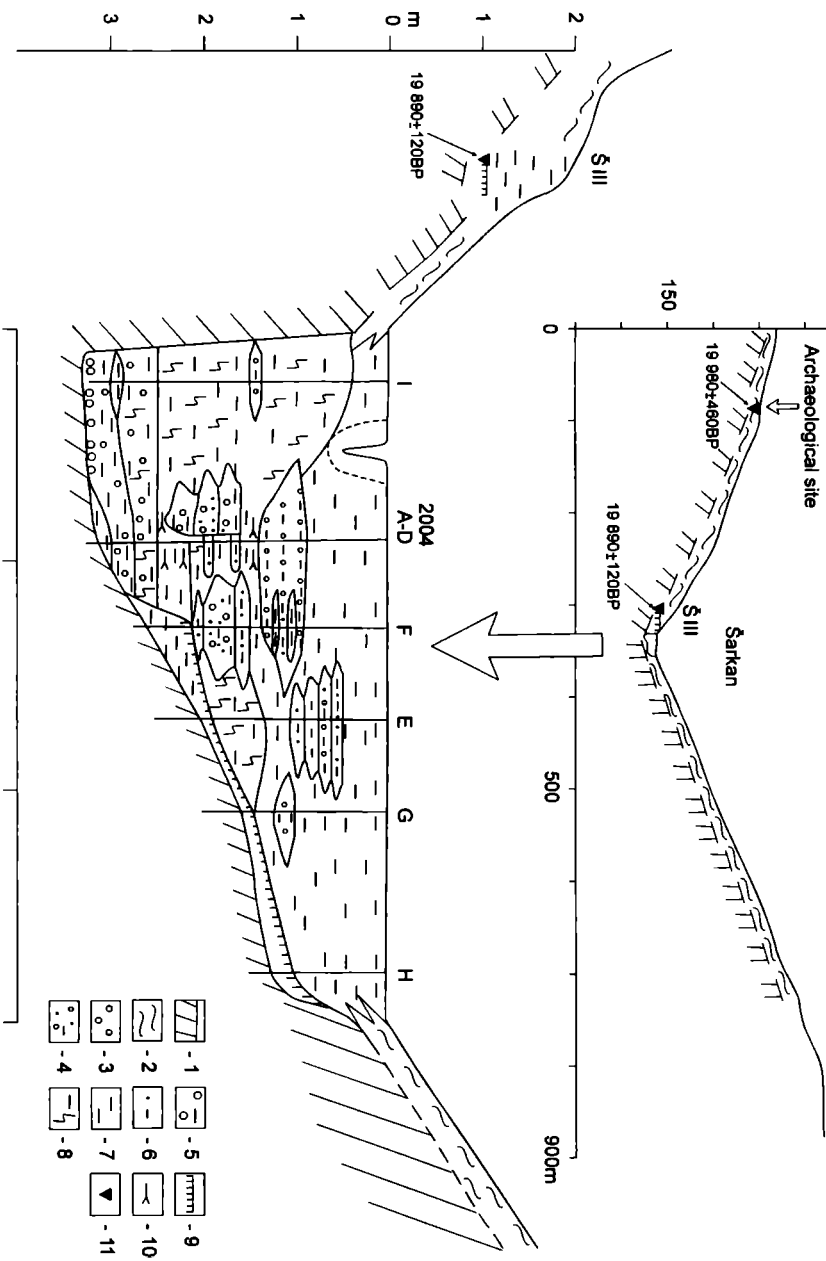



Fig. 19. Section across the Šarkan valley.
1 – Tertiary clays, 2 – slope deposits (deluvia), 3 – gravels, 4 – sandy gravels with silts, 5 – silty gravels, 6 – sandy silts, 7 – silts, 8 – organic silts, 9 – buried soils, 10 – detritus, 11 – radiocarbon datings.

