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5 The earliest occupation of Europe: Eastern Central and Southeastern Europe

Various series of primitive artefacts collected from Early Pleistocene deposits point to a high antiquity for the earliest occupation of eastern central and southeastern Europe. The earliest excavated assemblages (Přezletice and Stránska skála) date from earlier parts of the Middle Pleistocene. The number of sites increases considerably in later parts of the Middle Pleistocene.

1. Introduction

This paper gives a short review of Lower Palaeolithic localities in eastern Central Europe, mainly from the Czech Republic but also from Poland, Hungary, Ukraine, Croatia and Romania (Fig. 1). Information about the geographical position of sites is given as well as a short characterization of the archaeological assemblages and their stratigraphical context.

2. Czech Republic

2.1. Beroun, motorway cutting (Beroun district, Bohemia)

The site Beroun is situated between the villages of Beroun and Vráž, on the left bank of the river Berounka, about 30 km SW of Prague. The site, 70-90 m above the actual river, was located in a cutting with a length of about 500 m in which a body of sediments up to 28 m thick was exposed.

The lower part of the sequence consists of fluviatile deposits of the so called Vráž-terrace; gravel accumulation was followed by the formation of a Ferreto-soil, in its turn followed by backswamp deposits and another period of soil formation. The upper part of the sequence consists of a loessic colluvium with four intercalated brownearth palaeosols. This sequence was eroded once more by the river which formed the so-called Beroun-terrace, now covered by sandy colluvial sediments.

J. Fridrich collected three artefact assemblages from the exposures: one (A III) from the surface of the Vráž-terrace (this assemblage is probably of the same age as the Ferreto-soil), a second one (A II) from the upper part of the lowermost brownearth E and an isolated find (A I) from directly above the younger Beroun-terrace.

A total of 82 artefact-like pebbles was collected from a briefly exposed gravel surface of about 2000 m^2. The assemblage (A III) was described by Fridrich (1991a; 1991b) (Fig. 2:1-4), and the present author studied 12 pieces from this collection. Fridrich distinguished various types of choppers, protobifaces, two cleavers, cores, one pick, one polyhedron, a discoid and a subsphéroid, as well as several scrapers and 18 laterally retouched flakes. Beside pebbles some amorphic stones were used. Petrographically we are dealing with several quartzites, to a lesser degree with lydite, quartz and other silizites. All edges are more or less intensively rounded due to fluvial as well as aeolian processes. Part of the pebbles have a red-brown colour indicative of an original position within the Ferreto-soil. Most of the pebbles I studied show maximally three unifacial flake scars, three show more negatives and only one pebble was flaked on both sides.

Assemblage A II contains 9 pieces. I was able to study 7 of them and none of the specimens are figured sofar. The pebbles show the same degree of rounding as those from assemblage A III. Four pieces display probably more than three scars and one of these shows only traces of natural breakage, no conchoidal fractures. All are flaked on one side only. Assemblage A I consists of only a small chopper.

The Beroun exposure has been studied by a multidisciplinary group, who published their results in *Anthropozoikum* (Vol. 20 1991). The dating is, apart from geomorphological criteria, mainly based on the results of the investigation of the palaeosols (Smolíková 1992) and the palaeomagnetic analyses (Koči 1991). In the area of the Bohemian Massif there are no brownearth soils younger than PK VII, formed during an intra-Mindel interglacial. This soil might correspond with the uppermost brownearth A' of the Beroun sequence. The formation of Ferreto-soils ends during the late Cromerian s.l., which implies that all soils of the Beroun sequence date from the early Middle or Early Pleistocene (Smolíková 1991).

The lower and upper boundary of the Olduvai-Event has been found in the lower part of the Vráž-terrace, while the Matuyama-Brunhes boundary was identified in the deposits of the younger Beroun-terrace (Koči 1991). This implies that assemblage A III dates to the Olduvai-Event, A II to

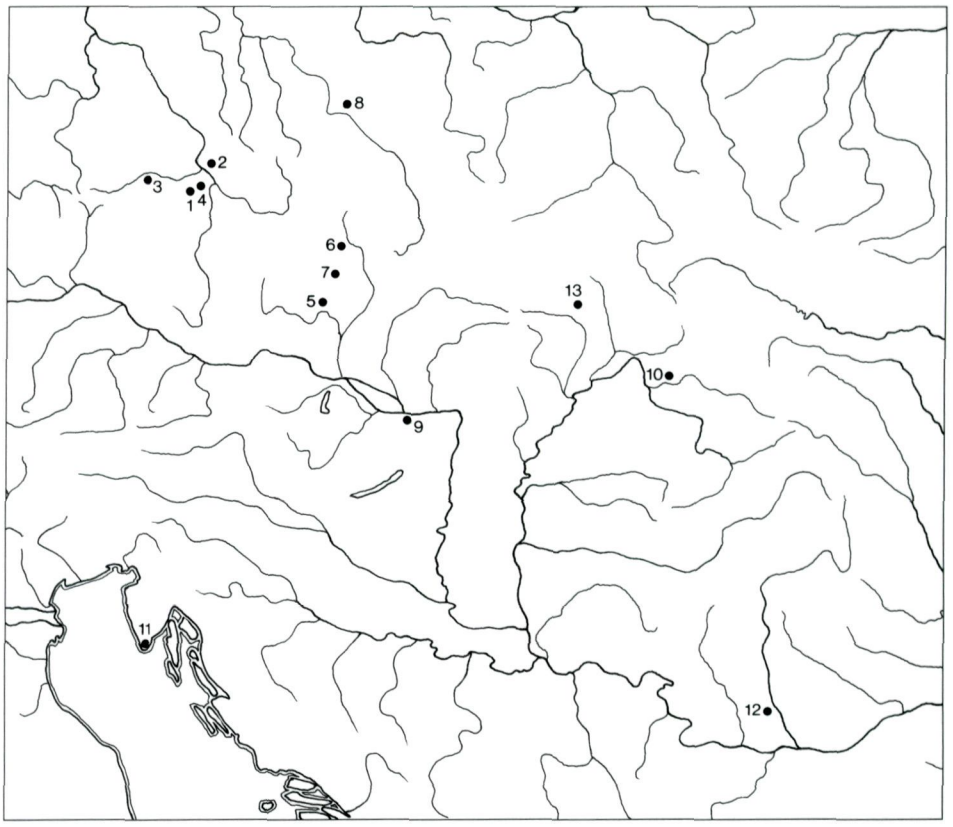

Fig. 1. Location of the sites mentioned in the text:
1. Beroun; 2. Přezletice; 3. Bečov; 4. Karlštejn; 5. Mušov, Ivaň; 6. Mladeč cave; 7. Brno: Červený kopec, Stránská skála, Švédské šance, Černovice; 8. Trzebnica; 9. Vértesszöllös; 10. Korolevo; 11. Šandalja I; 12. Tetoiu; 13. Travertine sites in NE Slovakia.

the following part of the Matuyama-Epoch and A I to the beginning of the Brunhes-Epoch. Palaeontological remains have not been found sofar.

The lithostratigraphical as well as the chronostratigraphical position of the finds is clear. Their artefactual character is however, questionable. Assemblage A III consists of a selection from the surface of gravel deposits and it is unclear whether such fractured pebbles occur all through the gravel deposits. The assemblage A II comes from a palaeosol formed in loessic slope deposits that are said to have been devoid of other stones. Furthermore the physical appearance (patina, rounding and flaking characteristics) of the cobbles does not differ from pebble tools collected on the surface. The human intervention on these cobbles is not excluded.

2.2. Bečov, site I-B (Most district, Bohemia)

About 70 km NW of Prague, within the area of the village Bečov, lies a promontory called Písečný vrch (sandhill) where quartzite was quarried since historical times. Remains of Middle and Upper Palaeolithic occupation were documented at several sites, while site I-B might document a Lower Palaeolithic occupation.

