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# A Lower Palaeolithic settlement at Kończyce Wielkie site 4, Cieszyn Silesian (Poland)

## Staropaleolitické osídlení na lokalitě Kończyce Wielkie IV, Těšínsko, Polsko

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***Abstract***

*In the southern part of the Oświęcim Basin, in the Kończyce Wielkie gravel-pit, we can find outcrops of Quaternary deposits with varied geological histories. The lower fluvial sequence is covered with glacigenic sediments. The glacigenic deposits occurring below the Brunhes-Matuyama boundary and interglacial sediments are older than the Cromerian Complex. This ice-sheet advance, in its maximum extent in southern Poland, is correlated with the Günz, i.e. pre-Cromerian glaciation in Western Europe. Cultural material was located within fluvial sands with fine-grained gravels, below a layer of diamikton – interpreted as till – and underneath the boulder pavement – an equivalent of diamikton. Raw materials inventory include local flint and hornstone, foreign flint, hornstone, quartzite, opalite, gneiss granite. Among the artifacts are macrolithic and microlithic cores, flakes and tools. The pebbles, flakes and microlithic-flakes were base for making the tools.*

***Keywords***

*Lower Palaeolithic, pebble-flake-microlithic inventory, extraglacial deposits, pre-Cromerian, below Brunhes-Matuyama boundary.*

***Editorial note***

*This study is complementary to the paper published in Journal of Archaeological Science (Foltyn et. al. 2010).*

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## 1. Introduction

The sediments in a gravel extraction pit at Kończyce Wielkie (Fig. 1) have been the object of geological investigations since the 1980s. A substantial progress was made during the 1997–2003 when the existence of Pleistocene formations older than the Matuyama/Brunhes boundary was established (Wójcik *et. al.* 2004). Archaeological material was first discovered in 2004. In the period from 2004 to 2005 the site was under permanent supervision of archaeologists and geologists who followed the progress of the industrial works. The supervision included the study of stratifraphic profiles, collection or extraction of artefacts from sediments, and organizing up-to-date documentation. Forty-five stone artefacts were found (Foltyn *et. al.* 2010).

The studied site is located north of the maximum extent of the Scandinavian ice-sheet advance (Fig. 2), on the Kończyce Plateau which is in the southern part of the Oświęcim Basin (Klimek, Starkel 1972). This region belongs to the Odra river drainage basin. The southern part of the Oświęcim Basin comprises hills with relatively flat summit parts and flat-bottom valleys. The loess-like loams, up to 12 m thick, predominate in surface deposits. Fluvial gravels, sands and fluvioglacial gravels with eratics, till, organic and Miocene materials crop out in erosional incisions and artificial (man-made) cuttings.

## 2. Results of geological studies

Quaternary deposits outcropping in Kończyce Wielkie site 4 have been divided into six sedimentary sequence

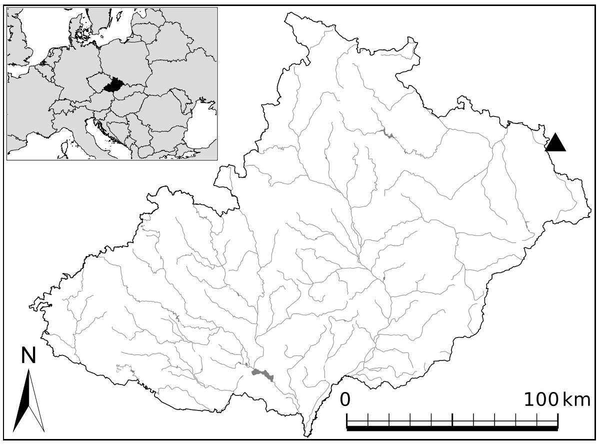


**Fig. 1.** Location of the Kończyce Wielkie site 4 site on the map of Moravia and Silesia.

**Obr. 1.** *Poloha lokality Kończyce Wielkie na mapě Moravy a Slezska.*

as follows: lower fluvial sequence (I), glacigenic deposits (II), lower muds with organic deposits (III), upper fluvial sequence (IV), upper sequence with organic muds (V), sequence of loess deposits with traces of fossil soils (VI).

The Miocene deposits are directly covered by the lower gravel-sandy fluvial sequence (I) which is up 15 m thick in the region of Kończyce site (Fig. 3). The fluvial series is two- or threefold. The lowermost part of the Quaternary deposits profile comprises sandstone fluvial gravels originating from the Carpathians. The lower part which is

7.5–11 m thick includes well and medium-well rounded massive gravels (Gm) with some sands and sandy-silts. In places, the gravels are graded (Gmg). The gravels are interbedded with sands (Sx) and sands with gravels (SGx) forming lenses of various sizes, while gravels are usually cross-bedded (Fig. 3). At a depth of 21.5 m from the ground surface, intercalations with sandy muds (Fm) are found. This sequence is followed by lithofacies of massive gravels (Gm) interlayered with cross-bedded sands (Sx) which fill the fossil troughs (Fig. 3). The described sequence was formed in an environment of a high-energy gravel-floor river. The petrographic composition of gravel indicates their Carpathian origin while imbricaiton points to transportation from south, probably by the Olza river.

Above Gm series, the grain-size of the gravels decreases while the sand content increases. The gravels grade upwards into cross-stratified sands (Sx, Sr), on which 3.5–4.0 m thick, fine sands and sandy silts, sometimes with ripple-mark lamination (Sr, FSr), rest (Fig. 3). Lithofacies of massive muds (Fm) with horizontal laminations (Fh) occur in the upper part of the fluvial series (I). These lithofacies are likely fragments of fossil fluvial silt and alluvial loams (madas in Polish or Auelehm in German). In the southern part of the site the muds are truncated and the uneven upper face of sequence I is at an elevation of 256–260.5 m a.s.l.

The lower fluvial sequence (I) is older than the glacigenic deposits and could have been deposited in a widely understood periglacial period comprising the lower Pleistocene and Prepleistocene (Linder 1992).

The glacigenic sediments (II) are overlying the truncated lower fluvial sequence (I). These glacigenic deposits differ as to their thickness and compositions in a particular profiles (A, B and C, Fig. 3). From example, glacial till (0.3 to 0.9 m thick massive greyish diamicton – Dm) separates fluvioglacial sands and gravels in profile C (Fig. 3) while it is lacking in profiles A and B. In the southern part (profiles B and C, Fig. 3) sands and fluvioglacial gravels are 2 to 6 m thick but in profile A their thickness does not exceed 1.5 m (Fig. 3). Sands and large-scale steep (planar) cross-bedded sands and gravels (Sx, SGx) are present in all profiles. The most common mineral represented in the gravel is quartz (50–70%). Other materials include white quartz, grey and red granites, granite-gneisses, quartzites, and singular limestones and lydites. Boulders and blocks of granites, granite-gneisses, quartzites, and metamorphic rocks are found in some places. They rest directly on the erosional surface of series I and are covered with the fluvioglacial deposits.

Above the glacial till, upper gravels and fluvioglacial sands up to 2 m thick occur. The sands and gravels are steeply cross-bedded, and massive gravels (Gm) are also present. Accumulation of the these sediments took place during the glacial maximum when the ice-sheet extended as far as the Carpathians.

On the glacigenic formations (II), a sequence of muds containing organic remnants (III) can be found in some places. The top of the muds is 14 m deep from the surface (263 m a.s.l.). These deposits fill up a fossil depression, likely of erosional origin, although its genesis during ice-melting cannot be excluded. In Kończyce, the contact with the lower lying glacigenic sediments (II) is usually sharp and of an erosional nature. In the lower part, sequence III is built of 2–3 m thick laminated muds and fine sands with distinct horizontal laminations (Fig. 3). They are overlaid by greyish-rusty loams, on which clayey silts, containing weakly silicated pieces of *Quercus* wood and individual hazelnuts (*Corylus*). Those silts are truncated and covered with a 0.1 m thick layer of brownish-rusty muds, which in turn are overlaid by the upper fluvial beds.

Organic remains are present in a section of the profile and samples for palynological analysis have been collected at depths 14.05–14.85 m (Figs. 3, 4). The high contents of pollen of stenothermal trees and shrubs (*Buxus*, *Ilex aquifolium* type, *Ligustrum*, *Euonymus* and *Hedera helix*) provide evidence of interglacial conditions. The vegetation history substantiates development of dense forest communities with oak (*Quercus*), linden (*Tilia*), hornbeam (*Carpinus*), maple (*Acer*) and hazel (*Corylus*). The pollen analysis results do not fit any presently known interglacial succession known from Poland. The pollen successions from Kończyce site differ significantly from the commonly known interglacial pollen stratotypes, thus cannot be attributed to local changes in vegetation. The discussed series III is in the superposition, it rests on the glacigenic deposits (II) and is covered with the upper fluvial series (IV). According to the performed palaeomagnetic investigations, those sediments were deposited in the Matuyama period (Fig. 5). Their stratigraphic position is close to the position of the Augustovian interglacial (Ber 2000). The identified pollen succession either corresponds with Integlacial I within the Cromerian complex (Zagwijn 1996) or with a Pleistocene warm stage older than the Cromerian.

The upper (3.5–5.9 m thick), fluvial series (IV) rests either on the glacigenic series (II) or on the series of organic muds (III). The bottom of the fluvial series (IV) extends laterally almost at the same depth. The fluvial series (IV) comprises mainly gravels of the Carpathian sandstones with a weakly marked imbricaiton and locally gravels of crystalline Scandinavian rocks. The presence of the letter is related to erosion of the glacial deposits.

In the whole discussed section, the lithofacies of the massive gravels (Gm) predominate. In the upper part, loosly packed gravel grains occur in a poorly sorted sandy-silty material. Massive sandy gravels (GSm) and, locally, several centimetre thick lithofacies of massive sands (Sm) occur as well. Sandy gravels (GSp) of fine cross-bedding and those of gully trough cross-bedding form lenticels. At the top of the discussed series (IV), there is a local occurence of a 2–40 cm thick layer of varigrained massive sands (Sm) with the orstein horizon, preserved in numerous places as a rusty-red stratum of "ferrous crust".

The upper fluvial sequence (IV) was formed by a gravel-floor braided river of abruptly changing regime and due to high overloading it was deposited at the Carpathian foreland. The poor sorting and usually massive structure of the sediments point to fast deposition


**Fig. 2.** Location of the Kończyce Wielkie site 4 profile against the extent of the Scandinavian ice-sheet as identified hitherto by different authors.
**Obr. 2.** *Poloha profilu na lokalitě Kończyce Wielkie IV ve srovnání s maximálním rozsahem skandinávského ledovcového příkrovu podle různých autorů.*

by a high energy river. Based on the stratigraphic division of Zagwijn (1996) and Lindner (1992), the accumulation of the upper fluvial sequence (IV) could have taken place in the so called Glacial A of the Cromerian complex.

Overlying the upper fluvial sequence (IV) is a sequence of silts and organic muds (V), with local peat horizons (Fig. 3). These sediments outcrop in many locations throughout the site, and the sequence (V) is 2–4 m thick. It consists of muds separated by 3 horizons of compressed peat. Sequence V has a complicated genesis and 11 layers can be distinguished with differences in colour and organic content. These sediments have been deposited on a wide, flat valley bottom. Muds and then peat were deposited on the moist valley floor. The top of sequence V consists of brown muds, and in many parts of the outcrop it is truncated and separated from the upper part of the profile by the orstein horizon or by reddish-orange ferrous horizon manifesting itself throughout the outcrop.

Changes in declination and inclination, point to the twofold nature of the studied profile (Fig. 5). From the ground surface down to the depth of 10.4 m declination oscillates near 0°, while inclinations are about 60°. This corresponds to the normal Brunhes magnetisation. The declination and inclination change abruptly at the depth of 10.4–10.85 m. Declination reaches 210° or even 260° while inclination is about 0° or can reach small positive and event negative values as evidenced by 21 samples (Fig. 5). This corresponds to Matuyama period (Fig. 5).

Similar values of declination and inclination have been found in the case of organic muds (sequence III). The obtained direction may have been modified to various degrees by subsequent changes in the magnetic field. The identified reverse magnetic polarity can be interpreted as the Matuyama–Brunhes paleomagnetic boundary (Fig. 5) dated to 778 000 years (Heller, Evan 1995; Nawrocki *et. al.* 2002).

