

## THE MULTILAYER PALAEO-LITHIC SITE OF DZIERŻYSŁAW I (UPPER SILESIA, POLAND) AND ITS ENVIRONMENTAL CONTEXT

### VÍCEVRSTEVNÁ PALEOLITICKÁ LOKALITA DZIERŻYSŁAW (HORNÍ SLEZSKO, POLSKO) A JEJÍ ENVIROMENTÁLNÍ KONTEXT

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#### Abstract:

*Stratigraphic position of three settlement phases dated to the end of the Penultimate Glaciation (OIS 6 – Early Middle Palaeolithic Micoquian) and to the last Interpleniglacial (OIS 3 – Early Upper Palaeolithic Bohunician and Szeletian) has been analyzed. The reconstruction of environmental factors which attracted the repeated occupation of the site has been used for the explanation of settlement processes dynamics, particularly during the Early Upper Palaeolithic.*

#### Key Words:

*Penultimate Glaciation (Oder, Warta stages), periglacial, Interpleniglacial, Bohunician, Szeletian, activity areas*

#### Site location

The site Dzierżysław I is situated on the Głubczyce Plateau, in Upper Silesia (southern Poland), near the Kietrz-Rozumice road, on its west side (Fig. 1A, 1B, 1C). Its geographical position is approximately 17°59'12" E and 50°02'30" N.

#### Morphology

The site is situated near the top of the Czarna Góra (Black Hill) whose culmination, at 288.4 m a. s. l. (Fig. 1C, 2), just like the neighbouring culminations of 187.1 m and 286.0 m a.s.l. – rises slightly above this part of the Głubczyce Plateau. Here a relatively broad, almost latitudinally oriented drainage divides can be distinguished, which extend between the valleys of larger rivers: the Psina, the Opava and the Troja. Smaller, curved ridges are usually meridionally oriented. The Black Hill is situated within one of such asymmetrical ridges (Fig. 1C, 3). To the west of this ridge a section of the Morawka – a tributary of the Troja river – cuts deeply into the terrain; to the east an extensive depression cuts into the Głubczyce Plateau, stretching as far as the Oder valley (Fig. 1B). The waters from the Psina, the Troja and the Biała Woda rivers were released into this depressions. The ridge where the site is situated forms the eastern edge of the Głubczyce Plateau.

#### Geology

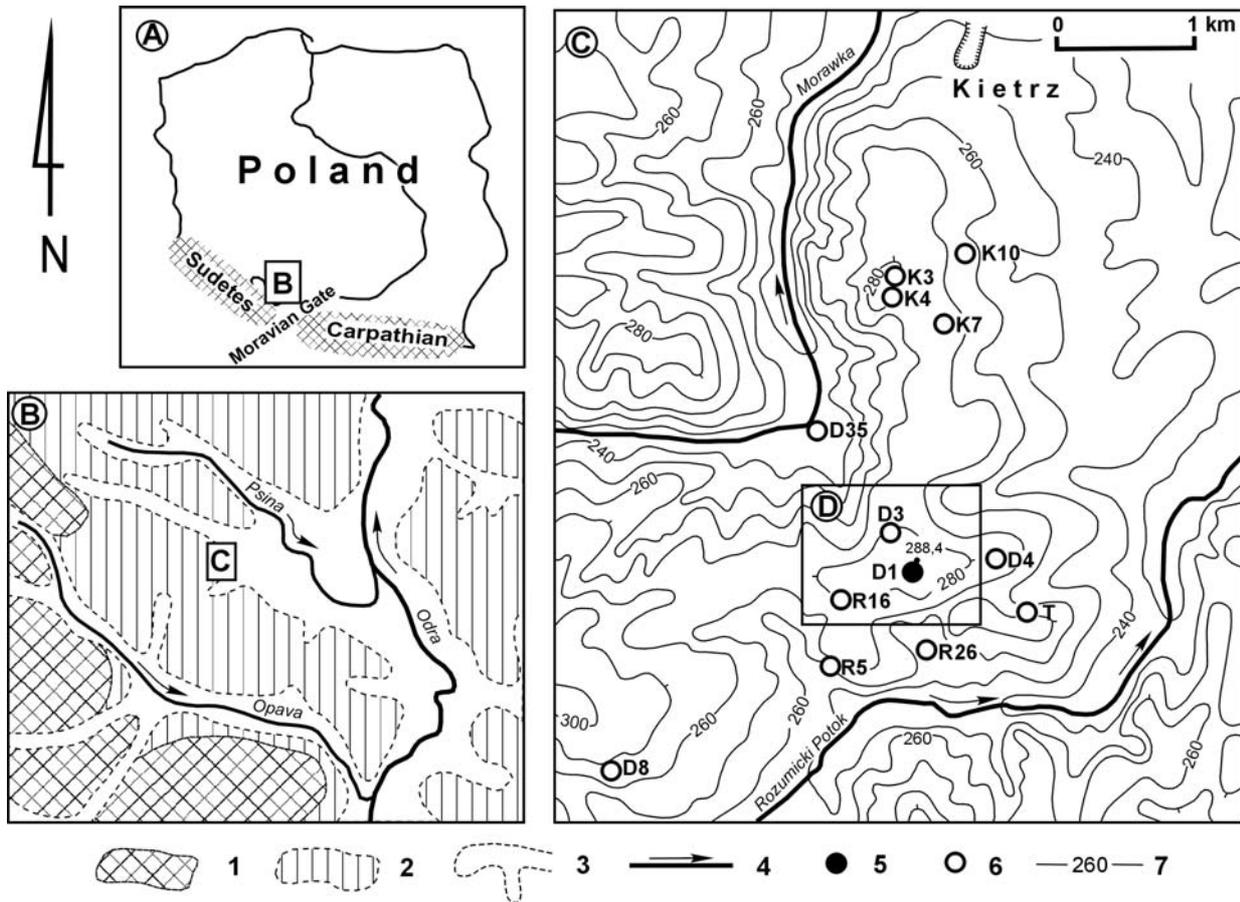
The ridge where the site of Dzierżysław I is situated is partially built of silty Badenian (Middle Miocene) formations containing medium- and thick-crystalline anhydrite. The outcrops of these older rocks are at about 2 km north of the site, on the Gipsowa (Gypsum) Hill. The younger sediments building the Black Hill indicate that this was, probably, a kind of kame which – at places – was sedimented on the crests of the Tertiary rocks. East of the archaeological site higher parts of the Hill are built of till deposits and fluvio-glacial sands and gravels. The entire formation is mantled closely by loess, occasionally re-

worked with the underlying sands and gravels of the substratum. At the site itself and west of it sands and gravels predominate. To the east of the Black Hill, locally, re-deposited, pre-glacial “Opava” gravels of milky quartz occur.

The culmination of the site is a mound built of gravel and sandy sediments, mainly thick-grade gravels that protrude from beneath the loess cover.

The sediments building the Black Hill were described in the 1920s and 1930s by German researchers (Kozłowski 1964) on the basis of a sand extraction pit that functioned in the western part of the Hill. In the year 1936 H. Lindner (1937, 1949, 1941), summing up the various views, stated that in the region of the Black Hill the loess mantle covered the sands and gravels of the Scandinavian erratic material of the Oder Stage (Saale Glaciation). Underneath this formation there were pre-glacial quartz gravels. During the San (Elster) Glaciation packets of Tertiary silts were pushed by the ice-sheet onto the quartz formation. The packets of grey, grey-blue and greenish silts within the sand-gravels formation were interpreted as Tertiary sediments that had been detached from the substratum and shifted by glaciectonics. According to H. Lindner the two lehmified levels identifiable within loess corresponded, probably, to the Göttweig/Paudorf Interstadials. The second of the two levels was, supposedly, weakly marked or absent. H. Lindner, using the schema proposed by W. Soergel, claimed the following age of the loess on the site: the lower loess corresponds to the Warta Stage and younger loess I; the upper loess – to younger loess II and the Brandenburg Phase of the Vistulian (Würm) Glaciation.

In 1992 four generations of Pleistocene fossile depressions were discovered in the various sediments in the vicinity of the site (Fig. 4) (Fajer *et al.* 1993), which was of essential importance for the explanation of the environmental context of the particular phases of Palaeolithic settlement. The four genera-



**Fig. 1.** General map of Dzierżysław, site 1: A – In Poland, B – on the background of geomorphological units of southern Poland, C – against the background of geomorphology of Kietrz region. 1 – mountains, 2 – uplands, 3 – valleys, 4 – rivers, 5 – Dzierżysław 1 site, 6 – other sites, 7 – isohypse. Site names R – Rozumice, K – Kietrz, T – Třebom. Mapa Dzierżysławi, lokalita 1. A: na mapě Polska, B: na pozadí geomorfologických jednotek jižního Polska, C: na pozadí geomorfologie regionu Kietrz.

tions of fossile depressions could be distinguished on the basis of profiles from different trenches:

### Generation 1

To the oldest depressions observable in the profile of the fluvio-glacial sand-gravel series, without glaciectonic distortions, belong two relatively large palaeo-depressions and a slightly smaller one filled with laminated dark-grey material resembling Tertiary silts. The smallest fossile depression uncovered in the southern part of a sand quarry was located slightly higher than the two larger ones. The two above-mentioned depressions together with a fossile structure identified by drillings east of the Kietrz-Rozumice road, constitute the oldest generation of depressions. These were, in all likelihood, inter-plateau closed basins from the melting of the dead ice within the fluvio-glacial series. In one of the basins (Fig. 4 – profile O2, Fig. 5) a layer of carbonate cemented sandstone was uncovered. Above the sandstone there were horizontally laminated, strongly lehmificated, silt-mud sediments resembling dy or gytja. The floor of the basin is practically devoid of plant pollen, although some organic carbon was present. Higher up a small amount of pollen of pine, fir, elm and larch was registered, also CaCO<sub>3</sub> concretions and organic carbon were present.

### Generation 2

Above the south edge of this depression an erosional furrow, about 1 m deep, was uncovered (Fig. 4). It had been cut in the sand-gravel sediment and, subsequently, filled with coarse gravels – the same that built the mound devoid of the loess cover.

### Generation 3

A younger generation of fossile depressions is represented by a wide trough uncovered in a modern ditch. Its filling are banded, occasionally even laminated, loamy-sandy sediments and thin layers of fine gravels (Fig. 4). This sediment is a loess slope facies with an admixture of sands and gravels from older formations constituting the walls of this structure. The filling of the trough is formed by coluvia and deluvia containing grey soil. Underlying the grey soil is a horizon of dessication polygons and three levels of humic grassland soils (Fig. 5).

The grey soil layer is fairly thin – about 0.6 m – because its illuvial level developed mainly on a layer of gravels. The iron dioxides and colloids migrating from the overlying soil levels encountered a strongly permeable layer that functioned as a horizontal drainage system. This caused that the surfaces of gravels show limonite precipitations.

Above the fossile trough with preserved grey soil, a basin filled with banded loess, at places strongly gleyficated, accumulated in the conditions of wet environment, which showed thin, gravel-sand laminae and darker spots enriched with organic substances. In the central part of the basin, a thick layer of sub-Arctic, swamp soil occurred that, laterally, on the walls of the basin graded into pseudo-gley soil mostly distorted by slope-washing processes.

A shallower basin, similar to the trough from the Late Phase of the Warta Stage, is situated on the other side of the gravel culmination, near archaeological trench I/89 (Fig. 6) (Bluszcz *et al.* 1994, Foltyn *et al.* 2000). This is probably a higher section of the slope of a smaller trough exhibiting traces of intensive slope washing processes (solifluction, soil creep, slope-washing).

The situation – although grey soil was not registered – in other areas was the same, for example in trenches: I/57, I/58,

II/58, III/58 (Kozłowski 1964), and trenches I/92, II/92 (Foltyn 1994) (Fig. 6).

#### Generation 4

In a large archaeological excavation dug in 1992 (I/92) a multilayer sediment distorted by frost action filled the basin of a shallow *alas* lake. A level of stagnogley boggy soil is well-marked (Fig. 7A). Laboratory analysis of the sediments from the palaeo-lake revealed, however, at least four levels enriched with humic material and observable in the profile (Fig. 7B). In between the second and the third humic level the very high proportion of carbonates is significant.