Three artefact bearing horizons were found in a cavity filled with Pleistocene sediments. The uppermost artefacts (I) were situated in a brownearth soil, the middle assemblage comes from the sandy lower part of the soil and the lowermost artefacts from the basal tuffit loam.

The artefacts, exclusively manufactered out of quartzite debris, have not been published yet; Fridrich (1972; 1976; 1989) mentions from layer I 107 pieces, from layer II 119 and from III 30 artefacts, mainly scraper-like forms. Choppers, polyheders and proto-bifaces are present to a lesser degree.

Based on the occurrence of a brownearth soil in the upper part of the sequence a *terminus antequem* of late Cromerian s.l. can be assumed (Fridrich and Smolíková 1976).

The artefacts from the Bečov site are unfortunately still hardly published. The good flaking properties of the quartzite would make the existence of clear traces of human flaking activities possible.

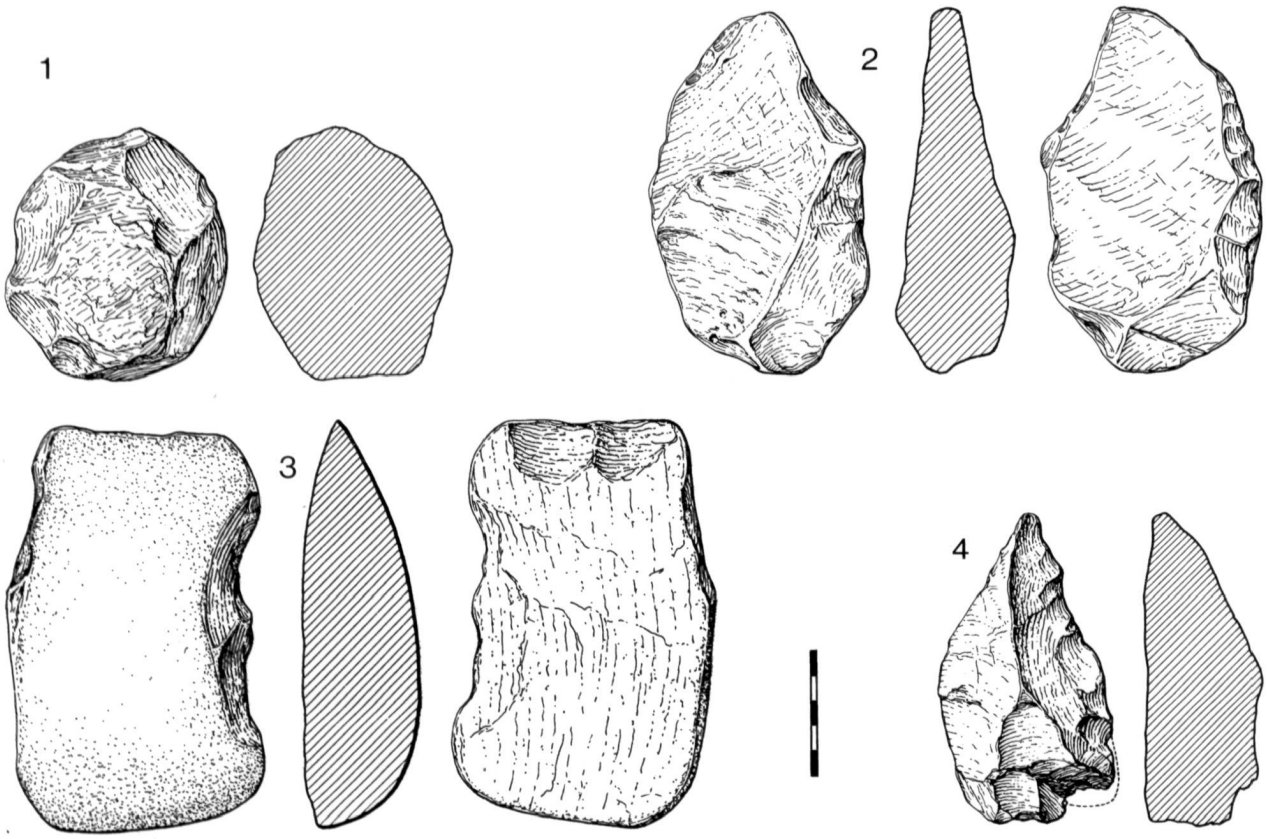

Fig. 2. Beroun, A III. 1. polyhedron; 2. proto-biface; 3. cleaver; 4. pick. Scale in cm.

2.3. PŘEZLETICE (PRAGUE-EAST, BOHEMIA)

A small, nowadays very reduced lydite cliff (called "Zlatý kopec" = "golden mountain"), is located at the northeastern boundary of Prague, north of the village Přezletice. Pleistocene, mainly lacustrine deposits are present at the foot of the cliff.

The base of these deposits consists of eroded schist (layers 21-18), sandy and loamy deposits and silty clays (layers 17-15). On top of these is a sequence of marly loams and sandy, respectively loamy freshwater marls (layers 14-6) with irregular layers (12) and lenses (in 13) of soil sediments of the Rendzina Series and loamified quartz sands with some lydite debris. Layer 5 consists of fine lydite debris with full-red coloured soil-sediments. The sequence is covered by a fossil soil (4), reworked loess and aeolian loess (3) with a polygenetic soil of Holocene age (2-1) (Šibrava *et al.* 1979).

The lacustrine sediments yielded a fauna with various smaller mammals (for example *Sorex savini*, *Desmana magna*, *Trogontherium schmerlingi*, *Pliomys episcopalis*, *Mimomys savini*, *Microtus raticepoides*, *M. gregaloides* and *M. arvalidens*) as well as larger mammals (for example *Mammuthus trogontherii* and *Dicerorhinus etruscus*). Mollusc- and ostracod-associations, rich in species, as well as rather poor pollen-spectra are also recorded.

Artificially broken bones as well as bones with signs of use, a few charcoal remains, burnt bones and stones as well as a fireplace are mentioned from this site. Remains of a dwelling with outer dimensions of 4 × 3 m and inner dimensions of 3 × 1,5-2 m with in the neighbourhood a fireplace was found in level 3 (Fridrich 1989; 1991b).

Fridrich distinguished four find levels with very similar palaeolithic artefacts; level 1 with 77, level 2 with 46, level 3 with 640 and level 4 with 107 artefacts (Fridrich 1976; 1979; 1989). The raw material consists mainly of the locally available lydite, some pieces are made out of vein quartz, quartz- and quartzite pebbles from gravels in the vicinity are rare (Fig. 3).

The biostratigraphical position of the site is rather clear on the basis of the fauna, which dates to the Late Biharian Templomhegy Phase (Fejfar in: Šibrava *et al.* 1979), i.e. before Interglacial III of the Cromerian complex (Roebroeks and Van Kolfschoten, this volume). Palaeomagnetic studies give dates of 0.59 - 0.66, 0,62 - 0.66 and 0.75 - 0.89 my to the deposits (Šibrava *et al.* 1979).

The problem of the locality lies in the artificial character of the finds (see Roebroeks and Van Kolfschoten, this volume). The available lydite has poor flaking properties: conchoidal fractures are not formed, only simple breakage patterns along the finelayered structure of the stone, and one can only recognize more or less notched edges without bulbs. It is therefore hard indeed to characterize the artefacts from a typological point of view. However, despite of this and despite of the vague traces of fire I personally do believe in the existence of worked angular debris and manuports in the locality Přezletice. However full publication as well as a detailed study of all the material is needed for a more objective assessment of the "artefact or pseudo-artefact"-problem.