As the total thickness of the investigated part of the profile (10.4 m to 10.85 m and 14.3 m to 17.2 m) is significant, the anomalous palaeomagnetic record is unlikely to be related to a short-term excursion of the geomagnetic field. In the Brunhes period, several excursions of that type have been reported (Nowaczyk *et. al.* 1994). The boundary between the magnetic periods is accepted at 778 ka and it is placed in Glacial A of the Dutch Cromerian profiles (Lindner 1992).

The palynologically studied upper organic muds (silts) sequence was deposited during the alternating cold and warm climatic periods (Fig. 6). The observed traces of the mineral accumulation in the form of the silty-sandy laminae reaching a thickness of 1 mm in the peat horizons suggest numerous sedimentation gaps. The bor-

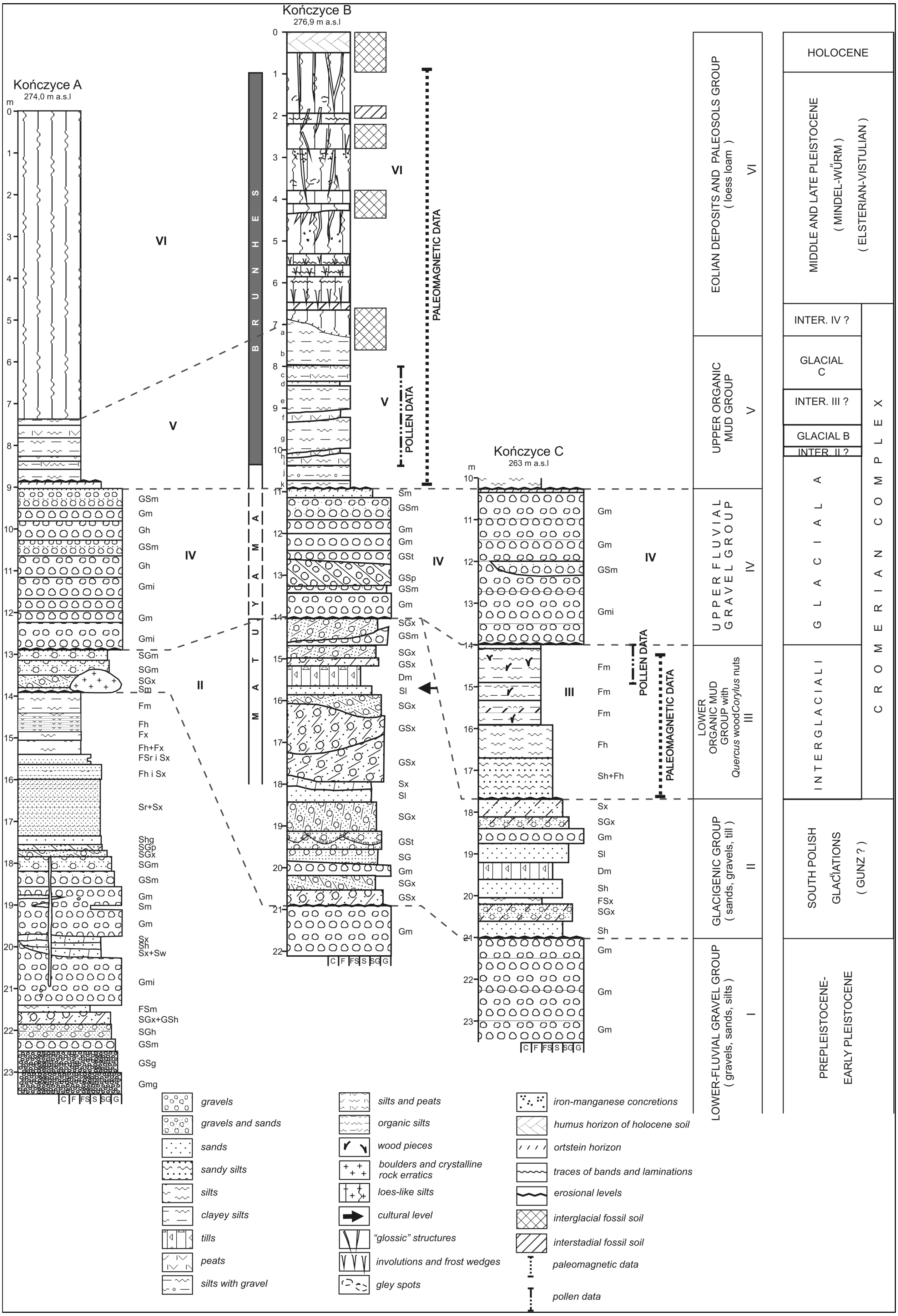


**Fig. 3.** Lithologic profiles of Kończyce Wielkie site 4 outcrops (exposures) A, B and C.
**Obr. 3.** *Litologické profily výchozů v Kończyce Wielkie IV – výchozy A, B a C.*

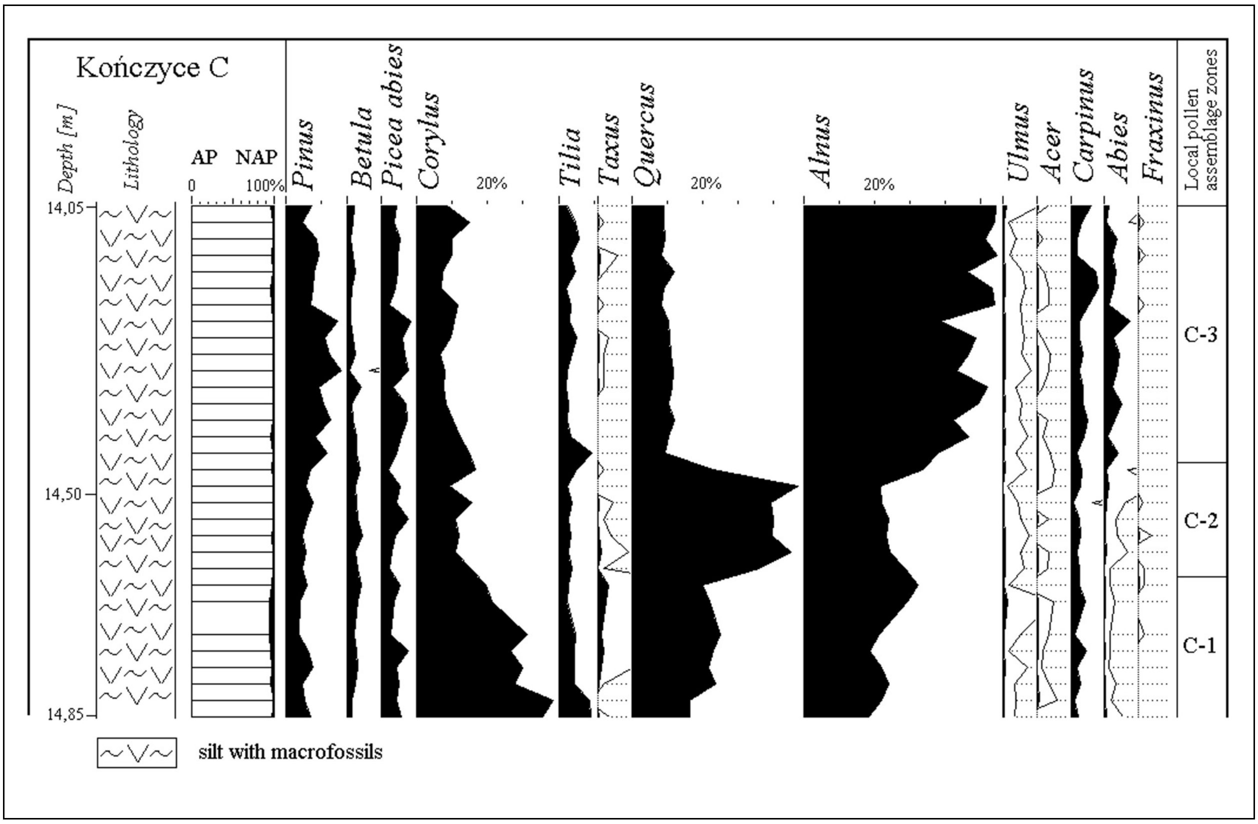


**Fig. 4.** Simplified pollen diagram of the Kończyce Wielkie site 4 – C profile.
**Obr. 4.** *Zjednodušený pylový diagram profilu C na lokalitě Kończyce Wielkie IV.*

ders between particular laminae are uneven which point to the erosional nature of those surfaces. Moreover, a small thickness of those sediments and the changes in the pollen contents suggest that the vegetation and climate variability are recorded in the sediments only fragmentarily. Because of that, the pollen diagrams are difficult to interpret and must be treated with caution.

The oldest part of the diagram (B-1 zone) represents the decline of the cold period which is (Fig. 6) directly above Brunhes-Matuyama border. The fragment of the warm period (B-2, B-3, B-4 zones) corresponds to *i.a.* the first peat horizon. The high AP (tree and shrub pollen) percentages, including *Alnus*, *Carpinus* and *Corylus* point to the interglacial character of that section of the profile (Fig. 6).

The increase in the herb pollen (NAP) in B-5 zone indicates a drastic deterioration of climatic conditions. Three younger zones in the middle part of the profile (B-6, B-7 and B-8) may represent the subsequent warming like an interglacial (Fig. 6). The stratigraphic pollen zones: B-2 to B-4 and B-6 to B-8 may correspond with interglacials II and III of the Cromerian complex, which are separated by Glacial B (Zagwijn 1996).

Above the second peat horizon, organic muds and the overlying peat horizon show increased content of herbaceous plant pollen (B-9 and B-10), which suggests another period of climate cooling and can be correlated with Glacial C of the Cromerian complex (Zagwijn 1996). The soil occurring at the top of series V may have been formed in the youngest interglacial of the Cromerian complex (Fig. 3).

The upper section of the profile at Kończyce comprises a sequence of loess-like loams (VI) which are 6.5 to 9 m thick and yellow or brown-yellow in colour. There are large sedimentation gaps associated with erosion of the formerly deposited silts and with soil formation processes.

The loess-like loams (VI) are interbedded with soil horizons, including at least two soils of interglacial nature. Their formation can be attributed to two interglacial stages: the upper and, maybe, the middle Pleistocene (Fig. 3). At the upper face, the humus horizon of the Holocene soil occurs.

Despite the stratigraphic and palaeomagnetic documentation of organic layers, the Kończyce sequence is very difficult to interpret. The problem of linking the particular Quaternary stages with those distinguished in Poland or other parts of Europe is difficult due to different criteria used for their identification. From the palaeomagnetic investigations it is apparent that the upper 10.4 m thick part of the profile comprising the loess-like sediments (VI) and the sequence of the upper organic muds (V) was deposited in the period of normal Brunhes magnetisation (Fig. 5). In the lower sequence of the organic muds (III) and the lower face of the upper organic muds (V) there is the anomalous palaeomagnetic record which can be interpreted as a trace of the reversed Matuyama magnetisation (Fig. 5).