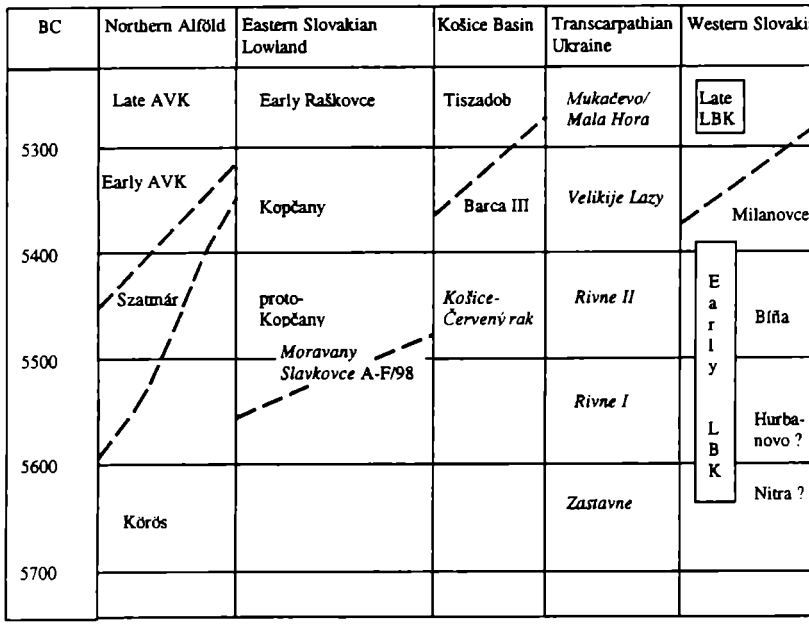



Fig. 20. The position of settlement at Moravany against the chronological sequence of Early Neolithic in the basin of upper Tisza and in Western Slovakia.

## Stone Artefacts

Almost 2,000 chipped stone artefacts (Kaczanowska *et al.* 2002, 192; Kozłowski *et al.* 2003, 136-139) were found during excavations; roughly three quarters of them in feature 2A/99. In the vicinity of this feature a workshop was located where the full cycle of stone processing (from unworked concretions to tools) was carried out and tools were produced to meet the needs of one household. The workshop yielded a total of 1,636 lithic artefacts, including 13 unworked concretions, 53 cores, 569 flakes, 344 blades, 513 chips, and 144 tools. The hypothesis that this workshop produced tools to satisfy the needs of the whole settlement has not been confirmed as the other features, also, contained artefacts representing various stages of stone processing. However these artefacts were less numerous (up to 100 specimens). Features 1/2000, 2/01 and 5/02 yielded unworked concretions; features 3/99, 2/01, 3/02 and 4/02 yielded partially decorticated concretions and flakes – both cortical as well as flakes in further stages of processing; while features 10/01 and 3/02 contained partially cortical blades and blades with use-wears. These facts confirm that probably in each household unit the full cycle of tool production was carried out to make tools to meet the needs of the group inhabiting this household.

The raw materials structure shows an overwhelming ascendancy of obsidian (in some features obsidian accounts for 100% of raw materials). In the most numerous inventory of feature 2/99A, its proportion is as high as 88.1%. Other raw materials such as radiolarite or limnoquartzite (both the Hungarian Boldogkövarálja type as well as a Slovakian type, probably from the Slanské Mountains) do not exceed 4%. Rhyolites, opals, quartzites and mudstones are extremely rare (only less than 1%). It is interesting that the local raw materials in the

alluvia of the Ondava river were exploited to only a very small degree. This suggests that the inhabitants of the settlement at Moravany were accustomed to using obsidians and limnoquartzites from the deposits in the Hungarian-Slovakian borderland. Northern contacts are evidenced by the presence of radiolarities, probably from the Carpathian Mountains (the nearest deposits occur in the area of Šariš and Spiš). In the inventory of feature 2/99A these radiolarites account for 3.1% of all the chipped stone material. In a number of other features this raw material does not occur at all. A unique artefact at Moravany is a trapeze made of chocolate flint, found in feature 2/2000 (Fig. 16:15). This specimen would point to possible contacts with the population of the Western Linear (*Bandkeramik*) Culture inhabiting the territories on the northern side of the Carpathians. An amusing – in light of the above – coincidence is the discovery of a trapeze made of the limnoquartzite (typical of Moravany) on the site of the older phase of Western Linear Band Pottery Culture in Gwoździec (district of Tarnów, southern Poland), that is on the Transcarpathian route leading through the Dunajec and the Poprad valleys.

The technique of blade production from small, single-platform cores, with preparation limited, as a rule, to the platform (Fig. 16:1,7,8), is the same as that employed at other Eastern Linear sites (Kozłowski 1989). The evidence of the macroblade technique could be two fragments of large limnoquartzite blades (Fig. 16:12). The dimensions of the preserved fragments indicate that these specimens could represent either an import from the Körös Culture sphere or reminsent of Körös technology. The blade could not have been made on the site under discussion as no debitage from macroblade cores was recorded. It is worth remembering that, for example, at Méhtelk elements of macroblade technique are known which are connected with the import of Balkan limnoquartzite and which document the technological tradition of the Starčevo Culture (Kozłowski 2001; Starnini 1994).