2.4. Mušov and Ivaň (Břeclav district, Moravia)

The two localities, three kilometres apart, are situated about 40 km south of Brno. Mušov I is a former gravel pit on the road to Vienna, Ivaň I a built over promontory within the village.

The geological setting of Mušov I is rather complex. The sandy gravels have a tertiary origin and were regarded as *in situ*. The discovery of artefact-like pebbles during the early 70's led to an extensive geological study which indicated that the upper and the lower part of the sequence consists of *redeposited* Neogene sediments. In between there was a few meters of fine sands of Pleistocene lacustrine/fluviatile origin. These sediments lie on top of an (early) Middle Pleistocene gravel deposit which covers the *in situ* Neogene deposits. The artefact-like finds are mainly from the lower redeposited Neogene sediments, present above the fluvial gravels.

In Ivaň I it was only possible to investigate sections in building pits, where artefact-like pebbles were found in similarly redeposited but sandy-clayey sediments with some gravels, with relics of early Middle Pleistocene fluvial deposits on top.

The assemblage from Mušov I consists of several hundred items, Ivaň I of only six. Petrographical analysis of the pebbles clearly shows their Neogene origin. The majority of the pieces has at most three unifacial scars, but there is also a number of pebbles with more unifacial negatives and also some bifacial ones (Fig. 4: 4, 5, 11), though true bifaces are absent. Besides a small number of cortical flakes with clear characteristics there is one blade-like flake with at least three dorsal flake scars, a ventral side with a bulb and a plain striking platform. The left part of the ventral side shows four steep flake scars and a bit of cortex. The flake (Fig. 4.3) was found at the base of the sandy deposits during a joint excavation by M. Oliva.

For both localities it is only possible to put forward a minimum age, a *terminus ante quem*. Kryogenetic structures with remains of a Ferreto-palaeosol could be observed in the upper part of the lacustrine and fluvial deposits in Mušov (Valoch and Zeman 1979). In this area the formation of the Ferreto-soils took place before the end of the Cromerian complex (Smolíková and Zeman 1981; 1982), which implies a Cromerian age or older. The situation in Ivaň is similar. There the artefact-like finds were collected from sediments with kryogenetic structures and pockets filled with sands and gravels. These gravels are relics of a younger cover of sand and gravel deposited before the end of the Cromerian complex s.l. (Zeman 1974; 1981).

In sum, the complicated geological and stratigraphical position of the supposed artefacts, which originate from redeposited Miocene sediments, makes a clear judgement of the assemblages difficult. It is hardly possible that the Mušov I flake mentioned above was formed by natural processes, while a number of pebbles show negatives which *could* be the result of human activities. The Miocene sediments have not been reworked by a river, but were redeposited downslope over a short distance only. The large number of fractured pebbles cannot have been formed during this process of redeposition. There are only two possible explanations: either we are dealing with pseudo-artefacts formed in the Miocene sea or with real artefacts made when the sediments were accessible at the surface. It should be noted that the assemblage does not represent a selection from a huge number of pebbles, as we are not dealing with an actual quarry still in exploitation here: Effenberger and the present author collected the pieces by simply searching through the lower part of the deposits which were exposed in an abandoned quarry.

2.5. Brno - Červený kopec (Red Hill)

This is the largest loess exposure in the area of Brno, and the sequence with its numerous fossil soils and terrace gravels has been described several times by G. Kukla (e.g. 1970; 1975).

During prospection of the exposures with V. Gebauer, we found a quartz pebble, totally covered with concretions, in the palaeosol PK X below the Matuyama-Brunhes boundary.

After cleaning it turned out to be a polyhedron (Fig. 4.2), flaked from various directions. Its edges are strongly rounded as a result of aeolian processes.

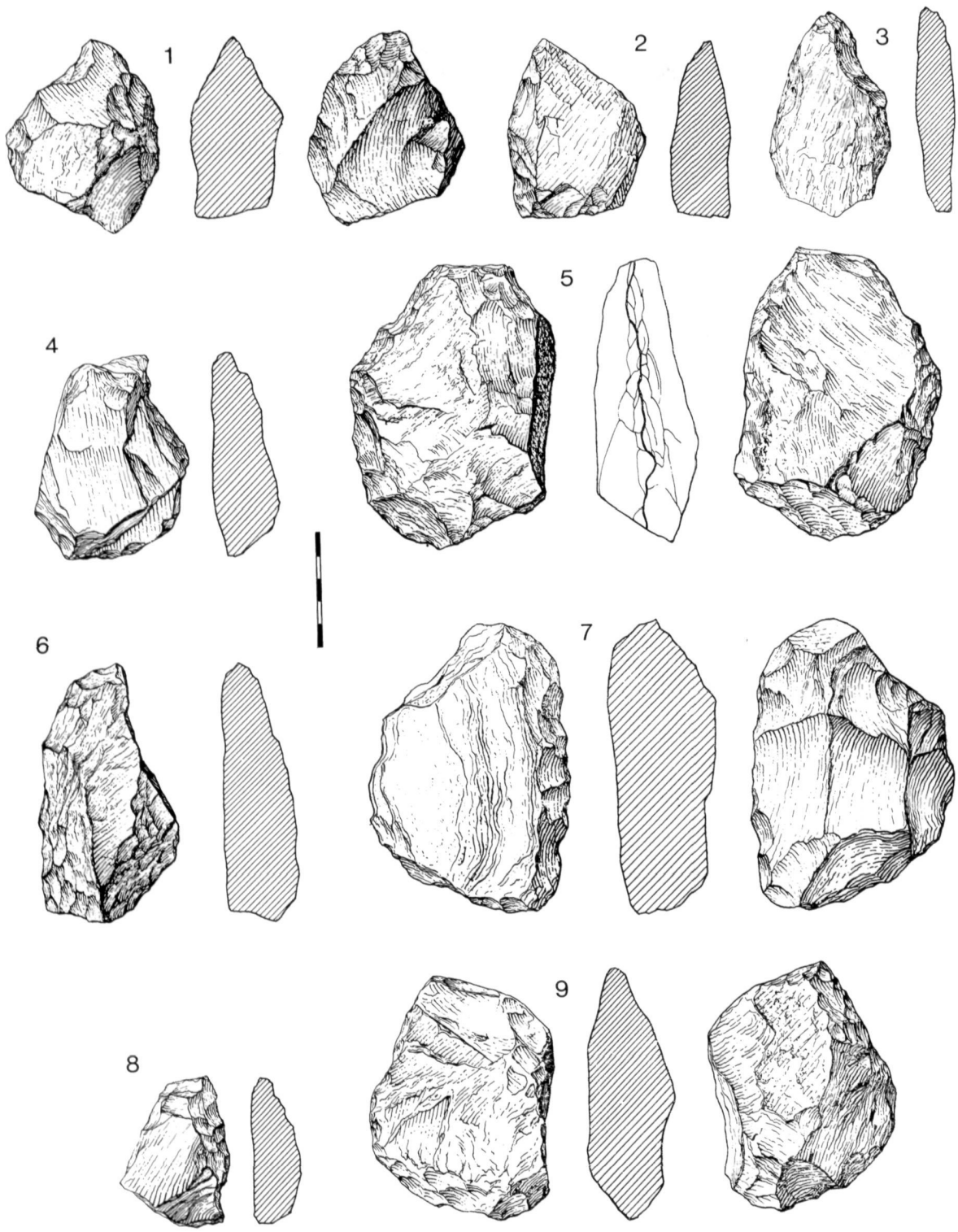

Fig. 3. Přezletice. 1, 5, 7, 9: proto-bifaces, 2-4, 6, 8: scrapers. Scale in cm.