The organic deposits at Kończyce can be linked to the so called Cromerian complex. In Kończyce site the fragments of three interglacials (Figs. 4, 6) with the oldest one from the Brunhes-Matuyma boundary

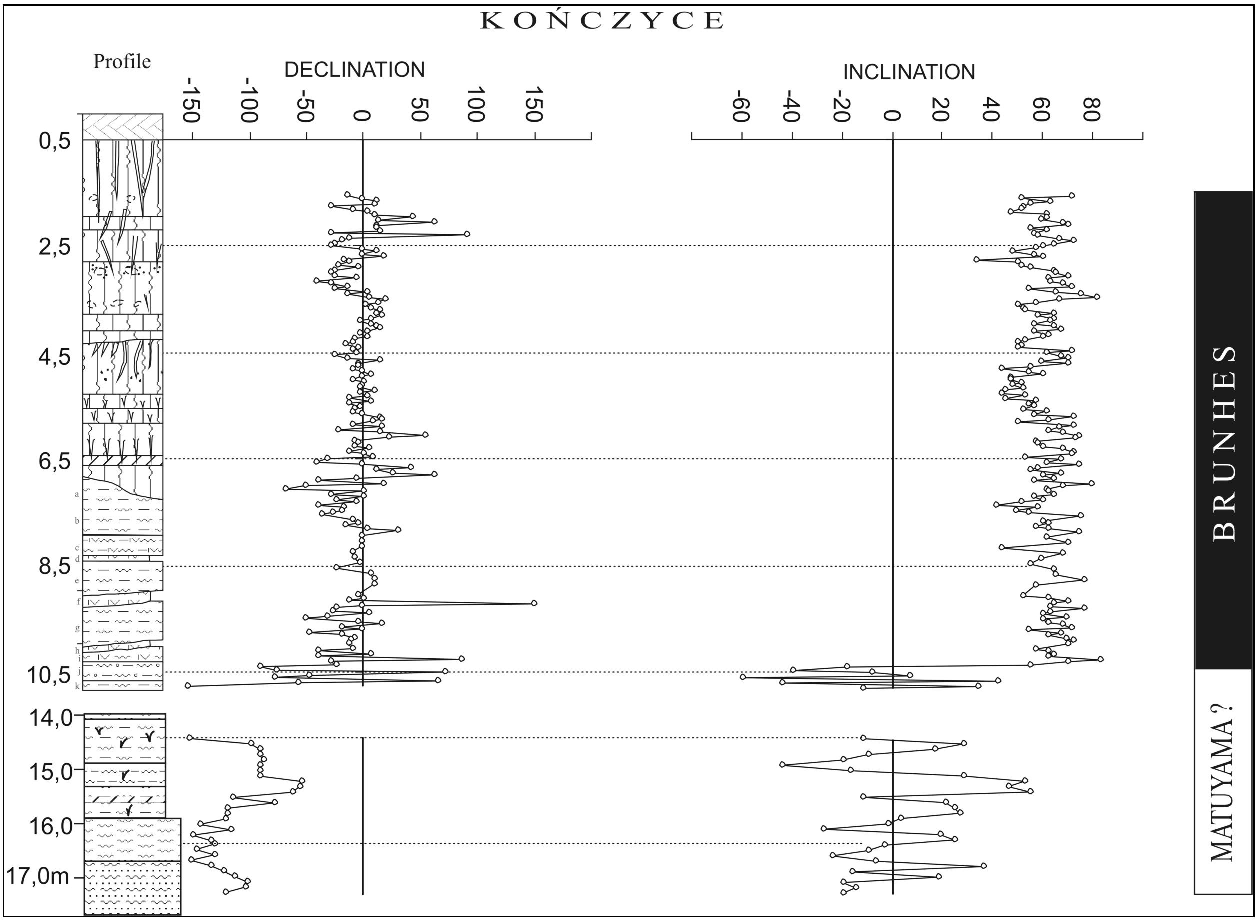


**Fig. 5.** The Kończyce Wielkie site 4 profile – inclination and declination changes characteristic.
**Obr. 5.** *Profil na lokalitě Kończyce Wielkie IV.*

can be indentified. The lower organic muds (III) of the reversed magnetic polarity, represent a fragment of succession of the warm interglacial which can be related to the I Cromerian interglacial in Dutch approach (Zagwijn 1996). The pollen sequence is unlike other pollen sequences known from Polish interglacial sites thus far.

The upper fluvial sequence (IV), covered with the upper organic muds (V) where the Brunhes-Matuyama boundary has been recorded, rests on the eroded glacigenic deposits (II) and organic muds (III). Immediately above this boundary, fragments of two interglacials separated by the cold stage have been stated palynologically in the muds. The deposits with warm sections of the Pleistocene rest directly above the B/M border which allows for linking them with the I and II Cromerian interglacials.

From the studies performed hitherto it is apparent that the ice-sheet entered the area of the Carpathian Foothils and the Oświęcim Basin once, during the Southern Polish Glaciations (Książkiewicz 1935; Klimaszewski 1952; Sokołowski 1952; Dudziak 1961; Lewandowski 1988; 2003). Based on the investigations in the area of the Moravian Gate, Macoun *et. al.* (1965) stated two advances of the ice-sheet. Inferring from the profile in Stonava (Fig. 2), where the Holsteinian Interglacial has been documented (Břizová 1994), it has been believed that the Saale (Odra) ice-sheet has the larger extent than the Elster (San) ice-sheet. The extent of the ice-sheet of the Middle Polish glaciation (Odra glaciation) in the considered area is still doubtful (Klimek, Starkel 1972) because the deposits of the Holstein interglacial in Stonava are not covered with glacigenic sediments. As in the Konczyce site only one glacial till occurs we cannot evidence two advances of the ice-sheet (Wójcik *et. al.* 2004). The position of the interglacial deposits above the glacial deposits in the Kończyce profile suggests a different stratigraphic setting of the glacial sediments which, until now, used to be correlated with the Sanian (Elsterian) glaciation (Lindner 1992; Mojski 1993).

The identified change in the magnetic polarity of the Kończyce sediments suggests that the glacigenic deposits (II) might be older than 787 ka and should not be correlated with the Mindel or Elsterian stage as suggested earlier by Zagwijn (1996). Therefore, the glacigenic sediments (II) may correspond with the pre-Cromerian traces of ice-sheet advances recorded in western Europe (Laban, Mejer 2004).

## 3. Stratigraphy context of the lithic materials

Culture materials were located at a depth of about 16 m, within a layer of fluvial sands with fine-grained gravels (to 25 mm) which are a component of the glacigenic sequence. The cultural material occurred in the upper part of this layer. The vertical finds distribution was up to 30 cm. Because the sands with finds were stratified be-

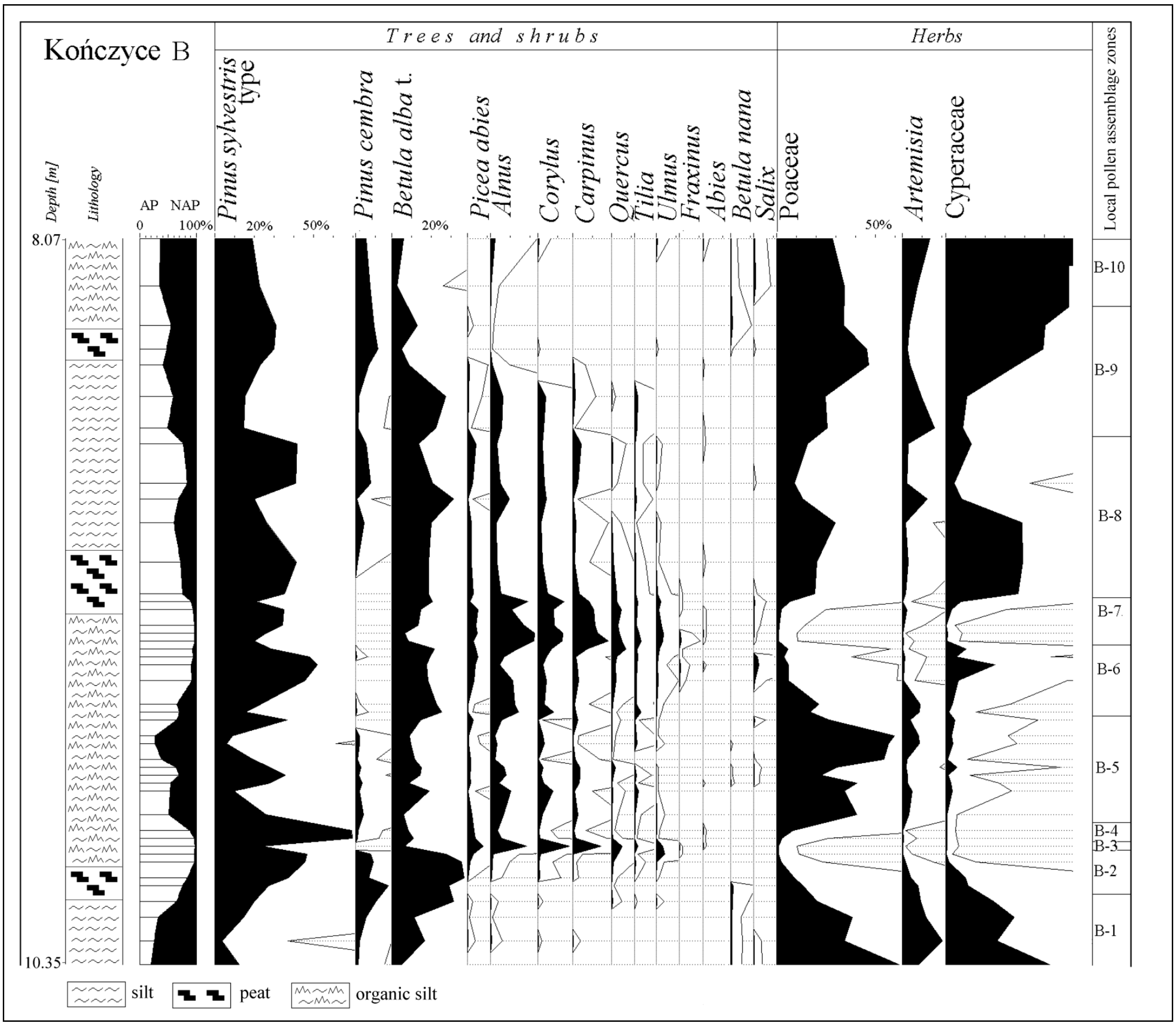


**Fig. 6.** The simplified pollen diagram of the Kończyce Wielkie site 4 – B profile.
**Obr. 6.** *Zjednodušený pylový diagram B profilu na lokalitě Kończyce Wielkie IV.*

low the diamikton – interpreted as a till deposit – and underneath the boulder pavement corresponding with diamikton, which at places sunk into the remnants of the till, and because sedimentational structures indicated water flow from the west, it has been assumed that these sands have an extraglacial genesis. The layer of sands can be seen along the entire length of the west and the south wall of the gravel extraction pit, revealing minor differences in grain size. The profile of the west wall (Fig. 7: A, B) shows poorly-sorted sand formation usually enriched with fine-grained gravels, at places with silt clasts. The highest part of the sand formation showed trough cross-stratification. At one place (Fig. 7: B) this sand formation and the overlying sands had been washed out. The sedimentational structures in this area suggest that thermokarstic phenomena must have taken place and, subsequently, cavities were filled up with sandy silts and silts. In the south profile (Fig. 8: A, B) the layer with artefacts was built of sands with fine-grained gravels. These sediments showed upwards grain-size distribution. The highest part of this layer contained individual gravels of larger diametres. Here the sedimentation was less dynamic – without traces of changing into the trough stratification structures as visible in the west profile. It is only near this area that in the shallow irregularities of the floor the sand-gravels sediment showed cross-laminations forming a microdelta. On the entire south wall and on most of the west wall, underneath the layer with finds, there were: laminated sands, silty sands and gravels – usually with sand admixture, silty layers with a large component of fine-grained sand and individual, scattered fine and medium-grained gravels. Occasionally, the silt level, which can be up to 40 cm thick, became thinner or even petered out. Both the silt layers as well as the sands and gravels separating them were slightly inclined to the east at an angle of 1–2 degrees. In the south profile the lower silt layers together with the adjacent sands and gravels were cut by an ice-wedge pseudomorphosis several metres high (Fig. 8: A).

