



**PALAEOBOTANICAL STUDY OF REPRESENTATIVE
UPPER PALAEOLITHIC SITES IN THE CENTRAL EUROPEAN PLAIN:
A CONTRIBUTION TO THE SC-004 PROJECT**

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1. INTRODUCTION

The main objective of the Sc-004 project was to reconstruct the succession of the climatic variations that affected the great loessic plain during the last Glacial-Interglacial cycle. For these climatic oscillations engendered changes of the landscape in which man and fauna evolved, palaeobotanical research deserved quite logically a particular role as long as the fossil material - charcoal and other macro remains - was well preserved in the loess deposits and could contribute to the reconstruction of palaeoenvironments and palaeoclimates.

Within the framework of the present project, the pollen analysis in the loessic deposits was not systematically developed because of the particular problem it entails in the loessic deposits and of the high contamination risks that distort the interpretations.

The second objective of the research was to reconstruct a coherent chronology of the climatic events recorded in the loess deposits. Regarding the period comprised between 50,000 and 10,000 BP, this chronology is mainly based on radiometric datings on charcoal. The anthracological analysis therefore took on a paramount importance as it enabled the taxonomic identification of the dated material as well as the control of its purity.

The present chapter is devoted to the comparison of the results achieved in the

Danube Basin (Willendorf and Schwallenbach in Lower Austria; Pavlov and Dolni Vestonice in Moravia) and in the Prut and Dniester Basins (Mitoc and Crasnaleuca in Romania; Cosautsi in Moldavia).

2. MATERIAL AND METHODS

In the loessic field, charcoal fragments can be found within human occupation layers, either in association with hearth structures either more or less scattered in the archaeological layers. Nevertheless, the preservation of charcoal is not limited to archaeological sites and can very well be satisfactory within natural geological deposits as observed at Schwallenbach.

Exceptionally other botanical remains such as charred fragments of herbaceous plants, fruits or seeds have provided further palaeoenvironmental information. It must be noted that the aim was not to achieve an exhaustive sampling of the macroremains preserved in a given horizon, but to get enough material for datings as well as unquestionable evidences of the local flora.

The adopted sampling method is presented in the report "Radiometric datings". We will simply stress the necessity of having a close control of the precise stratigraphic origin of the material.

The different steps are presented by DAMBLON *et al.* (1996) and can be summed up as follows : 1) water dispersion of the material - the use of sodium pyrophosphate and diluted hydrochloric acid allowing an easier dispersion of clays and elimination of

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carbonates, 2) sieving of the blend under low water jet or by successive agitation of the sieves in water (ϕ 1, 0.50 and 0.25 mm), 3) potential elimination of the silicates by HF, HCl and distilled water washing, 4) drying of the samples at 50°C for 12 to 24 hours depending on the quantity of material.

3. RESULTS

Table 1 presents the synthesis of the anthracological analyses carried out for the sites of Willendorf II and Schwallenbach in Lower Austria, Pavlov I Northwest in Moravia, Mitoc Malu Galben and Crasnaleuca in Romania, and finally Cosautsi in Moldavia. The addition of these 5 sites encompasses the period between $\pm 45,000$ (Willendorf II) and $\pm 3,000$ BP (Crasnaleuca). To enable an easier comparison, the table also includes the data available in the literature for the sites (in brackets) of Willendorf II (FIETZ in FELGENHAUER 1956-59), Dolni Vestonice and Pavlov (SLAVIKOVA-VESELA 1950, NECESANY 1951, VODICKOVA-KNEBLOVA in KLIMA 1963, MASON *et al.* 1994, OPRAVIL 1994). The periods of ascription of the analysed layers are marked as follows: Interpleniglacial (I) between 50,000 and 25,000; Upper Pleniglacial (U) between 25,000 and 13,000; Lateglacial (L) between 13,000 and 10,000 BP and Holocene (H).

For a synthetic presentation of the data Table 1 only sets out the occurrence and not the abundance of the macro remains of different taxa. These taxa are gathered in four main groups according to the types of macroremains and according to the ecoclimatic affinities of the ligneous taxa. The first group comprises conifers considered as boreal in the present nature, the second one includes the deciduous small-leaved trees and the third one the deciduous ligneous taxa that occur today in the temperate regions. These three groups consist mainly of charcoal. The last group comprises various charred macroremains of herbaceous plants, essentially fruits and seeds.