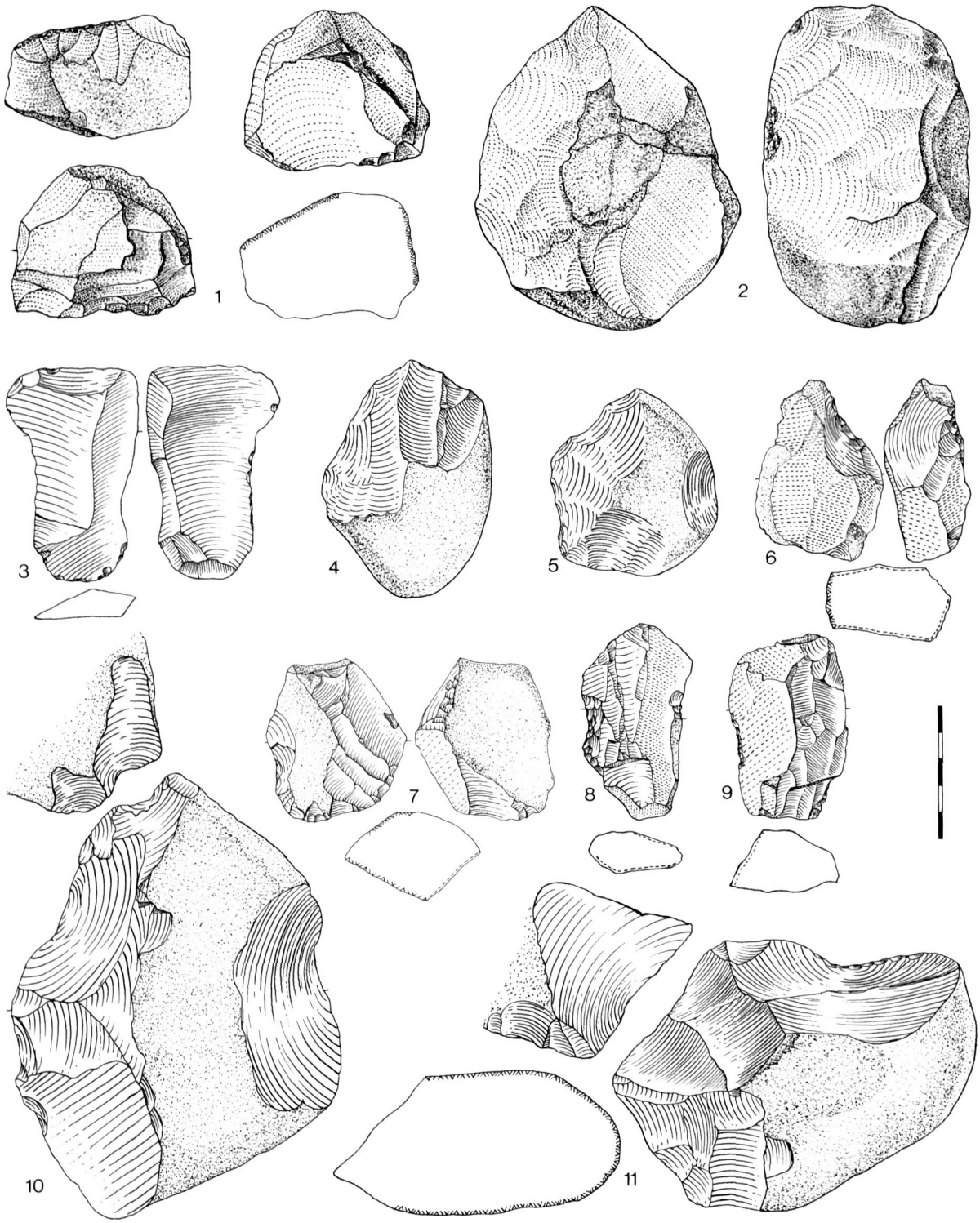

Fig. 4. 1. Mladeč cave; 2. Brno-Červený kopec (PK X); 3-5, 11. Mušov I; 6-9. Švédské šance; 10. Ivan. Scale in cm.

As the Matuyama-Brunhes boundary is located between the palaeosols PK X and PK IX the PK X has to correspond to the interglacial just before the palaeomagnetic transition.

The quartz pebble from Brno-Červený kopec was found in a soil formed in stone-free loessic sediments, with only calcite concretions. Gravel horizons from which the pebble could have tumbled down are also absent in higher parts of the sequence. In the vicinity of the find spot we also found a fragment of an antler and a piece of bone. It is almost certain that the pebble is a manuport.

2.6. Mladeč Cave (Litovel district, northern Moravia)

A cave-system (formerly Fürst-Johanns Höhle) in a limestone hill in the village of Mladeč (formerly Lautsch), yielded the famous upper palaeolithic human remains from Mladeč. During the 1959-1961 excavations here a quartz polyhedron was found in a side gallery, embedded in the calcite cover which overlies Early Pleistocene sediments.

There is no doubt about the intentional modification of the polyhedron (Fig. 4.1). Shaft III of the main cave yielded three possible artefacts; a flaked piece of chert (*Hornstein*), a large limonite flake and a small quartz pebble with one flake scar (Valoch 1993).

The age of the polyhedron is unknown; fragments of the calcite crust which covered the artefact were recently submitted for absolute dating. Judging from its faunal content, the sediment which yielded the three questionable artefacts dates to the Early Pleistocene.

While it is perhaps possible to get an indication of the absolute age of the Mladeč polyhedron, it is unfortunately impossible to accept the other three pieces as unquestionable artefacts.

2.7. Stránská skála I, Švédské šance, Černovice - gravelpit (Brno district)

These three localities are situated at the eastern boundary of the city of Brno. The most important one is a jurassic limestone cliff Stránská skála I, a second one is a much smaller limestone rock, Švédské šance, about 2,5 km south of Stránska skála I. Černovice is situated 400-500 m to the west of this former rock, on the edge of a huge sandpit which is still in exploitation.

Stránská skála (310 m above sea level) towers above a plain (240 m above sea level), which extends towards the south, and in which Švédské šance – with a height of 250 m above sea level – is hardly distinguishable. The plain is made up of a thick series of fluvial deposits (the so-called Tuřany-terrace of younger sand and gravel cover *sensu* Zeman 1974; 1981). These fluviatile deposits are exploited in the sandpit of Černovice. Augering has shown that the fluviatile deposits extend just unto the vicinity of Švédské šance, while Miocene deposits surface in areas more to the east.

2.7.1. Stránská skála I

In the northwestern slope of Stránská skála I, which is interrupted by a large former quarry, originally several passage-like caves were present, of which cave no. 4 and no. 8 are relevant in the context of this paper. Close to cave no. 8 there is a well developed body of sediments, deposited against an escarpment and containing an early Middle Pleistocene fauna (excavated by R. Musil in the period 1956-1972). Apart from remains of Würmian (=Weichselian) loess and a Holocene soil at the top (layers 17-21), there are Early and early Middle Pleistocene sediments which can be divided into four complexes. The upper one consists of a scree deposit with palaeosols and soil sediments (layers 6-16; the layers 13-15 are archaeologically important). The second complex is mainly formed by aeolian loesses (layer 5). The palaeomagnetic Matuyama-Brunhes boundary was recognized in the top of layer 5 or at the bottom of layer 6. The Jaramillo Event was found in a second scree deposit (layer 4 and 4a). The lower part of the sequence (layers 2, 3a and 3b) consists of fluviatile deposits which cover an erosional rock-terrace. Palaeontological remains are present in all the various layers.

Using this fauna, the small sections in both caves, of which the front parts were destroyed during quarrying activities, could be correlated with profiles higher up on the slope. J. Woldřich excavated cave no. 8 during the first two decades of this century (Musil in: Musil and Valoch 1968).