In the central part of this reservoir (Fig. 7A and 8) the following sequence of sediments and structures was registered:

1. In the bottom part of the reservoir, at a depth of 1.80 m, the yellow-orange loamy, banded formation contained a layer enriched with organic carbon,

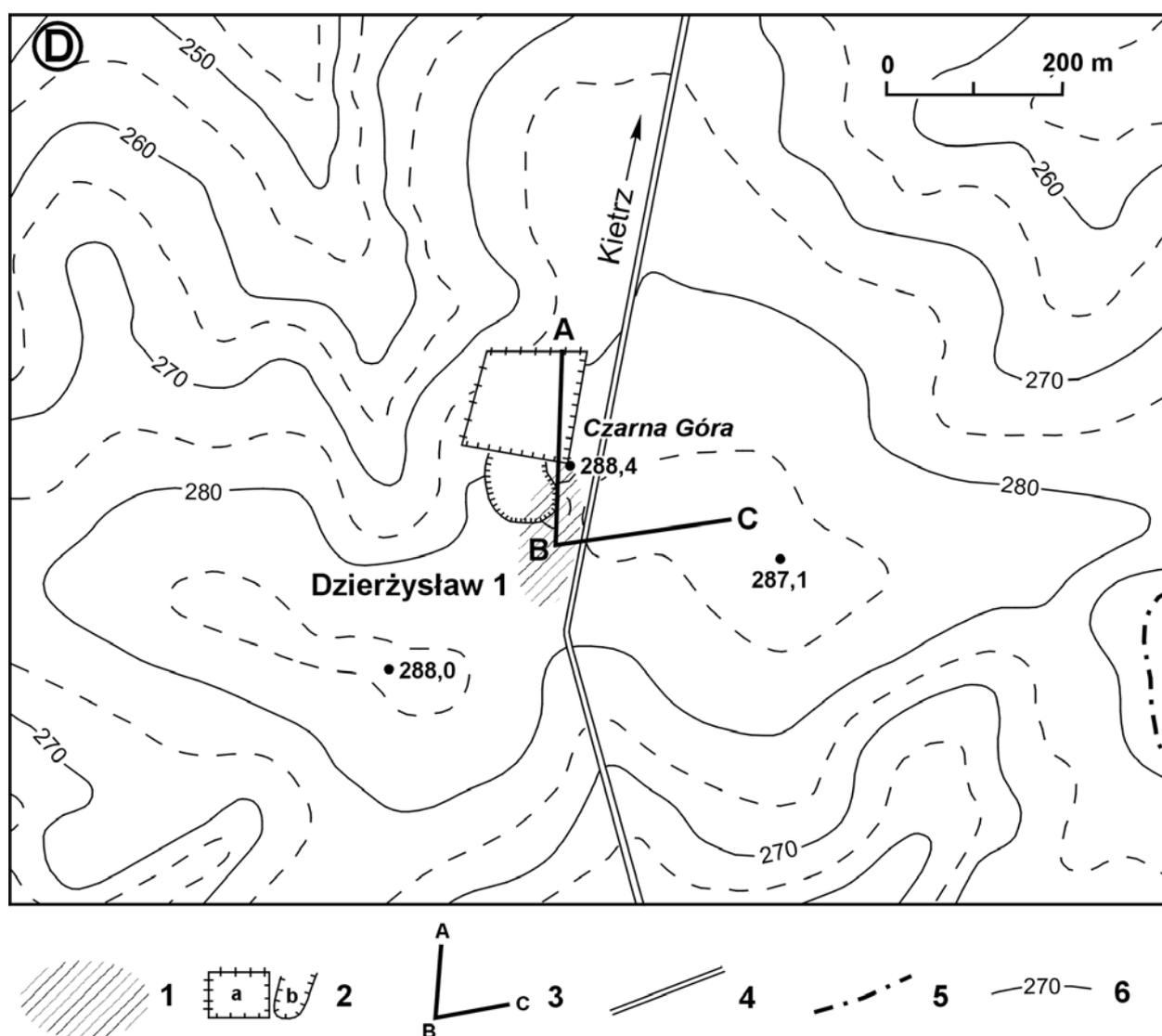
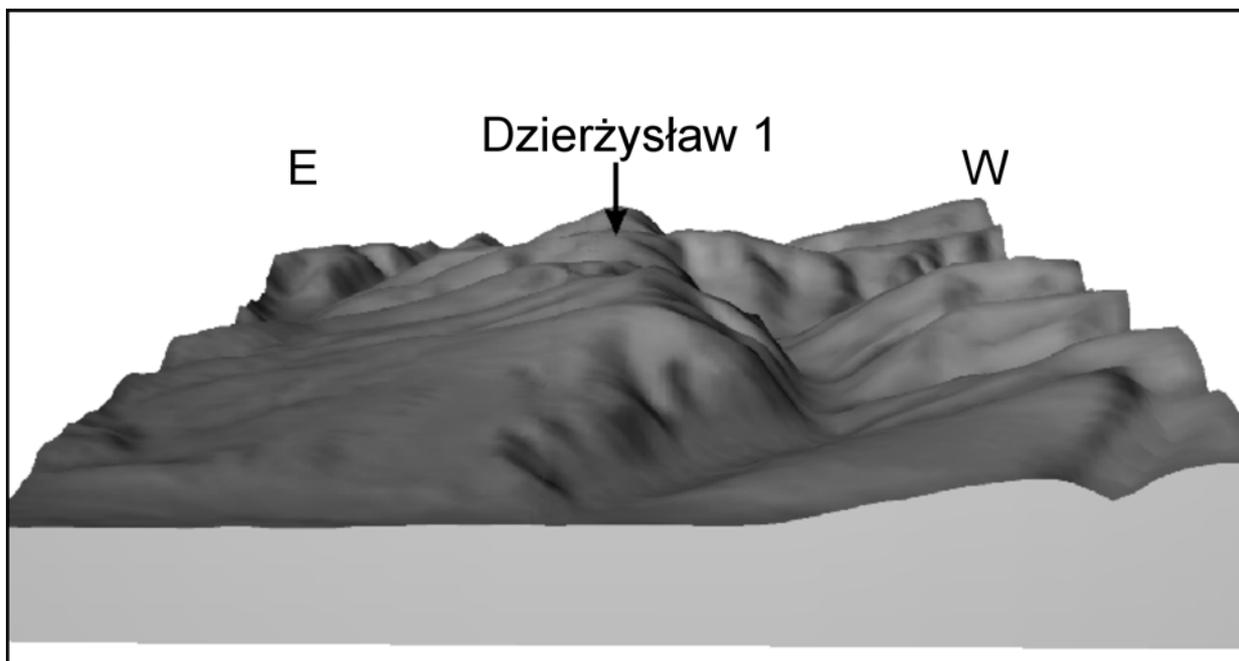


Fig. 2. Detailed map of Dzierżysław, site 1. 1 – site area, 2 – anthropogenic depressions (1a – garbage dump, 2b – sand-quarry), 3 – geological profile A-B-C see Fig. 4, 4 – roads, 5 – boundary of the state, 6 – isohypses. Detailní mapa Dzierżysławi, lokality 1. 1: prostor lokality, 2: lidské zásahy (a – jáma na odpad, b – pískovna), 3: geologický profil A-B-C (cf. Fig. 4), 4: cesty, 5: státní hranice, 6: vrstevnice.



**Fig. 3.** Position of Dzierżysław, site 1, on the blockdiagram of Kietrz area.  
Pozicje Dzierżysław, lokalitę 1 na 3-D modelu krajiny.

2. a layer at a depth of 1.60 to 1.40 m was yellow-orange banded loess with ferruginous-manganese microconcretions and a lense of pale, straw-coloured banded loess. The bands in the sediment were conformable with the contorted wavy laminae below.
3. At a depth of 1.40 to 1.10 m a layer of straw-coloured loess was weakly banded, with ferruginous and manganese microconcretions. At a depth of 1.30 m this loess was enriched with organic carbon, while the top of this layer was enriched with carbonates that precipitated in the form of concretions. In this layer the amplitude of distortions was smaller than that in the interface of the layers lower down.
4. Between 1.10 and 0.80 m was a layer of banded, dark beige loess with ferruginous and manganese microconcretions. In a sample from a depth of 0.80 m the proportion of organic carbon increased sharply.
5. Straw-coloured loess formed a layer at a depth of 0.80 to 0.50 m. In a sample from a depth of 0.55 m the proportion of organic carbon – although smaller than in the previous layers – was also increased.

The filling of the *alas* reservoir was disturbed by the processes of development and degradation of a silty-peat *palsa* structure. The shape and dimensions of the degraded structure are documented by concentric rings that remained from it. The structure could have measured 8 to 12 m in diameter and was not very deep (comp. Jahn 1970, 1976, 1986, Washburn 1988).

A fragment of a similar, though slightly smaller *palsa* structure was uncovered in trench II/92 situated between the *alas* lake and the gravel culmination. The complex of mounds and basins formed the, so-called, *palsa* complex (Ahman 1976).

In a trial trench situated east of trench I/92 two levels of pseudo-gley soil were uncovered, separated by a 50 cm thick layer of loess which could be identified with the Middle

Younger Loess (Jary *et al.* 2002). Above the pseudo-gley soils and the stagnogley boggy soil – sometimes separated by a solifluction series – ungleified beige loess was present. This loess is intersected by numerous, large ice cracks with the secondary filling from the melting of ice-wedges (Fig. 4). The filling in these pseudomorphoses is lighter in colour than the material around them, and their upraised parts are obliterated by recent pedogenesis. This loess yielded horse remains (bone and teeth) and remains of a woolly rhinoceros.

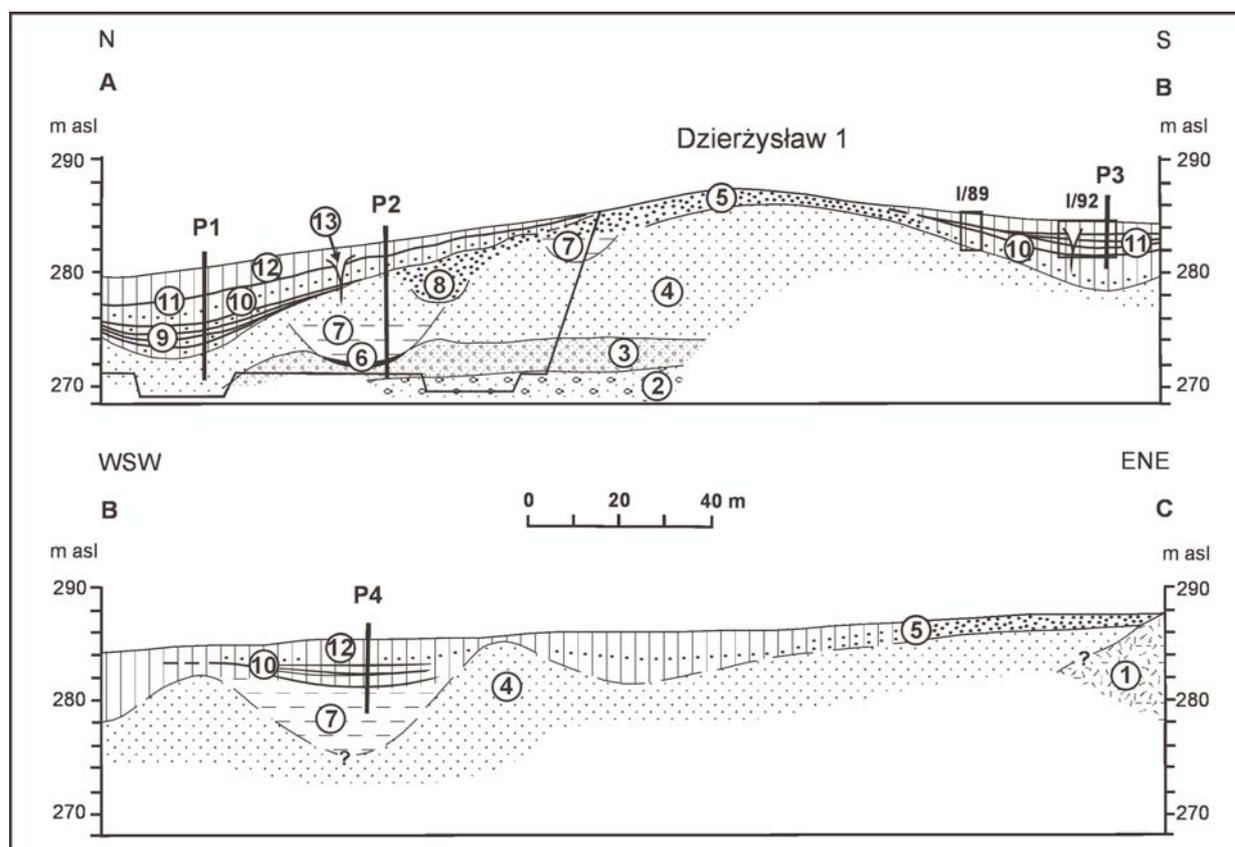
#### **The age of sediments and features and their palaeogeographical interpretation**

##### **The Penultimate Glaciation**

In agreement with J. Badura and others (Badura *et al.* 1994, 1996) we can say that “the fluvioglacial sands, gravels and local silts” uncovered in the vicinity of Dzierżysław I sedimented during the Oder Glaciation. In one of its stadials the sands and gravels in that area built a variety of forms and structures that, together with till series, formed the terminal morain. The sands and gravels also built outwash cones in this zone (comp. Zieliński 1992).