3.1. Willendorf II (Lower Austria)

The famous site of Willendorf II, located along the Danube between Krems and

Melk, provided a long loessic sequence including 9 archaeological layers from the Archaic Upper Palaeolithic up to the Gravettian.

Charcoal fragments were extracted from 11 layers encompassing the period between $\pm 42,000$ and $\pm 25,000$, thus most of the Interpleniglacial (see F.DAMBLON & P.HAESAERTS, this vol.). The material extracted from units D, C and B (HAESAERTS *et al.* 1996) is mainly from conifers. More particularly, *Picea* occurred in all sedimentary units from the lower unit D up to the upper loess B1. On the other hand, no *Abies* remains, mentioned by FIETZ (in FELGENHAUER, 1956-59) in cultural layers 4 and 5 (unit C), were discovered. Finally, while charcoal of *Larix* type - probably ascribable to larch - was preserved in sedimentary unit D, pine remains - mostly *Pinus cembra* - occurred in the upper part of the sequence from unit C2 up to the upper loess B1. In fact, the absence of pines in unit D and in the lower half of unit C is difficult to explain in comparison with the data achieved for Schwallenbach. It most probably results from the restricted extension of the anthracological sampling.

The remains of deciduous small-leaved trees, mainly *Betula* and *Salix*, occurred sporadically only in units C8 and C2, whereas some fragments of *Lonicera*, whose intrusive origin is not to be ruled out, were limited to C2. Moreover, these fragments coexisted with charred remains of axes with molten structures of uncertain origin.

The charcoal fragments from the deciduous broad-leaved taxa (*Fagus*, *Quercus*, *Acer*, *Cornus*) were extracted at the basis of the surface soil as well as in the transition zone between the latter and the upper loess B1, in which several boreholes were performed to find evidences of cultural layer 9. Consequently, the occurrence of these temperate-type taxa in the upper loessic deposits indicates their intrusive Holocene origin and confirms the reworked character of these transition deposits; therefore it dismisses the occurrence of *in situ* remains of cultural layer 9 within the considered section.

It is interesting to notice that various remains of herbaceous plant fruits and seeds were extracted from units C8 and C2 in which

the evidences of cultural layers 3 and 5 were discovered.

An attempt of pollen analysis was made on the humic horizons C2 and top of C1. The amounts of pollen grains were low and fluctuated greatly with proportions of spores and conidias sometimes higher than those of the pollen grains. The degree of pollen preservation varied considerably with a large proportion of grains of a fresh aspect in a set of corroded grains. Moreover, the results showed a mixture of boreal taxa comparable to charcoal - *Picea*, *Pinus*, *Betula* - with an other group of really temperate taxa like *Corylus*, *Fraxinus*, *Ulmus*, *Quercus*, *Carpinus*, *Fagus* and even *Juglans*. This assemblage seems typical of the Holocene and strongly suggests intrusion of pollen grains notably by way of bioturbations. Consequently, in the present state of the work, the palynological data from Willendorf II will be considered not reliable enough. Such a conclusion is reinforced regarding the homogeneity of the anthracological assemblages in the loess and the humic horizons.

3.2. Schwallenbach (Lower Austria)

The site of Schwallenbach, located along the Danube at 1 km upstream of Willendorf II, shows an almost identical sedimentary sequence. The anthracological analysis of 7 layers encompassing the period between $\pm 40,000$ and $\pm 29,500$ BP provided results of a great taxonomic constancy, with *Picea* and *Pinus cembra* as sole evidences of the ligneous stratum at the considered epochs. Contrary to Willendorf II, the pine remains were preserved in the lower unit D and not in the above lying sediments, which demonstrates the local character of the anthracological records.

Let us stress here the absence of any intrusion- or reworking-indicative taxon, although the sampled humic horizons were less afar from the present soil's surface than at Willendorf. However, the proportion of rootlets in the charcoal pieces was higher, requiring a very rigorous selection of the material for radiometric datings.

3.3. Dolni Vestonice I and Pavlov Northwest (Moravia, Czechia)

This group of remarkable sites along the River Dije presents a stratigraphic series derived from cold periods and more

temperate oscillations among which at least one materializes by means of a humic horizon (W 2/3 soil) corresponding to the Stillfried B Interstadial dated 29,940 in the brickyard and 31,700 in the station A at Dolni Vestonice I (Haesaerts 1990).