The layers 13 and 14 from the upper scree deposits yielded a few stone artefacts, some burnt bone-fragments and some broken bones, including a piece with several parallel striations on a concave surface. Several artefacts were found in the caves no. 4 and 8 and a burnt chert flake in cave no. 8. Here Woldřich gathered a rich macrofauna, whereas Musil could only find a small number of fossils of larger mammals. Cave no. 4 yielded microfaunal remains only. Most artefacts are made out of chert (*Hornstein)* nodules, from the locally occurring Jurassic limestone. Artefacts were only found in the layers 13 and 14 despite the fact that the scree deposits below and above the layers 13 and 14 contain limestone – as well as naturally broken chert fragments.

The sediments in cave no. 4 contain countless chert nodules and many still protrude from the wall. However, their general morphology does not correspond to the artefacts collected in this cave. Remarkable are a large core-like block and flakes from chert with limestone veins (Fig. 5.14). These flakes cannot be the result of natural rock-desintegration or frost action. These processes would follow the structure of the stone and result in a separation

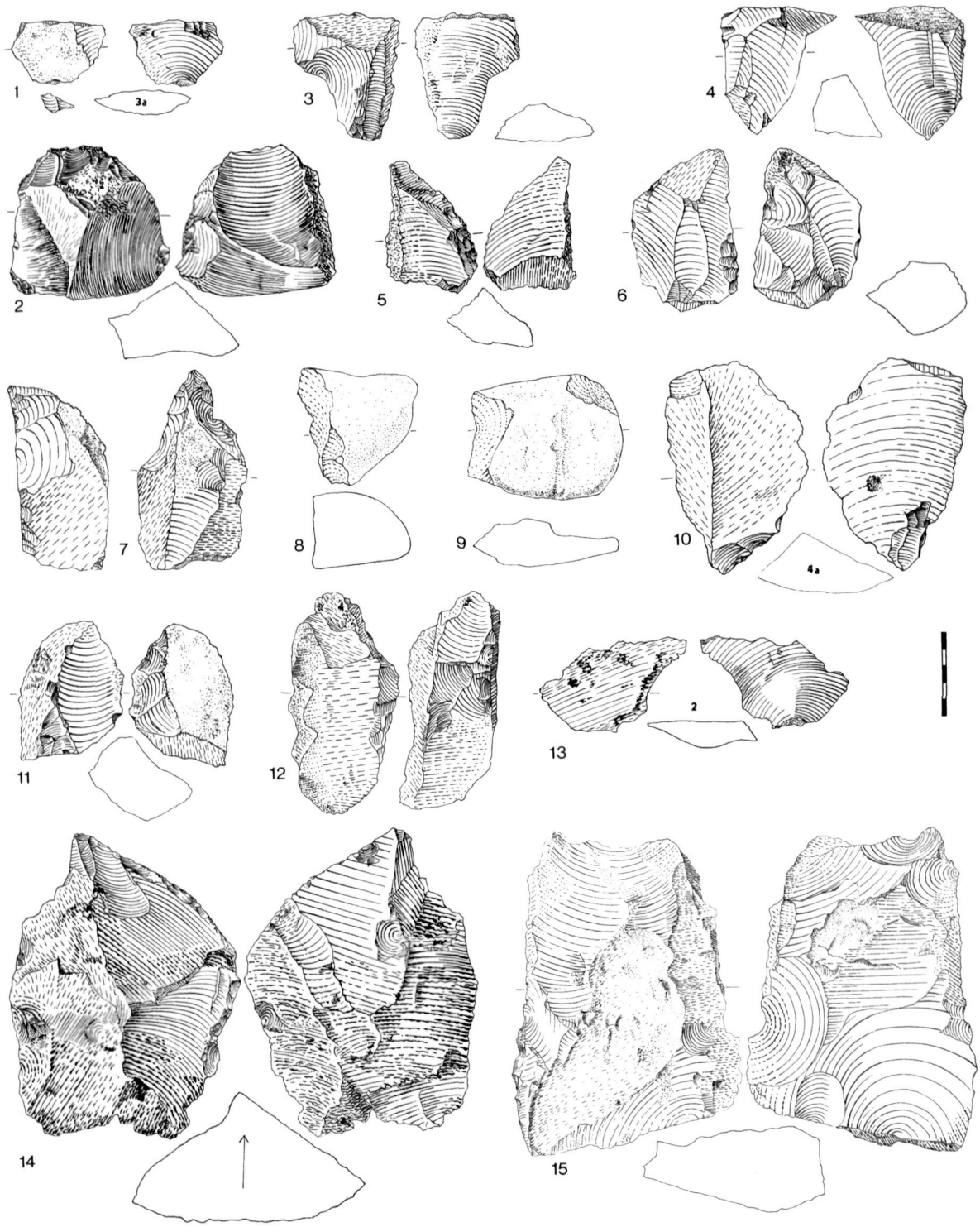

Fig. 5. Stránská skála I
1, 3, 4, 13. flakes with bulbus; 2. core-like tool with retouche; 5. scraper; 6 and 11. bifacially worked core-like tool; 7. pick; 8 and 9. choppers on pebbles; 10. limestone flake; 12. fragment with steep retouches; 14. pointed flake with bands of limestone (hatched), 15. bifacially worked core-like block. Scale in cm.

of limestone- and chert debris. As indicated by Koutek (1926) there are in Stránská skála at least three chert horizons with chert nodules of different conditions; the lowermost horizon is situated at the same level as the two caves. At least part of the artefacts seems to have been made out of chert from a higher level. Limestone flakes (Fig. 5.10) are rare.

As far as technology and typology of the assemblage is concerned, there are only a few flakes with a real bulb of percussion, a plain or cortical butt and a typically "swayed" ventral side. Concentric undulations are hardly visible (Fig. 5:1,3,4,13). Natural debris as well as corelike pieces (Fig. 5:2,6,11) were often used. We interpret the above mentioned block (Fig. 5.15) as a real core, and a split pebble as a hammerstone, both finds from cave no. 4. Two smaller pebbles – quartz and quartzite – look like choppers (Fig. 5:8-9). Regular retouch can been recognized on four artefacts (including a scraper and a pick like object (Fig. 5:5,7), partial and unregular retouch can be observed more frequently. The inferred intentionality of the parallel grooves mentioned above and of the seven striations on an elephant vertebra (excavation Woldřich) and the traces of wear of bone fragments, will be reinvestigated and evaluated by microscopic analyses in a joint project with Mrs. M. Patou-Mathis. Meanwhile, chemical analyses of some bone fragments has shown these were burnt, with temperatures of 200-500°C[1].

The artefact bearing layers 13 and 14 are situated rather high above the Matuyama-Brunhes boundary. The late Biharian fauna from Stránská skála is correlated with the Nagyhársányhegy-Phase (Horáček and Ložek, 1988) and with the period between Interglacial II and III of the Cromerian complex (Roebroeks and Van Kolfschoten, this volume). For the regional stratigraphy it should be noted that the lowermost fluviatile deposits (Layers 2 and 3) of the so-called Stránská terrace are situated one step above the accumulation of Černovice.

2.7.2. *Švédské šance*

A north-south oriented trench, 8 m deep and about 200 m long, was dug at the eastern foot of the Švédské šance. The western wall of the trench showed a profile in which 15 layers could be recognized. Apart from the uppermost aeolian loess with the Holocene soil on top, there are three soil-complexes in situ, redeposited soil sediments, sandy-loamy material and a layer of debris. Kryogenetic features were visible in the layers 3-10 which cover two sandy-loamy layers (11 and 12). The lowest one contains jurassic chert-debris, isolated pebbles and some artefacts. The base of the sequence (13-15) is formed by fluvial sandy deposits. Layer 14 shows traces of soil-formation (ferritisation) (Valoch and Seitl 1994).