In the western profile (Fig. 7: A) the culture level was overlain by medium-grained sands with fine-grained gravels with trough-cross laminations, also by silty sands with gravels and – above the erosional surface of the older sediment – by diamikton grey-brown in colour. Some

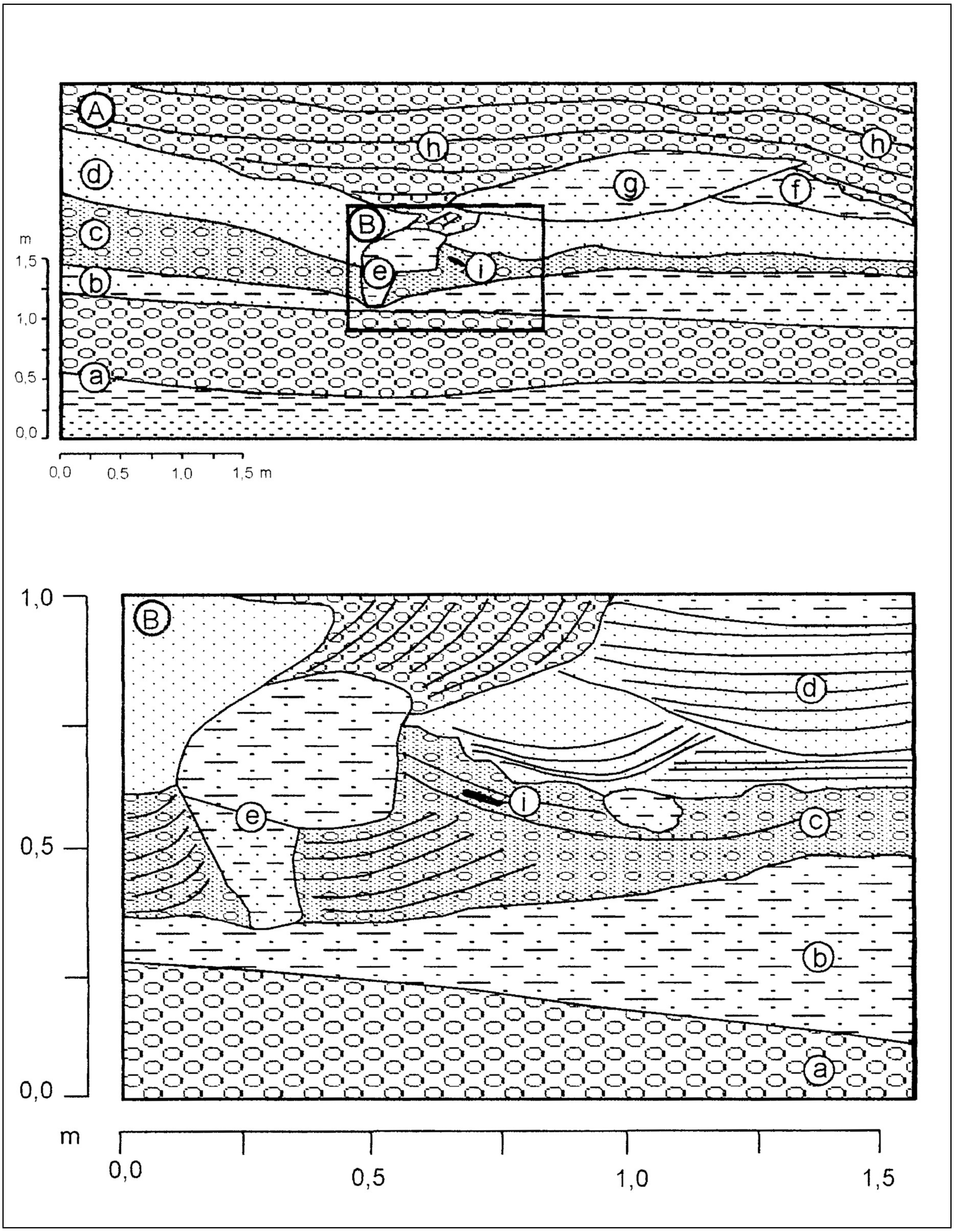


**Fig. 7.** Fragment of the wall of western outcrop (W) in the Kończyce Wielkie, site 4 (state from July 2004): a – stratified sands, sandy silts and gravels, b – silts with large content of fine-grained sands and single, dispersed fine- and medium-grained gravels, c – sands with fine-grained gravels and locally with clasts of silts, trough cross-stratified at the top, d – trough and planar cross-stratified sands, e – sandy silts and silts, f – grey-brow diamicton, g – sandy silts with gravels, h – coarse-grained massive gravels, i – artifacts.

**Obr. 7.** *Část profilu západního výchozu na lokalitě Kończyce Wielkie IV (stav v červenci 2004).*

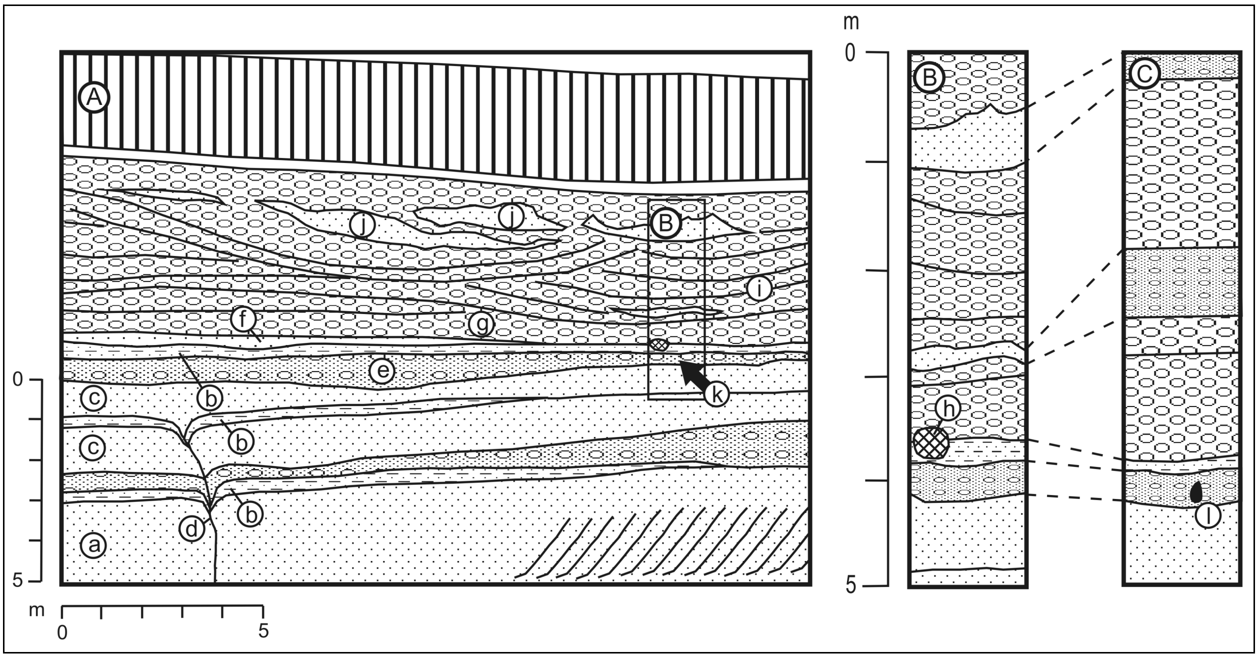


**Fig. 8.** Fragment of the wall of southern outcrop (S) in the Kończyce Wielkie, site 4 (A and B – state from September 2005, C – state from July 2005): a – sands with individual laminas of sandy silts and fine-grained gravels, b – silts with large content of fine-grained sands and single, dispersed fine- and medium-grained gravels, c – sands and sands with fine-grained gravels, d – frost wedges, e – sands with fine-grained gravels and with individual clasts of slightly larger diameter shoring grain-size distribution, sandy silts and silts, f – sand with significast admixture of fine- and medium-grained gravels, g – gravels with sands and locally tills, h – rock erratics, i – coarse-grained gravels, j – lens of sandy gravels and sands, k – positions of artifacts, l – artifacts.

**Obr. 8.** *Část profilu jižního výchozu na lokalitě Kończyce Wielkie IV (A a B – stav v září 2005, C – stav v červenci 2005).*

20–30 m to the south-west from this part of the wall, in a somewhat higher palaeomorphological location, i.e. 1.0–1.5 m higher than datum of diamikton in the western profile, the post-morainic boulder pavement has been preserved, with some of the boulders measuring more than 0.5 m in diametre or even more than 1 m in individual cases. Some boulders sticked into the diamikton, which allows us to interpret it as a till. In the south wall (Fig. 8: A) the silt level, that covered the layers with artefacts, was mantled by a thin sand layer with an admixture of fine- and medium-grain gravels. This layer thinned out to the west. Further to the west the top of this layer and the underlying silt were cut by erosion. Above there were gravels with a sand component and, locally, clays. Within these gravels, where the layer was interrupted, erratic boulders and diamikton packets appeared. The diamikton most probably constitutes the remnants of till. The remnants of till, or the erosional surface, in the south and south-west part of the profile were covered by thick-grain gravels indicating that the river flowing from the west, which accumulated them had a braided character. In between the gravel layers appeared sand-gravels and sand lenses. In the northern wall and the north-western part of the gravel extraction pit the fluvioglacial and sand-gravel sediments rested on till and were covered by thick-grained gravels.

The lithological characteristics of the sediments underneath the till and the boulder pavement, notably the character of sedimentational structures, point to their fluvial and limnic genesis. Most of the fine-grained material represents either overbank fluvial facies, or sediments of shallow flood basins or glacilimnic reservoir. The material was transported from the western direction. In the south wall this is evidenced by steep inclination of the sand layers to the east of the floor that constitute a central portion of the fossil delta, and by a similar inclination of microdelta laminae in the top of this sediment sequence. Also the sand and silt layers in between these formations, show a dip in the eastern direction. Moreover, the western profile, in the upper part of the layer with artefacts, showed the structures of trough cross-stratification confirming the flow of water from the west. A major portion of the sediments underlying the till deposits in the east part of the gravel extraction pit, also visible in the south wall, was accumulated in suspension by water current. In the typical lacustrine conditions cohesion run-off could have taken place in the weakly inclined bottom of the reservoir. The water level in the reservoir oscillated. When the water level was low the waters carrying thicker materials flew through the reservoir. Larger rock fragments, found within the sediments, with a variety of grain fractions, could be an example of “dropstones”. The sediments building the north wall were interpreted by A. Wójcik (Wójcik *et. al.* 2004) as extraglacial fluvial sediments. In the southern direction these sediments changed into fluvial sediments of the river with lower energy and lacustrine sediments. It should be added that the limnic conditions were strongly variable, leading even to the decay of the reservoir. Then humans could occasionally go across this area.

The spatial scatter-pattern of finds allowed to establish the existence of two artefact concentrations at a distance of about 60 to 70 m from one another. However, we should remember that the area between the concentrations has been destroyed by gravel exploitation. The first concentration was associated with the western wall and was 7 m long. The second concentration was uncovered in the southern wall, and the artefacts were registered in a 6 m long section. Moreover, a single flake was collected from the surface in the vicinity of the washing machine used for fractioning the sediments sampled from the southern and western wall. Unquestionably, the dispersion of finds has geological causes. At the same time, the dislocation of artefacts of about 60–70 m took place within the same sedimentational environment. With a few exceptions the specimens in two concentrations are unrolled. Gloss over the whole surface or locally seems to be more common. Edges and interscar ridges are sharp, sometimes – more or less – damaged. Fragmentation is poorly. In conclusion, the state of preservation of artefacts does not confirm longer transport.

## 4. Archaeology materials

### 4.1. Concretions and cores

1. A fragment of an initial core without preliminary preparation, with the striking angle of 90 degrees. A single flake scar with a deep bulbar notch is located on the narrower lateral wall of the chunk. Dimensions: 3.6 × 2.4 $cm$. Flint (Fig. 10: a).

2. A single-platform core unprepared. The broad flaking surface shows three scars. Deep bulbar notches have been preserved. The angle between the unprepared platform and the flaking surface is 90 degrees. Dimensions: 2.9 × 5.7 cm. Flint (Fig. 10: c).

3. A core with a narrow flaking surface partially extending onto the side of core. At first a blank was obtained from one platform with lateral preparation. Strong blows with a hard stone hammer caused that the upper part of the flaking surface was damaged and further reduction was not possible. As the knapper did not want to discard the core an attempt was made to change its orientation to opposite. As the second base the non-industrial surface was adopted. However, strong blows – just as before – damaging the flaking surface hindered exploitation in the new direction, even before it began. The core provided no more than 3 to 4 flakes. Core angles were 110° and 120°. Dimensions: 5.0 × 2.6 cm. Flint.

4. A large, robust core with a change-of-orientation and prepared platforms. The flaking surfaces are at the core dorsal side and back, and are perpendicular to each other. Each of the three consecutive, flakes detached from the older flaking surface was smaller than from the previous one. Coring was given up after three, incorrect flakes – the first larger than the second and third – were detached from the new flaking surface. The flaking surface shows bulbar scars. Similar scars are from platform preparation. The platforms and the flaking surfaces are at an angle of 100° to each other. Dimensions: 11.4 × 9.8 cm. Quartzite sandstone (Fig. 9).

