Moravia at the onset of the Upper Paleolithic

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Prologue

Rapid advances in genetic analysis in the last decades have provided important insights into the genetic history of humankind. The analysis of mitochondrial DNA of living people in the 1980s had identified mitochondrial Eve – a hypothetical ancestor of all present day living women – who lived around 200 ka in Africa (Cann et al. 1987). In addition, paleoanthropologists at the time also formulated a hypothesis proposing the spread of Anatomically Modern Humans (AMH from here) into the rest of the world and their genetic interactions with the local archaic populations – the Out of Africa hypothesis (Stringer, Andrews 1988), Multiregional Evolution hypothesis (Wolpoff et al. 1984), and Assimilation hypothesis (Smith et al. 1989). More recently, the completion of the Human Genome Project and sequencing of ancient Neanderthal DNA in particular allowed a comparison of both (Green et al. 2010). As the present-day Europeans and Asians share a small percentage of Neanderthal DNA in their genome, limited interbreeding between AMH and Neanderthals has occurred. The question is where it took place – one of the hottest candidates for that evolutionary event is the Near East, where both AMH and Neanderthals were documented during the time span ~120–80 ka BP before AMH spread into the rest of Eurasia. AMH groups expanding eastward to Eastern Asia and Australia met another Neanderthal derived population – Denisovans – and another interbreeding event resulting in an increase of ‘archaic’ DNA took place somewhere in Asia (Reich et al. 2010). The earliest European AMH fossil find from Pestera cu Oase contains 6–9% of Neanderthal DNA which suggests that interbreeding also took place in Europe (Fu et al. 2015). Although this particular population is extinct today, this finding shows that gene flow between AMH and Neanderthals continued around 40 ka cal. BP. Current advances in genetic analysis opened the door to a different level of analysis and confronted current archaeology with one of its greatest challenges – to connect the archaeological record with the genetic history that is written in our genome.

The earliest evidence of anatomically modern morphology is currently known from Jebel Irhoud in Morocco (Hublin et al. 2017), where human remains were recently dated to 315 ± 35 ka BP by thermoluminescence (Richter et al. 2017). There is only a narrow corridor connecting Africa to Asia – the Sinai Peninsula from where people followed a northern or a southern route (cf. Will et al. 2015). Somewhere in that area, the AMH and Neanderthals met each other resulting in a limited gene flow between both populations. The Near East is a nodal point on a hypothetical geographic route from Africa to Asia where both populations have been recorded in a specific time period so it is likely that interbreeding events took place there. The first appearance of AMH out of Africa was documented at Skhul cave in the Mount Carmel close to the current Mediterranean sea coast line, and in Qafzeh rock shelter on the Mount of Precipice in the Lower Galilee. Both of sites yielded remains of several individuals associated with Mousterian (Tabun C type) artifacts. In addition, Nassarius gibbosulus shells that were probably intentionally perforated were found in Skhul (Vanhaeren et al. 2006). Glycimeris insubrica shells with natural holes probably modified by humans (string) were found at Qafzeh rockshelter (Bar-Yosef Mayer et al. 2009). The age estimates for both sites range from 100–130 ka BP (Grün et al. 2005). An AMH calvaria found at Manot cave in Western Galilee has been dated to around 55 ka BP (Hershkovitz et al. 2015). Not far from Skhul Cave, near Mount Carmel, Tabun...
A cave known for its long stratigraphic sequence has yielded Neanderthal skeletal remains from level C. The estimated age is in the same time span as Qafzeh and Skhul (Grün et al. 2005). Slightly younger ages were estimated for other Neanderthal human remains in the region – 48–60 ka BP for Kebara cave located close to Mount Carmel Caves (Valladas et al. 1987) and 50–70 ka BP for Amud Cave in the Lower Galilee (Valladas et al. 1999). Currently available date suggest that both populations – Neanderthals and AMH – although probably employing different subsistence strategies (Lieberman, Shea 1994), were present in the Near East around 130–50 ka BP. This is the time period when the main interbreeding event is expected to have occurred.

Approximately 200km to the south of Mount Carmel in the Negev Desert (and still in the Near East) is another important site relevant to the technological development towards the Upper Paleolithic – Boker Tachtit. The site is located on the right bank of the Nahal Zin river terrace, near the present day township Midreshed Gurion. As human remains were not recovered at this site, the makers of the recovered artifacts are unknown. The site consists of four superimposed layers dated to the time span between 50–40 ka BP. While the three lower layers attributed to the Emiran are characterized by bidirectional production of elongated Levallois points including Emireh points from one core and Upper Paleolithic tool types in typological spectrum (including end scraper and burins), the upper layer shows different technology – production of elongated convergent blanks. Based on this sequence, A. Marks (1983) defined the Middle to Upper Paleolithic transition, i.e. between layers 3 and 4. In addition, the technology of this site was reconstructed in detail using refitting (Volkman 1983) which allows us to compare it with other sites from this period. On the opposite bank of the Nahal Zin is another important site – Boker – an Early Ahmariam site. The Early Ahmariam, fully Upper Paleolithic blade industry with el-Wad points can be seen as a next step in the local technological development and may represent a predecessor of the European Proto-Aurignacian.
The anatomical modernity of early AMH in Africa was supplemented by behavioral modernity that included various behavioral innovations (e.g. McBrearty, Brooks 2000). When tracing only a single attribute of symbolic behavior – personal ornaments made from shells (beads) – the earliest evidence is known from Qafzeh and Skhul in the Near East, and slightly later at many sites in Africa (e.g. Blombos Cave, Border Cave, Oued Djebbana, Grotte des Pigeons; e.g. d’Errico, Stringer 2011; Zilhão 2007). At a slightly later time, but still before 40 ka 14C BP shell beads were found in association with the Initial Upper Paleolithic in Üçağizli Cave in Türkiye (Stiner et al. 2013). The earliest European shell beads dating to around 44 ka cal. BP from Líšeň are associated with a specific (Líšeň Podolí I-type) Early Upper Paleolithic industry, while in other parts of Europe shell beads are associated with Proto-Aurignacian and Early Aurignacian industries (Zilhão 2007). At a similar time (i.e. in the period when first AMH penetrated the European continent), the use of shells was documented in a Neanderthal context e.g. Cueva de los Aviones (Zilhão et al. 2010).

We can conclude that even if the trajectory of those finds correlates with the trajectory of AMH advance, more research (including discovery of new sites with new finds, well dated and associated with human fossils) in this field is needed.

Given the lack of skeletal remains in Central Europe where humans occupied open air sites where osteological material was dissolved during pedogenesis, how do we trace the dispersal of the AMH? One possible way is to try and trace attributes of modern behavior and focus on inorganic material that has survived in the archaeological record. This material often includes only rock that was used to make stone tools. We are able to study raw material procurement including raw material networks, technology of production blanks and typology of tools. On rare occasions, shells have also survived in the aggressive soil sediments.
1. Introduction

1.1. The actors and the techno complexes

Moravia is well known for its Middle and Upper Paleolithic sites where hominid remains were recovered. Skeletal remains of Neanderthals were found in Kůlna, Šipka and Švédův Stůl caves (see e.g. Svoboda et al. 1996) and earliest AMH skeletal remains were found in Mladeč Caves (see Teschler-Nicola ed. 2006). A large collection of Upper Paleolithic AMH remains has been recovered from Moravian Gravettian sites (e.g. Sládek et al. 2000). In terms of lithic techno complexes, two so-called ‘transitional’ industries have been defined in Moravia – the Bohunician and the Szeletian, both of which date to GI-12–GI-11 period based on currently available radiocarbon dates. While the Bohunician is purported to be the oldest archaeological signature of immigrants from the Near East (Hoffecker 2009; Hublin 2012; Nigst 2012; Richter et al. 2009; Svoboda and Bar-Yosef 2003; Škrdla 2003a; 2003b), the Szeletian is thought to be the product of acculturation and the last archaeological signature of the Neanderthals (Allsworth-Jones 1986; 1990; Oliva 1991; Valoch 2000; Svoboda 2005; Tostevin 2007). After the HE-4 cold phase, both above mentioned ‘transitional’ techno complexes disappeared and were replaced by the Aurignacian techno complex. An Early Aurignacian/Proto-Aurignacian presence is known from, for example, the not too distant Willendorf II (Nigst 2012), but has not yet been documented in Moravia. Recently, a new industrial type combining characteristic features of all of the above mentioned techno complexes, was discovered in Lišeň/Podolí I.

The period between the Middle and the Upper Paleolithic, described as the Middle to Upper Paleolithic transition, Early Upper Paleolithic, or Initial Upper Paleolithic (Kuhn, Zwyns 2014 with ref.) coincides with the earliest penetrations of central Europe by AMH (e.g. Hoffecker 2009; Hublin 2012). Thus, in a broad sense, the most important reason for analyzing Moravian sites from this time period is to be in a position to test hypotheses about Neanderthal – AMH interactions.

1.2. Geographic setting of Moravia

Moravia is located mostly within the catchment of the Morava River (and Oder River in the northeast) draining the Carpathian Foredeep between the Outer Western Carpathians and the Bohemian Massif (Map 1.1). It is also situated at the intersection of two main pan-European connecting routes: a south-north route connecting the Mediterranean region and the Balkan Peninsula with the north European lowlands along the Danube, Morava, Bečva, and Oder Rivers, and an east-west route upstream of the Danube River (e.g. Schwabedissen 1943; Svoboda et al. 1996; Lisá et al. 2013; 2014). It is often claimed that these passages were used by migrating herds of Pleistocene fauna followed by people (e.g. Svoboda et al. 1994, 469; Lisá et
al. 2013). Geographic features such as river valleys fringed by mountain ridges undoubtedly played a role in ‘directing’ the first incoming AMH spreading towards the European interior. The ‘Danube Corridor’ hypothesis proposes that the Danube River valley acted as a corridor into the Swabian Jura (Conard, Bolus 2003; Iovita et al. 2014). Moravia is located alongside this hypothetical route so it is a suitable candidate for a ‘zone of contact’ during the expected ‘time of contact’ of the first AMH and the local Neandertal population (e.g. Zilhão 2006; Tostevin 2007; Škrdla, Rychtaříková 2012). In general, Moravia represents a nodal point in the center of the European continent, where incomers, residents, different hominids and different cultures had been meeting.

The Outer Carpathian depressions (Dyje-Svratka River Valley, Vyškov Gate, Upper Morava River Valley, Moravian Gate) and a promontory of Pannonian basin in the southeast form a lowland belt separating the Bohemian Massif from the Outer Western Carpathians in a southwest-northeastern direction. The Paleolithic occupation generally follows this corridor and sites are located on the margins of highlands bordering valleys. The exceptions are a concentration of sites along the Jihlava River to the Bohemian-Moravian Highland interior (Mohelno area), sites in Boskovice Furrow, and in the Moravian Karst. The region is rich in lithic raw materials and during the IUP/EUP period the most important raw material outcrops are surrounded by clusters of sites utilizing a particular raw material - Krumlovský les area utilizing Krumlovský les-type chert, Brno Basin area utilizing Stránská skála-type chert, Boskovice area utilizing Cretaceous spongolite chert, Prostějov area utilizing Drahany orthoquartzites, and Moravian Gate area utilizing erratic flint.

1.3. Surface sites versus stratified sites: the need for discovering new stratified sites

Although the IUP/EUP period has been intensely studied, our knowledge of the timing and nature of the possibly overlapping Neanderthal/AMH occupation is still poorly understood. Prior to the second decade of the 21st century, all theoretical developmental models (Svoboda et al. 1996; Svoboda, Bar-Yosef eds. 2003; Valoch 2012) were based on only two stratified Szeletian sites (Vedrovice V and Moravský Krumlov IV), two Bohunician site clusters (Bohunice and Stránská skála), and one Aurignacian site cluster supplemented by a cave site (Stránská skála and Mladeč Caves). One way of tackling this dearth of information is discovering
new stratified sites which can be studied using modern, interdisciplinary methods (Tostevin, Škrdla 2006). Southern Moravia in the south-eastern part of Czech Republic is an excellent place for such research due to the high concentration of surface sites with lithic scatters that have been attributed to the IUP/EUP period. Surface scatters of lithic material attributed to the IUP/EUP period are very common in southern Moravia and there are several hundred such sites documented (e.g. Oliva 1991; 1993a; Svoboda 1994; Svoboda et al. 1996; 2002; Škrdla et al. 2011a). The number of surface Szeletian sites is around 100 (Oliva 1991), the number of probable surface Bohunician sites up to 10 (Svoboda et al. 2002), and the occurrence of Aurignacian surface sites has been described as ‘…the highest concentration of Aurignacian sites east of France’ (Oliva 1993a, 37). Conducting surface collections of lithic artifacts has a long history in Moravia for at least the last one hundred years, by archaeologists and amateurs alike.

Tostevin and Škrdla (2006) have asserted the necessity of discovering (and excavating) new sites from the period of interest in order to advance technological studies, study the degree of homogeneity/heterogeneity of individual techno complexes, and refine the IUP/EUP chronology in Moravia. An intensive survey project, supported by the Grant Agency of the Academy of Sciences of the Czech Republic and directed at the discovery of new stratified sites began in 2005 (Škrdla et al. 2016a). The result of this project has been the discovery and excavation (mostly test pits and small scale-excavations) of 14 stratified sites including two Szeletian, three Bohunician and four Aurignacian sites. An excavation of the Bohunician site Tvarožná X was conducted in 2008 and 2015 in collaboration with G. Tostevin and the author (funded by the University of Minnesota and Project of National Science Foundation, USA). The project of Grant Agency of the Czech Republic allowed excavation of sites Líšeň/Podolí I and Ořechov IV (2015–2017). The above mentioned projects made a significant contribution to IUP/EUP studies in Moravia since the Stránská skála Czech-US project (Svoboda, Bar-Yosef eds. 2003).

Intensive and extensive agricultural and related landscape transformations that began as early as the Neolithic period have resulted in continuous disturbance of archaeological deposits (Dunnell, Simek 1995). Plowing and land clearance often exposes archaeological sites by removing soils and vegetation (Navazo, Diez 2008). The exposed and agriculturally utilized land causes soil erosion (from melting snow, rain, and wind) reaching several millimeters per year (Czudek 1997, 131). As a result of agricultural activities, hidden sites become exposed, they are continually disturbed until total exhaustion, and this process is repeated. This process was well documented during the 2005–2017 EUP Project – while it was not possible to find several sites whose locations were previously established, some new, hitherto unknown sites were recently exposed in the areas surveyed earlier with negative results.

Previous research suggests that surface scatters can be a useful indicator of stratified subsurface deposits (e.g. Roper 1976). The scientific value of surface sites is often dismissed due to disturbance, however surface artifact scatters hold great potential for understanding past landscape use (Fanning, Holdaway 2001; Škrdla 2005; 2006). As chronological change through time cannot be studied using surface artifacts, there is a potential to investigate change across space (Holdaway et al. 1998), or changes in landscape use and preferences for site locations (Škrdla 2005; 2006).

Surface prospecting with the aim of discovering Paleolithic sites has been carried out in Moravia since the early 20th century (e.g. Absolon 1936; Skutil 1936). In particular, field data collected by H. Freising (e.g. 1928; 1933) and J. Lavický (unpublished catalogue of sites deposited in the Moravian Museum, Brno) in the Bobrava area were utilized during the 2010–2017 EUP Project.

After World War II, all notable Moravian archaeologists continued in surface surveys of different microregions (e.g. Valoch 1956; 1967; Klima 1986; Oliva 1987; Svoboda 1994). As the precise maps and easy to use GPS devices were not available till the end of Cold War, the ability for recording positions of finds as well as detailed spatial research on artifact scatters was limited. Most, if not all, surface sites documented in Moravia were discovered after being exposed by plowing. In contrast, most stratified sites were discovered accidentally through wartime bombing (e.g.
Stránská skála II: Svoboda 1987b), or earthmoving activities such as quarrying and construction (e.g. Bohunice: Valoch, 1976; Škrdla, Tostevin 2003; Stránská skála III and IIa: Svoboda 1987a; 1991). Other sites were accidentally discovered during archeological excavations focused on more recent periods (e.g. Vedrovice V: Valoch 1993a; Moravský Krumlov IV: Neruda, Nerudová eds. 2009).

It is important to reflect on the spatial relationships between surface artifacts and the corresponding subsurface contexts that they originate in. An empirical study designed to detect the extent to which objects found in archaeological surveys reflect the true scale and nature of past human activity has concluded that the distance archaeological objects can be moved by mechanical farming can vary greatly, ranging from 0 to 100m (Navazo, Diez 2008). A controlled experiment conducted in an actual agricultural field utilizing metal objects as models for archaeological artifacts (allowing easy recovery with a metal detector) indicated that after two years objects from a single spot (shallow pit) were dispersed into an elliptical-shaped area 7×3m in size with the long axis oriented in the direction of plowing. In addition, only a single item (out of a total of 30 experimentally placed items) was detected on the surface on one occasion – this suggests that only a small fraction of the total number of artifacts in the plow-zone is visible at any one time (cf. Ammerman 1985).

The effects of external factors influencing surface surveys were tested over six years through repeated surveys at Ořechov IV. This site was not known to amateur archaeologists so our results were not affected by their activities (Škrdla et al. 2016a). GPS units were used in the surveys and track logs and positions of artifacts were recorded (Fig. 1.1). In addition, weather conditions (light-sunny/cloudy), field conditions (type of plowing, extent of surface washing, type of crop planted and its height) were also recorded. The analysis of collected data indicated plowing as the most important factor, followed by the intensity of field surface washing (i.e. intensity of rain), while weather conditions, crop type and height played a lesser role. The currently used agricultural field maintenance works often involve shallow plowing using rotating disc only, combined with deep plowing once every three years. These practices are directly reflected in the number of artifacts collected on the surface. While deep plowing increases the number of artifacts on the surface, their numbers decrease in the following seasons. Deep plowing brings artifacts to the surface providing valuable information about new

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Fig. 1.1. GPS aided survey, Ořechov IV. Google Earth image.
sites in the landscape, but it also disturbs intact sediments. The latter was observed at Ořechov IV – surveys of deep plow grooves brought up charcoal redeposited from intact subsurface hearths as well as intact artifact bearing horizons that were documented by subsequent salvage excavations. As erosion continues and plowing reaches deeper layers, the intact sediments with artifacts are continually being disturbed and destroyed. On the other hand, recent disturbances of intact deposits are beneficial for archaeological surveys, finding of artifacts, and discoveries of hitherto unknown sites at locations where past surveys experienced negative results.

1.4. Survey method

Generally, intact deposits are expected to be located:

a) on the boundaries of previously recorded surface artifact clusters rather than within individual clusters, where intact deposits have already been destroyed by erosion and plowing. In contrast, sometimes the intact deposits have been observed to infill depressions within the surface artifact cluster (Ořechov IV).

b) in parts of the landscape that have similar characteristics to known sites.

c) at unexpected locations – parts of the landscape that differ to known sites. Therefore surveys must repeatedly cover large areas.

d) in areas of earth-work inspections – various construction activities and archeological excavations targeting more recent periods with sunken features.

Given the fact that stratified sites are required to address chronometric as well as techno complex homogeneity/homogeneity questions, a new surface survey strategy was developed during the first decade of the 21st century in the search for new stratified sites. The main difference to previous strategies lies in enhanced locating of finds utilizing satellite navigation (GPS) and detailed spatial analysis that employs modern digital maps combined with geodetic software. After the US government announced the end of intentional degradation of GPS accuracy known as selective availability in 2000 (Clinton 2000), GPS devices began to play an important role in archaeological surveys. GIS software and increasingly accurate geographic maps represent a major improvement in surface surveys. We started using hand-held GPS units in 2003 and tested their efficacy for recording artifact positions and analyzing track logs (Škrdla 2005). Evaluations of initial surveys aided by GPS devices during a previous project (Škrdla 2005) resulted in a need to record all artifacts collected on the surface. This made it possible to perform spatial distribution analyses of surface finds. From 2005 we started to systematically record each discovered artifact (our database currently numbers over 10,000 items) and analyzing spatial distributions of finds and surveyed areas at the level of individual artifact clusters, as well as entire microregions. In order to locate new stratified sites, over the last ten years, we have been refining a systematic method, combining our knowledge of surface site locations with modern technology. We call this technique GPS aided survey. This technique is based on 4 basic steps: 1) analysis of all available data, 2) survey with GPS recording and subsequent GIS analysis, 3) test pits at predicted locations, and 4) excavations of promising sites.

The first step can be called ‘Data collecting’ and it involves a review of all available data including literature (books, journals, newspapers, personal diaries, museum archives), museum and private collections (reanalysis of artifacts, checking for possible osteological remains, and hand-written notes that can be present in boxes with artifacts). Apart from techno-typological aspects, artifacts are also examined for possible traces of CaCO₃ crust. Promising sites are re-located combining written records and old maps (from pre-GPS days) and then the location of probable positions is plotted on a current map. In addition, using the predictive modeling approach (settlement strategy model), the locations of other potential undiscovered sites are then hypothesized. The settlement strategy approach (SSA) has been developed by Škrdla (2005) and shows that rather than being distributed randomly, Paleolithic sites in Moravia follow a strict distribution pattern controlled by geomorphological factors.
The second step can be called ‘Surface survey’ during which a field search for artifacts is conducted. The entire area of interest as selected in the first – analytical – step is systematically surveyed and GPS track logs and coordinates are obtained for all Paleolithic artifacts, with particular attention given to artifacts with CaCO₃ surface crust, CaCO₃ concretions, and fossil bones and teeth. The latter are (from our experience) the most reliable indicators of subsurface calcareous deposits (Škrdla et al. 2016a).

These data (including attributes for each artifact such as e.g. CaCO₃ crust, raw material, technology, typology, etc.) are then stored in a database and processed in map applications such as Garmin MapSource with TOPO Czech Pro 1:10,000 scale maps (or any other GIS software) and GoogleEarth imagery. It is then used to locate potential intact sediments which could, in turn, contain stratified archaeological material. When a site is re-located or a new site is discovered, the find spot, including the adjoining areas, are repeatedly surveyed and artifact density and distribution is recorded along with bedrock (underlying sediments, well visible after deep plowing) outcrops.

The third step can be called ‘Checking’ and involves exploratory test pits (Photo 1.1) dug to test for intact sediments containing artifacts. The locations of the exploratory test pits are determined on the basis of results obtained in the second step. The test pits are commonly located along the margin of a surface artifact cluster, in an area where artifacts suddenly peter out, in an area where artifacts are covered by a CaCO₃ crust, osteological remains, calcium concretions, charcoal, and in areas where artifacts within subsurface sediments (i.e. sediments below the topsoil, often lighter in color and calcareous) were found after deep plowing. If evidence for intact subsurface deposits is found, a decision is made whether a small or large scale excavation should occur.