Four artefacts come from layer 12; three of them are fragments of jurassic chert with traces of modification and partial retouches (Fig. 4:6,8,9), comparable to those of Stránská skála. The fourth piece is a quartzite pebble, bifacially struck from various directions into a polyhedron, with a large part of the cortex preserved (Fig. 4.7). Additionally, the layers 3, 9 and 14 yielded in total four pebbles with one flake scar, but their artificial origin is not sure (Valoch and Seitl 1994).

Unfortunately we have only geomorphological observations at our disposal to date the finds from this site. The basal sandlayers (13-15) are certainly related to the Tuřany terrace and can probably be correlated to the lower part of the accumulation in the gravel-pit Černovice. The formation of the artefact bearing layer 12, as well as the overlying layer 11 with pockets of fine sands, took place directly after deposition of the basal sandy layer, probably under periodical influence of water. Within this framework it can be stated that the artefacts from Švédské šance might be of the same age as those from Stránská skála or slightly older.

2.7.3. *Černovice*

A sequence of 8 to 10 m of sand and gravel is situated on top of Miocene sands and is covered by an intensive Ferreto-soil and a fairly well developed Ca-horizon with kryogenetic structures. An intercalated clay-layer yielded a rather rich mollusc (water- as well as land-molluscs) and ostracod fauna as well as remains of *Ursus deningeri*.

Last year (1993) the gravel pit here yielded a few objects which might be artefacts. They were collected by the amateur archaeologist R. Klíma, who has been inspecting the pit for several years. Three of these are undisputed, four others show less clear traces of modification. The best piece is a pointed flake made out of grey chert. It displays a pronounced bulb of percussion with a bulbar scar and a facetted striking platform, several flake scars on the dorsal side and on the left edge probably intentional retouches. All the edges and ridges are slightly rounded, and there is no cortex (Fig. 6.2). The second piece (Fig. 6.1) is a long flake, with a pronounced bulb of percussion, a bulbar scar and a cortical striking platform, made from a white patinated slightly rounded chertstone. The dorsal side of the flake shows a large flake scar and a small rest of the cortex. Both edges show natural pseudo-retouches. The third artefact is a sub-prismatic core with three parallel and one irregular flake scar made from a light grey chert pebble with intensively rounded ridges (Fig. 6.3).

The formation of the Tuřany terrace ended before the end of the Cromerian complex, as indicated by the presence of a well developed Ferreto soil on top of the terrace deposits (Zeman, 1974; 1981; Pfeifrová and Zeman 1979;

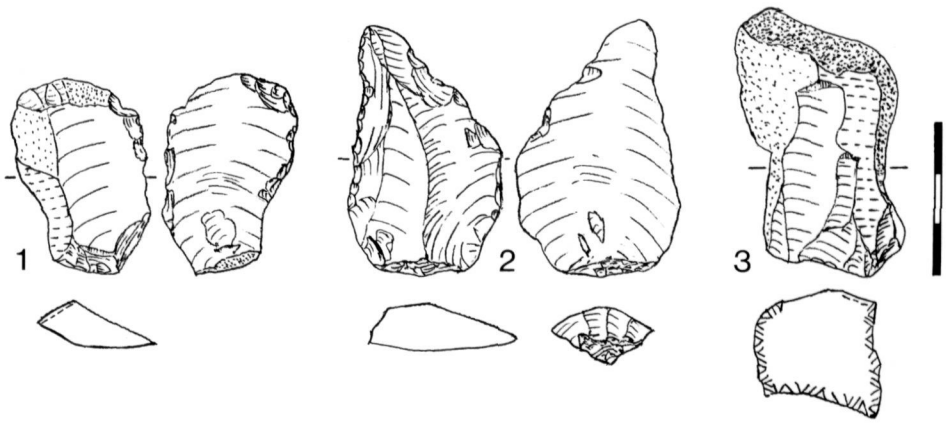

Fig. 6. Brno-Černovice, gravel-pit finds. Scale in cm.

Smolíková and Zeman 1981; 1982). According to the amateur collector, the stray finds (stones as well as faunal remains, e.g. horse and bovid molars, bone and tusk fragments) originate from the lower part of the gravel-layers, as inferred from the progression of the quarrying activities.

2.7.4. Summary

Stone artefacts, traces of fire (burnt bones and a chert flake) as well as broken bones show in my opinion unambiguously the presence of human beings in Stránská skála I. At least the quartzite polyhedron from Švédské šance and the three pieces from the gravelpit Černovice have to be regarded as artefacts. All three localities date to roughly the same period of the Cromerian complex, a period in which the river gradually deposited the sediments of the Tuřany terrace. One should remember that the fauna from Stránská skála contains a large number of water and marsh birds. The artefacts from the gravelpit are redeposited over a small distance (from Švédské šance?). The people at Stránská skála inhabited small caves. Musil suspects the former existence of a third cave above the exposed slope deposits, destroyed due to quarrying activities. The layer 13 and 14 are related to the original content of the cave. That indicates that three caves were inhabited.

2.8. Artefacts of unknown age from Bohemia and Moravia

In view of the large number of surface collections of pebble-tools from Bohemia (Žebera 1952), southern Moravia and recently also from Lower Austria (Zwerndorf im Marchfeld) and near Bratislava in Slovakia this problem is briefly mentioned here. Because most of these pebble-tools are collected from the surface of gravel deposits or relics of gravel-layers, there is only a *terminus post quem*, based on the position of the terrace. In southern Moravia we are mainly dealing with the younger sand and gravel sheet, rarely (e.g. Pouzdřany) with the older one. A relative dating criterion is the absence of wind polish on Late Pleistocene (Middle and Upper Palaeolithic) artefacts collected from the surface. The intensive reddish brown colour of the pale quartz pebbles – the result of impregnation of ferro-oxides – indicates the influence of chemical processes during the formation of the Ferreto-soil (Valoch *et al*, 1978).

One can therefore suspect that these pebble tools (proto-bifaces, polyhedrons, *epannelés*, chopping tools and flakes), date to the Middle Pleistocene, partially even to the early Middle Pleistocene. The finds are important because they seem to document a relatively intense occupation of the area, with numerous settlements along the banks of the river during the Middle Pleistocene.

2.9. 'Holsteinian' finds

Artefacts from the latest phase of the Lower Palaeolithic – the Holsteinian complex – are in the loess areas known from the soils PK VI and V. Bohemia and Moravia yielded only isolated flakes and pebble tools from that period, found during quarrying activities in those soils. Examples are the brickpits Brno-Červený kopec, Brno-Židenice I and II, Sedlešovice near Znojmo, Letky near Prague (Valoch 1977; Valoch in: Musil *et al.* 1955; Prošek 1946). Fridrich collected an assemblage of about 30 artefacts from the PK VI soil in Karlstejn near Beroun. The assemblage contains an *epannelé*, a core, scrapers and small unretouched flakes (Smolíková and Fridrich 1984). Perhaps slightly older is the

assemblage from the brickpit Sedlec near Prague, collected by K. Žebera. In a charcoal layer at the base of a loess profile with intercalated paleosols, just above gravels of the 'Mindel'-terrace (Záruba 1942) he found several good choppers, chopping-tools and polyhedrons with rather sharp edges (Žebera 1969, Plate VII-XVIII). Some strongly rounded pieces (Žebera 1969, Plate III-V) are regarded as being older ("Heidelbergian"). Several 'Holsteinian' travertine deposits in Slovakia yielded artefacts at Hranovnica, Vysné Ružbachy and, possibly, the lower levels at Horka (Bárta 1974).

3. Trzebnica (Silesia, southwest Poland)

The loam pit Trzebnica 2 is located about 15 km north of Wroclaw, in the northern part of the village Trzebnica, at the "vineyard hill" (Winna Góra).