The morphology of tools from Moravany does not differ from that of tools of the Early Eastern Linear Culture. We can see this primarily in the huge domination (more than 60% of all obsidian tools) of blades with lateral retouch (Fig. 16:10,11). Moreover, retouched flakes (Fig. 16:13,14), end-scrapers, splintered pieces, perforators and a large number of geometrical microliths (Fig. 16:2-5,15) were recorded. Among microliths the biggest group are, obviously, trapezes which resemble the specimens that occur in large numbers on Eastern Linear sites (e.g. at Slavkovce, feature E/88; Kaczanowska, Kozłowski 1997). It is important that, besides bi-truncated trapezes, a trapeze retouched on three sides was present (Fig. 16:5) as well as a triangular point and an angulated backed piece (Fig. 16:6). Trapezes with lateral retouch on three sides are known from the Körös Culture sites, however the two other forms seem to be derived from the Mesolithic industries with an Epigravettian tradition that occur in the Carpathian Basin. Angulated backed implements are also recorded on the Western Linear sites on the Middle Danube (e.g. at Brunn 2) and we are inclined to regard these forms as the evidence of an encounter with Mesolithic groups (Kaczanowska, Kozłowski 2002).

The lithic industry from Moravany exhibits distinct similarities with other assemblages of the Early Eastern Linear Culture. Its characteristic feature is that – on the one hand – the raw materials exploited from the deposits in the Zemplin Plateau between Hungary and Slovakia are favoured, while – on the other hand – there is evidence of penetration of the area of Šariš and possibly also Spiš, or it is likely there were even contacts with the Western Linear Band Pottery Culture groups on the northern side of the Carpathians.

It should be stressed that in Moravany polished tools – most prominently from mudstones – were also made. Flakes from this raw material come from the shaping of tools by means of

the coring technique. These tools were subsequently polished. For example, there are several small trapezoidal axes with triangular cross-sections. A miniature (3.3 by 1.8 cm) rectangular axe was also found. Moreover, about 10 polishers, elongated or egg-shaped, were discovered, also two grinders preserved as fragments, and a grinding-stone. In addition, several dozen lumps of ochre were found, most of them in feature 4/02.

**Archaeobotanical Analyses**

Archaeobotanical analyses (Fig. 17) of charcoals showed a distinct predomination of deciduous trees: oak, ash-tree and elm. Wood from pine, birch and fir tree was used to a lesser extent. The wetsieving of the filling of the pits identified a large number of grain macroremains; however, in the cases when a precise examination was possible, only *Triticum dicoccon* was identified. Among wild plants, goosefoot family (*Chenopodiaceae*), grasses (*Graminae*), soap-wort (*Saponaria sp*), and brome grass (*Bromus sp*) showed the highest frequency. Plant imprints on daub pieces consisted mainly of traces of cereals and grasses; in the cases when an exact denomination was possible *Triticum dicoccon*, *Triticum monococcum* and *Hordeum vulgare* were distinguished.

**Radiocarbon Chronology**

So far, we have obtained 14 radiocarbon dates from anthropogenic structures (Fig. 18). These dates require some comments. The dates of Ki-9247, Ki-10372 and Ki-10374 are obviously too early when compared with the common dating of Eastern Linear Pottery Culture (Hertelendi *et al.* 1995; Horváth, Hertelendi 1994). We believe that this result is caused by the pollution with Late Pleistocene fossile charcoals. The dates of Ki-11152, Ki-9249, Ki-10375 and Ki-11149 seem to refer exactly to the Neolithic occupation of the site. In our opinion, the remaining dates are, a little too late.

**Palaeogeographical Studies Around the Site**

Palaeogeographical studies were carried out, not only on the archaeological site, but also in the neighbouring area. Some borings and outcrops were situated on the sections across the Šarkan valley and the Ondava flood plain.

Buried soil dated at 19 890±120 BP (Poz-6322) occurs on the slope of the Šarkan valley (Fig. 19). The sediments, about 3 m thick, filled the flat bottom of this valley. The black clays in the top of Tertiary sediments are probably buried soil, only partly preserved at the margin of the valley. This layer is covered with organic silts with numerous charcoals. Some zones with a sandy-gravel admixture could be distinguished inside this silty member. These deposits, on different levels, reflected the channel changes during the filling of the valley. Further radiocarbon datings and pollen analyses of sediments should establish the aftermath of events caused most probably by climatic fluctuations and human impact. Šarkan's alluvial fan (Fig. 2), covering the margin of the Ondava flood plain, is very young because charcoals from the limit between its sediments and the Tertiary bedrock were dated at 365±30 BP (1440-1640 cal AD) (Poz-6323).