In the context of the results of investigations conducted at Rozumice 3 (Foltyn *et al.* 2004) it is likely that the Early Middle Palaeolithic flake discovered in trench VI/92 by J.K. Kozłowski (1964 a) could originate from the fluvioglacial sediments.

If we assume that the oldest (1) generation of depressions came from the melting of the dead ice, then these depressions must have formed and were filled in during the Oder ice-sheet degradation phase at the earliest or at least at the end of the Oder Stage and the Lublin Stage. At that time the relief of the terrain around the site – the present day surface of the upland – must have been much more varied than it is today. Besides the basins from ice melting there were also sand-gravel hillocks with, sometimes, fairly steep slopes. Later, various morpholog-



**Fig. 4.** Geological cross-section of the sediments in the vicinity of Dzierżysław, site 1: 1 – moraine clay, 2 – sands, gravels and stone blocks, 3 – sand with gravels (up to 40 mm diameter), slightly stratified, with ferruginous precipitations on the top, 4 – sands with gravels (up to 8 mm), 5 – gravels and coarse gravels. Chronology: 1-5 – Oder stage; 6 – calcareous sandstone, 7 – grey silt passing into stratified sands (with small pebbles up to 30 mm) At the lower boundary of this layer (contact with layer 4) – fine laminated sands. Chronology: 6,7 – End of the Oder stage/ Lublin interstadial; 8 – gravels (up to 80 mm) and sands filling the erosional basins, 9 – three beige-orange loess units with intercalations of gravels from slope wash and three brown loess layers (A-horizons of hydromorphic humic soils); the upper part of the sequence is formed by beige-orange loess with well developed Parabraunerde soil horizons: A, Eet, Bt. Chronology: end of the Warta stage and beginning of the Eemian, 10 – gleyified loess with additions of gravels, enriched with organic matter. 11 – gleyified loess with several soil horizons (pseudo-gley, and arctic hydromorphic). Chronology: Interpleniglacial (Komorniki soil complex). 12 – light beige loess topped with Holocene pedogenesis, 13 – ice-wedge pseudomorphosis.

**Geologický profil sedimenty v okolí Dzierżysławi, lokalita 1.**

ical processes, including loess accumulation made the topography considerably milder.

The sediments in the basins from ice melting accumulated in the effect of washing down of the finest fraction from the area directly around the basins. Only occasionally the profiles show sandy intercalations. Such sorting-out of deposited material was related to the vegetation on the slopes which – as palynological analyses have shown – was at first poor, probably mosses, and subsequently became richer. Similar palaeobotanical and lithological characteristics of sediments filling older basins from ice melting and lakes were registered at Ossówka (Krupiński 1995), Jarosów (Krzyszowski *et al.* 1995, Pazdur 1996) and at other localities (Borówka 1992, Żurek 1996). Possibly, the rate of accumulation of silty sediments decreased and, gradually, the deposition of precipitates grew in importance. Such a model of sedimentation in depressions from dead ice melting, located on morainic uplands has been unequivocally confirmed by R.K. Borówka (1992). It is likely that some of

the calcium carbonate that precipitated in the depressions at Dzierżysław is zoogenic.

The current state of research into the sediments under discussion does not allow us to determine the precise time span of the functioning of the structures or the age of sources of the infilling materials. Hopefully, profile 3 situated at about 100 m east of the site of Dzierżysław I will provide further information. Despite macroscopic similarity of the sediments in the first generation of depressions to Miocene formations, they have been ascertained to be the filling of basins from melting of the dead-ice and cannot be regarded as redeposited packets of glaciectonic silts. On the other hand, in profile X–Z at Dzierżysław uncovered by J. K. Kozłowski during the investigations in 1958 (Kozłowski 1965, fig. 1), revealed glaciectonic Miocene silt intrusions.

When the remnants of the Oder ice-sheet began to disintegrate in the vicinity of Dzierżysław I a local network of valleys began to develop. Its erosional base corresponded to the floor



In trenches I/62, I/89 and II/92 the level of laminated-banded sandy loess yielded a TL date of  $180 \pm 35$  Ka B.P. Its type indicates slope-washing origin; the delluvia were deposited synchronously or/and after the deposition of new loess. In view of this, this loess can be correlated with the older loess from the end of the Warta Stage. This level yielded individual flint artefacts assigned to the Micoquian (Foltyn *et al.* 2000).

Before the Eemian the growth of steppe vegetation alternated with phases of its degradation and ensuing denudation and slope-washing. When the sediments dried they sometimes formed desiccation cracks in depressions of the terrain. The grey – forest – soil recorded in the fossile trough must have developed in the Eemian Stage (comp. Jersak 1991, Jersak *et al.* 1992, Jary *et al.* 2002), while grassland soils, stratified lower, developed at the end of the Warta Stage and the beginning of the Eemian.

In that period the Morawka basin deepened considerably. In a brickyard in the nearby locality of Kietrz, the Eemian soil was uncovered at a depth of about 227 m a.s.l. (i.e. about 4 m above the modern valley floor).

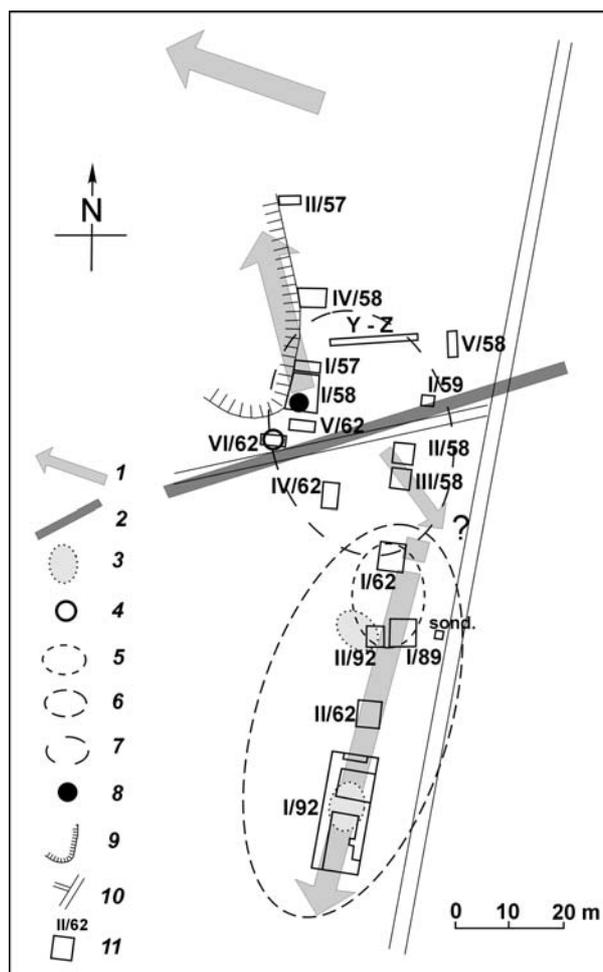
In the vicinity of the Magdalenian site of Dzierżysław 35, dated to  $13.22 \pm 0.07$  and  $13.5 \pm 0.08$  Ka B.P., situated in a meander of the Morawka river, drillings revealed probable Eemian pavement in the old river bed, at a depth of 6.1–6.5 m (Ginter *et al.* 2002). We can, therefore, assume that the erosional base of the Morawka river was lower in the Eemian than it is today.

### The Last Glaciation

In the vicinity of Dzierżysław I the increase in the thickness of sediments rich in organic substances that can, locally, be seen above the grey soil, morphologically lower down, and the frequent soil creep, evidence relatively mild – for a periglacial zone – climatic conditions in a number of episodes after the Eemian. Until the end of the Interpleniglacial the climate of some episodes showed relatively higher humidity. However, the milder episodes were separated by intervals with more severe climatic conditions when loess accumulated. In the older phase of the full Wisła Stage younger loess IIa gradually accumulated on the Głubczyce Plateau. J. Jersak (1991) divided it into three portions. The lower portion accumulated in wetter conditions – usually oxidizing-reduction conditions, on a watersaturated substratum; this loess is more silty, usually devoid of carbonates, grey in colour with reddish and black spots and ferruginous and manganese concretions. The middle portion accumulated in somewhat drier conditions – this loess is ochre in colour, less cleyey, sometimes with about 1 % of carbonates. The upper portion was transformed by the soils belonging to the Komorniki complex. Where younger loess IIa is not underlain by the older loess, than the sand fraction in it is higher.

The identification of the various layers of this series in the uncovered profiles is difficult due to the slope-washing processes in the past, and also to intensive gleyification of sediments combined with the obliteration of initial morphological features by pedogenesis of the Komorniki soil complex.

The stratigraphical position of the Interpleniglacial Komorniki soil complex corresponds in the uncovered profiles to the following: the pseudo-gley soil, the arctic-boggy soil and the stagnogley soil that south of the Black Hill occur in even several levels. The upper boundary of this complex at Dzierżysław I is the level dated at  $22 \pm 3$  Ka (Bluszcz *et al.*

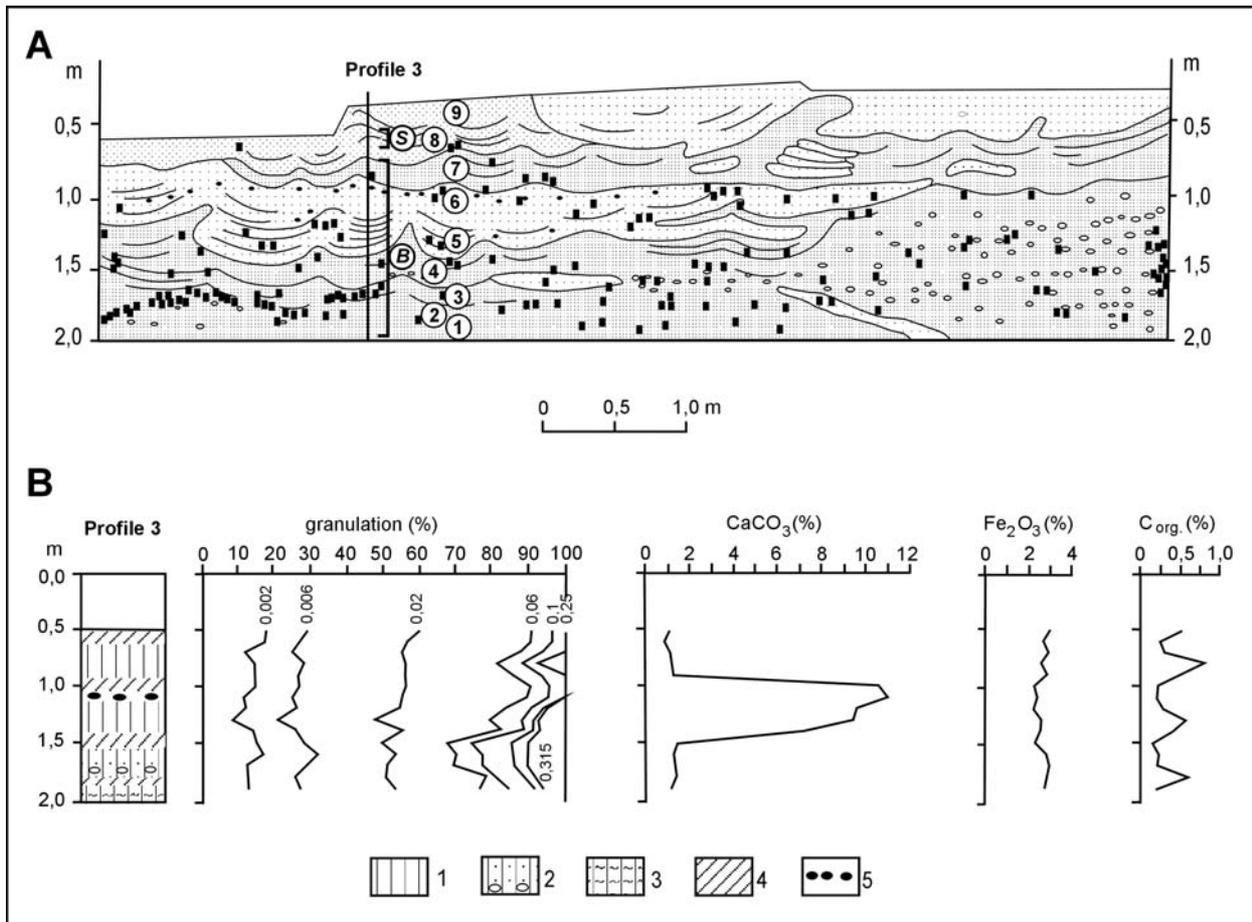


**Fig. 6.** Reconstruction of the fossile geomorphology of Dzierżysław 1 site: 1 – fossile trough shaped Eemian valleys, 2 – axis of the fossile sandy-gravel ridge, 3 – extensions of fossile palsa structures, 4 – location of the Early Middle Palaeolithic flake, 5 – hypothetical range of Micoquian artifacts, 6 – area of distribution of Bohunician artifacts (confirmed and tentative), 7 – area of distribution of Szeletien artifacts, 8 – Szeletien dwelling structure, 9 – sand quarry ridge, 10 – roads, 11 – trenches.