The fourth step can be called ‘Excavation’ and involves small- middle- or large-scale excavations in locations determined as most promising in the third step. An interdisciplinary approach is applied using modern excavation methods including wet sieving of excavated sediments and 3D recording of each artifact. The excavation is aimed at recovering a diagnostic collection of artifacts supplemented by material suitable for dating from stratified, well controlled contexts.

This four-step technique has produced good results with discoveries of previously unknown stratified sites. Using the above described technique, we have so far discovered stratified cultural deposits at no less than 14 sites. We have subsequently conducted middle-scale excavations at Tvarožná X, Liščí I, Liščí/Podolí I, Želešice III, and Ořechov IV. The 2010–2017 survey project has resulted in doubling the number of stratified and absolutely dated IUP/ EUP sites in Moravia.

1.5. Dating

One of the greatest benefits of stratified contexts is the possibility of excavating dateable material associated with archeological remains. For the IUP/ EUP period, i.e. approximately 50–35 thousand years ago, radiocarbon dating is the most important method. Other usable methods are luminescence techniques (Richter et al. 2008; 2009; Nejman et. al. 2011)(Photo 1.2) and ESR dating (Nejman et. al. 2011).

Although there are several methodological problems, radiocarbon still remains the most utilized dating method. Firstly, the association between the dated carbon and the human occupation is sometimes uncertain because charcoal may not be associated with human occupation (forest or steppe fires, etc.). Dating bone collagen has a similar problem as bones may also not be directly
associated with human occupation. Therefore, charcoal from a well defined context (hearth) is preferable to scattered charcoal, and bones with traces of human activity (cutmarks) are preferable to bones without such traces. Such samples are not available in all cases. Secondly, the IUP/EUP period is ‘at the end of the \(^{14}\text{C} \) time scale’ (Jöris, Street 2008) and a 1% impurity in a sample may cause a 7000 year error (Bronk Ramsey 2008). Therefore a change from the standard Acid-Base-Acid (ABA) pretreatment protocol to Acid Base Oxidation-Steped Combustion (ABOx-SC) has been recommended (cf. Bird et al. 1999; Higham 2011; Wood et al. 2012). However, the ABOx-SC pretreatment protocol requires over 100mg of charcoal – an amount that is often not available from our open site deposits. Due to the above mentioned limitation and the results of cross-dating by Haesaerts (et al. 2013) indicating that some results obtained by ABA statistically overlap with ABOx-SC results, we are still choosing the ABA pretreatment protocol in many cases. The only site that permitted a comparison of results from both pretreatment protocols is Ořechov IV, where Hearth No. 5 yielded sufficient amount of charcoal. The result obtained by ABOx-SC pretreatment protocol was older than the date obtained by ABA pretreatment protocol (see chapter 3 Bohunician). All dates in this book were calibrated using CalPal software (Weninger, Jöris 2008) on the IntCal13 (Reimer et al. 2013) curve.

Given the fact that calibrated radiocarbon results where ABA pretreatment was applied are often underestimates, two luminescence techniques were used for age estimates at Bohunician sites (Thermoluminescence and Optically Stimulated Luminescence). Thermoluminescence dating (of heated flints, i.e. directly associated with human activity) has only been used at the Bohunice type-site thus far. D. Richter calculated an age of 48.2 ± 1.9 ka BP\(_{\text{TL}}\) (Richter et al. 2008). A series of Optically Stimulated Luminescence dates from sediment samples for Bohunician sites Bohunice and Strânská skála (Nejman et al. 2011; Richter et al. 2009) ranged over a long time span between 60–40 ka BP. The age results of both luminescence techniques overlap with the oldest radiocarbon age, but in general tend to be older than the radiocarbon ages.

### 1.6. Spatial distribution of finds

Several levels of spatial analysis can be defined. Spatial analysis can be used on continental, regional, or microregional scales, aimed at individual artifact cluster analysis, or a specific excavated area. Continental or regional analyses target characteristic features defined for individual techno complexes and study possible interactions, skill transfers, or migrations. Analyses at the regional and microregional scales allow investigations of settlement pattern and local development schemes. The study of particular surface artifact clusters allows intra-cluster analysis aimed at distribution of raw materials, specific technological or typological features, or osteological material analysis and search for areas suitable for test pitting aimed at the discovery of stratified deposits. All above mentioned analyses are realized with the assistance of Global Positioning System (GPS) devices used for site or artifact location recording. They are visualized in the virtual space using Geographic Information Systems (GIS) software (e.g. Škrda et al. 2016a). Lower-level analysis is specific to site context with spatial analysis of individual artifacts and other categories of finds within an excavated area. This analysis requires the use of enhanced excavation methodology comprising recording of all artifacts (Photo 1.3) and other finds (including ochre, osteological remains, charcoal samples, as well as horizontal or sunken features, geological boundaries, etc.), positions in Euclidean space (3 dimensions), and recording positions of all screened sediment samples of equal volume (often...
10 liters) in the same recording system (i.e. in three dimensions). Field data supplemented by attributes for individual finds (including raw material, technological, or typological determinations for lithics, quantities according to individual categories of screened finds), are digitized and analyzed using Surfer software (this author), or other software allowing spatial analysis. Given that each site and excavation conditions are unique, the methods used can differ at each site.

*Photo 1.3. Proveniencing of finds, Tvarožná X.*
2. Szeletian

2.1. Introduction

Bifacially retouched points are often called leaf points due to their shape. This artifact type is the type-fossil of western European Solutréan, but their presence is also recorded in the Middle Danube area. I.L. Červinka (1927, 66) in his ‘Introduction to the Archaeology’ discussed differences between the Middle Danubian and the western European leaf points (Middle Danubian are ‘coarser and more primitive’ and ‘have nothing similar with Solutréan’). He used the term ‘Szeletian’ (derived from Hungarian site Szeleta Cave; Photo 2.1) for the Middle Danubian finds. Later, the same term was used by F. Prošek (1953), for Slovakian sites and the Szeletian was chronologically attributed to the beginning of the Upper Paleolithic. In Moravia a series of articles defining the Szeletian were written by K. Valoch (e.g. 1993a; 2012), as well as his younger successors.

The type site for the Szeletian – Szeleta Cave – is located near the town of Miskolc, above the left bank of Szinva River draining the Bükk Mountains. The site was excavated at the beginning of the 20th century (Kadić 1916). The Szeleta Cave sequence represented the development of bifacial technology from the late Middle Paleolithic to the Upper Paleolithic (Kadić 1916; 1934; Hillebrand 1935; Mottl 1938; Gábori 1953; Vértes 1968; Allsworth-Jones 1986; Ringer 1989). Later Svoboda and Simán (1989) reclassified the Szeleta bifaces from Developed Szeletian to Gravettian with leaf points and more recently to Late Gravettian with leaf points (Svoboda et al. 2002). This attribution was supported by the presence of shouldered points (Lengyel et al. 2016). However, chronology of the Szeleta Cave is still problematic (cf. Adams 2009; Lengyel, Mester 2008; Hauck et al. 2016).

Approximately 100 Szeletian sites were hitherto reported in Moravia (Oliva 1991). However, all except Vedrovice V (Valoch 1984; 1993a), Moravský Krumlov IV (Neruda, Nerudová eds. 2009), and Želešice III (Škrdla et al. 2014) are surface scatters or of uncertain classification (see chapter 2.3.) finds (Map. 2.1.). The Early Szeletian technology in Moravia is based on flake and blade
production by non-Levallois methods of reduction (Svoboda et al. 2002). Cores are mostly unipolar with changed orientation, occasionally discoidal (Nerudová 2000a). The core striking platforms are often prepared by removing a single flake (Nerudová 2000a). The typological spectrum is characterised by a mixture of Upper and Middle Paleolithic tool types. The Upper Paleolithic tools include large numbers of end scrapers (including steeply retouched forms but not typically carinated) and side scrapers, and a small number of burins (Oliva 1991). Middle Paleolithic tool types (e.g. denticulated and notched artifacts, side scrapers, points) occur frequently, but are in fact rare in the Szeleta Cave assemblage (Adams 1998). Flat retouch on different implements is common. A type artifact of the Szeletian industry is the bifacially reduced implement called leaf point. However, leaf points also occur at Bohunice (the type site of the Bohunician industry), and probably some Aurignacian (Oliva 1990; however, within surface collections only – Škrdla 2016a) and late Gravettian assemblages (Svoboda 2007) in southern Moravia. They also occur in some of the Micoquian layers in Kůlna Cave (Valoch 1988).

Dating the Szeletian techno complex is a particularly challenging problem. Data from the type site of Szeleta Cave (excavated at the beginning of the 20th century; Kadić 1916) are problematic (Adams 2009; Lengyel, Mester 2008; Hauck et al. 2016). While the single date from another Szeletian site Moravany nad Váhom – Dlhá (characterized by poplar shape leaf points) overlaps with GI-8 (Kaminská et al. 2011), the dates for Moravian sites are significantly earlier. This has led to the separation of Early (Moravian) and Upper Szeletian (Moravany in Slovakia) in the Middle Danube region (Kaminská et al. 2011). While earlier dates from Vedrovice V and Moravský Krumlov IV overlap with GI-11 (Valoch 1993a; Davies, Nerudová 2009), the Želešice III dates extend the Moravian Early Szeletian back to the GI-12 peak (Škrdla et al. 2014, Fig. 5) which is consistent with recently reported dates from new samples at Vedrovice V (Haesaerts et al. 2013), Willendorf II, layer 2 in Austria (Nigst 2012), and Lubotyň 11 in Poland (Bobak et al. 2013). The new dates suggest that the Szeletian is somewhat older than previously thought and is now recognized as chronologically overlapping with the early
appearance of the Bohunician. In addition, both the Szeletian and Bohunician occupied the same region, shared similar site locations (from a topographic point of view), and utilized the same raw material outcrops. Therefore, the debate concerning possible contacts between the Neandertals and AMH, acculturation (e.g., Valoch 2000; Tostevin 2007), or assimilation (e.g., Smith et al. 2015) received new stimulus. On the other hand, Adams (1998) argues that the Szeletian is not a transitional industry. He argues instead that it is a facies of the Aurignacian industry (with which it appears to chronologically overlap) and the lithic differences are due to differing site activities.

2.2. The Szeletian key-sites

Key sites are stratified and excavated sites that yielded characteristic Szeletian artifacts with reliable dates. As mentioned in the Introduction, the only stratified sites in Moravia are Vedrovice V excavated by K. Valoch (1993a) during 1982–1983 and 1989, Moravský Krumlov IV excavated by P. Neruda and Z. Nerudová (eds., 2009) during 2000–2004, and most recently Želešice III excavated by P. Škrdla during 2010–2013 (Škrdla et al. 2014) (Map 2.1.).

2.2.1. Vedrovice V, ‘Široké u lesa’

The site is located on an elevated position (270m) above present day Vedrovice village, on the ridge jutting from a nameless hill with an elevation marker of 330.7m to the southeast. It is not possible to access the site at the present time because it is inside an orchard.

Although surface finds at this site had been collected by V. Effenberger since the 1950s, stratified sediments with in situ artifacts were discovered accidentally during excavations of a Neolithic site (V. Ondruš’s excavation of Linear Pottery Ceramic Culture burial ground). As isolated white patinated artifacts were found in several grave pits, K. Valoch was invited to check their context and stratigraphic position (Valoch 1993a). K. Valoch excavated ca. 160m² during 1982–1983 and followed with ca. 30m² in 1989, documenting several artifact clusters with charcoal concentrations interpreted as hearths (Valoch 2012)(Photo 2.2). Recently, a test pit was excavated for sampling and dating (Nejman et al. 2011).

The artifacts were recovered from the lower part of an interpleniglacial soil interpreted as Bohunice-type soil, 35cm thick (Valoch 1993a; 2012). Very little osteological material was found – just several horse tooth fragments. Analysis of charcoal shows there is twice as much of fir as spruce (Opravil 1993).

K. Valoch excavated a collection 17,064 artifacts produced almost exclusively from local chert outcrops – Krumlovský les-type chert (Fig. 2.1). The characteristic pebbles with black cortex can be found at many outcrops near the site. Sixty-four artifacts were made from reddish-brown radiolarite and a handful from erratic flint, probably Troubky/ Zdislavice-type chert and Cretaceous chert (Valoch 1993a, 28; Oliva 2016, 298). Flake blanks were removed mostly from unipolar cores. Atypical discoidal cores are also present but are very few in number. The collection consists of blades and tools made on blade blanks (e.g. Valoch 1993a, Abb. 12, 17) with several flakes indicating Levallois technology (cf. Valoch 1993a; 2012; Nerudová 2000b). Flakes (22.8%) prevail over blades (1.5%), cores (2.0%), fragments (4.9%), pebbles (0.6%). Microchips < 2 cm in dimension account for 68.2% of collection (Valoch 1993a). The most common striking platform is plain (42.4%), followed by linear (20.6%), faceted (16.6%), and cortical (16.4%). Retouched tools include notched and denticulated tools (40.0%), side scrapers of various forms (19.9%), end scrapers (often atypical on
Fig. 2.1. Vedrovice V. Selected material. Adopted from Valoch 1993a.
flakes, 7.8%), and burins (3.4%). Bifacially reduced tools including leaf points and knives represent 10.6% of collection. The workshop character of the site allowed K. Valoch (1993a, Abb. 31) to refit sequences which demonstrated simple reduction of unipolar cores (Nerudová 2011).

Heavy duty implements are made of local rock pebbles (granite, quartzite, granulite, wacke, chert) that were interpreted as hammer stones and stone slabs (Valoch 1993a, Abb. 33). Three types of pigments were reported – apart from limonite and hematite (probably of local origin) that are common in many EUP collections. Natural graphite was also recovered. The nearest known outcrops are in Chvojnice River Valley, i.e. ca. 15km to the north-northwest, across the Krumlovský les ridge. K. Valoch (1993a, Abb. 34: 5) also mentioned a ‘heart shaped’ chert pebble with ochre traces on its surface inside a depression and several flakes intentionally removed with rock crystal vug.

While a series of conventional radiocarbon dates from Valoch’s excavation (Mook 1993) suggested an age between 35–40 ka $^{14}$C BP and overlapped with GI-11, a more recently obtained AMS date from the material collected by K. Valoch – 41–37 ka $^{14}$C BP (Haesaerts et al. 2013) – extended the age of occupation till GI-12. This earlier age is much closer to the OSL dating results (Nejman et al. 2011). A date from the overlying layer (minimum age) is $45.1 \pm 2.5$ ka BP, the top of the artifact-bearing horizon is $60.3 \pm 3.4$ ka BP and the bottom of that horizon (possibly contaminated by underlying sediments) is $102.1 \pm 7.0$ ka BP.

### 2.2.2. Moravský Krumlov IV

The site is located 4.5km northeast of Vedrovice V, on a ridge projecting to the southeast from the top plateau with a nameless elevation marker reaching 381.1m. The altitude of the find spot reaches an elevation of 230m. The excavation was conducted when the area was deforested. Currently it is forested again.

The area of Krumlovský les is well known for its chert bearing deposits mined during prehistory. It has been continually surveyed and studied by M. Oliva over the last decades (Oliva 2010). In 1999 M. Oliva discovered an accumulation of decorticated cores of white patinated chert covered by calcium carbonate crust in a road cutting an elevated ridge above a valley showing traces of ancient mining activities (Neruda et al. 2004). The test pit dug on the find spot documented intact layers with *in situ* Paleolithic artifacts. The area was excavated by P. Neruda and Z. Nerudová during 2000–2003 and several artifact bearing horizons were discovered. The uppermost one (Layer 0) was classified as Szeletian. The Szeletian horizon was within an orange-brownish soil sediment separated by a thin loess layer from the Holocene soil. A small number of bones were found (Neruda 2009).

The excavation yielded a collection of 6,007 artifacts made exclusively from local chert (Nerudová 2009). Technologically speaking, the most common artifacts are flakes from different stages of reduction (96.6%), followed by cores (3.1%), microflakes (1.0%), and isolated blades (0.3%). The identified striking platforms are cortical (24.5%), punctiform (14.8%), dihedral (9.0%), plain (8.2%), and faceted (1.7%). The most frequent tool type is the leaf point (with fragments and unfinished products included, the proportion is 55.9%) supplemented by notched and denticulated tools (23.7%), side scrapers of different forms (15.3%), end scrapers (3.4%), and a retouched flake (cf. Nerudová 2009, Tab. 2, modified by author – Photo 2.3. Moravský Krumlov IV – bifacial reduction. Photo P. Neruda.)
The most important contribution of Moravský Krumlov IV is a series of refitted sequences permitting the reconstruction of leaf point production technology (Photo 2.3). The technology is described as direct shaping, when the volume of a raw material nodule is reduced by thinning flakes removed from lateral edges. After several flakes were removed from one lateral edge, often from both surfaces, the unfinished product possessed a bifacial knife form with a steep back (cortical or decorticated). In the second step, the artifact was turned around and a series of flakes was removed from the opposite lateral edge (both surfaces). This process was repeated several times until the thin leaf point was finished (Nerudová 2009, Fig. 11).

Based on refitted sequences documenting on-site production of leaf points, unfinished products and broken items, followed by bifacial thinning flakes, the site is interpreted as a leaf point workshop located directly on the raw material outcrop.

The charcoal samples from the artifact bearing horizon provided dates ranging 36–38 ka $^{14}$C BP (Davies, Nerudová 2009). The only available radiocarbon date from bone is too young; this may be due to the low amount of collagen present. The calibrated radiocarbon dates fit with GI-11 and slightly later. In addition, sediments from the artifact bearing layer were measured by OSL; the age of the upper part of the layer is $43.6 \pm 3.3$ ka BP and the lower part $64.6 \pm 7.0$ ka BP (Nejman et al. 2011). As the upper date probability range partly overlaps with the probability range of the calibrated radiocarbon dates, the lower one is significantly earlier. A similar discordance between calibrated radiocarbon ages and OSL ages was also documented at Vedrovice V. Another dating program using different dating methods (or pretreatment protocols) will be needed to solve this problem.

2.2.3. Želešice III

The Želešice-Hoynerhügel site is located within the Bobrava River Valley which dissects Bobrava Highland along the east-west axis. The Bobrava River is a right bank tributary of the Svratka River and both valleys are clearly visible from the site. The Brno Basin is also partly visible. The site is located on a significant elevation above the right bank of Hajany Creek, and is a part of a string of sites following Hajany Creek and Bobrava River from Ořechov to the west and Popovice to the east (cf. Valoch 1956; Škrdla et al. 2011). The site is located on the northern slope of a hummock situated between Ořechov, Syrovice and Rajhrad. Its summit has an elevation of 284.8m. The elevation of the site ranges between 268–276m. On the historical Stable Cadaster map, the site is located within field parcels ‘Hoynerhügel’ and ‘Dorfflüssen’. On the present day map (ZM 1:10 000) the area is called ‘Hajanský’. As Valoch (1956) used the field name Hoynerhügel for the site, we continue in using this name.

The site was mentioned already by H. Freising (undated manuscript in his archive deposited at Institute of Archaeology, probably a draft of a news article postdating 1936 – apparent from the text) who described it as ‘einem vierten Haltplatz…auf Schöllschitzer Gebiet… zwischen der sogenannten Kanitzer Marter und dem Hajaner Bach in der Flur Hounerhübel…’. In the scientific literature the site was first mentioned by K. Valoch, who rediscovered it with V. Gebauer (Valoch 1956). Oliva (1989a) mentions this site in his list of sites for the Brno-venkov district. This author described the stone artifacts and his interpretation concluded that the artifacts display both Szeletian and Aurignacian elements. In contrast, Valoch (1956) emphasized the presence of faceted platforms.

The site has been under investigation during 2009–2013, with regular excavations conducted in 2010–2013 (Škrdla et al. 2014 with ref.). Coordinates for 620 surface artifacts have been recorded using a GPS device.

Paleolithic artifacts are distributed over an area of 450×400 m. The main cluster covers an area of 120×130 m (301 artifacts – 65.3%). When analyzing the artifact distribution, areas with no surface artifacts became apparent. We also focused on the distribution of artifacts with CaCO$_3$ crust, which were concentrated along the slope edge above the wayside shrine. We selected an area with no surface artifacts but within a short distance of artifacts possessing CaCO$_3$ crusts as a likely
location to contain intact Quaternary sediments. We dug two test pits (Zel3_T01 and Zel3_T03) in this area south of the chapel, both yielding intact sediments with artifacts (Škrdla et al. 2010, Fig. 46). During 2010–2013 the small scale excavation (15m²) was realised in an area between test pits Zel_T01/09 and Zel_T03/09 (Škrdla et al. 2014). All excavated sediments were processed using a 3mm sieve. This excavation yielded a collection of lithic artifacts (1,505 items in total), red ochre lumps and charcoal.

Sediments underlying the excavation area are Miocene sands, which have been mined for industrial purposes in the recent past. Remnants of river terrace gravels were detected in the vicinity of the locality. These gravels contain pieces of Krumlovský les-type chert with a characteristic black cortex as well as Cretaceous spongolite chert. Within the excavated area we documented an irregular paleosurface which, surprisingly, does not reflect the current slope gradient. The paleosurface slopes in the opposite direction to the current slope gradient, most probably into a paleo-gully which is now filled by Quaternary deposits.

Vertical distribution of excavated artifacts indicates that the main artifact bearing horizon was a brownish layer with a fireplace, however the artifacts were scattered in the sediment layer below and also above (Fig. 2.2.). The refitting lines suggest homogeneity of the main find horizon and no refits with artifacts within the upper part of the section were documented. Because of the nature of those sediments and the gradient, we presume that the artifacts in the upper part of the section moved from a nearby area, where they lay on the surface and were subsequently redeposited. Therefore we cannot exclude possible contamination of material from above the main find horizon with a chronologically different assemblage. However, comparisons of the vertical distribution of raw materials, technology and typology do not support the contamination hypothesis and the excavated assemblage appears to be homogeneous. This presents a contrast to the surface collection (see discussion below).

The frost wedges infilled by loess-like material and calcium carbonate dissecting the upper horizons and continuing down the section indicate that artifacts in the upper part of the section were redeposited before its formation (MIS 2 or earlier). A similar frost wedge dissecting soil sediments was documented at the Bohunician site Tvarožná X (Škrdla et al. 2009).