Several successive anthracological analyses (Table 1) were focused on the main Gravettian occupation (KNEBLOVA 1954, MASON *et al.* 1994, NECESANY 1951, OPRAVIL 1994, SLAVIKOVA-VESELA 1950) dated between $\pm 27,000$ and 25,500 BP (see report 14C) and corresponds to the final phase of the Interpleniglacial.

Our contribution relates to the analysis of a hearth at the Pavlov I Northwest site (DAMBLON 1997) dated: GrN-20371: $26,170 \pm 450$ (VAN DER PLICHT 1997) as well as of the humic horizon W 2/3. Table 1 clearly emphasizes the predominance of conifers - mainly *Picea*, *Larix*, *Pinus cembra*, *P. sylvestris* and *Abies* - in the assemblages from the main archaeological layer of Dolni Vestonice and Pavlov. *Pinus mugo* and *Juniperus* were also identified (OPRAVIL 1994).

At Pavlov I Northwest the hearth remains contained mostly *Picea* and *Pinus cembra*. On the other hand, the samples from the humic horizon W 2/3 did not contain any other taxa than *Picea*. Besides, the anthracological assemblages analysed by the Czech and British authors also comprise some charcoal fragments of *Fagus*, *Ulmus* and *Taxus*, which all are typical of the temperate zone and of the interglacial epochs. Amongst the charcoal from Pavlov I Northwest that we analysed, the only piece of *Ulmus* found presented a different aspect than that of the conifer charcoal pieces : it was round-shaped like a permineralized eroded object. The hypothesis of an intrusive origin is therefore strengthened (DAMBLON 1997).

On the contrary, the presence of *Salix* and *Populus* charcoal fragments in the assemblages from Dolni Vestonice I and Pavlov I does not pose any serious problem regarding the edaphic character of these trees growing in humid areas and along riversides in the Holarctic area.

Let us finally note that charred fragments of roots ascribed to Asteraceae (MASON *et al.* 1994) were uncovered in

hearth D at Dolni Vestonice (DV XVI) dated $26,390 \pm 270$ BP (ISGS 1744). The authors assume that these fragments could be related to remains of plants consumed by the Pavlov hunters-gatherers.

3.4. Mitoc Malu Galben (Romania)

Located to the east of the Carpathians along the River Prut, Mitoc Malu Galben is an Aurignacian and Gravettian site whose loessic sequence encompasses the period between 32,000 and 23,000 BP, thus the second half of the Interpleniglacial and the first half of the Upper Pleniglacial.

At Mitoc Malu Galben, the anthracological assemblages mainly consist of *Picea*, *Pinus cembra* (mountain pine) occurring only in one level (cycle 5b, $\pm 24,000$ BP). Besides, *Alnus* charcoal fragments were preserved in three sedimentary cycles of the Interpleniglacial (9b, 6b) and of the Upper Pleniglacial (4a).

The charcoal assemblages from Mitoc Malu Galben clearly determine spruce as the main tree species in the forest component of the landscape near Mitoc for the period between 32,000-23,000. The mountain pine was perhaps less important but its scarce occurrence restricted to the period corresponding to cycle 5b suggests a local phenomenon. The occurrences of alder can be explained by the close vicinity of the River Prut, but the presence of *Alnus fruticosa* could also be possible. No really temperate elements were preserved in the charcoal assemblages from Mitoc Malu Galben.

The uncovering of herbaceous plants, mainly of grasses, in Aurignacian and Gravettian concentrations (cycle 11 dated around 31,160 and cycle 6b dated around 26,450) appears interesting on several accounts for such remains are rarely reported in the palaeoanthracological assemblages. They appear related to human activities and they surely come from the surrounding environment which covered the upland during the dry and cold phases of the Interpleniglacial. They also seem in accordance with some pollen diagrammes from Romanian caves (CARCIUMARU 1989) showing the predominance of grasses, sedges

and composites during Upper Pleistocene periods. In fact, the discovery of Caryophyllaceae, *Polygonum*, *Galium* and *Medicago* in the Malu Galben deposits slots well into a meadow context.

3.5. Cosautsi (Moldavia)

A 16 m high loess sequence ranging from 20,000 up to 10,000 is preserved at Cosautsi, near the River Dniester. This sequence also comprises some 21 human occupation layers dated between 19,500 (layer 10) and 16,000 (layer 1).