In the southern section of the pit loamy loess-like sediments with a thickness of about 6 m (Jary *et al.* 1990) overlie a gravel deposit. In the northern profiles Tertiary clays are present beneath glacigenic deposits, which can be divided in three units: an upper till, sands and silts with layers of varve clays, sands and fluvioglacial pebble beds and a lower till (layers 3-5) (Winnicki 1990). The glacigenic part of the sequence below the loamy loess-like sediments is in the entire area a little more subdivided. The lower till covers as a moraine relict a gravel pavement (layers 1 and 2), the upper till (layer 5) is situated between fluvioglacial deposits (Burdukiewicz and Winnicki 1989).

Artefacts were found at several places in the pit. Concentration B was collected from a moraine pavement or from the sandy-loamy deposits underneath (Burdukiewicz and Winnicki 1989), concentration C above the pavement at the base of the upper till (Burdukiewicz and Winnicki 1989).

The preliminary reports (Burdukiewicz 1990; 1991; Burdukiewicz and Winnicki 1989) indicate that we are dealing with an industry with small artefacts (scrapers, notches, denticulates, atypical borers [becs]), cores and a few choppers, mainly made from flint, rarely from Devonian limestone and basalt. A small number of bone-fragments is also present, horse and rhinoceros could be identified as well as a tooth fragment of pike.

The upper till is correlated with the Drenthe ice-advance, the lower one with the southern Polish Elster ice-advance. The older assemblage therefore dates to the Ferdynandów-Interglacial (Elsterian I/II), the younger assemblage to the Holsteinian (Burdukiewicz 1990; 1991; Burdukiewicz and Winnicki 1989; Burdukiewicz and Meyer 1991). Krzyszkowski (1993) has another opinion about the age of the assemblages, as he correlates the sandy deposits with the Warthe stage and both tills with the Drenthe ice-advance.

In sum, the industry seems to be comparable with the industry from Bilzingsleben. Sofar, there is no unambiguous indication for the age of the assemblages and further investigations are necessary to clarify this problem.

4. Vértesszöllös (northwestern Hungary)

The village of Vértesszöllös is located in the valley of the river Átalér in the shade of the Gerecse mountains about 15 km south of the river Danube. On the edge of the village is an extensive travertine limestone quarry on the 60 m river terrace. Three different sites were identified in the quarry area: the palaeolithic site (I), an exclusively palaeontological site (II) and a site where palaeolithic artefacts and footprints of animals were recovered (III). Four find horizons were distinguished at site I, three at site III. At Site I the travertine deposits reach a thickness of about 10 m and lie on top of fluviatile sediments. The find-horizons are located at a depth of 3-5 m. Layer 1 was located in between two travertine beds. Layer 2, in the middle of the upper travertine bed, is only locally present and was less rich. Cultural remains from layer 3 were scattered over this travertine bed. Above the travertine deposits was a loess layer, the upper part of it containing horizon 4 which is very poor in finds.

The rich and well-known fauna from this site includes *Macaca sylvana*, *Ursus deningeri*, Machairodontinae indet., *Stephanorhinus etruscus*, *Equus mosbachensis*, *Hippopotamus antiquus*, and some hominid remains: a human occipital bone and two dental fragments were found in layer 1 (Thoma in: Kretzoi and Dobosi 1990).

Large lithic assemblages, technologically as well as morphologically very similar, were found in all layers (I/1 3163 pieces, I/2 506, I/3 599, I/4 52, III/1 607, III/4-5 677). The industry consists of small-sized pebbles made of quartz/quartzite (50,8 %), flint (44,7 %), limestone (4,3 %) and other raw materials (0,12 %). Typologically one can recognize choppers, chopping tools, proto-handaxes, various side scrapers, borers, burins and end scrapers as well as points and some other tools (Dobosi in: Kretzoi and Dobosi 1990). L. Vértes (1965) classified the assemblage as a micro-chopper industry and called it the 'Buda industry' (see Dobosi, in: Kretzoi and Dobosi 1990 for a detailed description).

Layer I yielded several bone fragments, intentionally broken and used. Some of the fragments show cut marks (Dobosi 1983; Kretzoi and Dobosi 1990).

Traces of fire were recognized at sites I and III. I/1 yielded black spots (35 × 45 cm and 5 cm thick) with small as well as larger burnt bone fragments without charcoal (Dobosi in: Kretzoi and Dobosi 1990).

Biostratigraphical studies originally dated the site to an intra-Mindel phase (Kretzoi and Vértes 1965). Palaeomag-

netic analyses showed normal polarity, supposedly the Brunhes Epoche (Latham and Schwarcz in: Kretzoi and Dobosi 1990). Radiometric dating yielded various partially contradictory results with older ages recorded above younger ones. For the travertine between the Layers I and III ages of 245 and 350 kyr BP have been obtained (in: Kretzoi and Dobosi 1990).

In sum, the Vértesszöllös sites indicate a repeated occupation of the mineral water spring during the formation of travertine deposits. Hominids brought game to the site, produced a specific miniature pebble industry with a low level of standardisation, used bone fragments as tools and were able to keep a fire going. The exact age of the occupation is unknown but is by no means younger than the Holsteinian complex.

5. Korolevo (Transcarpatian Ukraine)

Korolevo is located in the valley of the river Tisza, in the most southwestern part of the Ukraine, hardly 10 km from the Romanian and about 20 km from the Hungarian border. Artefacts were found in several layers in profiles which were exposed in an extensive andesite quarry on the hill "Gostryj verch", on the left bank of the river.

Various sequences with up to six parautochtonic palaeosol complexes contained in total 16 palaeolithic horizons. The four lowermost horizons (Vc, VI, VII and VIII) have certainly a Lower Palaeolithic age. Vc and VI are situated within soil-deposits, VII in loamy deposits and VIII in loamy deposits with fluviatile gravels (Gladilin 1989).

The entire industry is manufactured from andesite. Complex Vc contains chips, small flakes and debris, Complex VI more than 9300 artefacts including 94 cores and 136 tools (amongst others choppers, proto-bifaces, bifaces, cleavers, scrapers, knifes and denticulates.

Complex VII consists of 1539 artefacts including 13 cores and 12 tools (6 choppers, 2 proto-bifaces and 1 biface), while Complex VIII consists of 426 artefacts including 11 cores and 12 tools (with 5 choppers and 2 proto-bifaces).

All assemblages are assigned to the Acheulean, though a small number of cores and flakes with Levallois features are present in the assemblage (Gladilin and Sitlivyj 1990).

The find bearing sediments are completely decalcified, and organic remains are hardly present, though palynological analysis yielded some results. A xerophile flora with *Zelkova*, hornbeam and *Pterocarya* is found in layer 15 (Complex Vc). The layers 16 and 17 (with Complex VI) were deposited during a cold phase, as inferred from the occurrence of *Betula verrucosa*, *B. pubescens*, *B. torbuosa*, *B. humilis* and *Alnus viridis*. Layer 18 dates to a warm phase during which areas with an open vegetation occurred based on the presence of Chenopodiaceae, Asteraceae and Cichoriaceae, *Fritillaria* and exotic trees such as *Zelkova* sp. and *Pterocarya*. Layer 19 marks another cold phase; noticeable is the decrease of trees and a flora with Chenopodiaceae, sedge, Asteraceae and cereals and for example *Polemonium acubiflorum*. A short warm phase with a boreal steppe vegetation (30-45% boreal pollen) is represented in the layers 20-21, and layer 22 indicates another cold phase with birch and pine trees. Layer 23 with elm, walnut, oak, *Zalkova* and hornbeam is indicative for a warm phase. Complex VII has been collected from layer 25 with pollen from birch and pine trees and some demanding species which indicate mild cool climatic conditions. Layer 26 contained only a small amount of pollen from elm, walnut, beech, *Pterocarya* and water plants (*Azolla*, *Pediastrum pennales*). Artefacts of Complex VIII as well as a few pine and birch pollen are found in Layer 27, at the base of the sequence.