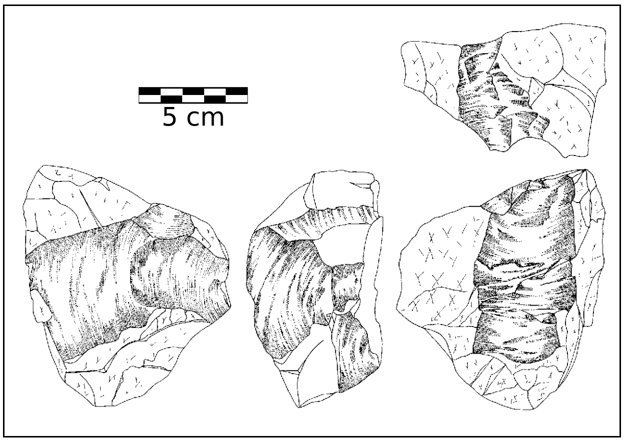


**Fig. 9.** Kończyce Wielkie, site 4. Core.
**Obr. 9.** *Kończyce Wielkie IV: jádro.*

5. A bisected elongated concretion. On “striking platform” can be seen percussion point. From the side of surfaced of split a bulbar scar is well marked. Dimensions: 5,9 × 3,2 cm. Flint (Fig. 10: b).

### 4.2. Flakes

1–3. Three flakes with cortical and/or natural surfaces, microlithic (1.6–2.6 × 1.6–1.9 × 0.8–1.2 cm) and small (2.5 × 3.1 × 1.5 cm). In outline the specimens are polihedral, trapezoidal and triangular. The cross-sections are triangular. Butts are unprepared. Butt dimensions oscillate from 0.2 to 1.1 $cm^2$. Butt angles are in the interval of 68°–94°. Bulbs are weakly marked (2) or broken off. One flakes shows conspicuous waves on the ventral side. Flint.

4–9. Six microlithic (1.2–2.9 × 1.6–2.1 × 0.9–1.2 cm) and small flakes (2.1 × 3.3 × 0.8 cm), with >50% of cortical and/or natural surfaces. Flakes are trapezoidal (4) and polihedral (2) in shape. Cross-sections are semilenticular (3), trapezoidal (2) and rhomboidal. The dorsal patterns are short opposite (3), unidirectional (2), transversal scars. In the distal part of a one flake is a one-sided crest. Butts are prepared (3) and linear (2), measuring from 0.4 to 2.3 $cm^2$ in area. The angle between the butt and the ventral side measures up to 130° (0°, 92°–130°). Preserved bulbs are weakly convex (2), diffuse, with a flaw or broken off (3). The waves from removals on the ventral side are more often weakly marked (2) rather than conspicuous. Flint (4), Jurassic flint, hornstone (Fig. 10: e, 11: g).

10. A somewhat bigger (3.6 × 2.6 × 1.1 cm) trapezoidal flake, the dorsal side is natural in > 50%. In the distal part, on the right side can be seen a kind of two-sided crest, but it is not certain whether it is intentional. The flake has a triangular cross-section. The butt is small (0.2 $cm^2$), unprepared. The butt angle is 110°. The bulb was thinned. Flint.

11. A fragment of a fairly large (>4.1 × 3.2 × 1.8 cm), trapezoidal flake with a triangular cross-section. The dorsal side in natural (>50%), the scar pattern is transversal. The butt was broken off. The edges, or protrusions were slightly chipped. Flint.

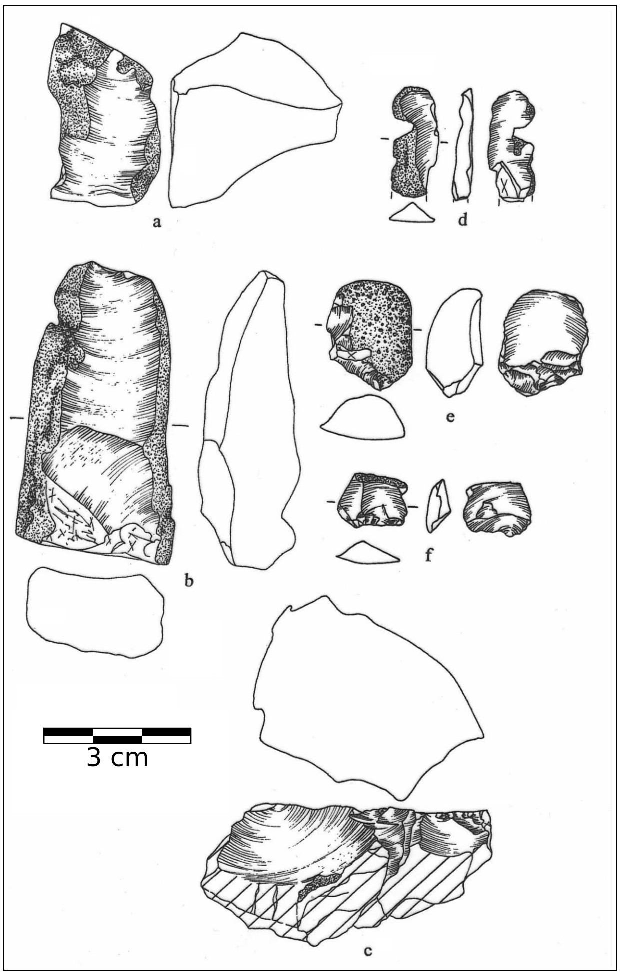


**Fig. 10.** Kończyce Wielkie, site 4. Cores (a, c), flakes (d–f), concretion (b).
**Obr. 10.** *Kończyce Wielkie IV: jádra (a, c), úštěpy (d–f), hlíza (b).*

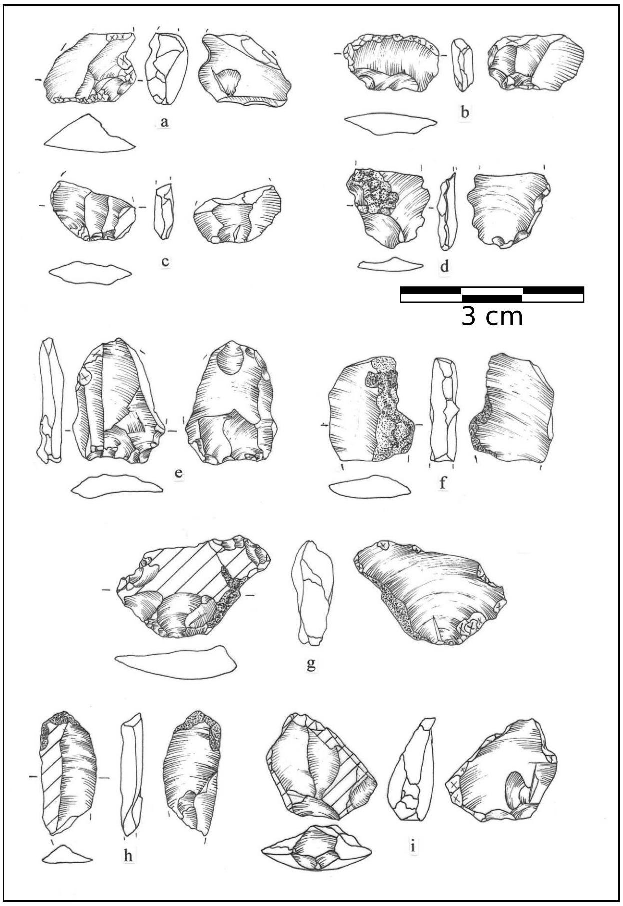


**Fig. 11.** Kończyce Wielkie, site 4. Flakes.
**Obr. 11.** *Kończyce Wielkie IV: úštěpy.*

12. A big polyhedral flake with >50% of natural surface. The dorsal patterns are unidirectional. The flake has a trapezoidal cross-section. The butt is medium (1.1 cm$^2$) single-blow. The butt angle is 92°. The bulb is convex. Dimensions: 4.9 × 4.9 × 1.0 cm. Flint/hornstone (Fig. 12: a).

13–21. Nine, partially cortical, microlithic (1.2–>2.7 × 1.0–2.7 × 0.3–1.0 cm) flakes. Three specimens meet the metrical criteria of a blade (Fig. 10: d, 11: f, h). Oval (3) and trapezoidal (3) specimens are the majority, followed by polygonal (2) and rectangular flakes. More than half of the specimens have triangular (5) cross-sections. Lenticular (3) and rectangular cross-section is less frequent (3). The dorsal pattern of scars is parallel to the direction of detachments. An exception is a flake with unidirectional+transversal scar pattern. Cortex is present on both lateral sides. Butts are unprepared (2), linear (2) and single-blow (2), measuring from 0.1 to 1.1 cm$^2$ in area. The butt angle does not exceed 92 (0, 65–92) degrees. Bulbs are thinned (3), broken off (2), weakly convex. Flint (3), Jurassic flint, opalite, hornstone (2), flint/hornstone (2) (Fig. 10: d, 11: a–f, h–i).

22. "Kombewa" type flake, unidirectional (1.2 × 1.5 × 0.5 cm). A single-blow butt measures 0.5 cm$^2$, the flaking angle is 60°/113°. The bulbs are broken off and a weakly convex with a flaw. Flint (Fig. 10: f).

23–27. Five chipps. Dimensions: 0.8–1.5 × 0.9–1.5 × 0.2–0.7 cm. Flint (2), Jurassic flint (2), opalite.

### 4.3. Tools

1. A transversal chopper on a pebble of gneiss granite (0.35 kg). The sharp edge was prepared by two, short and broad consecutive blows; the second blow was shorter. Two bulbar scars can be seen. The angle of retouching is 70 degrees. Dimentions: 8.9 × 7.4 × 4.7 cm (Fig. 13: d).

2. A lateral chopper transitional to a side-scraper, made from a large flint pebble (0.46 kg). The intentional preparation on the longer edge is careful. The retouch is thick, uni- and biseride, fairly high. The angle is up to 70–75 degrees. The ridge between retouched and the natural edges exhibit slight crushing. Dimentions: 6.7 × 10.1 × 6.3 cm (Fig. 14).

3. A tool on a very large, robust (0.72 kg) flake with a convex bulb and with an extensive, partially preserved, flaw. On the dorsal side the flat biseriate retouch was executed from the working edge. On the ventral side attempts at levelling the surface are seen as the thinned bulb. In ad-

dition, the edge has flat, marginal retouch on two sides. It is fairly carelessly executed causing that the edge is undulating. The angle of retouch is 70°. The base is flat, resembling the base of a handaxe. The back – similarly to a blunted back – is arched, cortical, thick and blunt. Dimentions: 11.1 × 9.8 × 6.7 cm. Flint (Fig. 15).

4. A transversal denticulated tool with three distinguished tangs. The denticulated edge is formed by finely retouched notches. The tool was made on a transversal flake with a cortical butt. Dimentions: 1.8 × 2.8 × 0.9 cm. Flint (Fig. 12: f).

5. A transversal denticulated tool with three finely retouched notches. It was made on a unidirectional, partially cortical flake with a punctiform butt. Dimentions: 2.0 × 2.6 × 0.5 cm. Hornstone (Fig. 12: d).

6. A notched tool with an inversely retouched notch, made of a cortical (<100%) unidirectional flake. Dimentions: 1.5 × 1.7 × 0.8 cm. Flint (Fig. 12: e)

7. A notched tool made on a partially cortical flake with an unprepared butt. The dorsal pattern is unidirectional+transversal. The Clactonian notch was made by a single blow struck on the ventral side. Dimentions: 1.5 × 1.5 × 0.3 cm. Flint (Fig. 12: g).

8. A tool with two notches: with one notch located on the side, and the other – a single Clactonian notch "open" in the distal part. The tool was made on a cortical flake with a single-blow, obliquely located platform. Dimensions: 2.0 × 1.6 × 0.8 cm. Hornstone (Fig. 13: b).

9. A Quinson type, trihedral point (and/or transversal side scraper), stocky (1:1.7), made on a flint chunk. Retouch covers the entire surface of the flat-concave side. Flat, broad retouch was executed from the right lateral side. On the left lateral side the retouch is steep, marginal. The second, convex side are two natural surfaces; the angle between the two surfaces is obtuse. The sinister edge of a weakly distinguished hinged point, located off the axis, was shaped by semi-steep, "end-scraper"-like retouch. The right side shows scars from shaping by short, parallel burin blows. The base is straight, unprepared. Dimentions: 2.6 × 1.6 × 0.9 cm (Fig. 12: b).

10. A perforator, in shape resembling a triangle, robust, made on a cortical flake. The tip is sharp, straight, located on the axis, shaped by biseriate retouch: steep, low and fine, marginal. The base is thick, convex, made "flat" by two removals in the centre. The remaining surface is unretouched. Dimentions: 3.4 × 3.4 × 1.4 cm. Jurassic flint (Fig. 12: c).