Only 413 artifacts recorded in absolute coordinates were analyzed for raw material and technology. The artifacts obtained from wet-sieving, mainly microchips and microfragments (1,092 items in total), were not included in this analysis. All artifacts were analyzed as a single assemblage, i.e. they were not separated into individual layers.

Fig. 2.2. Želešice III, stratigraphy. Adopted from Škrdla et al. 2014.
The main raw material is Jurassic Krumlovský les-type chert originating in local gravels. Isolated pebbles of this raw material are present directly at the site, however, the main sources are located in Miocene gravels in the vicinity of Mělčany, Pravlov and Trbošany (cf. Přichystal 2009), i.e. 6km southwest of the site. In addition, quartz, Cretaceous spongolite cherts and a fragment of an unidentified local rock were most probably collected from local gravels, or from the Svratka River terrace located 4km to the east. Raw materials of local origin comprise 46.0% of the assemblage.

The second group (22.3% in total) includes raw materials of semi-local origin (10–30km from the source). The most important is the presence of Jurassic Stránská skála-type chert, whose source is strictly localized to the Stránská skála outcrop located 12km northeast of the site. Other important raw materials include Cretaceous Olomučany-type chert characterized by its rich glauconite content (35 items), whose source is localized to the Olomučany area in the Moravian Karst 26km north-northeast of the site. This group includes three types of siliceous rocks whose provenience is not clear; (i) a white-patinated chert (12 items) rich in inclusions (petrosilex) resembling cherts from Rudice deposits in Moravian Karst, (ii) a raw material of lower quality macroscopically resembling the Olomučany chert (17 items) which may originate in the Moravian Karst, or in the wider area of the Carpathian Foredeep (however, the dimensions of artifacts from this chert and the utilization method – i.e. not used sparingly – suggest the closer source), and (iii) a siliceous weathering product most probably from the vicinity of the site, or outcrops in Krumlovský les.

The third group of raw materials includes materials imported from a distance of more than 50km away from the site. This group accounts for 11.6% of the collection. The raw material types are radiolarites most probably from the White Carpathians clippen belt zone (the nodule cortex indicates primary outcrops), erratic flint from northern Moravia or southern Poland glacioluvial deposits and Troubky/Zdislavice-type chert from Litěnice Highland. The minimum distance of radiolarite outcrops is 115km to the east, the erratic flint 100km to the northeast, and Troubky/Zdislavice-type chert 50km east-northeast (in a straight line) from the site.

The most common technological category – over one half of the collection (236 items, 57%) are flakes. There are 12 cores, often irregular in shape. The only exception is a bidirectionally reduced specimen (Škrďla et al. 2014, Fig. 4: 9). Two artifacts are microcores (smaller than 3cm). Blades are relatively rare (10 items), however blade fragments are represented by 46 artifacts. There are only 6 microblades and one microblade fragment. Blades, microblades and their fragments account for 17.4% of the assemblage. Nine blades and 3 flakes are partially retouched. Retouched tools account for almost 10% of the assemblage. The collection also includes 20 fragments, 25 microchips (smaller than 1.5cm) and 4 raw material pebbles.

Several artifacts have a faceted striking platform (Škrďla et al. 2014, Fig. 4: 1–4, 7, 8). However, in contrast to the Bohunician technology (cf. Škrďla, Rychtaříková 2012), the faceting is coarser without the characteristic overhang. The dorsal scar pattern is unidirectional or centripetal rather than bidirectional or opposed directional. We can conclude that although several artifacts have a faceted striking platform, the general character of those artifacts differs from the products of Bohunician technology. Two retouched flakes were refitted and one flake is a thinning flake from flat retouch (Škrďla et al. 2014, Fig. 4: 6). In addition, two quartz pebbles which were probably used as hammerstones were classified as heavy duty industry and are not included in the list of technological categories.

The collection of tools is characterized by end scrapers including an end scraper with lateral retouch on a massive blade (Fig. 2.3: 15), a blade end scraper refitted from three fragments (Fig. 2.3: 17), a blade end scraper combined with an opposed notch reconstructed from three fragments (Fig. 2.3: 14), an end scraper on a laterally retouched blade (Fig. 2.3: 16), an end scraper on a laterally retouched flake (Fig. 2.3: 13), two end scrapers on a broken blade (Fig. 2.3: 18, 19), two end scrapers on a flake (Fig. 2.3: 10, 12), an atypical end scraper on a flake (Fig. 2.3: 8), and two end scrapers are represented only by a broken end (Fig. 2.3: 9, 11). Although many of the end scrapers are on thick blanks and steeply retouched, none of them are carinated.
Fig. 2.3. Želešice III, selected artifacts.
The end scrapers are supplemented by side scrapers, burins, splintered pieces and points. Side scrapers include a transversal side scraper (Fig. 2.3: 25) and a side scraper reconstructed from two joined broken pieces (Fig. 2.3: 24). Burins include two burins on a broken blade (Fig. 2.3: 26) and a refitted burin (Fig. 2.3: 35). The group of splintered pieces is composed of a splintered piece reconstructed from 3 chips (Fig. 2.3: 34) and two other items (Fig. 2.3: 20). Of particular significance are the Jerzmanowice-type points, i.e. ventroterminally retouched points (Fig. 2.3: 3, 5), two unifacially flat retouched points with ventroterminal retouch (Fig. 2.3: 4, 7), a fragment of a convergently retouched point (Fig. 2.3: 2), and a fragment of a convergently retouched blade point.

The collection of tools is completed by a truncated blade (Fig. 2.3: 21), a piece refitted from medial and proximal blade fragments (Fig. 2.3: 36; the latter fragment was reutilized as a microcore after a break), a bec (Fig. 2.3: 22), a retouched blade (Fig. 2.3: 23), four retouched tool fragments (Fig. 2.3: 27, 28, 29, 33) and partly retouched broken blades (Fig. 2.3: 6, 30–32). Wet-sieved material includes the tip of a small radiolarite point (Fig. 2.3: 1) and a retouched tool fragment.

Tool type and raw material analysis of the stratified artifacts indicates that tools were manufactured predominantly from Krumlovský les-type chert (16 items), although this is somewhat proportionate to the overall ratio of this raw material in the assemblage. Thirteen tools are manufactured from radiolarite and 5 tools from Olomučany-type chert. Tools from other raw material types are rare. Jerzmanowice points are made exclusively from radiolarite. In contrast, the surface collection contains two Jerzmanowice points from Krumlovský les-type chert, one from Stránská skála-type chert, one from erratic flint and one from radiolarite. It is worth noting that although radiolarite accounts for less than 10% of the assemblage, a third of all tools are made from this raw material. Other types of points in the stratified collection are manufactured from Krumlovský les-type chert (2 items) and radiolarite (1 item). Leaf points in the surface collection were manufactured exclusively from Krumlovský les-type chert. Very few tools in the stratified collection are manufactured from Troubky/Zdislavice-type chert (1 item), siliceous weathering product (1 item) and Stránská skála-type chert (1 item).

Comparison of the surface and stratified collections shows notable differences in both raw material spectrum and typology, so the degree of homogeneity of the surface collection is in question. The most important difference is the significantly greater proportion of radiolarite and raw material originating in the Moravian Karst (Olomučany-type chert, Rudice-type chert) in the stratified collection while only several pieces are present in the surface collection. In contrast, Krumlovský les-type chert is present in the surface collection in greater proportions. The second important difference is the absence of leaf points in the stratified collection. When comparing Levallois products, there are more elongated artifacts with parallel dorsal scars (including an artifact with a bidirectional dorsal scar pattern) in the surface collection.

Olomučany and Rudice-type cherts were obtained from outcrops located within several kilometres of Pod Hradem Cave in the Moravian Karst. Recent excavations in Pod Hradem Cave have produced evidence for short infrequent visits during the time period that the Želešice III site was occupied. This evidence could suggest that humans using the Želešice III site had links to the Moravian Karst region (Nejman et al. 2013).

Three samples from small charcoal lenses within the artifact bearing horizon were dated (Fig. 2.2). While one date fits with GI-11, two other dates are older and fit with the preceding GI-12.

### 2.3. Other important sites

#### 2.3.1. Rozdrojovice

The site is located on the southern slope of an elevated position (summit of which reaches an elevation 271.5m) above Mnišší Creek, left bank tributary of Svratka River, around an altitude 265m. The site was known as a surface artifact cluster. K. Valoch (1955) excavated a series of test pits in 1954 and found lithics in the B-horizon of a Holocene soil and in the underlying brownish loessic sediments. The artifacts made from quartz
were later refitted by Neruda and Nerudová (2004) and the UP cores made from Kraków-Częstochowa Jurassic chert were reclassified as Epi-Gravettian (Nerudová 2016). No date is available.

2.3.2. Maršovice II

The site is located in a saddle between a ridge jutting from Krumlovský les to the southeast and a hill with an elevation marker of 277.4m. The find spot is on a shallow south facing slope at an elevation of ca. 260m. The site was discovered by A. Otta and subsequently excavated by K. Valoch and L. Seitl (1988), who found Szeletian artifacts within an interpleniiglacial soil – probably Bohunice-type soil. Although the site is stratified, no date is available.

2.3.3. Bohunice II, ‘Družba’

The site is located on the southern slope of Red Hill sloping down to Leskava River Valley. The elevation of the site ranges between 240–270m. During sewage construction for a new housing estate, R. Klíma discovered several find spots (I–V) witholithics in a soil horizon (Bohunice-type soil?) interstratified with loess (Valoch 1974a, 10). The industry is made from Cretaceous spongolite and Krumlovský les-type cherts, supplemented by radiolarite, quartz, and quartzite (Oliva 2016, 143). The individual raw materials were clustered in separate concentrations. The industry mostly consists of flakes and a small number of tools including a leaf point, end scrapers, and side scrapers (Valoch 1974a, Tab. 1, 2). The lithics can be classified as Szeletian and some of them were refitted (Nerudová 2005). One side scraper (Valoch 1974a, Tab 2: 3) is very similar to a side scraper from the Bohunice 2002 (Bohunician) collection (Škrdla, Tostevin 2005, Fig. 12: 18) by its shape and identical raw material. Two dates covering a time span of 40–39 ka ¹⁴C BP were recently reported (Neruda, Nerudová 2013, 11), however, the dated material is probably from old samples not directly associated with the finds. This area is now a housing estate.

2.3.4. Bratčice I

The site is located 5km southwesterly of Želešice III on a south-western margin of a large elevation, sloping down to the Leitna River Valley, but still in sight of the Dyje-Svratka River Valley towards the south. The altitude of site ranges between 256–261m. The site was known as a Szeletian surface cluster (Oliva 1989a). The artifact cluster had been disturbed by a Medieval sunken road that is currently backfilled, but still visible in the field, and on aerial photos and LIDAR images as a shallow depression.

The site was surveyed and several surface artifacts had traces of calcium carbonate coating on their surfaces. Two test pits were dug in the area where coated artifacts were concentrated, close to the margin of the above mentioned sunken road – the spot where the plowed up artifacts probably originated from (Škrdla, Nikolajev 2013). The first test pit, located inside the surface artifact cluster, yielded two artifacts. The second test pit, located on the boundary of the surface artifact cluster, yielded one artifact from intact sediments. Both test pits revealed a redeposited paleosoil in the section consisting of two stratigraphic elements (Škrdla, Nikolajev 2013, Fig. 1) and resembled the Bohunice-type soil (Valoch 1996). The artifacts were located in the upper part of the paleosoil. Test pits at Bratčice I have yielded intact sediments with a small number of artifacts and there is future potential for excavation projects.

2.3.5. Pod Hradem Cave

Pod Hradem Cave is situated in the Moravian Karst, about 20km north of the Brno Basin. The cave is located in a towering cliff above the Pustý žleb karstic dry valley, close to Punkevní Caves and the Macocha Abyss. The entrance opens to the north. The cave is accessible along a steep trail. It was excavated by K. Valoch (1965a) in 1956–1958 and recently re-excavated by L. Nejman (Nejman et al. 2017)(Photo 2.4). Both the old and new excavations have yielded a small number of artifacts from the cave entrance and the cave interior, suggesting low-level use of this cave by humans and frequent use by cave bears. A radiolarite leaf point was excavated from layer 7 and a spongolite leaf point from layer 10 (Nejman et al. 2017). Although these artifacts are not diagnostic and could pertain to the Micoquian, Szeletian, or Bohunician, they may indicate short visits of the cave by Szeletian hunters, which agrees with the age of the deposits.
(GI-12 to GI-9). This scenario is consistent with the presence of cherts from nearby (ca. 5km in direct line from the cave) outcrops (Olomučany-type cherts and cherts from Rudice formation) at the Szeletian site Želešice III. In addition, more dates ranging between 40–35 ka ^14C BP were recently obtained from bones excavated near the leaf point in the 1950s (Neruda, Nerudová 2013, 11).

2.3.6. Rytířská Cave

Rytířská Cave is located in a dry side-valley to the Punkva River Valley, ca. 1.5km in a direct line southwesterly of Pod Hradem Cave, close to the famous Kateřinské Caves. Apart from the prevailing Magdalenian occupation, two leaf points indicate earlier visits to the cave, in the time span between Szeletian and Late Gravettian (Jarošová 2002). Although the cave was repeatedly excavated, the stratigraphy of the cave was difficult (probably influenced by Medieval activities – cave served as a ‘cave castle’) and the excavations did not resolve the chrono-cultural attribution of the leaf points.

2.4. Surface collections

The Szeletian (i.e. leaf point industries) are known from dozens of surface sites scattered across Moravia. They are grouped into three main concentrations – Krumlovský les area, Bořitov area and Prostějov area. Raw material economy in the first concentration (Krumlovský les area) utilizes rich local chert outcrops. The most important sites – Vedrovice V and Moravský Krumlov IV are supplemented by rich surface artifact clusters at Jezeřany and many others on the Krumlovský les ridge (e.g. Oliva 1989a; Nerudová 2008). The sites continue to the west upstream of Jihlava River deeply into the Bohemian-Moravian Highlands (e.g. Oliva 1986; Škrda 2012), as well as in the easterly direction downstream of Jihlava and Bobrava rivers with sites on cadastral territories of Dolní Kounice, Měščany, Bratětice, Sílíčky, Ořechov, Hajany, Želešice, and Modřice (Valoch 1956; Oliva 1989a; Škrda et al. 2011). The Krumlovský les area is connected in the northerly direction through the Boskovice Furrow (with Neslovice, Tišnov, Čebín) with the second concentration in the Bořitov area, where the raw material economy relies on utilization of the local Cretaceous spongolite chert outcrops (Svoboda 1983; Oliva, Štrof 1985). The Bořitov area is adjacent to the western boundary of the Moravian Karst. It is characterized by a strong Middle Paleolithic component suggesting a possible Middle Paleolithic presence in the rich surface clusters (cf. Neruda, Válek 2002).

In regards to the spatial distribution of Szeletian sites, Brno Basin is a special case because it is also known for its contemporaneous Bohunician occupation. The Szeletian occupation was documented on the southwestern margin (Želešice, Modřice), western margin (Bohunice II), and northwestern margin (Rozdrojovice). On the eastern margin of the Brno Basin (Lišen) leaf points are also found in rich artifact clusters with Bohunician and Aurignacian implements, but these are not classified as Szeletian sites. No traces of Szeletian have been identified in the vicinity of the Stránská skála rock. This apparent absence of Szeletian occupation directly at the Stránská skála rock is surprising because the Stránská skála-type chert is present in the Želešice III stratified assemblage, and because many leaf points found on the eastern margin of the Brno Basin are made of this raw material (Nerudová, Přichystal 2001; Svoboda 1987a, Tab. 9).

Szeletian sites are located on the eastern periphery of the Brno Basin on elevations flanking southern and south-eastern margins of the Drahany Upland. They then continue through the Výskov Gate area at Drnovice and Opatovice (Svoboda 1994; Mlejnek 2011) and then further to the north in the Prostějov area with sites on cadastral territories of Vincencov, Ondratice, Želeč, Otaslavice, Drysice,
where Szeletian implements are often combined with Bohunician and Aurignacian features at the same find spot (Mlejnek 2015). The concentration of sites within the Prostějov area is spatially limited and the raw material economy is based on local orthoquartzite supplemented by material from local gravels. The imports of Stránská skála-type chert and erratic flint are a minor component. The most important site in the area – Ondratice I – characterizes the problem of surface artifact clusters in the area – while J. Svoboda (1980) identified the quartzite component as Bohunician, M. Oliva (2004) published a small concentration (Ia) as Szeletian. O. Mlejnek (et al. 2012) identified Bohunician, Szeletian and Aurignacian elements, and most recently Z. Nerudová (2015) recognized possible Gravettian elements. Although the mixture of technological and typological elements can be interpreted using the palimpsest hypothesis (cf. Škrdla et al. 2011), O. Mlejnek defined the term Ondratice-type industry (Mlejnek et al. 2012). The excavations in intact sediments on the margins of surface artifacts cluster documented isolated hearths with a small number of mostly undiagnostic artifacts (Mlejnek et al. 2016). However, the presence of a leaf point (found in backfill) and bifacial thinning flakes in Test Pit 4 points to a possible Szeletian classification of that particular concentration around a hearth dated to 45–43 ka cal. BP (Mlejnek et al. 2016).

The region that includes the southern part of Upper Morava River Valley and the lower course of the Bečva River (south-western part of Moravian Gate) is unique as it contains the so-called ‘Aurignacian of Morava type’, or ‘Miškovice type’ industries. Several sites in this area yielded leaf points (including triangular forms) together with Aurignacian artifacts (Škrdla 2007a). As the sites are surface sites (with only two exceptions – Zlín-Louky and Hlinsko-Kouty, no dates are available), the integrity of the assemblages is not clear and the palimpsest hypothesis cannot be rejected.

Isolated occurrences of Szeletian are also known to the east of the Prostějov area in Olomouc (Droždín, Trňáčková 1967) and following upstream Morava River in Dubicko (Schirmeisen 1933) within the Upper Morava River Valley. The most northern Moravian occurrences are Třebom and Otice (Svoboda et al. 2002) in the erratic flint bearing deposits. As those industries are characterized by both Middle and Upper Paleolithic types located on the raw material outcrops, a palimpsest hypothesis cannot be rejected.

### 2.5. Concluding Remarks

When the surface Szeletian sites of inconclusive cultural classification are considered together with the stratified sites, we can see a pattern of three dense clusters – Krumlovský les area (with sites following upstream of Jihlava River to the west as well as downstream of Jihlava and Bobrava rivers to the east), Prostějov area (extended to Výškov Gate), and Bořitov area – loosely connected by isolated sites. The sites were located on elevated positions allowing control over large parts of the surrounding landscape, which is a characteristic feature of the IUP/EUP settlement strategy. Moravský Krumlov IV represents a primary workshop at the raw material outcrop located at an unusually high altitude compared to other sites. The caves were not occupied, however, cave sites in the Moravian Karst may have been visited occasionally, for specific activities, or for hunting purposes.

The Szeletian raw material economy in Moravia is characterized by the utilization of local Krumlovský les-type chert as evidenced from the excavation of stratified sites. If surface clusters are also considered, spongolite chert is commonly used in the Bořitov area. In contrast to the Krumlovský les sites Vedrovice V and Moravský Krumlov IV, in Želešice III the proportion of imported rocks is distinctly greater. Two important raw material types are present in Želešice III: Olomučany-type chert from the central Moravian Karst and Stránská skála-type chert from the eastern margin of the Brno Basin. While the Olomučany-type chert suggests contact with the karstic area, Stránská skála-type chert suggests contact with the Stránská skála cliffside, where large Bohunician workshops were documented in the same time period (GI-12–GI-9). The presence of erratic flint and radiolarite indicates contacts with northern Moravia and western Slovakia. Valoch (1993a) mentioned a possible Troubky/Zdíšalvice-type chert from eastern Moravia in the Vedrovice V assemblage. In addition, Z. Nerudová (1997) summarized the
occurrence of exotic raw material within Moravian Szeletian surface scatters. Although the cultural homogeneity of surface collections is questionable and such isolated occurrences of artifacts made from exotic rock may represent contamination by other Paleolithic techno complexes, Neolithic, Chalcolithic, or Bronze Age (cf. Palimpsest hypothesis, Škrdla et al. 2011), in several cases the Szeletian attribution of such surface finds is supported by the morphology of the artifacts. The most important finds include a leaf point made from quartz porphyry (Bükk Mountains) and a dejeté side scraper combined with a burin from Hungarian radiolarite – both found at the Ořechov II surface cluster (Nerudová 1997, Fig. 1: 3, 5). The third important raw material is obsidian – represented by an end scraper on a bilaterally retouched blank (Oliva 1989a, Fig. 3: 3; Nerudová 1997, Fig. 1: 1) found at Neslovice I surface cluster. The fourth exotic find are Kunětická Hora porcelanite artifacts excavated from Pod Hradem Cave, where cultural attribution is unclear (Nerudová et al. 2012; Nejman et al. 2017).

Cores at Moravian Szeletian sites are often irregular with an emphasis on producing flakes rather than blades (Valoch 1993a). Some blades are present, however, the corresponding cores were not found. Bifacial reduction was successfully reconstructed at Moravský Krumlov IV (Neruda, Nerudová 2005). A small portion of blanks have a faceted striking platform. In contrast to Bohunician striking platform preparation, the faceting is coarser and straight (not continuing to the percussion point). Elongated artifacts with a bidirectional dorsal scar pattern that characterize the Bohunician technology are not present in stratified Szeletian collections.

The Szeletian is characterized by a type artifact – the bifacially retouched leaf point. Such artifacts were excavated at Vedrovice V and Moravský Krumlov IV. Leaf points are absent in the Želešice III stratified collection (although bifacial thinning flakes are present), but they are present in the surface collection. This could be due to the small sample size, however, we cannot exclude a behavioral interpretation – different site function as P. Nigst (2012) argued for Willendorf II. Another important typological feature is the presence of steeply retouched end scrapers resembling Aurignacian forms. However, no characteristic Aurignacian carinated end scrapers, nor bladelet technology were documented.