Despite the abundant charcoal material of the whole sequence and regarding the pollen record from Cosautsi (MEDIANIK 1994), the charcoal assemblages give a rather poor spectrum with only 3 arboreal taxa. From the lowermost cultural layer 10 (around 20,000 BP) up to layer 2a (dated around 17,230 BP), and in contrast with palynological data, *Picea* charcoal remains predominant, except in the upper layers 1 and 1b (dated around 16,000 BP) which present higher amounts of *Pinus t. cembra*. This should logically concord with a climatic degradation but, as observed in the Willendorf and Schwallenbach deposits, a very local distribution of the charcoal pieces could also have caused the absence of pine in the lower assemblages. Only one deciduous small-leaved tree was represented by *Salix* charcoal in layer 1. The occurrence of *Salix* is easy to understand because of the vicinity of the River Dniester. Not a single piece of other small-leaved nor of temperate broad-leaved trees was observed in the charcoal assemblages which were also free of fruit and seed remains.

Such results appear in contradiction with standard pollen data from loess deposits, notably from Cosautsi (MEDIANIK 1994), showing more or less heavy proportions of pollen of ligneous temperate taxa (*Quercus*, *Tilia*, *Ulmus*, ...). Intrusive phenomena are suspected but the question will be discussed later.

In other respects, the whole sequence presented many twisted charcoal pieces and charcoal debris with scolyte galleries. This can result from the harshness of the climate and indicates that man collected deadwood for fuel.

3.6. Crasnaleuca

Crasnaleuca is a final Bronze Age site located some km to the north of Mitoc Malu Galben. The material analysed on the basis of the Noua cultural ashtrays (dated around 3,300 BP : DAMBLON *et al.* 1996) was constituted of an assemblage of ligneous caducifoliated trees, notably beech (*Fagus*) and hornbeam (*Carpinus*) - temperate type trees characteristic of the second half of the Holocene. Wood fragments from small trees growing in humid zones along the River Prut (*Salix*, *Populus*, *Alnus*) also occurred. The absence of conifer remains which developed at that time in the Carpathians (POP *et al.* 1970, FARGAS *et al.* 1997) is to be noted. This confirms the local character of the anthracological assemblages in the region. The Crasnaleuca assemblages are in accordance with the palynological data available for Romania and Eastern Europe (POP *et al.* 1970, CARCIUMARU 1989, HUNTLEY & BIRKS 1983, FARGAS *et al.* 1997). They constitute therefore a good reference in comparison with the assemblages preserved in the deposits of the Last Glacial.

4. DISCUSSION

The anthracological analysis of the Upper Palaeolithic sites of Central Europe enlightens the paramount role held by spruce, arolla pine and probably scots pine, in the arboreal stratum of the vegetation that covered Central Europe during the period between 50,000 and 10,000 BP. The other conifers appear less important, except very locally, whereas the deciduous species are restricted to pioneer or riparian trees and shrubs. No serious evidence of temperate species was discovered. Of course, all the Crasnaleuca Bronze Age samples consisting almost exclusively of deciduous trees and shrubs growing in temperate zones or humid areas are in contrast with the assemblages from Upper Palaeolithic sites.

Regarding the taxonomic diversity, the anthracological data can appear to be very poor in comparison with the pollen records. However, the palynological data from the sites presented in this study are of variable significance. For instance, we do not have any published data for Willendorf II and the essays we made were disappointing.

Yet, the loessic site of Stillfried B provided some pollen spectra discussed by URBAN (1984). In Moravia, the sites of Dolni Vestonice and Pavlov underwent palynological analyses (URBAN 1984, SVOBODOVA 1991), as well as the close peat bog site of Bulhary, located in the bottom of the Dije valley and which provided for the period around 25,675 (+2750-2045) BP a nice diagramme including the pollen deposits from the local marsh, riparian woods, loessic and loamy slopes and hill crests dominating the Dije valley (RYBNICKOVA & RYBNICEK 1991). But, the Bulhary pollen diagramme presents considerable proportions of mesocratic ligneous trees such as *Quercus*, *Tilia*, *Ulmus*, *Acer* and *Corylus*, whose local or regional origin is contested by SMOLIKOVA 1991 and SVOBODOVA 1991, who suggest reworking phenomena by lateral deposits. Once again the question of the integrity of the fossil pollen assemblages remains relevant (DAMBLON 1997).