Thermoluminescence as well as palaeomagnetic analyses have been carried out. Layer 16 has a TL date of 360 ± 50 Kyr BP, layer 19 a date of 650 ± 90 kyr BP and layer 25 of 850 ± 100 Kyr BP. The Matuyama-Brunhes boundary is indicated between the layers 21 and 22, far above artefact Complex VII (Gladilin 1989). The lowermost series of Korolevo are without any doubt Lower Palaeolithic industries, and both stratigraphical and floral and faunal evidence suggest a rather high age. They probably belong to the Acheulean s.l. Attempts at dating the various series have not yielded unambiguous results so far.

6. Šandalja I (near Pula, Istrie, Croatia)

Two degraded caves, located close to each other, were exposed in a quarry about 4 km NE of Pula.

The lowermost deposits in the first cave consisted of an Early Pleistocene breccia with a rich faunal association, including a left first lower incisive which was thought to be of human origin. The upper deposits contain a late Würmian/Weichselian Gravettian industry. The second cave contained only late Würmian/Weichselian deposits with human skull remains and an Aurignacian and a Gravettian industry.

A small pebble (L 64 mm, W 53 mm, Th 34 mm) made of olive-grey flint was found in the breccia. The narrow side of the pebble shows three large flaking scars which extend to halfway the dorsal side. The edge has been modified by numerous retouches. The ridges are slightly rounded, probably by aeolian activities (Fig. 7). Some bones show traces of fire while charcoal remains are also present. The dominance of immature herbivorous mammals in the fauna might indicate a selection by humans.

The fauna from Šandalja I is correlated with faunas such as St. Vallier, Perrier, Senèze, Chagny and the upper Val d'Arno fauna dating to the Middle-late Villafranchian (Malez; 1974, 1975, 1976).

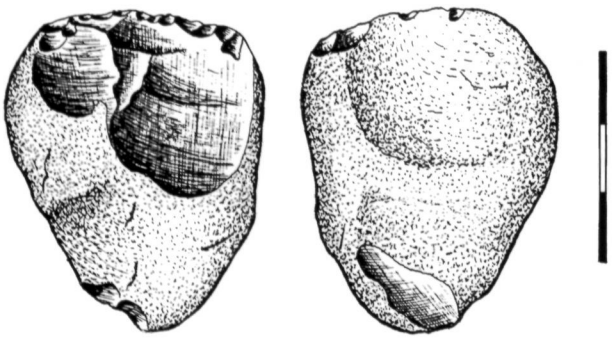

Fig. 7. Šandalja I, chopper. Scale in cm.

The chopper as well as the traces of fire point to a human presence, a statement which might find some support in the faunal evidence. In the context of the cave the chopper as well as a second pebble without clear traces of modification have to be manuports. However, the small number of finds does not allow an unambiguous interpretation of this old site and it can therefore not be accepted as unambiguous evidence for human occupation.

7. Tetoiu (Bugiuleşti, Olténie, Romania)

Along the middle Oltet river (a tributary of the Olt) in southern Romania, well developed fluviolacustrine deposits are present between the villages Tetoiu and Irimeşti, with several layers containing rich late Pliocene faunas.

Three layers with faunal remains have been identified: the lowermost level (T-1), about 20 m thick, consists of sands and clayey sands with gravel layers. The middle level T-2 is about 40 m thick and consists of sands and lenses of gravel and pockets of clay. The uppermost level (T-3), up to 35 m thick, consists of coarse sands with numerous pockets of gravel.

A small number of flint and quartzite pebbles with possible traces of modification have been found in an exposure, Dealul Mijlociu, in a gravel- and sand layer with a thickness of 1,5 m. The layer is located in the sequence T-1, between the fossiliferous horizons La Pietris (below) and Valea Graunceanului (above).

Of the 'artefacts' found here three small chopping tools are mentioned, and two of them have been figured. Unfortunately there are no detailed descriptions yet and the pictures are not clear enough to get a good idea about the pieces. The two flint pebbles have about the same size (1: length 53 mm, width 38 mm, thickness 24 mm; 2: length 53 mm, width 39,5 mm, thickness 26,5 mm), the third one, a quartzite pebble, is slightly larger. The two artefacts which have been figured show some flake scars.

The find horizon might be correlated with the Olduvai event around 1,7 Myr BP. This is based on the presence of a middle sized *Trogontherium (T. dacicum)* in the fossiliferous horizons La Pietris below, and Valea Graunceanului *above* the findhorizon. The same species occurs in Slatina-3 (the type-locality of *Trogontherium dacicum*). Slatina 3 has a normal polarity, assigned to the Olduvai Event (Radulescu and Samson 1991).

The artificial character of both figured pieces cannot be evaluated on the basis of the publications available. The artefacts should have an age of about 1,7 Myr BP. The authors furthermore mention finds from Dealul Viilor with a younger age of 1,2 Myr BP (Radulescu and Samson 1991).

8. Conclusions

This paper has given a short sketch of the Lower Palaeolithic occupation of eastern Central Europe. This area has a rather large number of Lower Palaeolithic localities. Dating evidence suggests that hominids were already occupying this part of the world in the Early Pleistocene. From the earlier parts of the Middle Pleistocene onwards there are various sites with unambiguous traces of human presence, three of which – Stránska skála, Přezletice and Korolevo – have been excavated. At Stránská skála and Přezletice the artefacts were associated with a rich *Mimomys*-fauna from the second half of the Cromerian complex and the paper has explicitly dealt with the evidence for *human* occupation at the sites (*contra* Roebroeks and Van Kolfschoten, this volume and Roebroeks 1994). From this period onwards there are more Lower Palaeolithic sites in eastern Central Europe, all dating to the second half of the Middle Pleistocene.

notes

1 Since no fireplace was found in layer 13 at Stránska skála, it was necessary to analyse the black bones, believed to have been burnt. Our proof of burning is based on the assumption that bones — beside the mineral component hydroxyapatite (Posner 1985) — generally consist of organic matter also and this had to be partly removed during the stay of bones in a fireplace. According to experimental measurements, the temperatures at open fireplaces prevalently vary between 300 - 500°C. That is why we used the differential thermal analysis DTA (Mackenzie 1970) and the ROCK EVAL pyrolysis (Espitalié *et al.* 1977) to prove the burning of the bones. Four sets of samples were analysed by both methods, each set from the same findspot in layer 13 and containing a bone of usual white appearance (non-burnt) and a black bone believed to have been burnt. The same quantities of both bones under the same conditions were analysed.

The results of the analyses have been very similar in all four sets. The DTA curves have shown that as a consequence of structure breaking, the burnt bones have a higher content of moisture on the one hand, on the other hand a part of organic matter is missing at temperatures between 250-450°C as compared to non-burnt (white) bones.

The results of the ROCK EVAL pyrolysis have been even more unambiguous. The amount of primary volatile organic component up to 250°C is always higher in the white bones than in the black bones). A similar picture is given by the S2 peaks: the content of non-volatile organic matter is again higher in the white bones because in the black bones it was partly cracked during their contact with fire. The index of production (IP, i.e. relative abundance of volatile compounds primarily present in the sample expressed by the ratio S1 to the sum S1+S2) of all white bones is higher than IP of corresponding black ones. The residual organic matter in the black bones therefore gives higher Tmax values than the organic matter of white (non-burnt) bones. The exception in S2 and Tmax observed in the fourth sample could be the result of a secondary (anaerobic microbial) activity, which is most remarkable in the deepest horizon.

We can conclude that the black bones from layer 13 at Stránska skála have been indeed affected by contact with fire, during which a part of organic matter was removed at temperature between 200 and 500°C.

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