The most important typological feature of the Moravian Szeletian is the presence of Jerzmanowice-type points, which appear to be ca. 5 thousand years older than elsewhere in northern Europe (Flas 2011, Tab. 1). They are understood to be a type artifact of the Lincombian-Ranisian-Jerzmanowician techno complex, which is traditionally connected with the last Neanderthals (Flas 2011). Artifacts with partial ventral retouch on proximal or distal tip were documented within excavated Bohunician assemblages at Stránská skála III (Svoboda 1987a, Fig. 24: 4), IIIa (Svoboda 1987a, Fig. 26: 12), IIa (Svoboda 1991, Fig. 9: 10), Tvarožná X (Fig. 3.8: 40), and Lišen/Podolí I (Fig. 4.5: 42) and characteristic Jerzmanowice-type points are common at the nearby surface artifact cluster of Lišen-Čtvrtě (Svoboda 1987a, Fig. 32). The role of Jerzmanowice-type points in ‘transitional techno complexes’ (Szeletian and Bohunician) and their presence in northern European Late Middle Paleolithic assemblages (Flas 2011) is an important question for current lithic archaeology.

While earlier dates from Vedrovice V and Moravský Krumlov IV overlap with GI-11 (Valoch 1993a; Davies, Nerudová 2009), the Želešice III dates extend the Moravian Szeletian back to the GI-12 peak (Škrdla et al. 2014) which is consistent with recently reported dates from new samples at Vedrovice V (Haesaerts et al. 2013), Willendorf II, layer 2 in Austria (Nigst 2012), and Luboń 11 in Poland (Bobak et al. 2013). In addition, the OSL method applied to Moravský Krumlov IV and Vedrovice V resulted in earlier dates – while upper dates from both sites statistically overlap with 14C statistical ranges, the stratigraphically lower samples were significantly older – probably contaminated by older quartz grains.

The new dates suggest that the earliest appearance of Szeletian is somewhat earlier than previously thought and is now recognized as chronologically overlapping with the early appearance of the Bohunician. In addition, both the Szeletian and Bohunician occupied the same or almost the same regions, shared similar site locations (the same settlement strategy), and shared the same raw material outcrops – the characteristic Szeletian raw
materials including Krumlovský les-type chert and Cretaceous spongolite chert are present (up to 10%) in Bohunician collections, while the characteristic Bohunician raw material – Stránská skála-type chert was documented in Želešice III (represented by several items).

Kaminská (et al. 2011) attempted to separate the Szeletian into two chronological phases (Early and Late) based on a relatively late date of the western Slovakian Szeletian site Moravany-Dlhá. Although triangular leaf points reminiscent of the ‘poplar-like’ Moravany-Dlhá leaf points have been documented in Moravia, all dated Moravian sites fall into the Early Szeletian phase.
3. Bohunician

3.1. Introduction

The term Bohunician is derived from the word Bohunice, the name of a suburb in the western part of the city of Brno, where this lithic industry was first discovered (Valoch 1976; Oliva 1981; Svoboda 1990). The Bohunician industry is characterized by the utilization of a specific technology conceptualized as a fusion of the Levallois and Upper Paleolithic crested core techniques (Svoboda, Škrðla 1995; Škrðla 2003a). While the former has a Middle Paleolithic origin, the latter is typical for lithic reduction in Eurasian Upper Paleolithic assemblages. The Bohunician technology is more volumetric than classical Levallois technology and its aim is the serial production of Levallois points with blades as secondary products (Škrðla 2003b; Škrðla, Rychtaříková 2012).

The Bohunician occupation is concentrated in a 100km² area within the Brno Basin (southern Moravia), where two clusters of stratified sites (Bohunice and Stránská skála), and a series of surface artifact clusters have been documented (Svoboda et al. 1996). There are three other surface artifact clusters in Moravia, including the Bobrava area (Škrðla et al. 2011a), Ondratice area (Svoboda 1980), and Mohelno area (Škrðla et al. 2012)(Map 3.1). Isolated sites with evolved Levallois industries have also been reported from adjoining regions including Hradsko in Bohemia (Neruda, Nerudová 2000; Škrðla et al. 2013a), Nižný Hrabovec in eastern Slovakia (Kaminská et al. 2009), and Dzierzyslaw I in Poland (Foltyn, Kozłowski 2003)(Map 3.7).

On a broader scale, the Bohunician fits into a complex of similar lithic industries described as Emiro-Bohunician (Svoboda 2001, 35), or Initial Upper Paleolithic (Kuhn, Zwyns 2014 with ref.) known from the Near East (Boker Tachtit at Israel, Ksar Akil in Lebanon and Üçağizli Cave in Turkey), the Balkan Peninsula (Temnata), Ukraine (Kulychivka) and further to the east (e.g. Kara Bom in Altai, Shuidonggo in northern China) (Derevianko et al. 2000; Svoboda 2001; 2004; Bar-Yosef, Svoboda 2003)(Map 3.8).

3.1.1. History of research

Research on the Bohunician can be separated into five historical stages. The first stage began with early isolated finds and concluded with Valoch’s excavation in Brno-Bohunice. The second stage involved Svoboda’s and Valoch’s intensive excavations at the Stránská skála hilltop sites during 1981–1989. The third stage is connected with the re-excavation of Stránská skála during 1997–1999 (Svoboda, Bar-Yosef eds. 2003). The fourth was a salvage excavation in Bohunice in 2002 (Škrðla, Tostevin 2005; Richter et al. 2008; 2009). The most recent field research includes the excavation of Tvarožná X (2008 and 2015; Škrðla et al. 2009), Ořechov IV (Škrðla et al. 2017b), and Líšeň/Podoli I-type industry (Oliva’s Podoli I site, Oliva 1981; Škrðla et al. 2017).

Similarly, the history of understanding of the specific features of the Bohunician industry also has a distinct trajectory. In the 1970s, K. Valoch (1976) recognized specific characteristics of the industry from Brno-Bohunice, characterized by
the prevalence of Stránská skála-type chert and evolved Levallois technology in combination with bifacial reduction, radiometrically dated as early as ca. 40 ka ^14C BP, and influenced by its similarity with industries from the Bobrava microregion (Valoch 1956). Valoch (1973) described it as a ‘Szeletian of Levallois facies’ (Szélétien de faciès levallois). Subsequently, J. Svoboda analyzed collections from large surface sites Ondratice I and Liščín-Čtvrtě, he recognized the similarity of those industries to the Brno-Bohunice industry and defined a complex ‘Bohunice-Liščín-Ondratice’ (Svoboda 1978), and later the ‘Bohunice-type industry’ (Svoboda 1987a). Finally, the industry was labeled as ‘Bohunician’ (Oliva 1979; Svoboda 1990).

A difficulty with the term ‘Bohunician’ is its heterogeneity when comparing two key groups of sites (Bohunice and Stránská skála) and its different meanings for different authors. While Oliva (1979) separated the Levallois component of the industry from the bifacial technology products which, in his view, were obtained by trade from Szeletian workshops, Svoboda (1980; 1990) concluded that the products of bifacial reduction represent an integral part of the Bohunician industry. Possible explanations of the role of bifacial reduction within Bohunician industries were studied in detail on the basis of the Bohunice 2002 collection (Tostevin, Škrdla 2006). In addition, the technologically oriented definition of Bohunician as a fusion of Levallois and Upper Paleolithic narrow prismatic core reduction principles were based on refitted cores from Stránská skála (Svoboda, Škrdla 1995; Svoboda, Bar-Yosef eds. 2003). However, an alternative interpretation was presented by K. Valoch (et al. 2000). By this time Valoch (1976) had noted the similarity of the Bohunice assemblages to Near Eastern assemblages, an hypothesis which was later tested using in depth technological analysis (e.g. Svoboda, Bar-Yosef eds. 2003; Škrdla 2003a; 2003b). The term Bohunician has recently been expanded to the Eurasian scale and is known as the ‘Emiro-Bohunician’ (Svoboda 2004; Bar-Yosef, Svoboda 2003).
The first stage of research

Paleolithic occupation was documented at several places in the area of Red Hill (Photo 3.1), an elevation on the western margin of the Brno Basin (Škrdla, Tostevin 2003 with ref.). Isolated artifacts (including an artifact resembling Levallois morphology) had been reported from Kohn’s Brickyard since the end of the 19th century (Makowsky 1889, 183, Fig. 219). J. Skutil also reported finds of probable Early Upper Paleolithic lithics showing Levallois technology from the area of Brno’s central cemetery as early as 1936 (Skutil 1936, Taf. X:1). The most important site, however, is Bohunice-Kejbaly and its vicinity, which were surveyed by K. Valoch during loess quarrying and the building of a panel-making factory, new road, and new houses during 1962–1973 (fully published in Valoch 1976). In addition, locality IV of the Bohunice-Kejbaly site cluster was excavated by Valoch during 1977–1981 (Valoch 1982).

The second stage of research

This stage concerns the excavations at the Stránská skála hilltop sites. The excavations were initiated in 1981 when a water pipeline trench disturbed a large Aeneolithic sunken feature. As white patinated Paleolithic artifacts were discovered within an Aeneolithic feature infill and within the intact sediments at the bottom of this feature, Valoch (Stránská skála III-1; Valoch et al. 2000) and subsequently Svoboda (Stránská skála III-2; Svoboda 1987a), conducted excavations (Photo 3.2). Both excavations uncovered a characteristic Bohunician industry in an Interplenioglacial soil. During subsequent years Svoboda continued with systematic excavations of the Stránská skála hilltop and discovered the sites labeled as Stránská skála IIIa, IIIb, and IIa (Svoboda, Valoch 2003 with ref.). Svoboda (1991) made an important stratigraphic observation when he documented the superposition of separate industries: a Bohunician horizon in the lower part of the Interplenioglacial soil and a Middle Aurignacian horizon in the upper part of Interplenioglacial soil. In addition, an Upper Aurignacian industry (at site IIa only) was present above the Middle Aurignacian layer, i.e. the lower part of the upper loess.

The third stage of research

Excavation at Stránská skála continued as a collaboration between J. Svoboda and O. Bar-Yosef in the late 1990s (Photo 3.3). The sites excavated include IIIc, IIId, IIIe, and IIIf located in the area of previously excavated sites III and IIIa.
Only IIIc, located near IIIa, produced a significant Bohunician assemblage (Svoboda, Bar-Yosef eds. 2003).

The fourth stage of research

The latest excavation at Bohunice was conducted by P. Škrdla and G. Tostevin in July–August 2002 (Photo 3.4). The rescue excavation of Bohunice-Kejbaly in 2002 was necessitated by the building of a new superstore and the related widening of Kameničky Street at the location of Valoch’s locality IV. In contrast to the earlier excavations at Bohunice, a laser theodolite was used to provenience artifacts and excavated sediments were screened using sieves with a 3mm-diagonal grid. The main goal was to test the homogeneity/heterogeneity of the industry, i.e. Oliva’s (1981; 1984a) traded point hypothesis. As refitting shows that bifacial reduction and Levallois core reduction were performed at the site, Oliva’s traded point hypothesis was rejected. As no spatial patterns of the studied attributes (raw material, Levallois technology, bifacial reduction) were identified, it was concluded that both technologies were pursued within this Bohunician locality. Only one exception was observed – the distribution of Krumlovský les-type chert varied over the excavated area. AMS, TL and OSL techniques were applied in order to set the time frame for the deposition of the layer and the age of the excavated industry (Richter et al. 2008; Richter et al. 2009).

The fifth stage of research

As all the previous investigations of Bohunician lithic variability were based on the analysis of two site clusters – Bohunice and Stránská skála – and several surface artifact clusters, we argued for the necessity of finding and excavating new stratified sites that would make it possible to test the presented hypotheses (see Tostevin, Škrdla 2006). For this reason, since 2005 the author has conducted intensive and extensive surface surveys of the Brno Basin, Bobrava, Mohelno, and Ondratice regions aimed at finding new stratified sites (e.g. Škrdla et al. 2011a; 2016). During 2008–2012, surveys were supported by Grant Agency of the Academy of Sciences of the Czech Republic (project No. IAA800010801). This project resulted in the discovery of two sites with artifacts within intact sediments – Tvarožná X and Ořechov IV. The third site originally reported as Bohunician based on surface finds was later reclassified as the Lišěň/Podolí I type industry (see chapter 4). Tvarožná X (or ‘Za školou’ after a local field name) was excavated over two seasons (2008 & 2015) by G. Tostevin and P. Škrdla (Photo 3.5). The excavation project was supported by the University of Minnesota (2008) and National Science Foundation

Photo 3.4. G. Tostevin with a total station at Bohunice 2002.

Photo 3.5. Excavation at Tvarožná (a tent).
(project No. 1354095). As the analysis of excavated material is still in progress, only preliminary data are presented in this work. Ořechov IV (or ‘Kabáty’ after a local field name) was excavated by the author since 2013 with large scale excavations in 2016 and 2017 (supported by Grant Agency of the Czech Republic, project No. 15-19170S). In addition, a Liščín/Podolí I-type industry displaying limited affinity with the Bohunician was excavated in 2015 and 2016 (Škrdla et al. 2017).

3.1.2. Bohunician technology and typology

The Bohunician technology was originally defined as a mixture of Levallois technology and Upper Paleolithic prismatic core reduction. Later, based on the analysis of refitted cores from Stránská skála where both techniques were used on the same core, the definition was refined as a conceptual fusion of Levallois and Upper Paleolithic technologies (Škrdla 2003a, b). All reconstructed cores from Stránská skála (14 completely reconstructed cores and a series of shorter sequences) show the tendency towards production of Levallois points (or a series of points) as the target artifact (Škrdla 2003a; 2003b; Škrdla, Rychtaříková 2012). In this concept blades were removed in order to shape the frontal surface of the core so they are considered as a secondary product (technologically). However, both blade and flake (including Levallois flake) blanks were frequently used for tool production.

The Bohunician technology as documented on completely reconstructed cores from Stránská skála can be described in the following way (Fig. 3.1). The raw material nodules or prismatic blocks were shaped into a core with a frontal crest (shaped by a series of flake removals, or utilizing a natural crest in the case of prismatic blocks) and one or two prepared reduction platforms. The core reduction started with the crested blade removal. It was followed by a series of blade removals, often reduced from both opposed platforms. The aim of these removals, called débordant blades (cf. éclat débordant; Boëda 1995), was the attainment of an elongated triangular shape on the frontal face of the core. At that point the frontal face was ready for Levallois point production. Now, the first Levallois point, or in many cases two Levallois points were produced (in the same direction). The striking platform was often reshaped before each point removal. The outcome was a wide frontal face of the core, not pointed, and the loss of its distal convexity – the necessary shape for removal of a Levallois point. Therefore, it was necessary to narrow the wide frontal face of the core with several blade removals to pre-prepare it for the production of another Levallois point. This process was defined by these two steps: 1) shaping and narrowing; and 2) Levallois point production, continued until the exhaustion of the raw material. The striking platforms of blades and points were faceted allowing better control of the point of impact of the strike. The prevailing dorsal scar pattern of points was bidirectional, or opposed directional (Škrdla 2003a, Table 7.1).

Bifacial reduction was documented only at the Brno-Bohunice type site. This technology of artifact shaping was not documented at the Stránská skála site cluster (although it was present in surface collections), nor at Tvarožná X and Ořechov IV, i.e. at other stratified sites. Although bifacially worked leaf-shaped implements are known from many surface sites classified as Bohunician, their relationship to the Bohunician industry is in doubt at those sites.

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**Fig. 3.1. Conceptual scheme of the Levallois Bohunician technology.**
The excavated sediments from Bohunice 2002 and Tvarožná X were wet-sieved using a 3mm mesh, but no bladelet technology was documented. Most recently, a bladelet technology was documented at Ořechov IV (Škrdla et al. 2017b).

The Bohunician typological spectrum represents a mixture of Middle Paleolithic and Upper Paleolithic tools. The Middle Paleolithic tools include different types of side scrapers, points, and notched and denticulated tools. The prevailing type of point is the unretouched Levallois point (often elongated), supplemented by the retouched Levallois point, Moustesian, Chatelperronian, Jerzmanowice-type, and Quinson-type points (Svoboda 1987; 2003b). Another important type of point from stratified contexts known only from Bohunice is the bifacially retouched leaf-shaped point.

The Upper Paleolithic toolkit is represented mainly by end scrapers produced on different types of blanks including flakes (cortical, semicortical, non-cortical, Levallois and non-Levallois), blades (cortical, non-cortical, and crested) and infrequently burins, often from a single blow. The end scrapers are often thin, the steeply retouched end scrapers resembling Aurignacian forms (not carinated) are rare. Similarly, no carinated burins were documented. It is also important to note the Upper Paleolithic tool types (end scrapers and burins) made on Levallois points. No bladelets were documented.

3.2. Key Bohunician sites

A detailed description of the Bohunice site cluster excavations were presented in Valoch (1974; 1976; 1982) and Škrdla and Tostevin (2003; 2005; 2006). Similarly, a comprehensive description of the Stránská skála site cluster excavations is available in Svoboda and Bar-Yosef (eds. 2003). Therefore these site clusters are not described in great detail in this work. The new stratified site Ořechov IV is described in greater detail although only the first part of collection is presented – the second, excavated in summer 2017 is still being analyzed. As the results of the Tvarožná X material are still unavailable, only preliminary information about this site is provided.

3.2.1. The Bohunice site cluster

Paleolithic occupation was documented at several places (including Kejbaly, Družba, and other find spots; Valoch 1974a; 1976; 1982) in the Red Hill setting (311.5m), an elevation on the western margin of the Brno Basin (Maps 3.2, 3.4). Isolated Paleolithic artifacts had been reported from Kohn’s Brickyard since the end of the 19th century.
A. Makowsky (1889, 183, Fig. 219) reported a charcoal concentration including an isolated bone fragment and an artifact morphologically resembling a Levallois point. This author also discovered human skeletal remains (Brno 1, Makowsky 1889), but its Paleolithic attribution is questionable (this specimen is now lost).

J. Skutil also reported finds of probable Early Upper Paleolithic lithics from Brno’s central cemetery (eastern slope of Red Hill) as early as 1936. One of his finds is a characteristic Levallois point (Skutil 1936, Taf. X:1). Other finds, mostly Lower and Middle Paleolithic artifacts, were collected at various findspots at the brickyard by various professional as well as amateur archaeologists during the first half of the 20th century (e.g. Valoch 1965b; Klíma 1963).

The most important setting in the Bohunice site cluster is Bohunice-Kejbaly and its vicinity, which were surveyed by K. Valoch and his colleagues (J. Jelínek and V. Gebauer) during loess mining expanding in a westerly direction and the building of a panel-making factory and new houses during 1962–1973 (completely published in Valoch 1976). The new housing estate built on the southern slope of Red Hill necessitated the construction of new infrastructure, including a new road (Kamenice Street) and the factory. As early as the beginning of 1969, M. Drmola discovered a concentration of artifacts in a road cutting (Valoch 1976, 4). This find initiated intensive rescue works by the Moravian Museum (especially by M. Drmola and R. Klíma) under the supervision of K. Valoch during 1969–1973. Three concentrations of artifacts labeled I-III were documented. The find spots were located in the entrance area of the panel-making factory K-I) below the administrative building (K-II) and inside the factory (K-III) at 280m (Valoch 1976; current location Map. 3.2). Another find spot was discovered by M. Drmola and R. Klíma in a construction pit located ca. 1km to the southeast of Kejbaly on the cadastral territory of Horní Heršpice. In 1973, R. Klíma discovered several concentrations of artifacts in trenches located ca. 600–800m to the southeast of Kejbaly 240–260m. The site was documented by K. Valoch and V. Gebauer and named Bohunice-sídliště Družba (Valoch 1974a), however, its Bohunician classification is unclear. Locality IV at the Bohunice site, 15–20m to the east of site I, was discovered by R. Klíma in 1977, and excavated by K. Valoch in 1977–1981 (Valoch 1982). Klíma’s survey and digging in the section together with Valoch’s small-scale excavation resulted in a collection of 1625 artifacts (Valoch 1982). In general, the surveys and excavations under supervision by K. Valoch resulted in artifact collections reaching thousands of items (Valoch 1974a; 1976; 1982).

The rescue excavation of Bohunice-Kejbaly in August 2002 was conducted by the author and G. Tostevin. It was required due to the building of a new superstore and the widening of Kameničky Street at the place of Valoch’s locality IV (the location of the former excavation was confirmed by R. Klíma).

The main goals of the research were to apply precise methods of excavation to the recovery of artifactual and geological data as these were lacking at the time of the site’s original discovery and to obtain more material for 14C dating of the Bohunician industry. In addition to 14C dating, optically stimulated luminescence dating methods were also applied. In order to preserve the greatest amount of information from the portion of the Bohunice site destined for destruction, excavation included three dimensional proveniencing (using a computer-aided infrared theodolite & EDM) of lithics, charcoal, manuports, ochre, etc., as well as geological horizons (Upper and Lower paleosoil boundaries). In addition to aiding interpretations of site formation processes at Bohunice, the three dimensional recording of artifacts will also allow the analysis of the spatial distribution (both

horizontal and vertical) of particular raw materials, technological, and typological features of the lithic industry. Extensive wet sieving of the sediments (only area A, 7m³ of sediment in total) was conducted in order to recover the smallest remains of artifact production.

Stratigraphically, the uppermost part of the section consists of a layer of modern refuse followed by an intact loess horizon 1.2–1.5m thick overlying two paleosols - the Upper and Lower Interpleni-glacial soils approximately 30cm and 30–50cm thick (Škrdla, Tostevin 2005). Gravel was concentrated at the bottom of the lower paleosol with the main artifact bearing horizon just above this gravel. A small number of artifacts (43 items) was also found in the Upper Paleosol. The bottom of the Lower Paleosol was penetrated by a series of “tongues” of the underlying sediment indicating horizontal (solifluction) and vertical (cryoturbation) movement. As the excavation was conducted in hot and dry summer condition, cryoturbation was visible only in Test Pit 3 (Photo 3.6).

The excavation covered an area of approximately 60m² (Map 3.2) yielding 3,400 recorded artifacts (over 1.5cm in size). The most frequently used raw material used for making knapped stone artifacts in both the Upper and Lower Paleosol assemblages is Stránská skála-type chert. The second most abundant raw material is Krumlovský les-type chert. The retouched tools and a selection of the debitage were analyzed by A. Přichystal, who observed a breccia-like inner structure within the Krumlovský les-type raw material. From this data, A. Přichystal considers the source of the Krumlovský les-type chert to be in gravel relicts within the Brno Basin (e.g. below the Hády Hill) rather than the primary sources in the Krumlovský les area. Only one piece of Krumlovský les-type chert was found in the Upper Paleosol (representing 2.9% of the Upper Paleosol assemblage). More pieces of this raw material were found in the Lower Paleosol (8.3% of the Lower Paleosol assemblage). Conversely, of the artifacts over 1.5cm in maximum dimension, Stránská skála-type chert accounts for 82.9% of the Upper Paleosol assemblage (n=29) and 82.3% of the Lower Paleosol assemblage (n=1,322).