Despite these problems, it is to be noted that the palynological data from the Central European loess are in keeping to demonstrate that the arboreal pollen come basically from conifers, mainly *Pinus sylvestris*, *P. cembra*, *Picea* sp. and *Juniperus*. Yet the loess generally contain pollen assemblages dominated by herbaceous taxa from open areas such as steppes, salted grounds, meadows, marshlands or open water. Pollen of deciduous temperate taxa appears only locally or scattered in numerous spectra. In fact, the humic horizons present higher percentages, and probably concentrations, of arboreal pollen, mostly under the influence of conifers.

Finally, if both palynological and anthracological records both emphasize the predominant role held by the conifers, mainly spruce and pines, the qualitative and quantitative differences between charcoal and pollen records could be explained in various ways : either ancient man made a choice of gathering wood for fire - but this would be surprising during the Upper Pleniglacial -, or spruce represents very local stands around the encampments, or pine is overrepresented in the pollen spectra because of its large pollen grain production. The most probable scenario could be an addition of these factors, considering that pines are supposed to have been regionally overspread,

that man was established on the firm loessic slopes supporting spruce, and that it was easier for him to collect dead spruce wood directly available around the settlement.

5. CONCLUSIONS

The charcoal analyses carried out in the loessic field of Central Europe highlight the predominant role of spruce in the Upper Pleistocene fossil assemblages. Among the pine charcoal pieces, those from the cembro pine seem the most important. These results, clearly contrasting with the palynological data or with other anthracological observations, very likely derive from the local character of the anthracological records.

Whereas the deciduous ligneous small-leaved taxa - birch, willow, poplar, alder - appear as logical companions of pioneer and riparian communities during the successive phases of the continental Glacial, remains of temperate type deciduous trees are limited to the Holocene deposits. No solid evidence has been provided yet for the persistence of these taxa during the Glacial within refuges in the Central European loessic plain. This question will be discussed in a further publication.

The charred remains of herbaceous plants in the Central European loess contribute to rule out, if need be, the hypothesis of a differential preservation of the charred vegetable remains in loessic environment. These remains concentrated within the cultural layers could derive from direct or indirect human activities.

Finally, the occurrence of charred remains of herbaceous stems or of seeds in the Gravettian and already in the Aurignacian concentrations of Willendorf II and Mitoc Malu Galben poses the question of plant - man relationships during the Upper Palaeolithic. Admittedly at Mitoc Malu Galben a contamination could be considered but seems unlikely at the depths (5.9 m and 9.7 m) where traces of bioturbations were rare. On the contrary, the discovery of charred culm and rhizom segments together with charred fruits and seeds in remains of hearth concentrations is certainly not the whim of fate. We assume that a handling by man is to be invoked as a result of waste, or still, as

remnants of drier feces of herbivores used for fuel. The transit through a digestive tract is suggested by the observation of several charred empty and crumpled seeds showing undulations and of large slit like seeds weakened by a partial digestion. Considering the charred remains of stems and rhizomes, their occurrence in the form of vitreous mass and transversally sectioned segments strongly suggests cutting up of fresh material subsequently burnt up. A thorough study on this type of material should be performed to reach a better understanding of the way man exploited the plant environment during the Upper Palaeolithic (MASON *et al.* 1994).

The anthracological assemblages in loessic sites reflect the local environment, but the repetition over long distances of conifer assemblages dominated by spruce suggests that the latter formed the bottom of the more or less dense or scattered arboreal strata in the loessic field during the whole glacial period. Some palynologists will consider this as obvious, although it is in discordance with the palynological data achieved in the loess of Central Europe and other regions.

Concerning the structures of vegetation, the assemblages of charred remains from Central Europe points to the existence during the period between 40,000 and 15,000 BP of a patchwork environment made of steppe-meadow and of spruce-taiga type. At the present stage of the study, it is not possible to estimate relative proportions of steppic and woody groups. Of course they should have fluctuated with more humid phases favouring afforestation by spruce, and with more arid periods leading to the spread of steppe herbs and forbs while arolla pine rose in the remaining woods and thickets. Narrow woods are supposed to have formed galleries along the river beds.

Only slightly significant vegetation and climatic fluctuations can be inferred from Upper Pleistocene assemblages. This is unfortunately due to the large homogeneity of the ligneous component fixed in the anthracological records. Of course the Holocene can be clearly distinguished from the Upper Pleistocene assemblages, but comparing the Moravian and the Transcarpathian records, some weakening in the arboreal diversity is observable from the Interpleniglacial to the Upper Pleniglacial periods.