11. A side-scraper made of a thermal fragment, steep. The retouch is very steep (90°), biseriate – high and fine, marginal. The lateral retouch is weakly denticulated. Dimentions: 4.7 × 4.4 × 2.1 cm. Hornstone (Fig. 13: c).

12. A large, steep side-scraper on a cortical flake (0.15 kg). The right lateral side is slighty bruised, shows traces of steep retouch. Possibly, the retouch continued along the butt edge. The butt is large (20.4 cm$^2$), "Clactonian", originally unprepared, now thermally fractured. The angle is obtuse (115°). Dimentions: 4.8 × 6.9 × 4.0 cm. Flint (Fig. 13: a).

13. A robust (1 kg), large hammerstone/anvil, trapezoidal in shape, exhibiting traces of strong hammering on the longest edge, and scars from flakes accidentally split off. Dimentions: 9.9 × 13.6 × 6.3 cm. Flint.

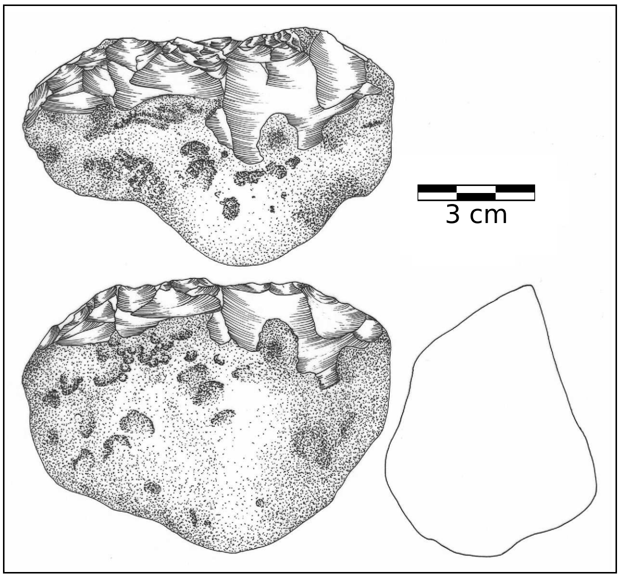


**Fig. 14.** Kończyce Wielkie, site 4. Tool.
**Obr. 14.** *Kończyce Wielkie IV: nástroj.*

## 5. Raw materials. Lithic reduction. Typology

We can assume that no major effort and skill were engaged in the processing of reduction. As far as raw materials are concerned flint (75.5%) dominates. Hornstone (13,3%), hornstone/flint (6.7%), quartzite sandstone (2.2%), gneiss granite (2.2%) played a minor role. The frequency of types of raw materials together with the frequencies of the various flint types are given in Table 1. Among flints Upper Silesian erratic flint is best represented in the form of redeposited nodules, concretions and plaquettes occurred within the Pleistocene sediments of the Silesian-Kraków Plateau. Three flint types: I – III (60%) have been included to this raw material. As regards colours these flints are generally brown and light-brown, sometimes various shades of grey. Often, they have calcareous cortex; they are semi- or weakly transparent. The siliceous mass is homogeneous, although inclusions of petrosilex and fragments of silicified organic remains can bee seen. Flint type IV (8.9%) appears as numerous concretions within the Rauracian and Oxfordian limestones of the Kraków-Częstochowa Jurassic Plateau. An identical situation is seen with respect to flint type V (2.2%). The range of occurrences of this type is restricted to Jurassic limestones building the Sowiniec-Zwierzyniec Ridge. Flint type IV has a thick and rough calcareous cortex and its weakly-transparent mass is uniform in colour (Kaczanowska, Kozłowski 1975). The macroscopic characteristics of flint type VI (4.4%) indicate that it does not originate from any of areas with secondary or primary flint deposits know in Poland. The glassy polish of flint VI is on the grounds of the high content of opal in its mineral composition. Basing on macroscopic data and mineral composition flint VI has shown that this flint corresponds to the – so-called – opalites from the mountains

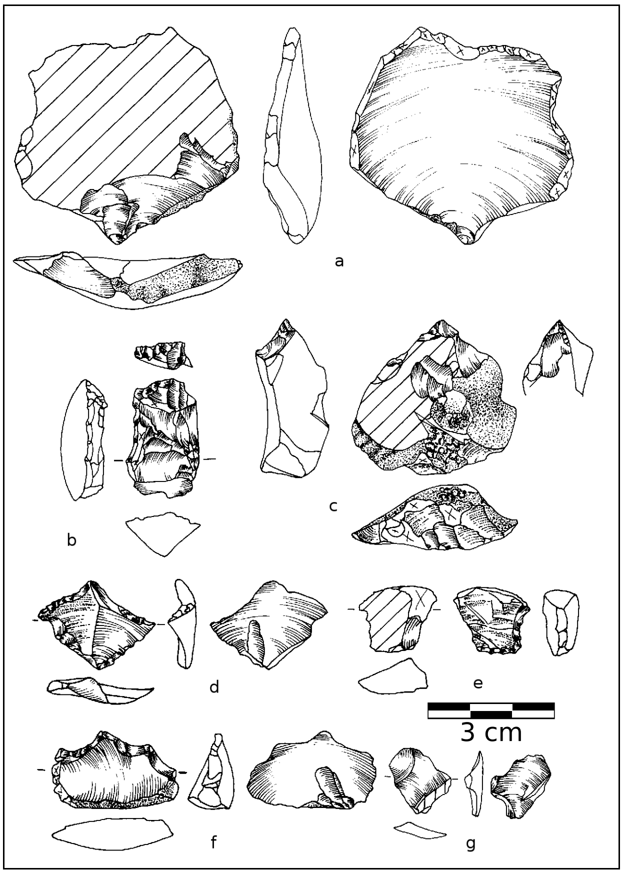


**Fig. 12.** Kończyce Wielkie, site 4. Flake (a), tools (b–g).
**Obr. 12.** *Kończyce Wielkie IV: úštěp (a), nástroje (b–g).*

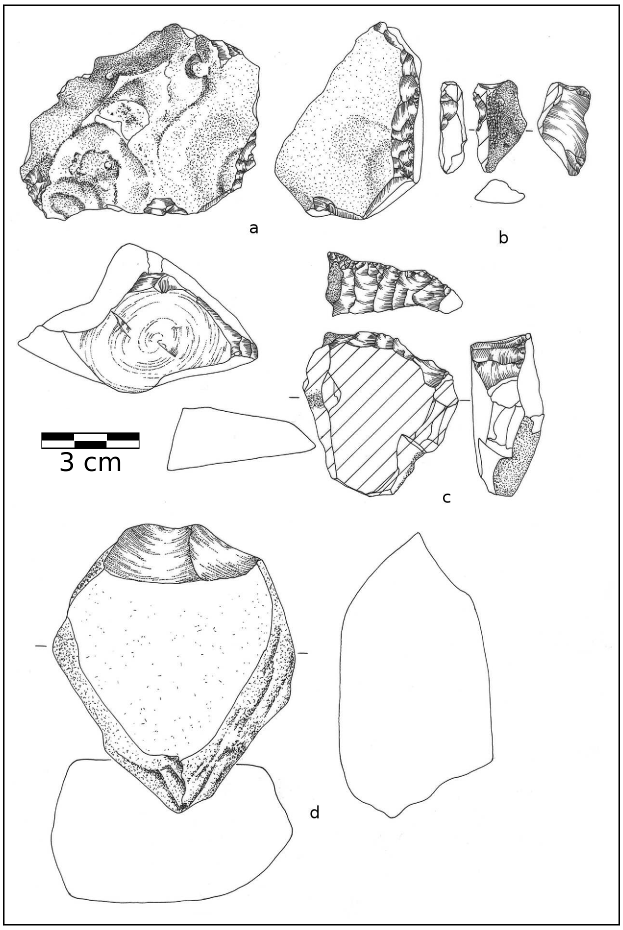


**Fig. 13.** Kończyce Wielkie, site 4. Tools (a–d).
**Obr. 13.** *Kończyce Wielkie IV: nástroje (a–d).*

of northern Hungary (Takács-Biró 1986). The hornstones that occur in the assemblage may come from Moravia, while the quartzite sandstone shows considerable similarity to quartzite nodules that occur in outcrops situated within the Drahany Highlands described as Knollensteine (Štelcl 1964). The provenience of gneiss granite is problematic. If we assumed that its area of origin was the Sudetes region than we could interpret it as Strzelin granite.

The lithic artifacts document a system of reduction based on the use of a hammerstone. Cores were exploited from one platform and tendency towards a change-of-orientation was registered. Flaking surfaces were located on the broader and on the narrower wall. Striking angles are obtuse or straight. Preparation is limited to the platform.

The change-of-orientation caused that either the core tip or a side functioned as a new platform. The old flaking surface was retained and reduction was conducted in the opposite direction or perpendicular to the primary, or was made a new flaking surface on the back of core. To make the situation clear: in one case out of two change-of-orientation was a unsuccessful and the core could no longer be exploited. The hight of most cores ranges from 3.5 to 6.0 cm. One core is microlithic (less than 3.0 cm). A massive, large, quartzite core, weighing 710 g and measuring more than 11 cm, differs from all the other specimens. The extent of core reduction was small. Four flakes – at the most – were obtained from one platform. Mainly, the knapper was satisfied with detaching two flakes even when a core could still be exploited. Of interest is the skillful use of a hammerstone. Majority of the blows are gentle, precise, seen as deep bulbar scars. On the other hand, there are traces of repeated blows that were too powerful, crushing and damaging the platform and/or flaking surface.

The flakes produced during reduction may be characterized, predominantly (60%), as microlithic (<3.0 cm) and small (<0.4 cm). About 75% of the specimens do not exceed 3.0 cm. Flakes >4.0 cm are a distinct minority. But flake scars on cores, just the opposite, indicate that specimens >4.0 cm were obtained. Among tools, too, there are large flakes whose length/width is more than 6 cm. The forms of flakes are far from standardized, although more than 40% are trapezoidal. Three flakes could be defined as blades. In terms of position in the reduction cycle the artefacts were detached, probably, in the initial and the advanced phase of core reduction. Absence of decorticated flakes is noteworthy. It is, probably, an effect of extending flaking surface onto natural surface. The dorsal pattern of flakes suggest that flakes come from unidirectional or change-of-orientation reduction. Flakes have non-industrial or prepared platform. The higher proportion of prepared butts in the group

**Tab. 1.** Kończyce Wielkie, site 4. Raw materials of artifacts.
**Tab. 1.** *Kończyce Wielkie IV. Suroviny na výrobu štípané industrie.*

| Raw material | Variety | Number | % |
|---|---|---|---|
| Flint | **I:** brown and light-brown, silky gloss | 15 | 33,3 |
| | **II:** dark-grey, grey-brown, silky gloss | 8 | 17,8 |
| | **III:** grey, light-grey, silky gloss | 4 | 8,9 |
| | **IV:** grey-brown, silky gloss | 4 | 8,9 |
| | **V:** ashen-blue, silky gloss | 1 | 2,2 |
| (Opalite) | **VI:** grey, light-grey, glassy polish | 2 | 4,4 |
| Hornstone | hornstone | 6 | 13,3 |
| | hornstone/flint | 3 | 6,7 |
| Quartzite sandstone | - | 1 | 2,2 |
| Gneiss granite | - | 1 | 2,2 |

of cortical flakes or flakes with natural surfaces in >50% could be due to the change-of-orientation procedure when the "old" flaking surface was used as a new platform. Butts are basically small which confirms that percussion points were located near the butt edge. Butt angles, with the exception of punctiform butts, oscillates from 65 to 130 degrees, the most frequent mode is from 75 to 94 degrees. Varied bulbs argue the use of a hard hammer and a "soft" hammer (*cf.* Ohnuma, Bergman 1982). Thinned of bulbs is the evidence of an interesting technical operation that sharpened the edge and caused that flakes resembled Kostienki knives.