### Rekonstrukce fosilní geomorfologie Dzierżysławi, lokality 1.

1994). This level documents activation of intensive slope washing processes that are synchronous with the bed mass (virtual mass) movement (Manikowska 1995) registered in Central Poland, and in the Upper Oder basin with erosional processes and subsequent infilling of basins with sediments enriched with organic substances (Jersak, Sendobry 1991).

Because there are no dates for trench I/92 the descriptive, stratigraphical-palaeogeographical model of sediment sequences in this trench were reconstructed by analogy with the corresponding layers in the nearby trench I/89. The chronology of layers in trench I/89 was defined by TL and C14 dates (Fig. 5). The association of the sediments in the two trenches has been confirmed by the presence of culturally homogeneous assemblages in corresponding levels.



**Fig. 7.** Cross section of the palsa structure disturbed by pseudomorphosis from trench 1/92. A – see fig. 8, B – Bohunician horizon, S – Szeletian horizon (confirmed in this place only by two artifacts). Rectangles = artifacts. B – lithological features of sediments: 1 – loess, 2 – sandy loess with gravel, 3 – laminated loess, 4 – soil horizons, 5 – calcareous precipitations.

**Řez palsou porušenou pseudomorfózou ve výkopu 1/92.**

The most difficult level to interpret in trench I/92 is the lowest, humus-enriched level. It seems to be contained within the floor portion of the series in the reservoir, but it could equally be associated with the substratum formations. We cannot say with all certainty whether the humus-enriched level is the oldest sediment in the reservoir or whether this is a soil stratified in situ, just underneath the reservoir floor. In the consequence of soil frost and the formation of the *palsa* structure this soil was re-worked with the lake sediments.

After the reservoir was infilled with the silty-sandy sediment, another layer enriched with organic substances developed. Biochemical processes caused that this layer was not so rich in ferruginous compounds which had been carried to the lower part of the reservoir. The first and the second soil levels, together with the loess separating them, contained lithic materials of the Lower Interpleniglacial archaeological level associated with the Bohunician (Bluszcz *et al.* 1994, Foltyn, Kozłowski 2003).

The next series of loess laminae contains a very high proportion of  $\text{CaCO}_3$  (up to 11 %) and even carbonate concretions. This phenomenon was registered in a number of trenches in the area of the site of Dzierżysław I in a similar stratigraphical sit-

uation. The calcium carbonate could originate from the leaching of younger loesses and, locally, from older formations stratified at higher elevations. It is also possible that some calcium carbonate came from the large quantities of animal bones in the vicinity, whose origin was anthropogenic, dissolved in the acidic, boggy tundra environment. It should be added that, locally, some levels with a high calcium carbonate content or even with its concretions, could be associated with the contact between the active seasonal-zone and the passive zone of the long-term permafrost (comp. Kozarski 1995).

The third, in turn, organic level in the reservoir series, is richer in humus and is seen as distinctly brown colouring in the sediments. Excavations revealed that this is an extensive packet of organic-silty material from the slope congelifluction. Following the incline of the central part of the reservoir, at a distance of 6 m, the terassette of the congelifluction tongue, overlying the pseudo-gley soil level, was identified.

In trench I/92 an ice-wedge was registered, intersecting the third soil level. The wedge was filled with organic-silty sediments. Above the soil banded loess was stratified. This loess and the lower-lying sediments were distorted by the development and degradation of silty-peat *palsa* structure. The lense of

sediments distorted by the filling of the *palsa* structure is situated in the centre of the reservoir, probably at a depth of between 0.6 to 1.70 m. Directly above the *palsa* pseudomorphosis the fourth level enriched with organic material appeared. In the trial trench made east of trench 1/92 this level was developed on a loess layer as pseudo-gley soil. In other areas in the surroundings of the site, in the same horizon, solifluction tongues occurred with, among others, sands and sands/gravels. This series of the sediments contained the younger Interpleniglacial archaeological level attributed to the Szeletian.

A basically undisturbed layer of younger loess IIB accumulated above the *palsa* pseudomorphosis, the solifluction series, and the upper pseudo-gley soil. That the climate at that time was more severe and more continental is evidenced by relatively numerous, large permafrost structures with secondary filling from ice-wedges melting. Animal remains represent cold steppe species (horse, woolly rhinoceros). The degradation of the *palsa* structure and the solifluction had taken place before the accumulation of younger loess IIB.

To sum up the data obtained the history of the palaeo-lake has been reconstructed:

1. Because the climate ameliorated – becoming more oceanic – a thin layer of organic material began to accumulate in the basin in the upper section of the trough valley. The layer accumulated heat from the sun's radiation and, consequently, the permafrost underneath began to thaw filling the basin with water. In the warm seasons the water reached fairly high – for periglacial conditions – temperatures. This accelerated the onset of thermal karst processes.
  2. The palaeo-lake under discussion was by no means the only one in the area. The people of the Bohunician culture arrived at the lake and left artefacts in its basin (Fig. 6). The position of artefacts mirrors the layers distorted by sedimentation. This indicates that the ice-filling formed after the Bohunician group had left the lake. The palaeo-lake was situated on the flat culmination of the Głubczyce Plateau near its edge which dominated the broad, boggy basin of the lower Psina and Troja rivers, rich in vegetation and fauna.
  3. The episode of the change of sedimentation from organogenic to loess-carbonate one, registered between the second and the third layer of fossile soils (between the stagnogley soil and the stagnogley-boggy soil subsequently displaced by congelifluction) did not necessarily mean deterioration of climatic conditions – just the opposite. In the warmer interval the intensification of plant and algae photosynthesis caused the increase in the absorption of CO<sub>2</sub> from the lake water. This took place at the cost of Ca(HCO<sub>3</sub>)<sub>2</sub> present in the water, better soluble and more mobile than CaCO<sub>3</sub> which easily precipitated in the lake (comp. Kajak 1998). The presence of loess is not typical in such a situation, but it can be accounted for by the more intensive – perhaps periodically – washing down of loess from the soil surface, which man stripped of vegetation, into the reservoir. As we have already mentioned, initially, the CaCO<sub>3</sub> content in the material washed down could have been higher.
  4. The climatic conditions favourable for vegetation growth, that persisted over a long time interval, are documented by well-developed stagnogley-boggy soil in the lake basin.
- Climate was not the only factor. Most probably, human activity also influenced the abundant growth of aquatic and swamp plants and the intensive formation of peat, which finally caused that the lake vanished. When the inhabitants of the camp introduced into the lake large quantities of nutritive substances (mainly phosphorous and nitrogen compounds) the shallow lake became eutrophic and the biomass increased. Moreover, within the well-developed soils biochemical processes caused migration of carbonates into the lower loess series.
5. The deteriorating climatic conditions are documented by the development of frost cracks with secondary seasonal filling, or even secondary filling from the melting of ice-wedges.
  6. Finally, the worsening climatic conditions are evidenced by the formation of the *palsa* structure. The presence of a peat layer in the basin of the former thermokarst (*alas*) lake was of primary importance for its formation.
  7. In this cold interval also loess was accumulated. Within the level of the Middle Younger Loess, synchronous with the Interpleniglacial cooling, H. Maruszczak (1982) and others distinguished distortion patterns related to the development of hydrolitolites.
  8. In all likelihood, in the period when the *palsa* structure functioned and the loess mantle grew, a group of Szeletian people arrived at the lake.
  9. In the next interval climatic conditions improved to such an extent that the *palsa* structure degraded and slope-washing processes set off. The congelifluction of the saturated packet of sediments with the stagnogley-boggy soil is, probably, connected with this interval. The warmer climate caused that on top of the Middle Younger Loess a higher level of pseudogley soil developed.
  10. Following this relatively warm interval a long period of severe climate occurred. In the consequence, only a fairly thick layer of Younger Loess IIB developed. It contained a level of frost structures and ice-wedges.
- The dating of the events described above on the basis of lake sediments is not simple. However, when we take into account the dates from the nearby trenches the following schema can be proposed:
1. The two lowest organic layers with the loess layer separating them and with the Lower Interpleniglacial Bohunician level can be dated to the Moershoofd and/or Hengelo Interstadial. The difficulties in the precise chronological ascription of the sediments to these two Interstadials in western and central Europe have been pointed out by, among others, B. Manikowska (1999).
  2. The layer with the high carbonate content and the overlying stagnogley-boggy soil rich in organic substances which was displaced by congelifluction, can also be dated at the Moershoofd/Hengelo Interstadials.
  3. The layer that registered, first, the development of frost structures, then, of the *palsa* structure and loess accumulation evidences the deterioration of climate i.e. the cold interval probably between the Hengelo and the Denekamp Interstadials. The loess layer provided the TL date of 36.5–5.5 Ka B.P. Frost structures from this period are

known, among others, from central Poland (B. Manikowska 1994).

4. In the same period the presence of man is registered who left the artefacts assigned to the Upper Interpleniglacial Szeletian level.
5. The *palsa* structure degradation, the development of solifluction and congelifluction structures, subsequently the formation of the highest organic level took place at the end of the middle Pleniglacial – possibly in the Denekamp Interstadial.
6. The overlying Younger Loess IIb is associated with Pleniglacial II (LGM). It can be dated at between  $22\pm 3$  until, at least,  $19.65\pm 0.2$  Ka B.P.

#### **Environmental factors favourable to repeated occupation of the site of Dzierżysław I**

In terms of morphology of the terrain a potent environmental agent that always attracted the presence of man and influenced the type of occupation (short-term, transitional, or long-term) near Dzierżysław is the vicinity of the Moravian Gate that constituted an easy passage for both people and animals from the territories north of the Carpathians and the Sudetes to the territories inside the Carpathians Basin and further to the south.

The second agent was the nearly flat, easy to cross surface of the Głubczyce Plateau. Beginning from the Warta Stage it was mantled by loess which, owing to its hygroscopic properties, was clad with scanty herbaceous vegetation even in more severe climatic conditions, while in the warmer intervals of cold stages it was covered with richer grassy-herbaceous tundra vegetation, bush-tundra or even forest-tundra. From underneath the loess mantle protruded fluvio-glacial gravels and boulders, also till with abundant lithic material including flint. The small, usually barren elevation built of permeable gravel and sand-gravels formations played an important role as a site suitable for setting dry camps in the intervals of greater climatic humidity and formation of boggy tundra caused by impermeability of the substratum of persistent permafrost. On the flat surface of the Plateau thermokarstic lakes functioned periodically (Jersak *et al.* 1992) which provided drinking water but also a habitat for a variety of animals, even a place for bird hatching, and – finally – reservoirs of water for simple domestic activities.

The third factor that made the site of Dzierżysław I attractive was the vicinity of the large, swampy basin of the Lower Psina and Troja rivers. Moreover, the similar floor of the Upper Oder basin was relatively close to the site. These terrains had rich vegetation cover and provided grazing areas for a number of large mammals. Either accidentally or chased by hunters the game was trapped in swamps. Thus, this was a territory abounding in game where hunting was successful. Most of this territory could easily be surveyed from the edge of the Plateau, a few hundred metres from the camp hidden behind a small elevation. In addition, the deep valleys of the Morawka river and the Rozumice stream and their arms, also the steep hillsides had an important role in hunting strategies as from the top of the Plateau hunters could drive the game down into closed traps.