Comparing the percentages of Krumlovský les-type chert by excavation areas, the highest percentage is in area D (17.4% of the pieces in this area), a lower percentage in area C (9.3%), and the lowest percentage in area A (5.8%). There are a number of highly patinated artifacts (7–13% of the Lower Paleosol assemblage depending upon excavation area) where distinguishing between Krumlovský les-type chert and Stránská skála-type chert is difficult. Other raw materials (radiolarite, Cretaceous spongolite chert, and erratic flint) are present in only very small numbers (each less than 1.1% of the Lower Paleosol assemblage). Quartz and Kulmian graywacke were used as hammerstones.
in the Lower Paleosol assemblage, a functional role indicated by characteristic impact traces on their surfaces. Quartz was also knapped for cutting edges as indicated by a core and several flakes. A collection of red ochre lumps determined (by A. Příchystal) as low-quality iron ore (weathering crust) probably derived from Devonian basal clastics were also found. This ochre, hard and not easy to process, is similar to the ochre utilized in Ořechov IV, but significantly differs from the ochre excavated at Stránská skála.

The artifacts that best characterize the Brno-Bohunice 2002 assemblage are presented in three plates of artifact drawings. These are the most diagnostic and/or important artifacts in the assemblage. Figure 3.2 shows Levallois bidirectional cores characteristic for the Bohunician, supplemented by a Levallois core (Fig. 3.2: 6), a unidirectional core on a small pebble (Fig. 3.2: 9) and a small Levallois core (Fig. 3.2: 3). Figure 3.3 shows products typical for the Bohunician Levallois technology (Fig. 3.3: 1–16,

Fig. 3.2. Bohunice 2002. Selected cores.
The end scrapers on Levallois blanks (Fig. 3.3: 25, 26) are important to note as similar artifacts were recovered from the Bohunician assemblage Stránská skála IIIa, level 4 (Škrđla 2003a, Fig. 7.8c). The last figure presents the foliate points in the assemblage (Fig. 3.4: 1, 2, 5), including two that are unfinished (Fig. 3.4: 4, 7), as well as a Mousterian point (Fig. 3.4: 3) and different types of side scrapers (Fig. 3.4: 6, 8, 9, 10). The side scraper with bifacial retouch was refitted to an overshot/outrepassé flake and undoubtedly proves that bifacial reduction occurred at the site (Fig. 3.4: 9). Generally, while the Krumlovský les-type chert was preferred for retouched tools (including bifacial reduction), the Stránská skála-type chert was utilized exclusively for Levallois production. In addition complete hammer stones identified by their characteristic use wear (both impact features and edge abrasion), made respectively from quartz (Škrđla, Tostevin 2005, Fig. 9: 1, 3) and a softer
greywacke (Škrdla, Tostevin 2005 Fig. 9: 2, 4) were found.

The Bohunice type-site was dated by $^{14}$C, TL, IRSL and OSL methods (Richter et al. 2009 with ref.; Nejman et al. 2011). While the radiocarbon dates (calibrated using CalPal, Weninger, Jöris 2008) have a relatively wide spread (between 40–48 ka cal. BP), a TL weighted average of eleven artifacts from the Bohunice 2002 excavation yielded a result of $48.2 \pm 1.9$ ka BP.
3.2.2. Stránská skála site cluster

The isolated Jurassic limestone rock of Stránská skála (cadastral territory of Brno-Slatina) is situated on the eastern margin of the Brno Basin in direct view of Red Hill (Map 3.3). The straight line distance between these two elevations is 7km. Its current summit (it has been quarried since Medieval times and was probably originally higher) is 310.0m. While the north facing edge is formed by steep rocky slopes (‘cliff’), the southern slope is gentle with aeolian deposits. The Jurassic limestone and weathered deposits (screes) in the lower parts of the rocky outcrop were used as a source of the chert. The Stránská skála site cluster consists of Stránská skála hilltop sites (IIa, III, IIIa–f) and several locales in the vicinity of Stránská skála (e.g. Podstránská, Bílá hora, Lišeň). In addition, P. Matějček’s surveys showed that the distribution of surface finds covers a larger area and almost all of Stránská skála (Kuča et al. 2011, Fig. 1).

Surface surveys at Stránská skála began in the 1920s at the site currently labeled II that is classified as Aurignacian (cf. Valoch 1954). The collection also included Levallois implements whose significance was not discerned at the time of publication (Valoch 1954).

Although the first stratigraphic observation was made by K. Valoch in a grenade crater at the end of World War II (Svoboda 1987b), the first excavation was initiated in 1981 when a north-south water pipeline trench on the Stránská skála hilltop disturbed a large Aeneolithic sunken feature. During the salvage excavation of a Funnel Beaker Culture lithic workshop, Paleolithic artifacts originating from an Interpleniaglacial soil sediment disturbed at the bottom of an Aeneolithic sunken feature, were also found. When the excavation of Aeneolithic sunken feature was completed, K. Valoch continued in excavating the Paleolithic artifact bearing horizon. The site was labeled Stránská skála III-1 (Valoch et al. 2000). This excavation was continued by J. Svoboda, who excavated a collection labeled as Stránská skála III-2 (Svoboda, Valoch 2003 with ref.). In the following years J. Svoboda (1987a; 1991; Svoboda, Valoch 2003) continued testpitting (1983) and excavations of sites labeled Stránská skála IIIa (1984), IIa (1986–1987), and IIIb (1988–1989). These excavations yielded collections of Bohunician artifacts (in superposition with an overlying layer containing Aurignacian artifacts in IIIa, IIa, and IIIb) and the first radiocarbon dates for the Bohunician and Aurignacian assemblages.

Excavation on the hilltop, a collaboration of J. Svoboda and O. Bar-Yosef took place during 1997–1999 (Svoboda, Bar-Yosef eds. 2003). Sites labeled IIIc (located in the vicinity of the previously excavated IIIa) and IIId (located in the vicinity of Stránská Skála III) were excavated. Only the first site yielded a rich collection of Bohunician artifacts. In the following paragraphs, the sites are briefly described (an exhaustive description was published in Svoboda, Bar-Yosef eds. 2003)(Fig. 3.5).

Stránská skála IIa

Site IIa is in close proximity to site II on its south-eastern margin and this area is currently a plowed field. The site was discovered by J. Svoboda, who found stratified artifacts in the walls of a trench dug for powerline construction. During two consequent field campaigns (1986–1987) an area of 52.5m² was excavated (Svoboda 1991). Overlying the Bohunician layer, two Aurignacian layers strongly affected by frost and slope processes were identified. The Bohunician artifact-bearing horizon was within the paleosoil sediment overlying limestone scree (including chert nodules) layer. The excavation yielded a collection of 1,863 artifacts (including chips) that were produced from prevailing Stránská skála-type chert, supplemented by isolated artifacts from Krumlovský les-type chert, radiolarite and quartz. Technological spectrum with prevailing raw material fragments, cores and debitage indicate a primary workshop on a raw material outcrop. Typological spectrum is characterized by end scrapers, supplemented by side scrapers and other tools (Svoboda 1991). A noteworthy find is a proximal fragment of a Jerzmanowice-type point (Svoboda 1991, Fig. 9: 10).

Stránská skála III and IIIId

These sites were discovered during the salvage excavation of an Aeneolithic sunken feature in 1981. K. Valoch (et al. 2000) excavated an area of 160m² that yielded a collection of 10,104 artifacts. Subsequently, J. Svoboda (1987a) expanded the
Fig. 3.5. Stránská skála. Selected Levallois points. SS-III: 1–3, 7, 13, 15, 16–19; SS-IIIa: 4–6, 8–12, 14, 20. Radiolarite: 3, 19; Krumlovský les-type chert (?): 18; all others: Stránská skála-type chert.
excavation by an additional 83m² that yielded a collection of 4,876 artifacts (including chips). Unfortunately, each excavation was published separately.

J. Svoboda defined three artifact clusters labeled A, B and C. Cluster A contained a hearth in a shallow depression. Charcoal from this hearth yielded an age of 38,500 ± 1,400-1,200 ¹⁴C BP (GrN 12298). Charcoal from K. Valoch’s excavation yielded a similar result of 38,200 ± 1,100 ¹⁴C BP (GrN 12297). The most abundant raw material was Stránská skála-type chert supplemented by imported material reaching 7% in Svoboda’s excavation and 3% in Valoch’s excavation. The main imported raw materials are Krumlovský les-type chert (variety II according to A. Přichystal et al. 2003) and radiolarite, followed by isolated occurrences of Cretaceous spongolite chert, erratic flint, Drahany orthoquartzite, quartz, and others. Radiolarite blanks were selected for tool production more often than other raw materials. Refittings suggest a typical Bohunician technology (Fig. 3.6) aimed at manufacturing a series of elongated Levallois points production (Škrdla 2003a) however, a differing interpretation of the manufacturing technology was suggested by Valoch (et al. 2000). The collection is characterized by a series of

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Fig. 3.6. Stránská skála. Refitted core No. S02/94.
unretouched Levallois points. The most abundant retouched tools are end scrapers followed by side scrapers and various points including a Mousterian point (Fig. 3.5: 19) and a ventro-distally retouched Levallois point (Fig. 3.5: 15). Other tool types were not as frequent. J. Svoboda found an accumulation of red and yellow ochre lumps in concentration A.

Located not far to the south from J. Svoboda’s concentration C excavated in 1982 was Stránská skála IIId. The trench dug in 1998 was 15 m² in area and yielded only a small collection of artifacts and ochre lumps in association with one hearth. The charcoal samples yielded a series of dates ranging 38–35 000 ka ¹⁴C BP (Svoboda 2003a).

Stránská skála IIIa

In 1983 J. Svoboda dug 5 test pits in the field to the west of Stránská skála III. In the following year one of the test pits with finds was expanded and an area of 39 m² was excavated. The site was labeled Stránská skála IIIa (Svoboda 1987a). Stratigraphically underlying the upper loess layer was a complex of two superimposed paleosoils. The upper one yielded Aurignacian artifacts and the lower one yielded Bohunician artifacts. This was the first time that both techno complexes were excavated at the same site in the Middle Danube area and pointed to the necessity of rethinking the interpretation of surface assemblages, where characteristic elements of both techno complexes were being found together (e.g. Slatina-Podstránská, Líšeň-Čtvrtě).

The Bohunician artifact bearing horizon yielded a radiocarbon date of 41,300 ±3,100-2,200 ¹⁴C BP (GrN12606)(Svoboda 2003a). The excavation yielded a collection of 3,534 Bohunician artifacts (including chips) produced mainly from Stránská skála-type chert supplemented by only isolated items made from imported rocks. The knapping technology and raw material economy was studied through refitting after complete nodules or blocks of raw material were reconstructed. The technology was defined as aimed at the production of a series of characteristic Levallois points that were often exported. The best items are missing in the refitted cores although a series of points was found at the site (Photo 3.7). End scrapers and side scrapers are the most common retouched tools with other types also present including a distal fragment of a possible Jerzmanowice-type point. The site is interpreted as a workshop on a raw material outcrop, however, some degree of domestic activity is indicated by the presence of retouched tools (Svoboda 1987a).

Stránská skála IIIb

A trench labeled Stránská skála IIIb was dug in a field (currently in a private garden, grassed and not available for excavation) between Stránská skála III and IIa. In 1988–1989, J. Svoboda (1991) excavated an area of 39 m². Two paleosoil horizons were present below the upper loess, with Aurignacian (upper) and Bohunician (lower) artifacts overlying a limestone scree layer with an irregular surface. Osteological material relating to the Bohunician was found in depressions among the limestone scree (Musil 2003). The lithic artifact counts in both horizons were not high.

Stránská skála IIIc

Stránská skála IIIc was located several meters to the northeast of site IIIa. Trench IIIc was excavated in 1997 and finished in 1999 to ascertain stratigraphic provenience of artifacts using more advanced excavation methodology and to obtain new radiometric dates. Fifteen metres squared were excavated resulting in a collection of 2,400 artifacts (including chips) produced mainly from Stránská skála-type chert and a small number of items made of orthoquartzite, quartz, Krumlovský les-type chert, and Cretaceous spongolite chert. Characteristic Bohunician technology was
documented based on refits. Levallois points were found at the site. But some small nodules (e.g. Škrdlå 2003a, Figs. 9.11: b, 9.12, 9.14: a) are not typically Bohunician (no bidirectional reduction, less facetting), but pointed artifacts were still being produced (nodule size, or a more developed stage which is consistent with the younger dates?). Retouched tools occur infrequently. End scrapers are most common and there is also one borer and a notched tool. The charcoal samples yielded a series of dates ranging between 38–34 000 14C BP (Svoboda 2003a). Similarly to the neighboring site IIIa, IIIc has a workshop character.

3.2.3. Tvarožná X, ‘Za školou’

Tvarožná X is located 7km to the east of Stránaská skála rock in a field on the southern margin of the Tvarožná village with a local field name of ‘Za školou’. The field is sloping to the north and is bordered by Tvaroženský Potok stream to the north, Santon Hill to the west, and a low, expansive,
unnamed elevation to the south and east. The altitude of the site ranges between 265–270m. The site does not provide a direct view into the main valley and is protected by the rugged topography of the southern margin of the Drahany Upland (to the north of the site). The above mentioned geographic parameters are not very characteristic for Bohunician settlement strategies (or EUP sites in general). Geographically, the site is located at the entrance to the Výskov Gate, a naturally shaped corridor connecting the Brno Basin with the Ondratice area and valleys further to the north (Upper Morava River Valley, Moravian Gate).

The site was discovered in the autumn of 1990 during a surface survey by Petr Kos. While the first survey yielded a collection of 20 white patinated artifacts, more surveys in 1990–2000 resulted in a collection of 193 artifacts (Škrdlá, Kos 2002). Further surface surveys in 2005–2006 resulted in a surface collection of 506 artifacts which were published in detail (Škrdlá 2007b). As Škrdlá and Kos (2002) noted, surface finds were concentrated in a shallow erosional depression. Calcium carbonate coating on the artifact surfaces indicate that the surface artifacts originated from intact sediments (loess and paleosoils). Fifteen test pits excavated during 2006–2008 resulted in a definition of an area of 200m², where artifacts were found within intact sediments (Škrdlá, Tostevin 2008). Subsequently, the site was excavated in 2008 and 2015 as a collaboration between G. Tostevin and the author.

The collection of artifacts from the 2008 and 2015 excavations are currently being analyzed in detail (Figs. 3.7, 3.8). The following paragraphs provide a preliminary raw material, technological, and typological description that may be slightly modified before the final report. The radiocarbon and thermoluminescence dating is also in progress.

The assemblage of provenienced artifacts over 2.0cm numbers more than 600 items. Additional small artifacts, often chips (currently unstudied), were recovered from the sieved aggregate samples. In regards to raw material, the Stránská skála-type chert and cherts that originate in gravels near the Stránská skála hill account for 62% of the assemblage. Krumlovský les-type chert makes up only 22% of the assemblage which contrasts the surface collection (cf. Škrdlá 2007b), where proportions of the Stránská skála-type chert and the Krumlovský les-type chert were approximately equal. Other Moravian Jurassic cherts, probably obtained from local gravels account for 4% of the assemblage. Other utilized rocks include Cretaceous spongolite chert (6%), radiolarite or radiolarite chert (1%), and erratic flint (1%). There is one item from limnic siliceous rock, and two from Troubky/Zdislavice-type chert. The raw material of three artifacts was not identified and nine artifacts were burnt. The assemblage is supplemented by two quartz flakes, which may or may not have been worked.

A preliminary technological analysis indicates a prevalence of debitage, including flakes (58%), blades and blade fragments (21%; including crested items), flake fragments (7%), cores (6%), blades (5%), partly retouched artifacts (1%; including broken blades and flakes), and one bladelet. Tools account for 5% of the assemblage (excluding chips). There are also seven unretouched Levallois points (not included in the above mentioned 5%). Characteristic Bohunician attributes including bidirectional reduction of elongated blanks and platform faceting commonly occur.

The most frequent tool types are end scrapers (8 items; Fig. 3.8: 10–17) followed by points (5 items). Points include a convergently retouched Levallois point with a ventral impact scar on its distal end made on limnic siliceous rock (Fig. 3.7: 1) and a short Jerzmanowice-type point made of erratic flint (Fig. 3.8: 40). There are also several splintered pieces (Fig. 3.8: 6, 7), side scrapers (Fig. 3.8: 18), retouched blades (Fig. 3.7: 7, 8), and retouched blade fragments. A burin, a notched tool and a retouched flake are also present.

Initial analyses demonstrate the presence of Levalloisdebitage with seven unretouched Levallois points and one retouched Levallois point, a series of end scrapers, and other tool types typical of the Bohunician industrial type. Like the Bohunice site, the Tvarožná X assemblage is not located immediately at the raw material source, but unlike Bohunice it has a more diverse raw material spectrum than previously identified in other Bohunician assemblages (Škrdlá et al. 2009). Micromorphological study indicates that
Fig. 3.8. Tvarožná X. Selected artifacts.
the assemblage appears to have been moved by colluvial action to a moderate degree, estimated at between 0.5 and 3 meters (Škrdla et al. 2009). When all analysis is completed, the site will represent a significant contribution to the debate concerning Bohunician chronology, raw material supply, as well as technological and typological variability.

3.2.4. Ořechov IV, ‘Kabáty’

Ořechov IV is located in a field called ‘Kabáty’ on a gentle southwestern slope of Lichy elevation (346.89m) above the right bank of Bobrava River (Photo 3.10). Altitude of the site ranges between 330–335m. The bedrock is composed of granodiorite partly covered by colluvial and aeolian sediments. A small spring (Nad Spáleným mlýnem) is located 450m to the southwest at the bottom of a ravine. To the south the site is bordered by a ravine of Holocene age separating the main concentration (IV) from a satellite concentration (IVd). Another satellite concentration is located ca. 90m to the east (IVA) and has produced only a small collection with a lower proportion of Stránská skála-type chert and includes a fragment of a bifacially worked artifact. Concentration IVb is 250m to the west and a small collection of artifacts is made from Krumlovský les-type chert. Several atypical crenoidal pieces suggest that this collection is Aurignacian. On a ridge above the main artifact cluster (70m to the north) is a satellite concentration IVc which yielded a small collection of artifacts including a bilaterally retouched Levallois point and a Levallois core made of Cretaceous spongolite chert. Its probable classification is Middle Paleolithic.

The site Ořechov IV was probably discovered by Josef Lavický in the 1930s (Lavický’s diary is deposited in the Moravian Museum). It was published by M. Oliva (1989a) as part of his list of Ořechov sites; however, the site location was reported with an uncertainty (fixed to an elevation marker located only on a 1:25,000 map; cf. Oliva 2016, 243) which may have fortuitously prevented the artifacts from being collected by amateur archaeologists. We re-located this site in 2010 during surveys of the Bobrava River Valley (Škrdla et al. 2011) and systematically surveyed it since 2010. The repeated surveys during 2010–2015 (Škrdla et al. 2016b) yielded more than 3,000 lithic artifacts recorded with hand-held GPS units. The distribution area of surface artifacts (140×60m) has an elliptical shape with the longest axis broadly consistent with the direction of plowing over the last two centuries. Irregularly distributed clusters on the site peripheries have also been detected (Škrdla et al. 2017b). Simultaneously with surface prospecting, a series of test pits was dug during 2011–2013 resulting in four hearths and other charcoal lenses and one isolated artifact being located in situ (Škrdla et al. 2017a). In the summer of 2016, an area of 21.5m² was excavated in the same locale (east) resulting in another hearth with isolated artifacts. In the winter of that year, deep plowing removed sediments rich in artifacts (west). Three test pits dug in that spot identified underlying intact sediment rich in artifacts. The salvage excavation of the intact situation under threat was conducted in March and continued in July 2017. A total area of 25m² was excavated. The surveys and excavations will be continued in the future.

The surface collection was analyzed in detail (Škrdla et al. 2016b) concluding that approximately 69% of the raw material is Stránská skála-type chert and 18% Krumlovský les-type chert. A small percentage of exotic raw materials have also been recorded. This collection can be technologically and typologically characterized as Bohunician with no evidence for bifacial working.

Test pitting on the eastern margin of the surface artifact cluster has met with somewhat limited success in regards to in situ lithic artifacts. However, four structurally intact hearths with red burnt sediments along the edges were discovered. The hearths were embedded in the underlying weathered bedrock. Only one artifact was discovered in association with one of the hearths. Systematic excavation in 2016 produced another structured hearth (No. 5), rich in charcoal and a small number of lithic artifacts (including a proximal blade fragment with a faceted striking platform made of Krumlovský les-type chert). Anthropological analysis has resulted in 1,031 determinations. Almost all were identified as larch (Larix sp.). Thickness of annual rings suggests the trees were not climatically stressed and the results point to a light taiga landscape. Four radiocarbon dates from different hearths have produced a wide age range for the human occupation at the site (41–46 ka cal. BP) (Škrdla et al. 2017a).
In contrast to test pitting on the eastern margin, a salvage excavation in the western part of the surface artifact cluster has revealed a structured hearth (Photo 3.8) associated with many thousands of in situ artifacts (Škrdlá et al. 2017b). The artifacts were discovered directly under the tilled top soil in a stratified context. A shallow depression in weathered and rilled granodiorite bedrock that was filled by clayish and non-calcareous colluvial sediments was detected in a spatially defined area. The position of the artifacts on the granodiorite indicates that the human occupation occurred before the formation of the colluvial sediments. The structured hearth No. 6 and nearby pit infills yielded charcoal samples used for dating. Two hitherto available radiocarbon dates range from 35–41 ka cal. BP indicating a younger age compared to the above described hearths from the eastern margin. However, the samples were collected very close to the tilled soil and some degree of contamination cannot be excluded. The attempt to collect and date more charcoal samples was not successful – two other samples yielded very recent dates and indicate that the site was probably not covered by loess and therefore exposed to minimal erosion since the beginning of modern times.

The artifact distribution pattern correlates with surface irregularities – concentrations occur in sunken areas interpreted as erosion gullies as they copy the slope gradient (Fig. 3.9). The most important concentration is in a depression where all identified erosion gullies meet. Other artifact concentrations are in a hearth pit and pits located along the hearth, however, this area was intensively affected by plowing and the artifacts along the hearth were removed. The distribution of burnt artifacts does not show any specific patterning. As the hearth is positioned with respect to the erosion gullies (its location is in the middle of a ridge between the two gullies), the gullies are most probably older than the hearths and people settled on the rilled bedrock when no sediments were present. The positions of artifacts that were concentrated at the bottom of the gullies were not influenced by water action after site abandonment, but by gravity (movement into lower positions) during occupation and plowing (destruction of the most vulnerable – uppermost – parts of the deposit) in recent times. This scenario is supported by refitting lines which do not seem to be affected by the erosion gullies.