The recent Ondava river course is also very young and is linked with the regulation and channelisation of the riverbed. A section across the flood plain shows an older meandering belt, much closer to the eastern slope of the valley. It could have been active during the Early Neolithic. The profiles with three buried soils occur in the valley bottom near the study area. The middle fossil soils were dated in the Topla valley at 4720±300 BP (Božčice – 4 km to NE)

and in the Ondava valley at 4200±900 BP (Kladzany – 15 km to N), whereas the lower and upper ones were combined with the Preboreal and the Subboreal, respectively (Bañacký *et al.* 1987).

**Discussion and Conclusion**

So far, we have not been able to determine, even fragmentarily, the boundaries of the settlement. For this reason, we do not know what its real size or function was. However, the results of the investigation indicate that the site was not a seasonal camp or a short-term settlement. We have the following evidence: i) the full chain of lithic (mainly obsidian) tools production; ii) large features, some of which contained "dense" archaeological material; iii) post-holes; iv) contacts with the territories situated north of the Pozdišovský Range including the Transcarpathian areas.

The chronological position of the settlement at Moravany demonstrates that its inhabitants belonged to the first Neolithic farmers and breeders in the territory of the Eastern Slovakian Lowland. In as much as there are no unquestionable traces of Late Mesolithic occupation in Eastern Slovakia, we could hardly talk about local Neolithisation based on the indigenous hunter-gatherer populations. Neither does the technology of stone processing point to local Neolithisation, as it is related to the Early Neolithic traditions of the Great Hungarian Plain. In the present state of investigation, it seems the most plausible that the settlement at Moravany was set up by a group of the Körös Culture people who came to Moravany from outside the territory of the Eastern Slovakian Plain around 5500 BC. The starting point of this migration was either the middle part of the Alföld or the territory of the present-day Transcarpathian Ukraine. The latter hypothesis is the more likely because the people of these Körös Culture sub-groups who penetrated the Upper Tisza basin or even crossed the main ridge of the Eastern Carpathians (Marinescu-Bîlcu 1993), were better adapted to pre-montane and inter-montane conditions.

The point of view presented above has some consequences for the overall approach to the Neolithisation of the Upper Tisza Basin (Fig. 20). It can be assumed that this process in the Eastern Slovakian Lowland proceeded, at least in part, independently of the basic trend of the evolution from the Körös Culture to the Eastern Linear Pottery Culture (AVK), this evolution characteristic of Northeastern Hungary. This main trend in the Hungarian Plain was a smooth transformation from the Körös Culture through transitional stages such as, locally, the Méhtelek and the Szatmár groups, to the AVK proper (Kalicz, Makkay 1977). In Eastern Slovakia, the incipients of the Early Neolithic could be rooted directly in the later evolutional stages of the Körös Culture. However the further development of Neolithisation followed a course that was basically independent of the Méhtelek-Szatmár-AVK model. Around the middle of the sixth millennium BC, in the Eastern Slovakian Lowland and in the Košice Basin, there appeared the beginnings of an autonomous, to some extent unique, models of material culture. This, however, was obviously set in the global Eastern Linear style.

The high topographical location of the Early Neolithic settlement at Moravany must have caused difficulties with the water supply unless the humid, Atlantic climate the Šarkan creek, which at present is a perennial creek, flowed at the bottom of the preently dry valley. This permanent creek had probably only one channel, but was more deeply incised. The altitude of the settlement is climatically favourable, with a lower number of inversions and the best thermal and humidity conditions.

To this day no Early Neolithic human activity has been discovered in the sediments of valley floors. It's worth mentioning, that the changes of the environment were relatively

insignificant. The buried soil on the flood plains indicate a dominance of vertical accretion in the bottom of the main valley and an alternation of phases of increased overbank deposition and soil formation. Small valleys, such as the Šarkan valley, were filled after the Late Pleniglacial/Late Glacial incision. Since slope erosion removed the layers associated with the Early Neolithic settlement, which were preserved only in the anthropogenic pits, the alluvial filling is probably younger than the Neolithic. The alluvial fan from the last centuries points to strong slope erosion caused by human activity under the Little Ice Age climatic conditions (fifteenth-seventeenth centuries).

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