In the conditions of cold climate the location of camps on top of the Plateau protected the inhabitants from thermal inversions and frequent fogs, although they had to face wind. It seems that the location of the Micoquian and the Bohunician

sites on the southern slope of the Black Hill was determined by the need to protect the site from wind. The Szeletian site was situated close to the culmination of the sand and gravel mound which offered a dry base for the camp, rising above the water-logged tundra that in the summer covered the boggy, loess layer of active permafrost. Here the camp was protected from the wind by a dwelling structure.

#### **Settlement phases and the evolution of environment**

##### **The Early Middle Palaeolithic**

The first population groups could have arrived at the site, also at the nearby site of Rozumice C, as early as the Oder ice-sheet retreat. The climatic conditions were very severe, and the presence of man in this area could be explained as, primarily, transitional, in search of lithic raw materials (Foltyn *et al.* in print, Waga in print).

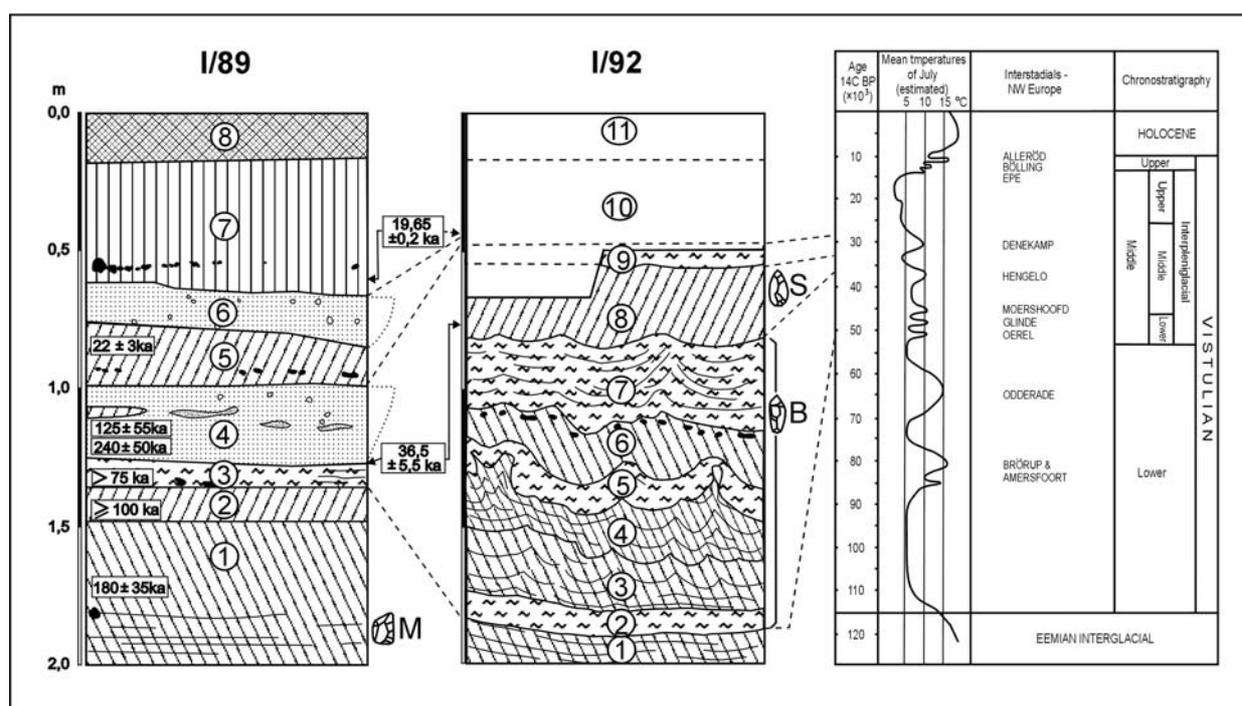
In the terminal phase of the Warta Stage, in the conditions of long-lasting loess sedimentation, the climate must have been cold and dry, with the mean annual temperature not higher than  $-5^{\circ}\text{C}$  (Jersak 1988). Occasionally, enclaves of dwarf trees and brush clusters persisted. Around Dzierżysław I herbaceous plants dominated. At that time the people of the Early Phase of the Micoquian culture briefly occupied the site.

##### **The Early Upper Palaeolithic**

In the Moershoofd Interstadial the site of Dzierżysław I was surrounded by forest-tundra with birch, pine and willow. Some researchers maintain that in that Interstadial even thin coniferous forest could have existed (Starkel 1983) with numerous, small and shallow water reservoirs and peat-bog. Permafrost could have partially disappeared. The mean July temperature is inferred to have been slightly higher than in central Poland (Tobolski 1984) i.e. more than  $11^{\circ}\text{C}$ , the annual mean temperature was up to  $2^{\circ}\text{C}$ , and annual precipitation is estimated at more than 400 mm. Such climate is described as moderately cool and wet. In the Moershoofd Interstadial the Bohunician population groups occupied the site.

In the interval of climatic cooling, after the Moershoofd Interstadial, clusters of trees could survive in sheltered areas such as e.g. some sections of valley floors. Forest-tundra covered the terrain around the site probably also in the next, Hengelo Interstadial (Chmielewski *et al.* 1961, Mamakowa, Rutkowski 1989, Wiśniewski 2003).

In the next cold episode between the Hengelo and the Denekamp warmings, the climate became more severe, permafrost, frost structures and *palsa* forms developed. The mean annual temperature was, at least, below  $-1^{\circ}\text{C}$ , and the temperature of below  $-10^{\circ}\text{C}$  is estimated to persist for at least 120 days, while annual precipitation was less than 400 mm (Washburn 1988). The vegetation cover was much more impoverished than in the previous cold episode. This was, probably, only brush tundra with occasional single trees which is indicated by pine charcoals at Dzierżysław I. The fact that frost crack structures developed suggests that some areas were stripped of vegetation which caused – as the snow cover was insufficient – that thermal contraction occurred in the frozen ground. In this cold Interstadial Szeletian population occupied the highest part of the Black Hill.



**Fig. 8.** Stratigraphic situation and chronology of sediments in trenches 1/89 and 1/92 (correlated with isotope curve of the Vistulian): Trench 1/89: 1 – sandy laminated loess (TL –  $180 \pm 35$  Kyr), 2 – stratified loess topped with pedogenesis and solifluction (TL -  $> 100$  Kyr), 3 – gley tundra soil developed on loamy sediment (the top is hydro-morphic) disturbed by palsa formation and cut by ice wedges (sediment pedogenetically transformed TL dated  $> 75$  Kyr), 4-6 – solifluction (TL dated  $240 \pm 50$  Kyr,  $125 \pm 55$  Kyr,  $36.5 \pm 5.5$  Kyr and  $22 \pm 3$  Kyr), with *Pinus silvestris* charcoals, 7 – bipartite loess stratified at the bottom; traces of gley or initial tundra soil (horse bone from this layer C14 dated –  $19.65 \pm 0.2$  Kyr). This loess is intersected by ice wedges, 8 – Holocene soil. Trench 1/92: 1 – yellow-orange laminated loess, 2 – laminated loess with organic carbon content, 3 – grey loess with contorted lamination, 4 – yellow-orange loess with strongly undulating lamination, 5 – pale loess with organic carbon content, 6 – calcareous slightly laminated pale loess topped with carbonate precipitations, 7 – dark beige loess rich in organic carbon, 8 – pale loess, 9 – pale loess enriched with organic carbon, 10 – youngest loess horizon, 11 – Holocene soil. M – Micoquian artifacts, B – Bohunician artifacts, S – Szeletian artifacts.

Stratigrafická situace a chronologie sedimentů ve výkopech 1/89 a 1/92.

In the Denekamp Interstadial the climate became not only relatively warmer but also precipitation increased which caused that – as permafrost was extensive – the ground was strongly saturated and thermo-karst developed (Mojski 1993) including the degradation of *palsa* forms. It is assumed that in southern Poland forest tundra with pine and birch was present. The climatic conditions at Dzierżysław I were probably milder than those inferred for south-east Greater Poland (Kozarski 1991), which has been confirmed by observations from Jaroszów in Lower Silesia (Krzyszowski *et al.* 1996). For Greater Poland observations were made on the basis of habitat requirements of *Selaginella selaginoides* – a diagnostic plant present in Denekamp sediments. The mean July temperature at Dzierżysław was  $+10^{\circ}\text{C}$  to  $+14^{\circ}\text{C}$ , the mean January temperature was from  $-15^{\circ}\text{C}$  to  $-25^{\circ}\text{C}$ , summer precipitation was 300–350 mm, the snow cover persisted for 200–220 days and the vegetative period lasted from 60 to 90 days. In the region around Cieszyn, situated in the north-east part of the Moravian Gate, the landscape was dominated by communities of *Cyperacea* and *Graminae*. Trees with a high potential of adaptation to a variety of ecological conditions were scattered or grew in

small clusters. The climate was variable: from relatively severe and dry, through somewhat milder and wetter, to increasingly arid with arctic-continental features (Niedziałowska, Szczepanek 1993–1994).

Another major cool episode took place at about 22–20 Kyr. B.P. It caused the degradation of plant cover, numerous mud flows and solifluction. Subsequently, the climate became more continental, loess accumulated and large frost structures and ice-wedges developed. The mean annual temperature was below  $-6^{\circ}\text{C}$ , the thermal gradients were large (up to about  $20^{\circ}\text{C}$ ) and precipitation was very low (Goździk 1973, Jersak 1991, Jary – Kida 1993).

#### Dynamics of settlement processes

##### The Bohunician

The Bohunician camp was set up near the edge of the upland, above the broad depression, at an elevation of 286–287 m a.s.l. This is in agreement with the model of settlement behaviour typical for Moravia where the Bohunician population was attracted by the borderland between uplands and lowlands,

at between 250–400 m a.s.l. (Svoboda 1995, 1999). J. Svoboda claims that such location of a camp allowed to control two different types of environment.

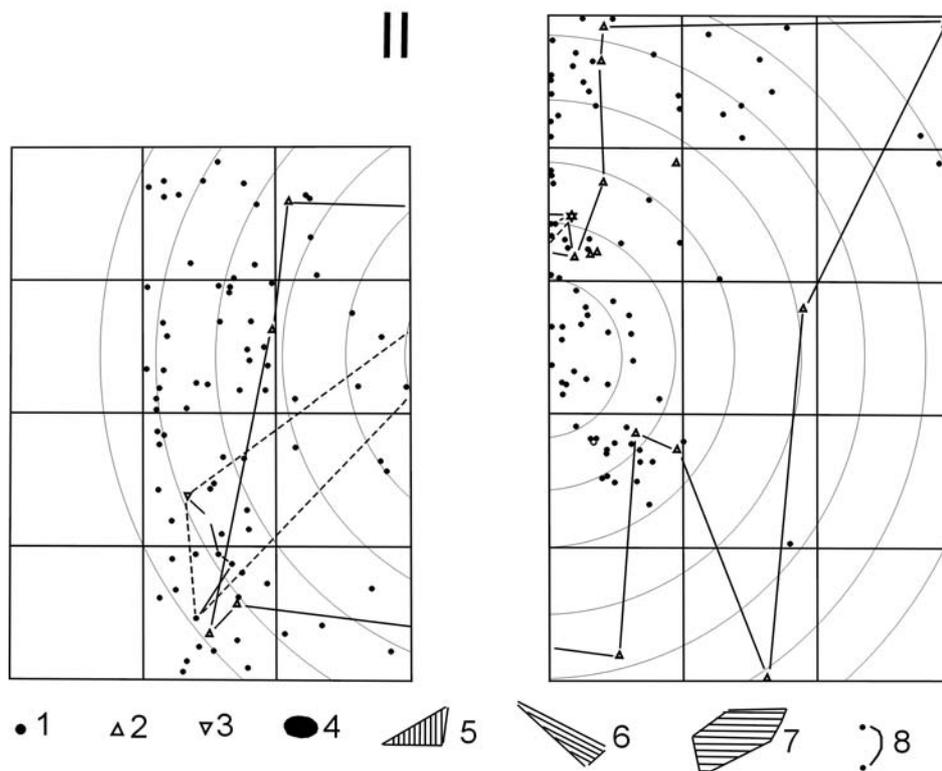
The camp at Dzierżysław I functioned in the central and in the higher part of the southern slope of the Black Hill, but at a distance from its culmination. This location probably protected the camp from the blasts of wind and allowed to take advantage of the sunny exposure. Moreover, the camp was set up on sand-loamy or loam-sandy sediments. In the conditions of permeable, sandy substratum the ground dried more quickly and became warm – especially when exposed to the sun. In the territory of Upper Silesia the norm seems to have been to avoid culminations when a camp-site was selected (Foltyn 2003). In the territory of Moravia camps are located both below as well as on culminations (Škrdla 2002).