Tools constitute 28.9% of the inventory. They are manufactured on flakes, cores and chunks. Besides very large and large tools there occur medium-size (>3.0 cm) and microlithic (<3.0 cm) specimens. Tools exhibit a fairly, careful secondary treatment. Microlithic and small tools are represented by: denticulated tools, notched tools, a Quinson type tool, a triangular perforator/point. Denticulated tools from the point of view of typology can be assigned to transversal types. Their denticulated edges were formed by fine, steep retouch. At the contact of notches two or three more or less blunt tangs are distinguished. Among notched tools of interest is a specimen with two notches: one – retouched on the side, the other – Clactonian in the distal part. The result of, rather accidental, proximity of the two notches is the formation of a kind of "bec" protrusion at the contact of the notches. The two remaining notched tools are flakes with single notches. Notches, located on the side, were made by inverse fine steep retouch or by a single blow. As far as the Clactonian notch is concerned it must not be associated with man's activity. An example of exploiting an accidentally selected a natural blank to make a tool is a steep side-scraper. Steep, high retouch combined with fine, marginal retouch covers the longest and thickest edge of a thermal chunk. The presence of marginal retouch can be interpreted as an attempt – though rather failure – at correcting the edge which is weakly denticulated with deep bulbar notches. A perforator/point exhibits similar retouch. Unlike in the case of the side-scraper the retouch is low. The working of the Quinson type point (and/or transversal side scraper; *cf.* Palma di Cesnola 1996) required the greatest effort of the shaping. This tool is characterized by the presence of four types of retouch – flat surface retouch, steep marginal, semi-steep low and burin blow. At the same time, the particular types of retouch are located on different edges. Three quarters of the dorsal surface are covered by flat retouch executed from the right side. The left side was blunted by steep, marginal retouch. The tip was worked by semi-steep retouch and short burin blows. The group of macrolithic tools contains choppers, a chopping tool or a proto-biface, a side-scraper and a hammerstone/anvil. Macrolithic tools can weigh 150 – 1000 g. Core, pebble tools are represented by two choppers. Of special interest is the lateral chopper with careful uni- and biseriate, high retouch. Except for its robustness and "thick" retouch this tool could be identified with a side-scraper. The second chopper, more classical, is transversal. It has on the tip two negatives of flakes detaching from the natural surface, at an angle of 70 degrees. A next tool, made on a very large flake 11.1 cm long, is difficult to classify. A core/pebble large enough to yield a flake this size was not revealed. The flat, surface, direct retouch consists of two sequence affectes the working edge. The ventral side shows traces of thinning the bulb twice. The point was sharpened by alternate, marginal, flat retouch. This retouch caused that the longitudinal profile of the edge is undulating. At first sight the tool seem to resemble a chopping tool (Bordes 1961). The thick base, the sharp tip, the triangular shape and extent of preparation is like a protobiface (Alimen 1955; Leakey 1971). On the other hand, the natural, thick-blunted back may be describet as a knife (Bordes 1961). Additionally, among large flake tools a steep side-scraper was identified. Along three quarters of the right side there is uniseriate, steep retouch with uniform scars. Because the butt is damaged we do not know whether the retouch continued beyond the lateral edge. This is the only flake in the collection that demonstrates features of Clactonian technique: a large, unprepared butt of >9 $cm^2$, the obtuse angle between the butt and the ventral side, a diffuse bulb and dense waves. Finally, with the group of tools is connected a hammerstone/anvil. It was made of a flint pebble and weighed 1 kg. On the longest and broadest wall there are present traces of bruises and battering.

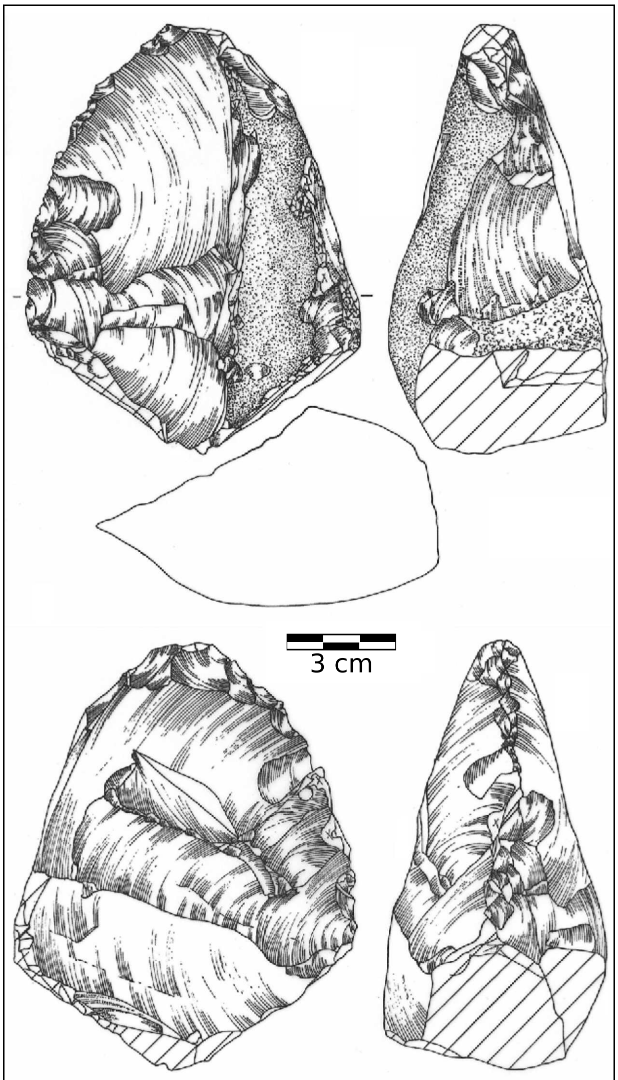


**Fig. 15.** Kończyce Wielkie, site 4. Tool.
**Obr. 15.** *Kończyce Wielkie IV: nástroj.*

## 6. Archaeological sites northwards from the Alps older than the Matuyama/Brunhes boundary

So far in the territory north of the Alps is known no more than 20 sites older than the Matuyama/Brunhes boundary. When we take into account the Carpathians-Sudetes line then the list of such sites is even badler (Bosinski 1992; Rolland 1992; Kraft 1994; Roebroeks, Kolfschoten eds. 1995; Otte 1996; Gamble 1999; Kozłowski 2004). Sites territorially nearest to Kończyce Wielkie, that chronologically correspond to it are situated in Moravia.

In the north this is the Mladeč Cave (Valoch 1993; 1995; 1996; 1998; 2003). In the clay layer with coarse-grained sand and intercalations of clear sand and gravels a quartz pebble artefact (length 7.05 cm) with faunal remains was discovered. On the basis of analysis of microfauna obtained from the Cave, typical of biozone Q2, layer 6 was placed at the P–M glacial cycle in Kukla (1978) opinion *i.e.* at about a million years BP.

Another site is Červeny kopec. The site yielded individual artefacts from two levels. These are: a core or a polyhedral specimen (11.5 cm), and a convergent chopper (9.2 cm) from quartz. The first item was found in PK X soil complex (Valoch 1977), the second within the layer of colluvial, clay-sandy soil (Svoboda *et. al.* 1998). Both stratigraphical levels are located below the Matuyama/Brunhes boundary (Valoch 1995; 1996; 1998; 2003).

Investigations at the site of Staré Město revealed the presence of artefacts within the alluvial sediments (layers B–F). On the basis of geomorphological data, lithological-mineralogical analyses and comparison of palaeomagnetic determinations of the formations building the adjacent alluvial cone the age of the sediments at Staré Město falls at before 783 000 years BP. The inventory consist of: cores, choppers, discoidal specimens, side-scrapers, retouched flakes, and burins. Cores were identified as polyhedral types. Raw materials included hornstone, veined quartz, silificated sandstone, and quartzite (Chlachula 1990; 1993).

The site of Švédské šance is of similar age (Valoch, Seitl 1994; Valoch 1995; 1996; 1998; 2003). In layer 12 a polyedre (6.0 cm) and three fragments, side-scrapers, bearing traces of preparation (2.7–7.7 cm) was identified. Layer 14 yielded a pebble with a scar (11.1 cm). Jurassic hornstone and quartzite were used. The sediments of layer 13–15, seen in the lower portion of the profile of a 10 m deep excavation, were of fluvial origin. These sedimens correspond to the formation of the Tuřan terrace. It is possible, that the substratum are gravels of the Stranská terrace. It is important to add that layer 12 was overlain by relics of 6 soil complexes. The uppermost complex cannot be younger than PK III (the Eemian) and is probably older. In view of the above the pre-Brunhes age of the sediments seems highly likely.

Another significant site is Brno–Černovice (Valoch 1995; 1996; 1996a; 1998; 2003). In the profile of the sand extraction pit that cuts the Tuřany terrace, from the gravels which contained bones, among them horse teeth, 2 cores, 2 flakes (3.9–4.9 cm), a fragment of a core tool, a chopper and pebbles with scars were obtained. Cores are single-platform (5.4 cm) and “discoidal”. The exploited raw materials were hornstone, cretaceous spongiolite, quartz and quartzite. The upper chronological boundary of the terrace is marked by ferreto type soil developed on gravels. The age of this soil is estimated at the Günz/Mindel interglacial (Smolíková, Kovanda 1982; 1983). At the same time, the palaeomagnetic dating of the terrace gravels indicates that they show normal magnetic polarity typical of the Brunhes episode (Koči 1982). For this reason, it can be assumed that the level with finds cannot be earlier than 783 000 years BP.

In the Czech territory, there is a number of other sites, whose age is earlier than the Matuyama/Brunhes boundary.

The richest of such sites are Přezletice (Fridrich 1989; 1991; 1997). The chronology of this site, on the basis of palaeomagnetic dating, is between 590–890 000 years BP. Lithic artefacts in the oldest level A4 were stratified within the sands overlying the lacustrine marls. Level A3 was contained in the lacustrine sediments. Level A2 was uncovered within a layer of gley soil disturbed by solifluction processes. Level A1 are the artefacts located within a cone built of rubble laid down on the lacustrine marls. Level A3 abounded in bone fragments, mainly of *Elephas trogontherii*. They were accompanied by remains of *Bison Schoetensacki*, *Equus caballus mosbachensis*, *Equus hemionus*, large mammals rodents (*Anura, Desmona, Mimonys, Pytimys*), birds (*Aves*), fish (*Tinca tinca, Exos lucius*) and – very small quantities – *Dicerorhinus etruscus*, *Rhinoceros* sp., *Ursus* sp., *Cervus elaphus*, *Cervus* sp., *Capreolus* sp. Lydite, quartz, quartzite and sandstones were exploited. Cores were absent in all the levels. The proportion of flakes is 2.17% (A2) – 14% (A4). In the group of tool side-scrapers predominate, knives, choppers, and notched tools are numerous. A somewhat smaller role belongs to protobifaces, cleavers, picks and perforators. Moreover, burins, discoids and polyedre are also present. Hand-axes, splintered pieces and subspheroids sometimes occur. The percentage of hammerstones from level A1 and A3 is 1.4–3.4%. Level A3 yielded, besides, an anvil. The average size of flakes is from 3.9 to 3.95 cm. Tool size is from 7.2 to 7.5 cm.

The discoveries at the site of Bečov I are of considerable importance (Fridrich, Smoliková 1976; Fridrich 1976; 1991; 1997). Three archaeological levels: 7–9 were distinguished. Remains of settlement in layer 7 were stratified in braunlehm soil. Culture level 8 was contained within a sandy sediment enriched with a loamy fraction. In turn, materials from the lower level occurred within silty tuffite disturbed by frost structures. The process of formation of the braunlehm soil correlates with the Günz/Mindel interglacial. In such a situation, layers, at 8–9 least, could be placed at the time interval preceding the Matuyama/Brunhes transition. The raw material is exclusively quartzite. It is striking that none of the layers yielded cores. Flake frequency is from 6.25% (layer 9) up to 14.7% (layer 7). Among tools in layers 7–8 side-scrapers dominate. In layer 7 the high percentage of picks is noteworthy. Choppers, notched tools and proto-bifaces are well represented. Subspheroidal specimens and burins do not exceed 6%. Moreover, this layer yielded handaxes, cleavers, discoidal specimens and knives. In layer 8 also perforators and splintered pieces were present. Average size of flakes is between 5.6 to 7.1 cm. The majority of tools are in the interval of 7.7 cm to 10 cm. A much poorer level 9 contained 7 choppers, 6 side-scrapers, a protobiface, a subspheroidal specimen, and a flake.

Also the site of Prague-Suchodol I (Fridrich 1976; 1991; 1997) should be mentioned. In the braunlehm soil were found 2 choppers (6.3–7.2 cm) and a polyedre (5.4 cm). The soil was covered by a layer of lacustrine marls which contained a set of Early Pleistocene molluscs. The soil is assigned to the Donau/Günz interglacial (Fridrich 1976) or the Cromer interglacial (Fridrich 1981), recently to the Eburon interglacial (Fridrich 1997).