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THE EUROPEAN LOESSIC PLAIN : ANTHRACOLOGICAL DATA

Region		Danube basin							Transcarpathia		
Country		Austria			Moravia				Romania	Mold.	
Site	Material	Willendorf II	(Willendorf II)	Schwallenbach	(Dolni Vestonice I)	(Dolni Vestonice II)	(Pavlov I / 1953)	Pavlov I / 1957	Crasnaleuca	Mitoc Malu Galben	Cosautsi
		<u>Charcoal</u>									
<i>Picea</i>	C	I-H	I	I	I	I	I	I	-	I-U	U-L
<i>Picea / Larix</i>	C	-	-	-	-	-	-	-	-	-	-
<i>Larix / Picea</i>	C	I	-	-	-	-	-	-	-	-	-
<i>Larix</i>	C	-	-	-	I	I	-	-	-	-	-
<i>Pinus t. cembra</i>	C	I	-	I	I	I	I	I	-	-	-
<i>Pinus t. sylvestris</i>	C	I-H	-	-	I	I	I	-	-	-	-
<i>Pinus mugo</i>	C	-	-	-	I	-	I	-	-	-	-
<i>Pinus sp.</i>	C	I-U	I	-	-	-	I	-	-	-	-
<i>Abies alba</i>	C	-	I	-	I	I	-	-	-	-	-
<i>Juniperus</i>	C	-	-	-	I	I	-	-	-	-	-
<i>Betula</i>	C	I-H	-	-	-	-	-	-	-	-	-
<i>Salix</i>	C	I	-	-	I	-	-	-	H	-	-
<i>Populus</i>	C	-	-	-	-	-	-	I	H	-	-
<i>Alnus</i>	C	-	-	-	-	-	-	-	H	I-U	-
<i>Taxus baccata</i>	C	-	-	-	-	I	-	-	-	-	-
<i>Lonicera</i>	C	I	-	-	-	-	-	-	-	-	-
cf. <i>Cornus</i>	C	H	-	-	-	-	-	-	-	-	-
<i>Acer</i>	C	H	-	-	-	-	-	-	H	-	-
<i>Quercus</i>	C	H	-	-	-	-	-	-	H	-	-
<i>Fagus</i>	C	H	-	-	I	-	-	-	H	-	-
<i>Carpinus</i>	C	-	-	-	-	-	-	-	H	-	-
<i>Ulmus</i>	C	-	-	-	-	-	I	I	H	-	-
<i>Fraxinus</i>	C	-	-	-	-	-	-	-	H	-	-
<i>Corylus</i>	C	-	-	-	-	-	-	-	H	-	-
<i>Cytisus</i>	C	-	-	-	-	-	-	-	H	-	-
<i>Prunus sp.</i>	C	-	-	-	-	-	-	-	H	-	-
<i>Pirus sp.</i>	C	-	-	-	-	-	-	-	H	-	-
<u>Carbonized fruits, seeds, roots</u>											
<i>Medicago</i>	S	I	-	-	-	-	-	-	-	I	-
<i>Vicia</i>	S	I	-	-	-	-	-	-	-	-	-
<i>Galium</i>	F	I	-	-	-	-	-	-	-	I	-
<i>Rumex</i>	F	I	-	-	-	-	-	-	-	-	-
<i>Polygonum aviculare</i>	F	-	-	-	-	-	-	-	-	I	-
Asteraceae	R	-	-	-	-	I	-	-	-	-	-
Apiaceae	F	I	-	-	-	-	-	-	-	-	-
Caryophyllaceae	S	I	-	-	-	-	-	-	-	I	-
<i>Lychnis</i>	S	I	-	-	-	-	-	-	-	-	-
Poaceae	c	-	-	-	-	-	-	-	-	I	-
cf. Cyperaceae	F	-	-	-	-	-	-	-	-	I	-
<i>Potamogeton</i>	F	I	-	-	-	-	-	-	-	-	-
X roots	R	-	-	-	-	-	-	-	-	I	-
<u>Legend</u>											
Sites: new data, (previous published data)											
Countries: Aus = Austria; Mor = Moravia; Rom = Romania; Mol = Moldavia											
Material: C= charcoal; c= culm; F= fruit; S= seed; R= root											
Periods: H: Holocene; L: Lateglacial; U: Upper Pleniglacial; I: Interpleniglacial											

Table 1: Synthetic anthracological data from the European loessic plain