Systematic excavation in spring 2017 of an area of 15m² has produced over 18,000 lithic artifacts with an additional 12,000 artifacts excavated during the summer field season. In total the excavated area reaches 25m² and has resulted in a collection of 30,000 artifacts. As the material from the summer excavation has not been analyzed yet, the following description concerns only the first half of the collection excavated in spring (i.e. 18,000 artifacts).

Of the 939 artifacts recorded in 3D during the excavation (artifacts over 2cm), 80% are made from Stránská skála-type chert (source is located 14km in a straight line north-east of the site) and 8% of Krumlovský les-type chert (source is located 7km to the south). The remainder is made from other local raw materials (2.7%), or burnt. The coarse (or heavy duty) industry consists of local granodiorite blocks, microdiorite cobbles, and quartz pebbles (the latter two possess traces of knapping). A total of 360g of ochre was also recovered during the excavation.

Technologically, the collection is characterized by frequently occurring products of Levallois technology (Fig. 3.11) including elongated products and characteristic opposed platform cores (Fig. 3.10: 15, 19, 20). Unidirectional dorsal scar pattern (38.7%) slightly prevails over bidirectional (30.0%). The crested dorsal scars account for 7.5%, cortical 4.6%, and centripetal 3.7%. The most abundant type of striking platform is the facetted platform (27.7%) followed by plain striking platforms (19.3%). Other types of striking platforms include dihedral, linear, punctiform,
and cortical, being represented by ca. 4% (each). Several artifacts possess a *chapeau du gedarme* (Fig. 3.11: 42, 43) and several others removal of bulb on the ventral surface resembling an Emireh-type point (Fig. 3.11: 41, 47) (*cf.* Copeland 2001).

A very unique feature of this assemblage is the presence of 529 microblades and bladelets (Fig. 3.11: 1–23). This is unprecedented for a Bohunician assemblage and has not been documented previously. It is not entirely clear how the bladelets were manufactured as artifacts from the critical phases of production (i.e. microcores or burins) do not seem to be present in the assemblage. Another technological component is the Levallois point (28 items supplemented by dozens of Levallois point fragments; Figs. 3.11: 24–36, 40, 45–51) ranging between 30.6–70.7mm in length (length/width ratios range from 1.2–3.7). Miniaturization is also evident in this technological class and has also not been observed in other Bohunician assemblages. Levallois technique and bladelet manufacture were performed on both Stránská skála-type chert and Krumlovský les-type chert so distance to source is
not likely to be a factor in the miniaturization of this assemblage.

One half of tools (27 items, excluding Levallois points) are end scrapers (Fig. 3.10: 1–9) made on blade and flake blanks (flat and not massive). The collection of tools also includes 3 notched tools, 3 retouched blades (Fig. 3.10: 10), 2 truncated artifacts (Fig. 3.10: 11), a point tip (Fig. 10: 14), a retouched flake, and a fragment of a retouched tool. The collection of tools is supplemented by 26 partly retouched artifacts.
Fig. 3.11. Ořechov IV – west. Selected artifacts.

It is likely that this site represents a palimpsest of different Bohunician occupations. This interpretation is also supported by the radiocarbon dating results. The recent results from the systematic excavations at Ořechov IV point to greater technological diversity during the IUP/EUP period than was previously thought.
This chapter summarizes other Moravian sites—unstratified and unexcavated (surface sites) that display a degree of similarity to the Bohunician techno complex. A characteristic feature of the Bohunician techno complex is the presence of evolved Levallois technology producing elongated Levallois points, often with bidirectional (less frequently opposed directional, or convergent) dorsal scars and with finely facetted striking platforms. Another characteristic feature is the presence of bidirectional Levallois cores and Levallois blades removed during Levallois core shaping. The sites are grouped according to microregions—Brno Basin, Bobrava River Valley, Mohelno area and Ondratice area, and supplemented by isolated Dolní Kounice XVIII site located halfway between Bobrava River Valley and Mohelno area.

In addition, isolated occurrences of artifacts bearing characteristic features of Bohunician techno complex are summarized.

The Brno Basin is an archaeological rather than a geomorphological term for the region that includes the present city of Brno. In the area of the confluence of the Svratka and Svitava rivers, it is a lowland, flanked by elevations to the east (Bobrava Highland), north, and east (Drahany Upland) and opening into the Vienna Basin towards the south. The elevated positions surrounding the lowland attracted IUP/EUP hunter-gatherers probably because of its strategic position allowing visual control of the lowland (Map 3.4). In addition, the high significance of the chert source on the Stránská skála rock and other raw materials available in local accumulations of gravel (including Krumlovský les-type cherts, Cretaceous spongolite chert, quartz) complete the genius loci of this place for the period of interest. A series of key sites were excavated within this microregion: the Bohunician type site Brno-Bohunice and a cluster of Bohunician and Aurignacian sites at the Stránská skála rock. However, individual Levallois implements are a part of many other collections.
Lišěn I, ‘Čtvrté’

Lišěn I represents a well-known Paleolithic surface site (e.g. Valoch 1962a; Svoboda 1987a; Škrdla 2000) located on the top of an extensive elevation (331.26m elevation marker) bordering the Brno Basin from the east, ca. 1.5km from the summit of the Stránská skála rock. The surface cluster with a diameter of ca. 400m is located to the south of the above mentioned elevation marker. The surface collection is characterized by the dominance of Stránská skála-type chert (90%) supplemented by radiolarite, Krumlovsky les-type chert, Cretaceous spongolite chert, and other rocks (Škrdla 2000). The surface collection includes characteristic Bohunician Levallois points and cores, supplemented by numerous end scrapers including steeply retouched forms, side scrapers, burins, notched and denticulated items, and other tools. Specific tool types are bifacially worked leaf points and Jerzmanowice-type points (Svoboda 1987a, Fig. 30–33).

Although Bohunician artifacts are more frequent, Aurignacian (Aurignacian end scrapers and polyhedral burins in the surface collection, e.g. Škrdla 2000, Fig. 2: 8, 23, 3: 10; and stratified site – see Aurignacian chapter) and other (Lišěn/Podolí I type industry) intrusions are likely. In addition, some of the artifacts may represent Epi-Gravettian, or Magdalenian admixture (Škrdla 2000). Other surface artifact clusters that possess a Levallois component in the Lišěn cadastral territory are on record (Oliva 1985), however, material is often mixed with Lišěn-Čtvrtě and only small collections are deposited separately. The area remains promising for future survey projects.

Podstránská (Valoch 1974b) is located on a plateau reaching a height of approximately 245m near the south-western foothills of Stránská skála. The surface collection is characterized by Levallois implements combined with characteristic Aurignacian tools. The artifacts are made from Stránská skála-type chert (most common), Krumlovsky les-type chert, erratic flint, Cretaceous spongolite chert, radiolarite, and unspecified Moravian Jurassic cherts. The site was classified as ‘Aurignacian influenced by Levallois technology’ (Valoch 1974b; Nerudová 2006). However, given the superimposed Bohunician and Aurignacian layers at Stránská skála IIa and IIIa (Svoboda 1987a; 1991), the mixing of Aurignacian and Bohunician occupations in the surface assemblage remains the most probable interpretation of this collection.

A test pit dug in 2012 at the site of Podstránská (Škrdla et al. 2013b) produced Paleolithic artifacts in two types of sediments: a non-calcareous colluvial sediment below the topsoil and a calcareous sediment from a fissure infill. One artifact has a prepared striking platform, which is characteristic for the Bohunician. Other artifacts are typically Aurignacian – a carinated end scraper and a unipolar core. Although it was not possible to clearly distinguish the two occupational levels, the documented presence of in situ artifacts is promising for a large scale excavation.

Židenice, ‘Bílá hora’

Bílá hora (Nerudová 2006) is located on the eastern slope of Bílá hora elevation (occasionally
called Nová hora) at an elevation of 275–285m. The summit of Bílá hora rock is 1km to the east from the summit of Stránská skála rock (Photo 3.9) and it is separated by a dry valley (former paleo-Svitava River Valley). The Bílá hora rock is formed by Jurassic limestone similar to Stránská skála and contains similar chert. The surface assemblage was collected in a field that is currently grassed. Geological observations in the 1980s and 1990s by the author document the presence of loessic sediments in the lower part of the field. The collection of 800 artifacts (Nerudová 2006) deposited in the Moravian museum is made from Stránská skála-type chert (most common), followed by Cretaceous spongolite chert, radiolarite, Krumlovský les-type chert, erratic flint, and unspecified Moravian Jurassic cherts. The collection of artifacts consists of characteristic products of Levallois technology in combination with Aurignacian tools and, similarly to Podstránská, may represent a mixture of both techno complexes.

3.3.2. Bobrava River area

The Bobrava Highland is drained by the Bobrava River in an easterly direction. The Bobrava River flows into the Svatka River ca. 4km from its confluence with Svitava River and ca. 8km south-southeast from the Bohunice type-site. The elevations along the downstream of the Bobrava River represent an important IUP/EUP microregion that is located close to the southwestern margin of the Brno Basin.

The Bobrava microregion contains numerous Szeletian sites. Artifacts commonly possess flat retouch which was always used on leaf points, side scrapers and other types of tools (Valoch 1956). However, the Levallois technology is also characteristic of the Bobrava microregion and its products are more or less present in the majority of Bobrava microregion assemblages (cf. Valoch 1956; Oliva 1989a; Škrdla et al. 2011a). Two key sites were excavated in this microregion: a
Bohunician site Ořechov IV and a Szeletian site Želešice III.

Želešice II, ‘Obenaus’, ‘Sádky’

The site is situated on the southern slopes of Kozi hora (Geisshügel, Geistbichel) – highest elevation at 355.7m. The elevation of the site reaches 223–225m and a relative elevation above the Bobrava River (flowing 700m to the south-west) ranges between 22–25m. The site is located in the area where the Bobrava River leaves the Bobrava Highland and its valley begins to open into the Dyje-Svratka River Valley. Its strategic position permits control of both valley junctions. The general area (Želešice, Modřice, Hajany) is rich in IUP/EUP surface sites but no other site is classified as Bohunician.

The site was discovered by a local farmer Robert Grim in 1930 and later introduced to scientific literature by H. Freising (1933) who published a photo (Photo 3.11) of selected artifacts documenting three basic characteristics of this small assemblage: 1) the presence of visible traces of calcium carbonate on the surfaces of several artifacts, 2) several artifacts were manufactured from banded Stránská skála-type chert and 3) characteristic features of Bohunician technology including a Levallois point, a Levallois flake and a bidirectionally reduced core. These characteristics suggest a Bohunician classification (cf. Valoch 1956; Oliva 1989a; Svoboda et al. 2002). The calcium carbonate indicates that artifacts were plowed up from intact calcareous sediments. The presence of loess in the field was already mentioned by Freising (1933), who noted that no fossil bones or charcoal were found. Later the stratigraphy was documented at a nearby construction pit (ca. 80m to the north-northwest, current address: Sádky 412). Below the topsoil was a layer of loess followed by a paleosol. The construction pit yielded one artifact – a frost fractured large blade made from Cretaceous spongolite chert (Škrdla 2003c). Freising (sketch deposited in Institute of Archaeology AS CR Archive) located finds to parcel plot No. 1403 and several neighboring plots in the eastern direction, at a distance of ca. 27m from the Želešice – Modřice road. Today the area of the site is under a building (current address: No. 289, 24. Dubna Street) and surrounding an asphalted car park (on the northern wall) so it will not be possible to reinvestigate. As the artifact

Photo 3.11. Želešice II. Selected artifacts. Adopted from Freising 1933.

bearing horizon located close to the surface was probably destroyed by the building activities, we are able to localize the site only on the basis of the information provided by Freising (coordinates N49 07.102 E16 35.429). It can be deduced from the short site description which presents all available data that this site held promising potential, but unfortunately has been lost to science before any archaeological excavation took place.

**Ořechov I, ‘Piskoňky’, ‘Pizoňky’**

The site is located on an extensive, shallow elevation (347.1m). The Bobrava River flows 1km to the north. The site was probably discovered in 1925 by H. Freising, who introduced it to scientific literature (Freising 1928). Later the collection deposited in the Moravian museum was analyzed and published by K. Valoch (1956), M. Oliva (1989a) and Z. Nerudová (1999) who classified it as Szeletian. However, Levallois products are clearly visible on the photo published by H. Freising (1928, Taf. 2)(Photo 3.12) and this is emphasized in all articles mentioned. The presence of the characteristic Levallois points led J. Svoboda (et al. 2002) to classify this collection as Bohunician.

Although the site is almost exhausted, we were still able to document its spatial extent and identify the raw materials (Škrdlá et al. 2011a). The confirmed extent of the site is elliptical in shape at 347.1m in its centre. It is 500m long (east-west) and 400m wide (south-east). The finds are scattered from the summit down to the 330m contour line. The recently surveyed collection consists of similar proportions of Stránská skála-type chert (52%) and Krumlovský les-type chert (43%). Cretaceous spongolite chert, radiolarite, quartz and erratic flint are also present (Škrdlá et al. 2011a). Similar raw material proportions were published by Z. Nerudová (1999). In contrast to the Ořechov I main artifact cluster, in the satellite concentration Ia in the eastern part, the proportion of Krumlovský les-type chert increases to as high as 62%. The same trend is visible in more easterly located sites Ořechov VI and VII (unpublished). Besides the Levallois points (material is deposited in the Moravian Museum) leaf points, side scrapers, end scrapers (including isolated Aurignacian pieces) and burins are also present (Nerudová 1999).

**Ořechov II, ‘Randlík’**

The site is located on the north-facing slope of Randlík elevation (highest point at 303.1m). Hajany Creek flows just below the site and the Bobrava River is situated 2.2km to the north. The Randlík Hill allows control of the Dyje-Svratka River Valley with the Pavlov Hills in sight. Recent surveys (Škrdlá et al. 2011a) have documented two neighboring artifact clusters within the mentioned area between the summit and the 298m contour line. Another artifact cluster was located slightly downslope (cadstral territory of Hajany). The main Hajany site is located another 400m to the east. A military base was present on the southern section and slopes of Randlík Hill (more suitable for Paleolithic occupation) so the surveys were (and still are) possible only on the northern slopes.

The recently collected assemblage (222 items) allowed an indicative raw material spectrum analysis (Škrdlá et al. 2011a). Krumlovský les-type chert (67%) significantly prevails over Stránská skála-type chert (24%). The rest of collection is composed of Cretaceous spongolite chert (6%) and several artifacts are made from radiolarite and erratic flint. The collection deposited in Moravian museum is characterized by frequent leaf points and side scrapers. The proportion of Levallois artifacts is lower compared to Ořechov I (Oliva 1989a; Valoch 1962b; Nerudová 1999). Although Valoch and Oliva classified this site as Szeletian, J. Svoboda (et al. 2002) reclassified it as Bohunician due to the presence of characteristic Levallois points. As in the case of Ořechov I, the palimpsest hypothesis (mixture of different technological behaviors) is a possible explanation.

**3.3.3. Mohelno area**

The surface surveys across the Mohelno highland plateau microregion bordered by Oslava River to the north Jihlava River to the south and 10km to the west of Krumlovský les ridge have a long tradition (Map 3.5). Many of the collections are deposited in Třebíč Museum, Moravian Museum, Institute of Archaeology AS CR, and in many private collections. The material was published by M. Oliva (1986) and more recently by the author (Škrdlá et al. 2012). Generally, the Mohelno microregion is significant for its specific IUP/EUP
industry (or industry from the Middle to Upper Paleolithic transitional period) combining the Levallois technique and bifacial reduction.

Mohelno, ‘Boleniska’

The Mohelno-Boleniska site covers a large area (250x100m) on top of an extensive elevation (elevation marker 374.5m) in a field called Na Boleniskách (actual map), Boleniska, or Bolenska. Administratively it is located on the cadastral territories of Mohelno (prevailing), Senorady and Lhánice villages. The artifacts were collected on the surface by many collectors. The site is now exhausted. Testpitting indicated a gravel terrace below the plow soil. The only artifacts in intact sediments – in soil sediment infilling a depression within gravels – were found in a small test pit dug in the early 1990s in the southern part of cluster (Škrdla, Plch 1993). However, subsequent attempts to identify the findspot were unsuccessful. Test pits dug in loess on the slopes of the northern margin of the surface artifact cluster were also unsuccessful. According to observations of collectors (including author), the surface artifact cluster can be separated into two parts – the northern part that is rich in retouched tools and the southern part that has a workshop character. Therefore, two separate occupational episodes cannot be excluded (Škrdla, Plch 1993; Škrdla et al. 2012).

The analyzed assemblage consists of several collections with over 900 artifacts (Škrdla et al. 2012). The raw material spectrum is characterized by prevailing Krumlovský les-type chert supplemented by radiolarite (although Škrdla, Plch 1993 presented 10% of radiolarite, in the new (non-selective) collections its proportion is significantly lower), Moravian Jurassic chert, and Stránská skála-type chert (ratio in single percentage digits) and infrequent artifacts made from rock crystal, siliceous weathering products, Cretaceous spongolite chert, and erratic flint. The Krumlovský les-type chert was imported in the form of pebbles or rudimentarily prepared raw material as indicated by the presence of cortical flakes, crested blades, abandoned pebbles (unsuccessful cores), and core residuals. The Stránská skála-type chert was imported as prepared cores rather than final products, as indicated by a crested blade. Similarly the presence of coarse fragments and large flakes often with traces of pebble cortex (indicating they originated in gravels) show a similar supply pattern for radiolarite.
The bifacial technology is characterized by bifacially or unifacially worked leaf points of different shapes (Fig. 3.12: 1, 2, 12, 18, 19). The leaf points were made (with equal proportion) only from radiolarite (nearest outcrops are 140km to the east in Vah River Valley) and Krumlovský les-type chert (outcrops are 15–20km to the west). Bifacial reduction was not applied to other raw materials. The leaf point half-product (Škrda et al. 2012, Fig. 3: 9) and bifacial thinning flakes (all from Krumlovský les-type chert except for one radiolarite; Škrda et al. 2012, Fig. 3: 1–4) indicate on-site shaping of leaf points. Flat retouch was applied to other tools including end scrapers.
Fig. 3.13. Mohelno, 'Boleniska'. Selected artifacts. Adopted from Škrída et al. 2002; Oliva 1986.

(Fig. 3.12: 5, 10), side scrapers (Fig. 3.12: 3, 8, 9), unifacial points (Fig. 3.12: 14, 17, 20), and borer/becs.

A detailed study of the Levallois component (elongated artifacts and cores in particular) is complicated by a high degree of fragmentation of artifacts due to frost processes as well as plowing damage. However, characteristic Levallois cores, flakes, and blades were documented (Fig. 3.13). The Levallois technology was applied almost to all identified raw materials. Although most
Levallois flakes are short, several elongated flakes (length more than twice the width) and fragments of elongated Levallois products were identified. In addition facetting of striking platforms and a bidirectional dorsal scar pattern are apparent on some artifacts.

Apart from points, the tools include end scrapers and side scrapers, burins and borer/becs. Other tool types are present only as isolated items. The end scrapers are prevailingly made on flake blanks, often massive flakes which resulted in steeply retouched forms (but not carinated), often with lateral or bilateral retouch. The most frequent type of side scraper has marginal subparallel retouch, however, side scrapers with steep, stepped, and flat retouch are occasionally present as well. The burins are simple (made by a single burin blow) as well as carinated. M. Oliva (1986) pointed out the presence of coarse borer/becs.

Several artifacts indicate the possibility of another (younger, Aurignacian?) component of the assemblage – a small core made of Kraców-Częstochova flint, carinated burins and several bladelets from erratic flint, and a carinated multiple burin on radiolarite.

It can be concluded for the Mohelno-Boleniska assemblage that both bifacial reduction (resulting in leaf points of different shapes, bifacial thinning flakes, leaf point half product) and Levallois technology (Levallois cores and artifacts with faceted striking platforms) are present. While the former was applied to Krumlovský les-type chert and radiolarite, the latter was applied to Krumlovský les-type chert, Stránská skála-type chert, Cretaceous spongolite chert, Moravian Jurassic chert, orthoquartzite, chert breccia, and possibly erratic flint are represented only by single items.

The analyzed assemblage includes several collections and consists of over 400 artifacts that are deposited at the Třebíč museum and Institute of Archaeology AS CR (Škrdla et al. 2012). The raw material spectrum is characterized by the dominance of Krumlovský les-type chert (over 70%) supplemented by Stránská skála-type chert and siliceous weathering products (ca. 10% each; Škrdla et al. 2012). Radiolarite, Cretaceous spongolite chert, Moravian Jurassic chert, orthoquartzite, chert breccia, and possibly erratic flint are represented only by single items.

It is technologically similar to the nearby site Mohelno-Boleniska with both bifacial reduction and Levallois technology present. The bifacial technology is characterized by the presence of bifacially worked leaf points of different shapes (Fig. 3.14: 17–20, 22) and bifacial thinning flakes (Škrdla et al. 2012, Fig. 8: 7–10) indicating onsite shaping. Bifacial reduction was applied to Krumlovský les-type chert, Moravian Jurassic chert, Cretaceous spongolite chert and radiolarite. Other types include several end scrapers, burins, a side scraper and retouched blades.

The Levallois technology was applied to Stránská skála-type chert, Krumlovský les-type chert and siliceous weathering products. Facetting of striking platforms and a bidirectional dorsal scar pattern are apparent on some artifacts. Several elongated Levallois blanks are present. A Levallois point (Fig. 3.14: 16) and several medial fragments with a characteristic ‘Y-arrete’ dorsal scar pattern (Fig. 3.14: 5–7) point to Bohunician technology (all of the artifacts are made from siliceous weathering products). Although cores are absent, the few crested blades indicate cores with a frontal crest.
As at Mohelno-Boleniska, M. Oliva (1986; 1988) classifies the assemblage as ‘Szeletian of Levallois facies’. Based on the frequent Levallois products, the author suggests affinity with the Bohunician (Škrdla et al. 2012). Again, possible interpretations include similarity to the Brno-Bohunice assemblage, a new undescribed techno complex, or a palimpsest.

Fig. 3.14. Lhánice I. Selected artifacts. Adopted from Škrdla et al. 2002; Oliva 1986.