In the territories north of the Alps arch a special position occupies the site of Korolevo (Ukraina) (Adamenko, Grodecka 1987; Adamenko, Gladilin 1989; Gladilin 1989; Gladilin, Sitlivy 1990; 1991). Archaeological materials were located in layers 27 and 26. The Matuyama/Brunhes transition was placed at the interface of layers 22 and 21. In addition, layer 22 was TL dated at 650±90 Kyr BP. Layer 26, which are alluvial sediments with small pebbles building the upper portion of the Kopany terrace, has been TL dated at 850±100 Kyr BP. This layer yielded 13 cores, 525 flakes, 19 blades, 723 fragments, 250 chunks, 6 choppers, 2 unifaces, and a handaxe. In the group of cores of interest are unprepared, discoidal, protoprismatic and flat specimens. Layer 27 were alluvial clay with small and medium-size pebbles. In the inventory are: 13 cores, 236 flakes, 16 blades, 112 fragments, 37 chunks, 5 choppers, 2 protobifaces, 2 denticulated tools, and 3 other tools. Cores were initial, without preparation, polyhedral, discoidal, proto-prismatic, and flat. As far as raw materials are concerned andesite and trace quantities of obsidian, quartz and quartzite were used.

At the site denoted Sinaja Balka in Bogatyri (Russia) cultural archaeological material has been axcavated in breccia with bones. The Taman-fauna (*Canis tamanensis*, *Castor tamanensis*, *Trogontherium caucasicum*, *Equus* cf. *suessenbornensis*, *Tragelafini?* cf. *Taurotragus?*, *Bison* cf. *schoetensacki*, *Elephas*) indicates a date towards the end of the Matuyama chron. The artefacts layer provided core (<10 cm) and 6 flakes (<4–5 cm) (Bosinski *et. al.* 2003).

From the territory of Germany we should mention the site of Kärlich (Bosinski *et. al.* 1980; Bosinski 1986; 1995; Kulemeyer 1986; Würges 1986). In layer A of loamy-clayey sands, 3 pebble tools of chopper type (5.2–7.7 cm) made of quartz and a skeleton of a hippopotamus were discovered. Within the gravel layer – designated Ba – of the high terrace of the Rhein a core made of tachylite occurred. Layer A is synchronous with the Jaramillo event. The upper portion of higher layer Bb already exhibits normal magnetism *i.e.* it is located after the boundary of the Matuyama/Brunhes episode.

At the site of Kirchellen the cultural relics was contained within the sands and gravels of the younger, main terrace 1 of the Rhein (Schmude 1997). Palaeomagnetic analyses of sediments revealed normal polarization corresponding – it is assumed – to the Jaramillo episode. This is confirmed by geological dating of the terrace complex at 0.9–1.6 MA BP (Brunnacker *et. al.* 1982; Thome 1997). The inventory includes 10 cores, 9 flakes, 51 tools, and 11 diverse items from various types of quartzite and flint. Sometimes, the line of distinction between a core and a pebble tool is difficult to establish. Of interest is the presence a certain number of choppers could have been previous cores. The predominant tools are: pikcs and triedres, polyedres and choppers. They are accompanied by chopping-tools, cleaver-like tools, proto-bifaces and bifaces. Small tools are limited to only two micro-choppers.

In the case of the site of Schermbeck lithic tools were discovered within the younger, main terrace 1 of the Rhein (Klingelhöfer 1997). In terms of palaeomagnetism the gravels represent reversed polarity. The silty-mud formation shows normal magnetism. Because the overlying layer shows negative polarity the silty-muds correlate with the Jaramillo episode. The chronology of the terrace established on the basis of stratigraphy at 0.9 to 1.5 MA BP is consistent with the palaeomagnetic dating (Brunnacker *et. al.* 1982, Thome 1997). Archaeological materials contains 3 cores, 7 flakes (9–16.6 × 6.7–20.5 ×2.8–4.9 cm), 52 tools and 8 diverse items. Cores represent amorphous initial forms and – which is interesting – discoidal forms. Choppers are the biggest tool group, more numerous than, proto-bifaces and bifaces. Other tools are: picks, side-scrapers, chopping tools, cleavers. Various types of quartzites and milky quartz were exploited.

In the gravel pit in Weeze the primary sediment containing artefacts were the gravels of the lower portion of the main terrace 3 of the Rhein (Schmude 1997; Schmitz, Thissen 1997). In accordance with the stratigraphical-geological interpretation terrace 3 formed in the interval from 0.6 to 0.8 MA BP (Klostermann 1988; Thome 1997). The Matuyama/Brunhes episode boundary runs in the upper third of terrace sediments. The following inventory was recorded: 19 cores, 15 flakes (5–10 × 7–15.5 × 2.2–4.5 cm), 41 tools and 15 diverse items. Cores without preparation were probably unsystematically exploited. Noteworthy are bi-polar cores whose reduction was, at least in part, carried out on a retoucher. Picks, choppers, proto-bifaces and bifaces occurred in high frequencies. Finally, tools inventory is completed by cleavers and small tools including microchoppers. The basic raw materials are a variety of quartzites, quartz, sandstone and flint.

From the site of Winningen the Mosel gravels yielded choppers, a chopping tool, a uniface, a side-scraper, a end-scrapers, a polyedres, point type Quinson and flakes (5.5–8.7 cm). The finds were made of quartzite and quartz (Berg, Fiedler 1983; 1987; Fiedler 1991; Bosinski 1995; Berg 1997). Geological dating of the gravels places them before the Matuyama/Brunhes transition (Brunnacker *et. al.* 1976).

Remains of prehistoric man's activity in Gondorf associated are with the gravels of the younger main terrace of the Mosel (Berg 1997). These gravels are estimated to be of the older Quaternary age. Rarely cores belong to single-platform, with narrow flaking surfaces, are characterized by weakly advanced reduction. Tools comprised cleavers, choppers, chopping tools and polyedres were distinguished. The exploited raw materials are quartz and quartzite.

A modest set of lithic artefacts was discovered at Gotzendorf/Sprendlingen (Fiedler 1989; 1997). Individual finds were found within the gravels that constitute the remnants of the main terrace of the Mein. It is assumed that the "level with artefacts" is older than 0.7 MA BP. The inventory contained chopping tools, a chopper, a discoid, polyedres, picks and bifaces.

The collection from Dorn-Dürkheim is not abundant (Fiedler, Franzen 2002; Fiedler 2003). In the sandstones of the Upper Rhein terrace a polyedre (62 × 44,5 mm), a side-scraper (36,5 × 37,5 × 15 mm) and a perforator (18,5 × 13,2 × 5,2 mm) were recovered (Fiedler, Franzen 2002; Fiedler 2003). All the specimens were made from quartzite. The same layer contained animal bones: *Ursus deningeri, Mammuthus trogontherii, Equus suessenbornensis, Equus altidens, Stephanorhinus etruscus, Bison schoertensacki, Cervidae* among others *Capreolus suessenbornensis, Mimomys savini, Microtus hintoni* (Fiedler, Frenzen 2002). They represent the fauna of transitional type that can be ascribed to the Late Biharian or/and the Late Cromerian. Palaeomagnetic dating allows to place the site just before the Matuyama/Brunhes.

The westernmost site – apart from Chilhac and Nolhac – is Soleilhac (Bonifay 1991; Bracco 1991). Artefacts were occurred in complexes of layers: D–B. The sequence begins with a complex of gravel sands (D). Overlying complex D is a sand complex intercalated with sands and gravels (C). The uppermost complex B are silty marls and fluvio-lacustrine gravely sands. The age of culture levels determined by the palaeomagnetic method is 0.95 to 0.90 MA (Thouveny, Bonifay 1984). This dating corresponds to the Jaramillo event (0.97–0.90 MA). The fact remains is that complexes B–D exhibit positive polarity within negative polarity of Matuyama episode. The chronology of the site is confirmed by geomorphological, palaeoclimatic and palaeozoological analyses. The fauna represents a typical post-Villafranchian species community: *Praemegaceros solilhacus*, *Cervus* cf. *Elaphoides*, *Capreolus* cf. *Süssenbornensis*, cf. *Bison*, *Hipoppotamus amphibius*, *Paleoloxodon antiquus*, *Equus* sp., *Dicerorhinus etruscus*, *Canis etruscus*, *Vulpes* sp., *Lynx* sp., *Mimomys pliocaenicus* (Fosse, Bonifay 1991). The inventory consists of: 9 cores, 110 flakes, 191 chunks, 136 tools. The raw materials composition shows the dominance of quartz. The rock next in importance was basalt. Flint and granite were also registered. Cores are represented by initial, multiplatform, residual and discoidal specimens. Preliminary preparation is absent. Flakes are small, their size does not exceed 4 cm. Preserved butts are natural, cortical and punctiform. Usually the butt angle is more than 90 degrees. In terms of typology the inventory a special position belongs side-scrapers and retouched flakes, followed by denticulated and notched tools. Two side-scrapers are consistent with the definition of an end-scrapers. Side-scrapers exhibit semi-steep and steep retouch, high biseriate retouch, and parallel "end-scraper"-like retouch. Notched and denticulated tools are with deep Clactonian notches that sometimes have additional retouch. Retouched flakes show discontinuous, flat retouch. A separate group are large artefacts – choppers and chopping tools. Attributed to category choppers or chopping tools are also pebbles with traces of battering. Core tools were worked from one or two sides. Scars from preparation extend well onto the surface. Retouched pebbles – whose unequivocal interpretation is difficult – were adapted to function as macrolithic side-scrapers and denticulated tools. One tool was ascribed as a polyedre.

The site Happisburgh lies 52°49' N in the East Anglian region of Britain. Flint artefacts were arranged in fluvial gravels and laminated restuarine sands and silts. The age of site before Matuyama/Brunhes boundary is established by palaeomagnetic metod and palynological (*Tsuga*, *Ostrya-type*, *Pinus*, *Picea*) and palaeozoological (*Equus suessenbornensis*, *Mimomys*, *Cervalces lalifrons*, *Cerphus elaphus*, *Microtus* sp., *Bovidae*) data. The assemblage contained of 78 specimens: cores, flakes, flake tools. A considerable majority of flint products constitute large flakes (>14.5 cm) (Parfitt *et. al.* 2010; Roberts, Grün 2010).

From the techno-typological point of view the sites discussed above can be divided into two groups or sub-groups. For the first group a distinctive feature is the co-occurrence of the pebble and flake components, with flakes measuring 4–5 cm. The second group is characterized by the third – microlithic – component *i.e.* blanks and tools measuring up to 3 cm. The site of Přezletice, Bečov I, Korolevo, Winningen, Kirchellen, Schermbeck, Weeze, Gondorf, Gotzendorf/Sprendlingen, Brno–Černovice, Staré Město and – conditionally as the site is poor – Kärlich, Švédské šance, Prague-Suchdol I, Červeny kopec, Mladeč Cave belong to the first group. The specified flakes inventory represents Happisburgh. To the second group belong the sites of Soleilhac, Dorn-Dürkheim (?), Bogatyri (?). The inventory of the site of Kończyce Wielkie well corresponds to the features of the second group.

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## Resumé

V jižní části Osvětimské pánve, v areálu lomu ve Velkých Končicích (Kończyce Wielkie) vystupují na povrch čtvrtohorní sedimenty různého původu. Na podložní sérii vrstev fluviálních sedimentů nasedají usazeniny glacigenního původu. Glacigenní sedimenty, které jsou deponovány pod paleomagnetickým rozhraním Brunhes/Matuyama, a interglaciální usazeniny jsou starší než cromerský komplex. Tento postup ledovce k jihu, v maximálním rozsahu až do jižního Polska, můžeme korelovat s glaciálem günz a s nejstaršími předcromerskými stopami zalednění v západní Evropě. Artefakty se nacházely ve vrstvě fluviálních písků s příměsí jemného štěrku

pod diamiktonem, interpretovaným jako till a pod balvanitou vrstvou s ním související. Mezi surovinami použitými k výrobě artefaktů převažuje místní pazourek a rohovec (silicity z glacigenních sedimentů), dále se objevuje také importovaný rohovec, křemenec, opál a rula. Inventář zahrnoval jádra a mikrojádra, úštěpy a nástroje. Nástroje jsou vyrobeny z oblázků, ústěpů a mikroúštěpů.