The scatter pattern of artefacts at the Bohunician camp-site shows that it was formed of three small and one large locus. On the basis of refits we can assume that the initial patterns were slightly spread out and displaced. This was caused by the development and, later, degradation of *palsa* type structures, solifluction and congelifluction processes.

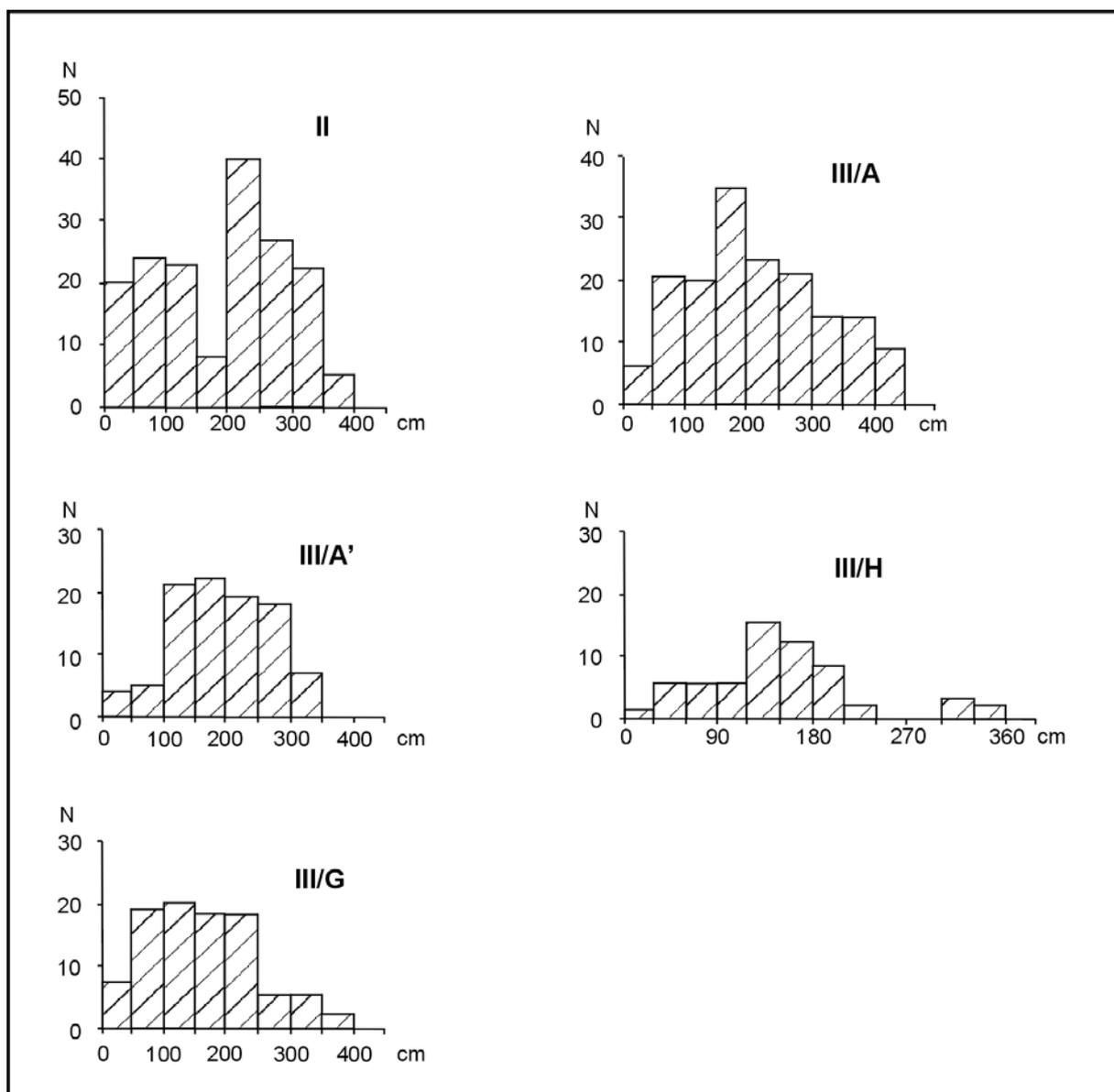
Locus I, unfortunately disturbed, was situated closest to the top of the Black Hill. Its destruction makes a reliable interpretation of this locus impossible. All we know is that the inventory from locus I exhibits workshop – domestic activity zone characteristics: a high proportion of cores (7.7 %), flakes (50.8 %), blades (20.3 %), technical waste (3.7 %) and a large percentage of tools (13.0 %) (comp. Kozłowski 1980).

Locus II was registered about 9 m south of the first one, lower down on the slope (Fig. 6). In outline locus II is an oval

concentration with the longer axis (6.86 m) NE–SW oriented, covering an area of 20 sq.m. The biggest dispersal of a refit of four fragments is up to 70 cm. Other fragments of refits are usually less than 5 cm from one another. When we take into account the density of artefacts locus II with the index of 11.15 specimens/sq.m. seems fairly rich in finds. The density of tools is also fairly high: 1.45 spec./sq.m. Cores are much less frequent (0.15 spec./sq.m). Cores and tools are distributed both inside the locus and at its edges, or even – as is the case of tools – outside the concentration (Fig. 9). The ring and sector method (Stapert 1990, 1992, 2003) revealed a bimodal distribution of flint artefacts. The first maximum can be seen at about 0.5–1.0 m from the hypothetical centre of the locus. The second is at about 2.0–2.5 m from the centre. The two zones of the biggest – on the scale of the whole assemblage of locus II – concentrations of debitage products overlap with the concentrations of cores and tools (Fig. 9, 10:II). According to D. Stapert (1992) – the creator of the ring and sector method – the bimodal distribution is signalled by remains from a habitation structure. From the area of locus II were collected: 3 cores, 69 flakes, 28 blades, 39 chips, 11 items of technical waste, 44 chunks, 26 tools (5 perforators, 4 burins, 3 endscrapers, 2 notched tools, 2 half-products of leaf points, 2 *pointes à face plane*, 2 retouched flakes, a Levallois point, a side-scraper, a raclette, a truncation, a hammerstone and three burins spalls. The frequency of major technological groups suggests that this was a workshop-domestic activity zone inventory (Kozłowski 1980). The high proportion of flakes, chips and tools is striking. It should be added that most tools show no traces of use. Usewears can be seen on only four tools (Winiarska-Kabacins-



**Fig. 9.** Dzierżysław, site 1. Scatter pattern of locus II: 1 – debitage products, 2 – tools, 3 – cores, 4 – seat/anvil, 5 – northern sector, 6 – southern sector, 7 – distribution of tools used for meat and hide processing, 8 – refitted pieces.  
**Dzierżysław, lokalita 1. Distribuce artefaktů v rámci plochy II.** 1: debitaž, 2: nástroje, 3: jádra, 4: sedátko/kovadlina, 5: severní sektor, 6: jižní sektor, 7: rozptyl nástrojů užitých ke zpracování masa a kůže, 8: složené kusy.



**Fig. 10. Dzierżysław, site 1. Diagrams of the artifacts density according to ring-and-sector method. Dzierżysław, lokalita 1. Histogramy hustoty artefaktů podle ring-and-sector metody.**

ka 1993). Two of them: a retouched blade and a burin were used for wood working. In addition, the burin shows abrasion from a wooden haft. Another burin was repaired. Summing up: locus II can be interpreted as a domestic activity zone with a habitation super-structure: a windbreak or a shelter. Besides domestic activities such as preparation and consumption of food, also tools were made, repaired and fitted in hafts.

At a distance of 22 m from locus II, locus III is situated southernmost and lowest (Fig. 6). Locus III covers an area of 180 sq.m of which 78 sq.m were excavated. The whole area is divided into units 8–9 (A–A' – H) which contained refits. The units surround the *alas* lake measuring 8–12 x 5–5 m.

An oval concentration H is situated in the north-west corner of locus III and covers an area of 8 sq.m. Tools are fairly uniformly distributed. Analysis by means of the ring and sector method (Stapert 1980, 1982) has shown that the concentration is unimodal with the maximum density of artefacts at about 1.3–1.5 m from the centre (Fig. 11, 10: III/H). The density index is 7.5 specimens/sq.m. The index of tool density is 0.88

spec./sq.m. Cores are absent. The inventory consisted of: flakes – 22, chips – 4, blades – 7, and two items of technical waste, chunks – 18, tools – 7 (a side-scraper, a raclette, a retouched blade, retouched truncations, a denticulated tool, a half-product of a leaf point, a burin). Three tools – the burin, the retouched flake and the denticulated tool – were used for wood working. The retouched truncation, the leaf point and the side-scrapers show use wears from quartering carcasses and from hide treatment. The leaf-point was repaired – possibly during use. These artefacts were located almost precisely at the southern edge of the concentration. Thus, the concentration seems to constitute two, separate sectors: the southern and the northern (Fig. 11). In the northern part of this zone the working of wood was carried out, hafts and wooden spear-shafts were made etc. In the southern part carcasses of hunted game were quartered – perhaps in a preliminary fashion – and hides were treated.

Concentration G, also oval in outline, is the part of locus III farthest to NW. Concentration G was excavated over an area of 13.5 sq.m. The southern boundary of the concentration, adja-

cent to concentration F, is obscure. In the western part of the concentration a stoneblock was discovered – this could have been a seat or an anvil. The stone block was brought to the site from outside the site area (Jochemczyk 1992). The position of the stone seat suggests that the uncovered concentration is no more than a half of a larger feature – unless we assume that the stone seat's excentric position was intentional. Tools are scattered around the edges. Cores are nearer the stone seat, dispersed in a radius of 0.8–1.3 m. At the same time the cores are within the area delimited by the tool scatter-pattern (Fig. 11). The scatter-pattern of finds analysed using the ring and sector method has shown a unimodal distribution with the biggest accumulation of artefacts at about 1.3–1.5 m from the centre (Fig. 11, 10:III/G). The index of artefact density is about 7.2 spec./sq.m. Cores are 0.22/sq.m, tools – 0.3/sq.m. The inventory consists of: cores – 3, flakes – 44, chips – 4, blades – 7, technical waste – 7, chunks – 28, tools – 3 (a half-product of a leaf point, a retouched truncation, a splintered piece), and a burin spall. The leaf point and the retouched truncation show micro-use-wears from working meat and hide. The leaf-point is a good example of a tool which was unsuitable for the original purpose and was used in a secondary function. To sum up: concentration G could have been a workshop zone where lithic raw materials

were processed, tools were produced, e.g. burins, and – to a smaller extent – carcasses were quartered and hides were treated.

Concentration F belongs to the smallest features (about 5 sq.m). It forms a bi-partite wavy belt, 0.83–1.2 m wide. The density of artefacts is 6.6 spec./sq.m: cores – 0.2 spec./sq.m, tools – 0.4 spec./sq.m (Fig. 11). The inventory consisted of a core, 22 flakes, 4 blades, one item of technical waste, 3 chunks, 2 tools (a side-scraper, a denticulated tool). The side-scraper shows use-wears from intensive exploitation for wood shaving and smoothing. Therefore, a possibility that in this concentration hunting equipment (for example spear shafts) was made cannot be excluded.