Lhánice II, ‘Kozének’

Lhánice II (after the local field Kozének, also Dvůr Kozének, V Alpách) is located on the eastern part of a shallow elevation (397.2m). Most of this field is currently an abandoned orchard and is not available for survey. A small section of the site is accessible. The elevation of the artifact cluster ranges 368–379m. Bedrock is composed of granulite and loess.
was documented on the margin of the surface artifact cluster with finds of osteological material and an artifact with a calcium carbonate crust. The site was discovered by F. Florián, surveyed by M. Oliva (1986; 1988) and more recently by the author (Škrdla et al. 2012).

The analyzed assemblage includes several collections numbering over 120 artifacts deposited at the Třebíč museum and Institute of Archaeology AS CR (Škrdla et al. 2012). The raw material spectrum is characterized by prevailing Krumlovský les-type chert (over 50%) and Stránská skála-type chert (40%). Cretaceous spongolite chert, siliceous weathering products, radiolarite, and erratic flint are represented only by single items.

The presence of Levallois technology is technologically significant (Fig. 3.15: 7–14). It was applied mainly to Stránská skála-type chert, and occasionally to radiolarite, siliceous weathering products and Krumlovský les-type chert. Facetting of striking platforms and a bidirectional dorsal scar pattern are apparent on some artifacts. The typological spectrum includes convergently retouched points, end scrapers, side scrapers and a

Fig. 3.15. Lhánice II. Selected artifacts. Adopted from Škrdla et al. 2002; Oliva 1986.
bec. The atypical carinated end scrapers (Fig. 3.15: 4, 16) could indicate a younger intrusion.

The site Lhánice-Kozének differs from Lhánice-Jezera and Mohelno-Boleniska only by the absence of bifacial reduction.

3.3.4. Ondratice area

The Ondratice area, named after the well-known site Ondratice I, is a site cluster located on the eastern slopes of the Drahany Upland, in the area where Vyškov Gate opens into the Upper Morava River Valley (Map 3.6). The area is rich in local orthoquartzites that served as a principal raw material during the IUP/EUP period. The most significant is a concentration of sites on the cadastral territories of Ondratice and neighboring villages including Želeč, Drysice, Otaslavice, Myslejovice, Alojzov, etc. Surveys in this microregion have a long tradition since 1900s and the first archaeological excavation was realized as early as 1915 (Červinka 1915), followed by K. Absolon (1936), H. Schwabedissen (1942), and most recently by O. Mlejnek (et al. 2012; 2016).

Although the collection from many sites within the area includes some Levallois implements, only six of the most important sites are described in the following paragraphs.

Ondratice I / Želeč I

Administratively the site is located on the cadastral territories of Ondratice and Želeč, in the fields Velká Začaková and Holcase. The surface artifact cluster is situated above an active sand mine that already destroyed a small concentration Ia (Oliva 2004; Mlejnek 2015, Fig 101). The main surface artifact cluster is on a shallow north facing slope of an extensive elevation above a valley drained by a small stream. Site elevation ranges between 320–335m. The site yielded a collection of artifacts reaching tens of thousands. While the orthoquartzite industry was published by J. Svoboda (1978; 1980), who on its basis defined the Bohunice-type industry (Svoboda 1980), later termed Bohunician (Svoboda 1990), the industry made of other raw materials (including local cherts, erratic flint, radiolarite, etc.) was published only in part (Mlejnek et al. 2012; Nerudová 2015). In addition, Oliva (2004)
published a small concentration labeled Ia. The most important recent contributions are rescue excavations conducted by O. Mlejnek, G. Tostevin, and the author during 2009–2012 (Mlejnek et al. 2016) resulting in new stratigraphic data and a series of radiocarbon dates. In addition, a new surface assemblage numbering almost 1,400 items was collected and published in detail (Mlejnek et al. 2012).

Basic description of surface collections can be gleaned from major publications (Valoch 1967; Svoboda 1980; Oliva 2004; Mlejnek et al. 2012; Nerudová 2015). Although different authors recorded differing proportions of raw materials, the prevailing raw material is orthoquartzite reaching 30–40%, followed by Moravian Jurassic cherts (20%). Other raw materials reach proportions of up to 10% each – erratic flint, Stránská skála-type chert, Krumlovský les-type chert, Troubky/Zdislavice-type chert, Cretaceous spongolite cherts, radiolarite, and others (data adopted and generalized from Mlejnek et al. 2012; Škrdla, Rychtaříková 2012; Nerudová 2015). The Levallois technology products that were well defined in the orthoquartzite assemblage (Svoboda 1980) do not occur as frequently, but they are still present on other raw materials (Oliva 2004; Nerudová 2015). In contrast to M. Oliva’s and Z. Nerudová’s claims, in the new collection O. Mlejnek (et al. 2012, 301) identified Levallois products on Stránská skála-type chert (13.4%), Krumlovský les-type chert (10.9%), Moravian Jurassic cherts (6.9%), orthoquartzite (5.0%), and one Levallois point was made from erratic flint. Plain striking platforms are most common (52.6%) followed by faceted ones (19.7%)(Mlejnek et al. 2012). Different data were published by Z. Nerudová (2015, 14) for the non-orthoquartzite assemblage, where faceted striking platforms are present on only 5% of all flakes. The elongated Levallois points that are a characteristic feature of the Bohunician in the Brno Basin are not present (perhaps a bias due to the surface nature of the collection?). Typologically, all collections are characterized by tools characteristic for several techno complexes including Levallois points, often retouched, convergently retouched points, leaf points, Jerzmanowice-type points, end scrapers, side scrapers, burins and others. The surface assemblage is generally accepted as a non-homogeneous industry combining characteristic features of several IUP/EUP techno complexes and resulting from repeated occupation events (palimpsest). While the Levallois technology suggests a Bohunician occupational episode, the bifacially worked leaf points suggest a Szeletian contribution, and the presence of carinated end scrapers and burins in combination with bladelets suggests an Aurignacian contribution (recently e.g. Mlejnek et al. 2012; Nerudová 2015). Z. Nerudová (2015) identified artifact characteristics of more recent periods as well. There is no general agreement on the classification of this assemblage.

The site was excavated a number of times since the 1910s – I.L. Červinka, K. Absolon and H. Schwabedissen all conducted excavations in an attempt to ascertain the stratigraphic position of the finds. Absolon (1935, 10) described one cultural layer with quartzite artifacts underlying a layer with chert artifacts. According to Lothar F. Zotz, J. Dania who supervised Absolon’s excavation noted that during this excavation all the artifacts were found in a single layer (Zotz 1951, 175). A subsequent excavation by H. Schwabedissen recovered just one cultural layer with chert and quartzite artifacts (Schwabedissen 1942). However, his worker E. Dania later reported to Valoch that quartzite artifacts had been found in separate layers deeper than the layer containing the non-quartzite industry (Valoch 1967, 14). This claim was confirmed by another worker J. Ječmínek (Svoboda 1980). The location of Schwabedissen’s excavation had been chosen on the basis of test trenches excavated in a radial pattern outward from the main concentration of surface finds (Schwabedissen 1942), however,
after World War II all attempts to re-locate this find spot were unsuccessful (Svoboda 1980). Expansion of the sand mine in the first decade of the 21st century exposed new profiles in the area west from the main concentration of surface finds. A series of test pits were dug, one of them (Zel_1) intersected charcoal lenses and yielded isolated artifacts on the stratigraphic boundary between soil sediment and the underlying sand. Subsequently three long trenches were dug by a mechanical scraper and several hearths (Photo 3.13) were observed in the sections. Three of them were selected for excavation (Trench Zel_4a, Zel_12a and Zel_12b). While areas Zel_12a and Zel_12b yielded only isolated small artifacts found during sieving, the largest area Zel_4a yielded 69 artifacts over 2cm and hundreds of small artifacts found during sieving (Mlejnek et al. 2016). The excavated artifacts are mostly undiagnostic (in terms of techno complex affiliation). The only exception is a series of bifacial thinning flakes indicating on-site bifacial thinning (Fig. 3.16: 1–5). Unfortunately, the most important find – a leaf point – was collected on a nearby discard pile after mechanical scraping (Fig. 3.16: 9). It was found in the area of the site, it is related to the bifacial thinning flakes, but its stratigraphic position is not clear.

Ten charcoal samples were dated. The strategy was to date samples from charcoal concentrations likely to be anthropogenic – hearths, pits and other features infilled by charcoal and charcoal lenses within individual levels. The second strategy was to date samples from different trenches for spatial comparison of different artifact concentrations. Obtained results were calibrated using CalPal 2014 software (Weninger, Jöris 2008) on the IntCal13 (Reimer et al. 2013) curve.

The probability distribution is clearly bimodal with the first peak in the time span between 42–46 ka cal. BP and the second peak in the time span between 33–37 ka cal. BP. In addition, the later peak can be divided into two intervals with two sub-peaks – the first around 34 ka cal. BP and the second around 32 ka cal. BP. Based on these results, people occupied Želeč during at least two periods. The earlier horizon that can be currently placed to GI-13–GI-12 (minimum age due to the use of ABA pretreatment protocol; needs to be clarified using ABOx-SC pretreatment protocol) is related to an unspecified IUP/EUP industry. Although there were two different techno complexes (i.e. Bohunician and Széletian) documented in Moravia during GI-12, we are not able to distinguish which can be related to the excavated artifacts. The dated samples were recovered from the main artifact bearing horizons in trenches Zel_1 and Zel_4a (70m each from other) on the stratigraphic boundary between the soil sediment and the underlying Miocene sand.

The upper chronological unit consists of soil sediment and it was documented in trenches Zel_4a, Zel_12a and Zel_12b (it was also present in Zel_1 but not dated). Only a small number of artifacts were recovered from this horizon. In comparing our dates to the overall Moravian record, the only techno complex that has been linked to this timespan (i.e. GI-8–GI-6) is the evolved Aurignacian, so these anthropogenic features with a few artifacts may represent an occasional presence of Aurignacian people. The dates obtained from hearth Zel_12b seem to be slightly older than the dates from feature Zel_12a. Although the difference is about 1,500 years, the probability distributions of both date groups partially overlap.
The new excavation documented two Paleolithic horizons which accords well with the analysis of the new surface collection (Mlejnek et al 2012; Nerudová 2015). The material from the lower horizon is deficient in diagnostic types, but displays a stronger affinity with the Szeletian than Bohunician and the most common raw material is not orthoquartzite, as reported earlier. Therefore the Bohunician occupation characterized by abundant orthoquartzite artifacts has probably not been documented yet and more research is needed in this promising area.

Ondratice III, ‘Smetanice’

Ondratice III is located on a shallow elevation ca. 1km northwest of Ondratice I/Želeč I at 330–340m. The site was surveyed by J. Ječmínek, however, it was not re-located during surveys by O. Mlejnek (2015, 90) who discussed the possibility that it was confused with Ondratice IV. A small surface collection recently reanalyzed by O. Mlejnek (2015, 90) is deposited in the Moravian Museum. O. Mlejnek (2015, 90) described two Levallois points made from Krumlovský les-type chert.

Ondratice IV, ‘Syrovátky’

The site labeled Ondratice IV is a surface artifact cluster located on a slope of a shallow elevation ca. 1km west-northwest from Ondratice I/Želeč I 330–340m. The site already surveyed by J. Ječmínek was re-located by O. Mlejnek (2015, 91). A small surface collection recently reanalyzed by O. Mlejnek (2015, 90) is deposited in the Moravian Museum. O. Mlejnek (2015, 90) described a Levallois core, 4 Levallois points (two of them retouched), 3 blades, and 4 flakes in the Moravian Museum collection. Two other Levallois artifacts made from erratic flint were collected during new surveys (Mlejnek 2015, 93). The raw material spectrum is similar to Ondratice I/Želeč. From the technological and typological points of view, the assemblage again combines elements characteristic from all three main IUP/EUP techno complexes and most probably represents a palimpsest (Mlejnek 2015, 92).

Drysice I, ‘Kluče’

Drysice I is a surface artifact cluster located on a northeast slope of Vojenská Hill (442m), ca. 1.4km to the west of Ondratice I/Želeč I. Site elevation is 390–398m which is about 60–70m higher than Ondratice I/Želeč I. It was previously surveyed by J. Ječmínek and re-located by O. Mlejnek (2015, 51). The material (almost 3,000 artifacts) is deposited in the Moravian Museum and it was recently reanalyzed by Z. Nerudová (2000b) and O. Mlejnek (2015). Mlejnek (2015, 51) points out the low proportion of orthoquartzite (7%) and high proportion of erratic flint (26%) compared to Ondratice I/Želeč I. Other raw materials such as Stránská skála-type chert, Krumlovský les-type chert, Cretaceous spongolite chert, Moravian Jurassic cherts, Troubky/Zdislavice-type chert, radiolarite and others have similar proportions as in the Ondratice I/Želeč I assemblage. While discoidal and Levallois cores prevail among the orthoquartzites, prismatic cores prevail in other raw materials (Mlejnek 2015, 51). Levallois blanks are represented by 24 Levallois points, 16 blades and 30 flakes (Mlejnek 2015, 52). Typologically, the collection is characterized by almost equal proportions of end scrapers and burins (including Aurignacian forms), followed by points (leaf points, Jerzmanowice-type points, Quinson-type points, and convergently retouched points), retouched blades, side scrapers, and combined tools. In a similar vein to the Ondratice I/Želeč I assemblage, characteristic features of all three main IUP/EUP techno complexes are present. The assemblage is most probably a palimpsest (Mlejnek 2015, 54).

Drysice III, ‘Žlíbky’

Drysice III is a surface artifact cluster located on an easterly slope of Vojenská Hill, ca. 1.4km southwest of Ondratice I/Želeč I at 378–390m (similar to Drysice-Kluče). It was previously surveyed by J. Ječmínek and re-located by O. Mlejnek (2015, 56). The collection is deposited in the Moravian Museum and has recently been reanalyzed by Z. Nerudová (2000b) and O. Mlejnek (2015). Raw material proportions are similar to Drysice-Kluče and the proportion of orthoquartzite (2%) is low compared to Ondratice I/Želeč I assemblage (Mlejnek 2015, 56); however, in a recently collected assemblage its proportion increases (Mlejnek 2015, 57–58). The higher proportion of Stránská skála-type chert (17%) and a specific weathered rock red in color (11%; Mlejnek 2015, 56) are noteworthy. The
Levallois component of the collection consists of 7 Levallois cores, 4 points (including an elongated item), 7 blades and 22 flakes. Typologically, the collection consists of retouched blades, splintered pieces, notched and denticulated tools, 3 leaf points, a Mousterian point, and combined tools. The proportion of Stránská skála-type chert and the use of Levallois technology suggest a strong affinity with the Bohunician. The proportion of bifacially worked tools and flat retouch is low. A high proportion of Aurignacian end scrapers and splintered tools suggest an Aurignacian component (Mlejnek 2015, 57).

*Drysice V, ‘U posedu’*

Drysice V is a surface artifact cluster located on the eastern slopes of Vojenská Hill, 5–20 meters lower than Drysice-Kluče (the elevation ranges between 378–390m). The site was discovered by O. Mlejnek (2015, 59). The collected assemblage (174 artifacts) has a low proportion of orthoquartzites (3 items) and erratic flint (6 items). The prevailing raw materials are Moravian Jurassic chert (55 items), Krumlovský les-type chert (27 items), and Stránská skála-type chert (more than 20 items) (Mlejnek 2015, 59). The Levallois component consists of two Levallois cores, a Levallois point, three Levallois blades and four Levallois flakes (Mlejnek 2015, 59). Three Levallois blanks were retouched and transformed into tools (two end scrapers and one notched tool). The tools include end scrapers, burins, notched tools and a fragment of a Jerzmanowice-type point. In terms of the raw material spectrum, technological and typological composition, Bohunician features prevail. As the site was not reported earlier and taking into account its similarity to the nearby Drysice-Kluče assemblage, this cluster may in fact represent the original Drysice-Kluče site that was not precisely re-located. Alternatively, both clusters could be two parts of one large surface artifact cluster.

**3.4. Isolated Bohunician Moravian finds**

*Diváky, ‘Borovinka’*

Diváky is known as a surface site located in the field Staré hory that yielded leaf points within an Aurignacian assemblage (Oliva 1984b; Svoboda, Havlíček 1987). However, on the other side of the Diváky Creek valley is another elevation – Borovinka (290.3m), where J. Němeček collected a small collection of artifacts (10 items) including a proximal fragment of a Levallois artifact (it cannot be determined if it is a point or a blade) with a finely faceted striking platform (Havlíček, Škrdla 2010, Fig. 13: 1). The artifact is made from Stránská skála-type chert. The findspot is located 24km south of Stránská skála.

* Dolní Kounice XVIII, ‘Jewish cemetery’

Dolní Kounice XVIII is located on the northern slopes above the Jihlava River, around 250m (Nerudová 2014) close to the Kounice Gate opening that connects Dyje-Svratka River Valley to Ivančice Basin. This surface site was surveyed by O. Svoboda and later A. Otta, who collected almost 600 artifacts that were analyzed and published by Z. Nerudová (2014). A stratigraphic trench dug by Z. Nerudová documented artifacts within the B-horizon of a Holocene soil that were probably redeposited and an isolated artifact on top of the underlying gravels (i.e. in a stratigraphic situation similar to Ořechov IV and Ondratice I / Želeč I). While the material was classified by M. Oliva (1989a) as Bohunician, Z. Nerudová (2014) argued for a Middle Paleolithic classification. The high proportion of Stránská skála-type chert (not usual for the local MP) is an important aspect. Z. Nerudová described crested blades, débordant blades (Nerudová 2014, Fig. 4: 1, 5: 1), Levallois blanks (Nerudová 2014, Fig. 4: 1–8), infrequent faceting of striking platforms, prevailing unidirectional dorsal scar pattern, scrapers made on massive blanks (Nerudová 2014, Fig. 4: 9–12), and a carinated (?) burin (Nerudová 2014, Fig. 5: 7). The characteristic products of Bohunician technology – elongated Levallois points – are missing. Based on a limited number of artifact illustrations (Nerudová 2014, Figs. 4, 5), there is some degree of morphological similarity to the material from Mohelno area (e.g. in the shape of Levallois blanks, scrapers on massive blanks from Lhánice I) and Lišěn/Podoli 1-type industry (e.g. scrapers on massive blanks while other characteristic attributes are absent, see chapter 4). Although according to the author (and M. Oliva) the high proportion of Stránská skála-type chert in combination with Levallois technology indicates contacts with the Brno Basin and is the most
diagnostic indication of the Bohunician (similar as nearby Ořechov IV), the most diagnostic Bohunician features are in fact missing (elongated Levallois points), and other features not typical for Bohunician sites are present (scrapers on massive blanks, a carinated burin). The classification of this industry remains uncertain. It is also possible that the assemblage is a palimpsest composed of several techno complexes and a part of it (Stránská skála-type chert in particular) represents the Bohunician.

**Milovice I**

Milovice I is a well known Gravettian and Aurignacian site below the Pavlov Hills. During the large scale salvage excavation, the Gravettian layer in the northern sectors of the excavated area was contaminated by older sediments with older artifacts (including leaf points). A Levallois point with a facetted striking platform and bidirectional dorsal scars was found in sector A in a mammoth bone deposit (230m)(Oliva et al. 2009, Fig. 8: 1). The point is made from Stránská skála-type chert. The point was very probably broken and repaired by retouching on its ventral surface – economic behavior that can be expected at this distance to the source (38km south of Stránská skála).

**Popovice, ‘Podsedky-Kopaniny’**

Popovice (Popovice cadastral territory is a part of Rataje village) is on a crest protruding to the northeast from Troják Hill (396.5m). Site elevation ranges between 300–305 m. The site was surveyed by Z. Schenk and M. Sedláčková (Pěluchová Vitošová et al. 2008) and by a local amateur F. Jedruch. Both collections are characterized by Aurignacian artifacts, however, the latter collection includes artifacts that seem unusual compared to the rest. Three artifacts were briefly studied by the author and differ in the raw material used (Moravian Jurassic chert) and in technology/typology (Škrdla 2010a). One artifact is a Levallois point and another is a Levallois blade. Both artifacts have a facetted striking platform and probably bidirectional dorsal scars. This point is 44mm in length and 39mm in width, so it is a flake point. The third artifact is a leaf point. An isolated occurrence of the Bohunician techno complex cannot be excluded in the Upper Morava River Valley.

**Reznice, ‘Horní pole’**

Reznice is on the right bank of the Jihlava River 6km southeast of Mohelno-Boleniska. M. Vokáč discovered four artifacts (including a Levallois blade with a finely facetted striking platform and bidirectional dorsal scars) on the northeastern slopes of the Horní pole field at 260–268 m (Škrdla 2012, Fig. 14). The artifacts are made from high quality Moravian Jurassic chert, most probably Stránská skála-type chert (det. A. Přichystal).

### 3.5. Bohunician sites in neighboring regions (Map 3.7)

#### 3.5.1. Bohemia

Hradsko u Mšena is located in central Bohemia, 12.2km northwest (in a straight line) of the confluence of Elbe and Moldau Rivers. The site is situated on a plateau near the Hradsko village (Photo 3.14), approximately 3.5km southwest of Mšeno. The plateau is shaped by Kokorínský důl (Kokořín Gorge) from the west and by Kaninský důl (Kanina Gorge) from the south. The summit of the plateau reaches an elevation of 334m. The collection of Paleolithic artifacts was obtained during M. Šolle’s (1977) excavation of an Early Medieval Hill-fort and subsequent surface surveys were conducted by Slavomil Vencł (1977, 3).

The documented artifact cluster is ellipsoidal in shape with dimensions of 150x100m, elongated in the north-south direction. The center of the artifact cluster is located approximately 60–70m to the...
south of the top of the plateau; the artifacts are concentrated on the southern part of this plateau, probably as a result of erosion processes (Vencl 1977, Fig. 2). Although the recent surveys yielded only a small number of mostly non-diagnostic artifacts, their spatial distribution is consistent with that documented by Vencl. The artifacts were excavated from two horizons – most were recovered from a fine-grained sandy sediment infilling gullies (erosion gullies?) and the remaining artifacts were recovered from a loessic sediment underlying a topsoil (according to Vencl 1977, 13). Vencl asserts that people settled directly on the sandy or rocky bedrock and after site abandonment the artifacts were redeposited as part of infills in gullies and depressions. Red ochre lumps and scattered charcoal identified as fir and pine (Vencl 1977, 14) were also found. The preserved traces of Paleolithic occupation and the stratigraphy of the site were affected by Holocene activities (hill-fort construction, digging sunken features, plowing) (Vencl 1977, 14).