Concentration A' is situated 5 m to the south of concentration H. It is oval in outline, fairly large covering 15 sq.m. The concentration could be incomplete. The horizontal scatter-pattern suggests that in the interior of the concentration, slightly excentrically, a large stone block is situated – either a seat or an anvil. The density of lithic artefacts is not uniform. Around the stone seat, within a radius of 0.5 m, a small number of artefacts is distributed. At the edges, to S and E, the number of artefacts increases and forms a kind of curved belt. From the NW side artefacts form, approximately, a trapeze 4.5 m long and 4.5 m

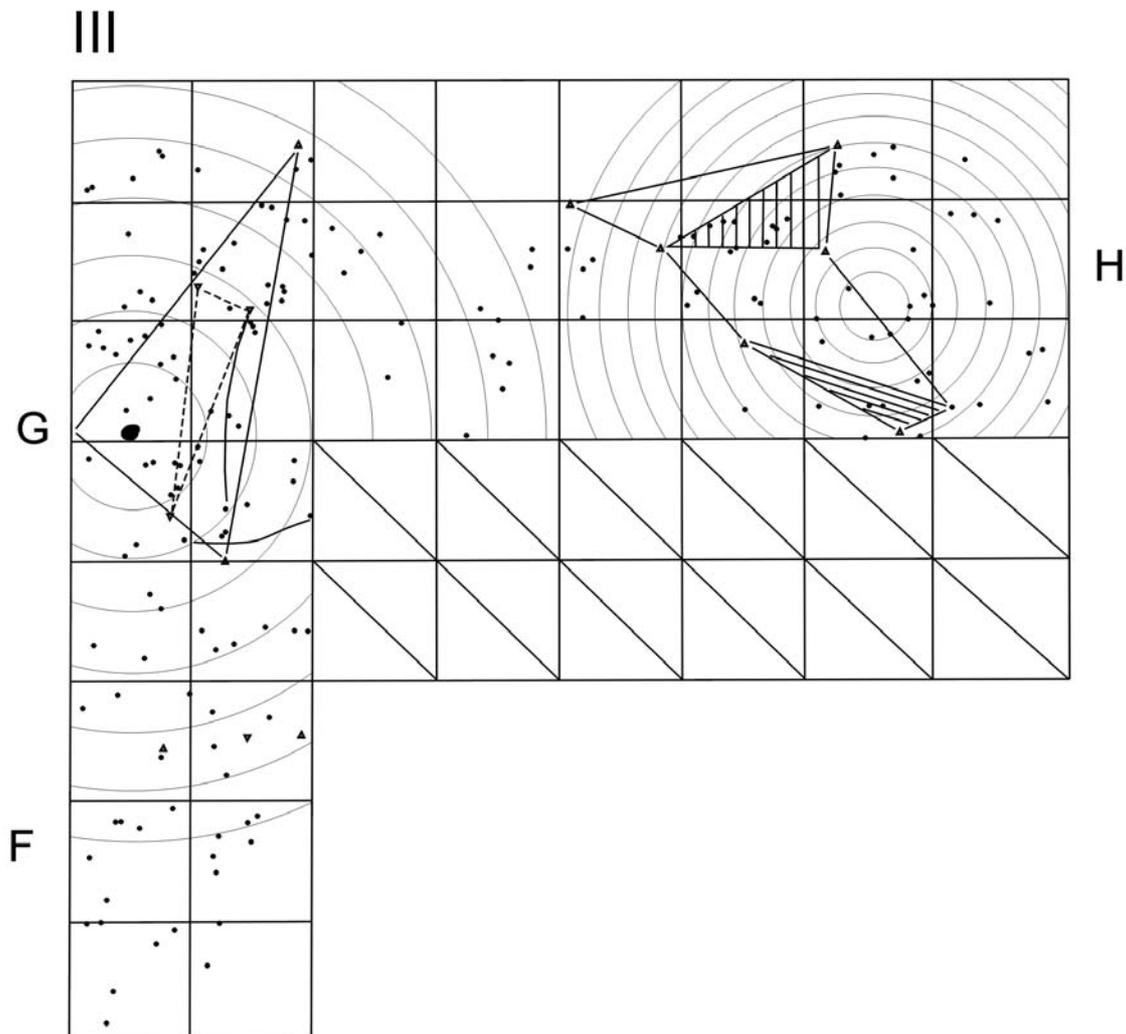


Fig. 11. Dzierzysław, site 1. Scatter pattern of locus III, concentrations F, G, H (Key see Fig. 9).  
Dzierzysław, lokalita 1. Distribuce artefaktů v rámci plochy III, koncentrace F, G, H (popis viz Fig. 9).

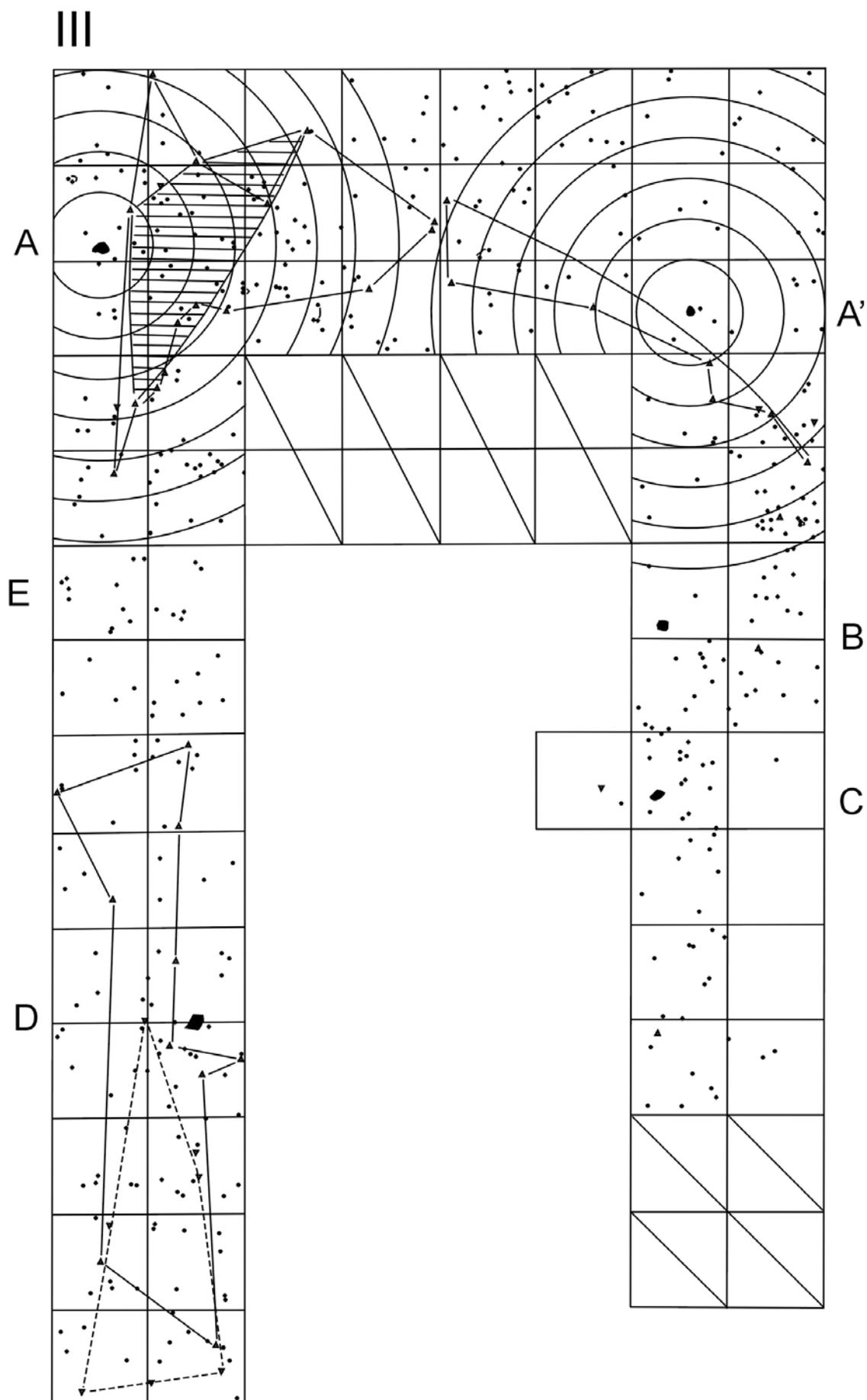


Fig. 12. Dzierżysław, site 1. Scatter pattern of locus III, concentrations A, A', B-E (Key see Fig. 9).  
 Dzierżysław, lokalita 1. Distribuce artefaktů v rámci plochy III, koncentrace A, A', B-E (popis viz Fig. 9).

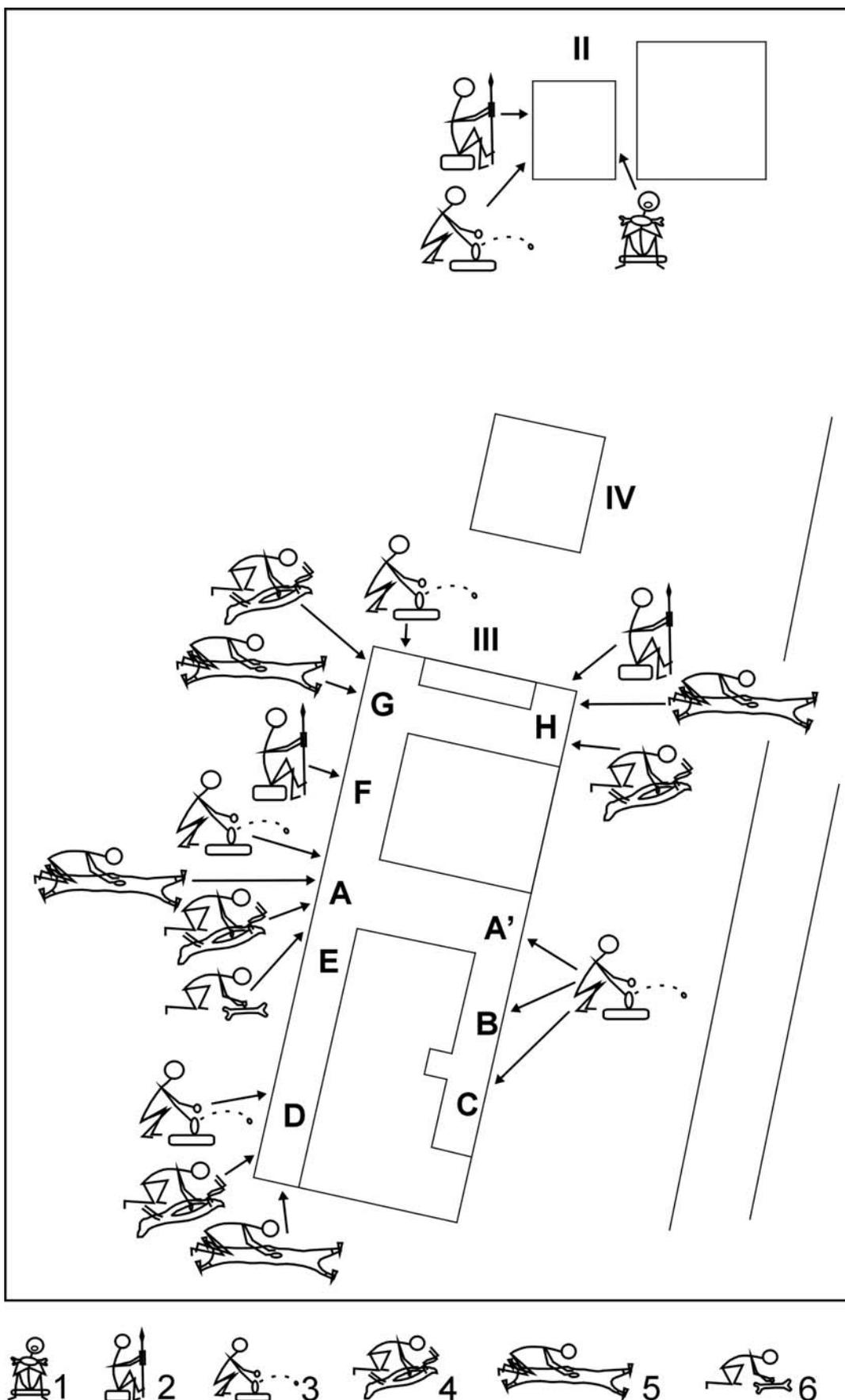


Fig. 13. Dzierżysław, site 1. Activity areas: 1 – food processing and consumption, 2 – wood working, 3 – flint processing, 4 – butchering, 5 – hide treatment, 6 – bone processing.

Dzierżysław, lokalita 1. Prostorové rozložení jednotlivých aktivit. 1: zpracování a konzumace potravy, 2: opracování dřeva, 3: opracování pazourku, 4: řeznictví, 5: zpracování kůží, 6: zpracování kostí.

broad (Fig. 12). If we hypothetically replaced the seat by a hearth then such a distribution would be in agreement with the model by L. Binford (1983) who distinguishes three drop zones: a drop zone near the hearth, a backward toss zone and a forward toss zone. Tools were scattered in the southern part of the concentration, basically in the peripheral zone. Cores group in the SE part. This gives the so-called centrifugal effect. In the light of the ring and sector method, bearing in mind that the concentration is incomplete, the concentration shows a unimodal scatter pattern, with the maximum artefact density in the mode from 1.5–2.0 m from the seat/anvil (Fig. 12,10:III A'). The index of artefact density is 6.8 spec./sq.m. The core density does not exceed 0.13 spec./sq.m. The index of tools is higher – 0.52 spec./sq.m. The inventory consisted of: 2 cores, 28 flakes, 8 blades, a chip, 7 items of technical waste, 49 chunks, 6 tools (a pseudo-Levallois point, a retouched blade, an initial leaf point, a truncation, a denticulated tool, a hammerstone). One burin spall was present. It should be added that with the exception of the hammerstone, tools do not show use-wears.

On the southern side concentration A' is contiguous and overlaps with a part of concentration B. This concentration covers an area of about 7 sq.m and, in all likelihood, too surrounds a stone seat/anvil. On the southern side of concentration B contiguous to it and partially overlapping, is a fragment of concentration C (measuring 5.5 sq.m in area). Unlike in concentration B the stone seat/anvil in concentration C is placed excentrically. The inventory in concentration B contained: 15 flakes, 4 blades, 2 items of technical waste, 37 chunks, 2 tools (an initial leaf point, a hammerstone). The leaf-point exhibits no use-wears. Concentration C yielded: one core, 14 flakes, 3 chips, 6 blades, 2 items of technical waste, 18 chunks, and only one tool – a side-scraper that was found in the southern part of the concentration. The tool shows use-wears from cutting meat with hide. It is likely that the tool had been lost and it remained in the concentration, or that it was brought there to be repaired. The index of artefact density is higher in concentration B – 8.6 spec./sq.m – than in concentration C which is 8.2 spec./sq. In respect of the index of tools the situation is similar viz.: 0.29 spec./sq.m and 0.18 spec./sq.m respectively. The core index in concentration C is 0.18 spec./sq.m.

Concentration A, B and C can be interpreted as small, open-air, workshops where no more the several concretions were reduced. The workshops produced hunting equipment and tools for post-hunting activities.

Concentration D, uncovered in the SW part of locus III – unfortunately only partially explored – differs from the other concentrations. The scatter-pattern of finds forms a belt; the finds are uniformly distributed. The belt is NS oriented, 2 m wide and 8.0 m long. In the centre a stone block (seat/anvil) was discovered. Tools occur in the whole belt, but areas with cores are separate (Fig. 12). The index of artefact density is 7.3 spec./sq.m, the core index does not exceed 0.44 spec./sq.m, the tool index is 0.63 spec./sq.m. The inventory included: 7 cores, 44 flakes, 3 chips, 10 blades, 13 items of technical waste, 30 chunks, 8 tools (a side-scraper, a raclette, a denticulated tool, a notched tool, a Jerzmanowice point, an end-scraper, a truncation, a retouched flake). Two burin spalls are present. The Jerzmanowice point functioned initially as a spear – point. Subsequently, when the tip had broken, it was used as a knife.

Concentration D is an example of a working area where activities such as core reduction, tool production, e.g. of burins, took place. In this area the hunted game was stored and quartered, also hides were treated. When a spear with a flint point was pulled out from the body of the dead animal the point was often broken. However, the damaged point was not thrown away but brought to the side and retrimmed to function as a knife for meat carving. The presence of a notched and a denticulated tool may also evidence wood working.

In the immediate vicinity of concentration A', on the west side, concentration A covers an area of 14 sq.m; the two concentrations are separated by a belt 0.5 m wide without finds. The status of concentration E (2 x 2 m) is not clear. It is situated in between concentrations A and D and may be the continuation of the former. Concentration A is a lenticular nucleus and irregular, elongated branches. On the western side of concentration A a stone block – a seat/anvil – has been preserved. The position of the stone block suggests that only a fragment of a larger concentration extending to the west has been excavated. Tools occur mainly round the edges (Fig. 12). The scatter pattern of finds from the explored part, examined by means of ring and sector method, revealed a unimodal distribution. The maximum density of artefacts is at a distance of 1.5–2.0 m from the centre – the stone seat/anvil (Fig. 12,10:III/A). The index of artefact density is highest – just as in other concentrations – 9.6 spec./sq.m, also of tools which is 9.6 spec./sq.m and cores – 0.11 spec./sq.m. On the other hand, the index of chips is higher than in the other concentrations. The inventory numbers 173 artefacts including: 2 cores, 56 flakes, 15 chips, 20 blades, 9 items of technical waste, 54 chunks, 17 tools (3 retouched flakes, 2 side-scrapers, 2 burins, 2 retouched truncations, 2 notched tools, a Levallois point, a Jerzmanowice point, a *pointe à face plane*, an end-scraper, a retouched blade, a splintered piece). On the basis of use-wears we have established that two tools – the Jerzmanowice point and the retouched blade – functioned as knives for dividing carcasses. The Jerzmanowice point was also used as a spear point. The two side-scrapers were used to remove meat from bones and to work fresh skin. One of the side-scrapers was retrimmed. The burin was hafted. It is of interest that the haft was fitted at the point where the burin had been detached. In terms of function concentration A(+E) was a zone where a variety of activities were performed: preparation and core reduction, tool production, repairing, and hafting; post-hunting activities such as: the quartering of carcasses, meat cutting, also processing of fresh hide and bone with meat. We can formulate a conclusion that, in comparison with other concentrations, concentration A(+E), together (or in addition to) with concentration D within locus III was of considerable importance.

Concentrations A–A'–H represent different latent structures, and zones of different activities. Small, short-term flint processing workshops are represented by concentrations A', B, C, whereas concentrations D, G, and F represent zones of complex activities. They were, probably, also workshops but this function lost its importance on behalf of post-hunting activities, provision and storage, quartering of carcasses, meat cutting, wood and bone working, treatment of hide. A different hypothesis can also be suggested namely that the workshop and post-hunting activities took place alternately. On the other hand, the paucity of the inventory seems to argue against it. Concentra-

tion H represents a different situation: here carcasses were divided, hide was treated, and – mainly – wood was worked.

The concentrations within Locus III surround the palaeo-lake that functioned as a water reservoir needed, among others, for the softening of hide. Simultaneously, it could also function as a rubbish dump into which lithic and organic remains were thrown. Such an interpretation is further supported by the increased proportion of CaCO<sub>3</sub> in the sediments of the palaeo-lake which, at least partially, come from animal bones and meat dissolved in the acid tundra boggy environment.

Because the concentrations in Locus III are complementary the territorial and chronological integrity of this locus can, justifiably, be assumed.

In between locus III and locus II a poorly discernible locus IV (trench II/62) was documented. It contained about 12 flint artefacts scattered over an area of 25 sq.m (Fig. 6). This seems to have been an *ad hoc* organized workshop where 2 cores were exploited using a hammerstone, and a halfproduct of a leaf point was made.

Summing up we can say that the Bohunician level is either a complex, very large settlement complex, or the result of at least two occupational episodes (comp. Kind 1985). If we adopt the first interpretation then in terms of function we can distinguish a zone of basic activity (locus III) and zones of auxiliary activities (loci I–II, IV) (Fig. 13). According to the second interpretation we are having to do with two, chronologically different, comparable as to the area, and multifunctional settlement structures. An indirect premise in support of the first interpretation is the complementary character of the functions of locus II and III i.e. the habitation zone and the domestic economy zone. Another argument could be the fact that a dump is associated, but – at the same time – separate from the habitation zone. A rubbish dump demarcates the boundary between culture and nature, between the clean and the dirty, between “us” and “others” (Hodder 1990, 1995).

The camp (camps) on the culmination of the Black Hill at Dzierżysław was inhabited by the Bohunician population from Moravia. This is evidenced by the presence of the quartzite from Drahaný Upland. During hunting trips a semi-permanent camp (camps). It constituted a centre from which the surrounding territory was penetrated. A satellite camp in relation to Dzierżysław I could, in all likelihood, have been Maków 15. An important fact that bears witness to probable associations between the two sites is the similar raw materials structure (Foltyn in print). Other camps of this type could be Dzierżysław 8, 4, Kietrz 4, 7, 10, Rozumice 16, 32, 36 (Foltyn 2003, Kozłowski 2000).

Little can be said about the seasonality or duration of settlement because no bone remains were found. The size of the site, large quantities of technical waste from tool production and retrimming, time-consuming activities e.g. hide treatment, suggest longer sojourns, probably from spring (late?) to autumn (?).

### The Szeletian

The scatter pattern of Szeletian artefacts indicates displacement by intensive solifluction and deluvial processes. This was related to the fact that the Szeletian population settled the top part of the Hill, north of the Bohunician locale. The Bohunician

and the Szeletian occupation are stratigraphically superimposed only in trench I/62.

In the eastern part of the top of the Black Hill Szeletian artefacts are dispersed: in trench II/58 there were only 28 artefacts, in trench III/58 – 23 artefacts, and in trench I/59 – 6 artefacts. The artefacts were contained within the loess and silty intercalations of the upper portion of the interpleni-glacial sediments disturbed by solifluction. The artefacts were variously positioned: from horizontal to nearly vertical position, most often they were located obliquely to the vertical axis at an angle of 40°; the longer axis of artefacts repeated the direction of solifluction.

In the western part of the culmination the displacement of artefacts was smaller, although here, too, they rested within all the intercalations of the solifluction series, including a thin layer at the floor of the solifluction series. In trench I/58 an oval structure made up of 41 erratic stones was discovered (Kozłowski 1964 Table II, Kozłowski, Kozłowski 1977, fig. 5) extending along the NE–SW axis; it measured about 2 m in diameter. The stones building the structure measure up to 35–45 cm in diameter. Some of them show thermal cracks, although there are no traces of hearths in the vicinity – possibly washed down by solifluction. In between the stones – most of which rested on the lower silty layer – was a shallow basin filled with reddish sand.

The preserved structure is, in all likelihood, a remnant of a habitation structure whose centre was a small basin dug in the surface of thawed ground; it was surrounded by erratic stones that constituted a foundation for the roof of poles or branches. When the solifluction processes set off some of the stones around the basin, on its east side, were shifted to the middle of the basin, while those on the western side still form a semicircle. The erratic stones of which the structure is built come from the morainic pavement about 50 m below the culmination of the Black Hill.

Only a few Szeletian artefacts occurred within the structure, but they are more numerous on its southern side, close to its boundary. On the north side there was a belt without finds, about 2–3 m wide. It is only beyond this belt that within trenches I/57 and I/58 a concentration of about 50 lithic artefacts was discovered.

In the eastern part of the site there occurred mainly cores (6), and products of flint debitage (ca 50), also a halfproduct of a leaf point. This zone functioned, most probably, as a workshop. On the western part of the site lithic tools were more numerous, notably leaf points (3), flakes with surface retouch (2), retouched truncations (2), side-scrapers (3), accompanied by blades and unretouched flakes.

The Szeletian camp at Dzierżysław I was a base camp set up at the culmination of the Black Hill. Its most important element is the habitation structure with the hearth next to it and the basic activities zone. The workshop zones were located at the peripheries where blanks and preforms of leaf points were produced. The camp functioned probably in one occupational episode. Because the foundation of the habitation structure is built of large erratic blocks, the occupational episode spanned cooler seasons as well (spring-beginning of winter). However, this hypothesis cannot be verified as no faunal remains have been preserved.

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### Resumé

Příspěvek se zaměřuje na detailní analýzu geomorfologické a geologické situace v místě lokality Dzierżysław 1 a v jejím blízkém okolí. Detailně hodnotí environmentální faktory, které ovlivnily opakované osídlení v zájmovém prostoru (vegetaci, přítomnost vody). Všimá si umístění lokalit v terénu – zatímco micocquien a bohunicien preferoval lokalizaci na závětrném jižním svahu Černé hory, szeletien sídlil přímo na vrcholu.

Studie se zaměřuje též na dynamiku sídelních procesů na lokalitách bohunicien a szeletien. Vlastní analýza využívá teoretických modelů navržených Stapertem (1990, 1992, 2003) a Binfordem (1983). Autoři předpokládají přítomnost sídelních struktur a analyzují vztahy jednotlivých skupin artefaktů k těmto strukturám. Výsledkem je pak model (pro bohunicien), který rozlišuje jednotlivé aktivity v prostoru (cf. Fig.13). Autoři předpokládají vazbu bohunického osídlení na moravské lokality, což dokládají přítomností drahanských sluňáků v Dzierżysławu.