The material from Hradsko was analyzed several times (including raw material, technology and typology) and at least two different components were separated – an evolved Levallois technology suggesting a Bohunician component and an Upper Paleolithic component (Vencl 1977; Neruda, Nerudová 2000; Svoboda 2001; 2004; Škrdla et al. 2013a).

The raw material types used in making the artifacts were identified in previous publications (Vencl 1977; Neruda, Nerudová 2000). The most common raw material is erratic flint (~60%) followed by tephrite (~30%). Other raw materials include radiolarite, porcellanite, schist and other siliceous rocks (~10% in total). The proportion of tephrite in the assemblage was originally higher because it was documented only in the excavated collection. Very few tephrite artifacts were found on the surface because this material weathers easily (Vencl 1977, 18).

As the Levallois technology was applied only to erratic flint, tephrite and radiolarite, the provenance of those raw materials is described in detail. The nearest sources of erratic flint are in the Ploučnice River terrace ~25km to the north of Hradsko (Jablonský 1981). Radiolarite is represented by the reddish-brown variety, and relics of pebble
cortex indicate its provenance in river gravels. The nearest outcrops are located in the Carpathian Klippen Belt (~300km to the southeast in a straight line) and in the Danube River Valley (~250km to the south). The most important raw material is tephrite. This raw material was already identified by Vencl (1977), however, J. Adamovič (in Škrdla et al. 2013a) recently analyzed thin sections of three original artifacts from Vencl’s collection and identified this raw material as a glass nepheline-bearing tephrite. When the tephrite was analyzed, the samples of all known tephrite outcrops in a 5km radius were compared. A petrographic analysis of basaltic rocks from nearby outcrops clearly pointed to a tephrite dyke source 1.6km north of Kokofín, 2.3km northwest of Hradsko. This tephrite dyke was studied in detail and mapped by Adamovič (1989) who documented it in north-northeast –

Fig. 3.17. Hradsko, selected artifacts. 1–5, 21, 22, 24: tephrite; 6–10, 13–20, 23: erratic flint; 11, 12: radiolarite.
south-southwest direction ca. 230m westerly from a 350.2m elevation marker. The most important outcrop is on the edge of Okolnice Gorge, where it is possible to collect blocks several tens of centimeters in dimension. The fresh tephrite is black in color and easy to knap, producing sharp cutting edges. The area around the primary outcrop was repeatedly surveyed (2014–2017) resulting in a small collection of Paleolithic artifacts and some post-Paleolithic items. All Paleolithic artifacts are made from erratic flint covered by a white patina. One of them has a faceted striking platform and a bidirectional dorsal scar pattern – both the features strongly connecting it with the Hradsko assemblage. The evidence of human activity found directly at the outcrop supports the conclusion that it was this particular tephrite outcrop that was utilized. As stated above, the Levallois technology was applied to erratic flint, tephrite, and radiolarite. However, there are differences in the technological categories indicating different economy of utilization for each particular raw material. While there are characteristic Levallois tephrite cores (bidirectional, with negatives of point blanks; Fig. 3.17: 21, 22, 24), such cores were seemingly not produced with erratic flint and radiolarite. The crested blades documenting preparation of a frontal crest are present only within erratic flint assemblage, but their relationship to Levallois technology is not clear. The blanks removed from cores – blades and flakes – are often fragmented, however, several Levallois blades (Fig. 3.17: 2, 14) and Levallois flakes (Fig. 3.17: 18, 19, 23) were recorded. Proximal fragments of Levallois blades and flakes (Fig. 3.17: 6, 7, 11, 12, 15–17) with faceted striking platforms occur frequently. Several artifacts can be interpreted as medial (Fig. 3.17: 20) and distal (Fig. 3.17: 8–10) fragments of Levallois points. There is only one Levallois point made from erratic flint and it is complete (Fig. 3.17: 13). In addition, several weathered tephrite artifacts have a characteristic Levallois point shape, however, faceting of striking platform and dorsal scars are difficult to interpret due to weathering (Fig. 3.17 : 3–5).

Vencl (1977, 20) noted the small proportion of tools in the assemblage (4%). He claimed that this was due to the poor preservation of tephrite tools due to weathering, intensive export of erratic flint tools (he used the term ‘negative selection’), and fire damage. The most frequently occurring retouched tools are end scrapers, often flat and made on flake blanks. Several of them are steeply retouched, nosed and carinated. Other tools include side scrapers, burins, points/borers, retouched blades, a splintered piece, a notched blade and a combined tool/chopper (Vencl 1977, 24–25). Some of the tools probably come from the younger component of the assemblage.

The artifact assemblage is probably not homogenous because some of the artifacts possess technological and typological traits that are not considered Bohunician. They are probably from a younger assemblage – Aurignacian or Epi-Gravettian. Examples of such artifacts include carinated end scraper/microcores (Vencl 1977, Fig. 8: 10, 11), small prismatic cores, dihedral burins/microcores on flakes, cf. Vencl 1977, Fig. 9: 12, 13), microblades and fine retouch on some artifacts.

The Hradsko assemblage can be compared to Moravian Bohunician collections by looking at the operational chain (cf. Škrdla 2003b; Škrda, Rychtaříková 2012; Škrda, Nikolajev 2014).

The raw material composition consists of equal proportions of local tephrite and imported erratic flint (from a distance of at least 25km). Other raw materials account for ~10%. Based on petrographic analysis of all the neighboring tephrite outcrops, the tephrite outcrop utilized at Hradsko was located 2.3km from the site, on the other side of the deeply incised Kokořín Gorge. The finding of several erratic flint artifacts at this outcrop is also consistent with this assertion. The radiolarite is probably of Carpathian provenience. Moravian Jurassic cherts such as Stránská skála-type and Krumlovský leste-type were not found at this site.

The core preparation stage has not been adequately documented as it is not possible to clearly recognize the position of flakes in the technological process and the pre-cores are missing. A crested blade (erratic flint only) indicates preparation of cores with a frontal crest. The production stage is documented more clearly – the blanks have faceted striking platforms and several cores (tephrite only) show bidirectional dorsal scars – both features are characteristic for the Bohunician technology.
In addition, several fragmented artifacts indicate evidence for elongated blanks (length is twice the width, or greater).

Although Vencl (1977, 20) pointed out a low proportion of tools, their proportion is still greater compared to other Moravian collections for which relevant data are available (e.g. Škrdla et al. 2016b).

In contrast to Moravia, where the Bohunician sites cluster in small microrregions including the Brno Basin, Mohelno area, Bobrava area, and Ondratice area, the Bohunician occurrence in Hradsko is isolated. Surface surveys conducted by Vencl (1977, note no. 4; pers. comm.) (though not intensive) and later by the author (Škrdla et al. 2013a) have failed to discover any other Paleolithic sites in the vicinity.

Analysis of the operational chain of the Hradsko assemblage indicates its strong affinity to the Moravian Bohunician industry. Hradsko currently represents the most westerly located site of the Bohunician techno complex in Europe. Its connection to the Moravian sites located ca. 200km away and separated by the rugged relief of the Czech-Moravian Highlands is still open to debate.

3.5.2. Slovakia

The only Slovakian site with Bohunician technology is Nížný Hrabovec in eastern Slovakia (Photo 3.15). This site is located in a strategic position above the Ondava River Valley, on a southerly elongated ridge (elevation ranges between 160–175m, i.e. 40–55m above the current river level), in an area where the east-Slovakian lowland ends and becomes connected to the Prešov region through a narrow pass. The lowland is bordered by the Vihorlat Highland to the east and Slanské Hills to the west.

The site was discovered and surveyed by Peter Zubko during 1987–2000 (Bánesz, Zubko 1992). As the series of test pits dug in 1998 and 2000 (Kaminská et al. 2000; Hudler et al. 2001) did not yield any artifacts within intact sediments, the site is reported as a surface site. Application of the technotypological approach allowed L. Kaminská (2003) to distinguish several hypothetical occupation phases – Middle Paleolithic (side scrapers), Bohunician (evolved Levallois technology), Aurignacian / Epi-Aurignacian (carinated end scrapers, burins, retouched blades, Gravettian / Epi-Gravettian (end scraper – burin combination and several burins). The Levallois component of the collection was reanalyzed in 2008 (Kaminská et al. 2009; Škrdla 2010a).

Levallois technology was applied only to local and semi local raw materials (with one exception) including brownish and greenish silificed marlstones (identified by A. Přichystal) and a black menilite chert. The outcrops of the former material are ca. 25–30km from the site and the latter 50–60km from the site (Kaminská et al. 2000). It is possible to collect both raw materials in gravels near the site. The only exception is an artifact made from brown radiolarite where the original outcrop is unknown. The nearest radiolarite outcrops are within the klippen belt ca. 70km to the northwest from the site.

Levallois technology was recognized on cores, blades and flakes including Levallois points. Most cores in the collection are technologically uninteresting pre-cores, cores at the initial stage of reduction and exhausted cores. There are also some cores displaying a series of characteristic bidirectional scars with two opposed striking platforms (Fig. 3.18: 29–31, 33). The characteristic Levallois removals consist of blades and flakes with a faceted striking platform and often with a bidirectional dorsal scar pattern (Fig. 3.18: 1–28). The Levallois blanks (with the exception of small flakes) are significantly elongated and the average length – width ratio reaches 2.44. The elongated

Photo 3.15. Nížný Hrabovec. A view of the site.
Fig. 3.18. Nižný Hrabovec. Selected artifacts. Adopted from Škrdla 2010a.
style of production is contingent on raw material shape – flat pebbles were initiated from a narrow edge.

Although it is a surface collection, it was possible to refit several sequences. Two sequences consisting of two refitted artifacts each show clear evidence of Bohunician volumetric reduction. The first sequence consists of two refitted Levallois points with finely facetted striking platforms (Fig. 3.18: 27). The re-facetting of the striking platform after the first Levallois point removal resulted in a step in the longitudinal cross section. The dorsal scars are unidirectional (convergent), however, the orientation of the most distal negative is not clear. Although it is a surface collection, it was possible to refit several sequences. Two sequences consisting of two refitted artifacts each show clear evidence of Bohunician volumetric reduction. The first sequence consists of two refitted Levallois points with finely facetted striking platforms (Fig. 3.18: 27). The re-facetting of the striking platform after the first Levallois point removal resulted in a step in the longitudinal cross section. The dorsal scars are unidirectional (convergent), however, the orientation of the most distal negative is not clear. The first sequence consists of two refitted Levallois points with finely facetted striking platforms (Fig. 3.18: 27). The re-facetting of the striking platform after the first Levallois point removal resulted in a step in the longitudinal cross section. The dorsal scars are unidirectional (convergent), however, the orientation of the most distal negative is not clear. The first sequence consists of two refitted Levallois points with finely facetted striking platforms (Fig. 3.18: 27). The re-facetting of the striking platform after the first Levallois point removal resulted in a step in the longitudinal cross section. The dorsal scars are unidirectional (convergent), however, the orientation of the most distal negative is not clear.

The typological analysis is questionable because the artifacts were not found in a stratified context and there may be an admixture of material from other Paleolithic techno complexes.

The site represents palimpsests from the Middle Paleolithic (flat retouch on menilite chert, radiolarite, and erratic flint, large flakes of dotted flint), through the Upper Paleolithic to the Neolithic (pottery in a test pit). The raw material economy of the Levallois component of the collection is based on local or semi-local raw material. Moravian raw materials were not identified in the collection. Andesite (Korolevo?) and possible Volhynian flint cannot be linked to the Levallois part of the collection. Although the technological process cannot be reconstructed in greater detail due to lack of context for the artifacts, the series of characteristic Levallois artifacts and the two refitted production sequences documented bidirectional shaping of the core front by removals from two opposed platforms, precise facetting of striking platforms, and serial production of predetermined blanks (Levallois points) – i.e. characteristic attributes of Bohunician technology.

3.5.3. Poland

Dzierzyslaw I is situated on an elevated position on the Glubczyce Plateau, Upper Silesia, near the current Czech-Polish border. The material from Foltyn’s excavation (Foltyn, Kozlowski 2003) deposited in Muzeum Śląsko Opolskiego in Opole was reanalyzed by the author in 2012. The industry was produced from erratic flint collected in local glacio-fluvial deposits. A part of the Dzierzyslaw I assemblage was published as Bohunician (Foltyn, Kozlowski 2003). Technologically, the collection consists of frequent raw material fragments missing significant traces of knapping, flakes, infrequent blades, cores and tools (cf. Foltyn, Kozlowski 2003). The cores are mostly prismatic with unidirectional dorsal scars and Levallois with centripetal dorsal scars. Isolated crested blades show frontal crest preparation. The facetting of striking platforms is neither intensive nor fine (often made with just a few blows). The faceted platforms are often straight and not concave. Blanks show a prevailing unidirectional dorsal scar pattern. The elongated Levallois blanks (both points and blades) with a bidirectional dorsal scar pattern and finely concavely faceted striking platforms (and associated cores) are absent in this collection. Typologically significant are Jerzmanowice-type points supplemented by coarse leaf points suggesting half products (or Middle Paleolithic bifaces) rather than finished leaf points. This collection does not show typical Bohunician technological or typological attributes. Foltyn’s collection is more likely to be of Middle Paleolithic origin.

Another site where elongated Levallois blank removals have been recorded is Piekary IIa
located in the Kraków area. The materials from W. Morawski’s excavations (layers 7a, b, c) were recently analyzed and dated (Valladas et al. 2003; Sitlivy, Zięba 2006). The time span recorded for layer 7c to 7a is 38.5–53.0 ka (TL-dates, mean weighted ages at one sigma level; Valladas et al. 2003: 66) which corresponds with Bohunician dates (cf. Richter et al. 2008; 2009). While the lower layer (7c) is characterized by ubiquitous Levallois elements and bidirectional reduction, the upper layer (7a) is more bladey with rare Levallois elements, and again with bidirectional reduction (Sitlivy, Zięba 2006, 398).

Isolated Levallois artifacts were recently excavated from the upper part of the late Middle Paleolithic sequence at Stajnia Cave near Częstochowa, known for Neandertal remains (Urbanowski et al. 2010). At least four Levallois points elongated in shape stand out from the rest of the late Middle Paleolithic industry and are characterized by an opposed directional dorsal scar pattern and concave faceted striking platforms (M. Urbanowski, personal communication 2012)(Fig. 3.19).

In conclusion, presence of the Bohunician techno complex was not confirmed in Dzierzyslaw I. Piekary IIa assemblage also differs from the Bohunician and the chrono-stratigraphic context of a small collection of Levallois artifacts from Stajnia Cave is poorly known because it has not been published in detail. Erratic flint from northern Moravia/southern Poland was documented in the Brno Basin Bohunician assemblages, which suggests a connection with the southern Poland region.

3.5.4. Ukraine

Kulychivka is multilayered site situated on Kulychivka Hill (highest point is over 350m) on the outskirts of the town of Kremenets (Ternopil region, Ukraine; Photo 3.16). This territory is on the border of two geographic regions – northern edge of Podillia Uplands and the lowlands of Male Polissia, watershed of Ikva and Goryn Rivers. The site reaches an elevation between 270–280m and its relative elevation is ca. 35–40m above the Ikva River (Sytnik et al. 2007, 181). It is situated at a strategic position allowing control of the surrounding landscape and near an outcrop of a high quality chert of Turronian Age.

Kulychivka site was excavated by V. Savych during 1968–1989. He defined four Paleolithic layers at the site. Cultural layer IV was recorded by V. Savych only within an area excavated in 1981–1984 (200m²). V. Savych wrote about the absence of dwellings and fireplaces in this sector, but he noted the presence of four concentrations of flint products – interpreted by him as places of flint-knapping. The total number of artifacts in layer IV is over 10,000. Approximately 8,500 of these artifacts are deposited in the museum at Ivan Krypiakevych Institute of Ukrainian studies.

Raw material procurement is based on the utilization of the local Upper Cretaceous (Turonian) flint nodules that were obtained from soft chalk deposits. They were relatively easy to extract. However, the nodules were also available in secondary (colluvial and alluvial) deposits. The Kulychivka Levallois points are both short and elongated (length over twice greater than width). Bidirectional dorsal scar pattern is common, unidirectional dorsal scar pattern is rare and centripetal dorsal scar pattern was not observed at all. Striking platforms on Levallois points are faceted, often just coarsely. The faceting created a protruding convex shape of the proximal end. The Levallois points are supplemented by blades, with faceted striking platforms infrequent. The proportion of tools in Kulychivka reaches 3.4% of the total number of

Fig. 3.20. Kulychivka. Refitted sequences. Adopted from Škrdla et al. 2016c.
artifacts (Sytnik, Koropets’kyi 2010, 24). Middle Paleolithic tool types include side scrapers of different forms, Levallois points, retouched flakes and notches. The Upper Paleolithic tool kit is represented by end scrapers, retouched blades, and burins.

In spring 2015 a team of three archaeologists experienced in refitting spent nine days of intensive research. It was possible to refit three technologically significant production sequences. All of the available material from layer IV was used, i.e. Savych’s 1984 excavation. The refitting was complicated by the exceptional homogeneity of the high quality chert and the incompleteness of the collection (approximately 1,500 artifacts from Savych’s 1984 layer IV collection are missing).

Refit 1 (Fig. 3.20: 1)

A Levallois point with a convergent dorsal scar pattern (the removals were directed from the same platform) and a faceted striking platform was refitted to a core fragment. The pointed form of the core face was shaped by two removals from the same platform where the point was removed. The Levallois point (Fig. 3.20: 1a) has a broken tip and it was slightly retouched at the intersection of the lateral edge and butt – similar type of retouching was also documented at Boker Tachtit and in the Moravian Bohunician (e.g. Marks, Kaufman 1983; Demidenko, Usik 1993; Škrdla 1996). After the removal of this point, the knapper tried to remove a second point. This attempt was probably unsuccessful. The core front and the striking platforms were not re-prepared. Inner inhomogeneity of the core may have contributed to this failed attempt as it resulted in a crack that broke the core. The resulting flake has part of the core volume on the ventral side of its proximal end (Fig. 3.20: 1b). This refitted sequence documents serial production of Levallois points.

Refit 2 (Fig. 3.20: 2)

An elongated Levallois point with an opposed directional dorsal scar pattern (the removals were directed from the opposed platform) and a faceted striking platform (Fig. 3.20: 2c) was refitted to a medial fragment of a Levallois point (probably second)(Fig. 3.20: 2d), in this case with a bidirectional dorsal scar pattern (the removals were directed from both opposed platforms). The pointed shape of the first Levallois point was achieved by two removals directed from the opposed platform and then the point was removed. After this point removal, the frontal face of the core was re-prepared by a series of removals directed from the same platform as the knapped point. There are scars from two removals on the right lateral edge and one on the left lateral edge on this artifact (Fig. 3.20: 2d). Although we have only a small medial fragment, the shape indicates that the artifact was most probably a Levallois point. The

<table>
<thead>
<tr>
<th>Lab no.</th>
<th>^14C BP</th>
<th>Std. Cal. BP</th>
<th>Std.</th>
<th>Note</th>
<th>Material</th>
<th>Layer</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>n.a.</td>
<td>31,000</td>
<td>35,000</td>
<td>n.a.</td>
<td>n.a.</td>
<td></td>
<td>3</td>
<td>Savich1995</td>
</tr>
<tr>
<td>Poz-38145</td>
<td>29,700</td>
<td>500</td>
<td>33,760</td>
<td>480</td>
<td>Test pit 01-2010</td>
<td>charcoal</td>
<td>3</td>
</tr>
<tr>
<td>Poz-51432</td>
<td>33,000</td>
<td>400</td>
<td>37,210</td>
<td>620</td>
<td>Old sample from Savych’s excavation</td>
<td>charcoal</td>
<td>3</td>
</tr>
<tr>
<td>Poz-51395</td>
<td>30,980</td>
<td>280</td>
<td>34,910</td>
<td>270</td>
<td>Old sample from Savych’s excavation</td>
<td>Mammoth tooth (molar?)</td>
<td>2</td>
</tr>
<tr>
<td>Poz-76197</td>
<td>37,100</td>
<td>1000</td>
<td>41,350</td>
<td>840</td>
<td>2015 trench, layer 20 cm above sterile sediment</td>
<td>charcoal</td>
<td>4</td>
</tr>
<tr>
<td>Poz-76198</td>
<td>39,200</td>
<td>1000</td>
<td>43,170</td>
<td>770</td>
<td>2015 trench, lowermost lens on the sterile sediment</td>
<td>charcoal</td>
<td>4</td>
</tr>
</tbody>
</table>

Tab. 3.1. Overview of available radiocarbon dates from Kulychivka. Dates were calibrated using CalPal 2014 software (Weninger, Jöris 2008) on the IntCal13 (Reimer et al. 2013) curve.
dorsal scar pattern is bidirectional. This sequence again documents serial production of Levallois points (in this case with re-preparation – thinning – of the frontal face of the core) and utilization of two opposed striking platforms.

**Refit 3 (Fig. 3.20: 3)**

A Levallois point with a bidirectional dorsal scar pattern and a faceted striking platform (Fig. 3.20: 3c) was refitted to a Levallois blade with a convergent dorsal scar pattern and a faceted striking platform (Fig. 3.20: 3f). The pointed shape of the Levallois point was formed by removals directed from both opposed platforms. After this point removal, the frontal face of the core was reshaped by at least two blade removals from the same platform as the point. A proximal fragment of one of these blades was refitted.

The three sequences document serial production of elongated Levallois points from convergent, bidirectional and opposed directional cores, which is a characteristic feature of the refitted assemblages from Stránská skála (Škrdla 2003a) and Boker Tachtit, levels 1–3 (Marks, Volkman 1983), i.e. it is a generic feature of Emiro-Bohunician assemblages.

Several dates were obtained for Kulychivka (Tab. 3.1) – the first by V. Savych (Savych 1995) and the second series of dates was obtained by a Ukrainian-French research team (Sytnik et al. 2012). The resulting dates were significantly younger than the generally accepted age for the Bohunician (cf. Meignen et al. 2004, 63). Therefore new samples were collected in 2015 by the author and R. Koropets’kyi (Škrdla et al. 2016c). The 2015 trench was located as close as possible to the area where V. Savych identified layer IV in 1984 (cf. Škrdla et al. 2016, Fig. 1). Although only a small area was excavated (3×1.5m) and the artifact density was low, loessic sediment with several charcoal lenses and several artifacts below layer III were identified. Samples from the two lowermost charcoal lenses were collected for dating. All of the collected charcoal was identified by J. Novák as larch. The sample from the lowermost charcoal layer situated on the underlying sterile sediment yielded a result of 43,170 ± 770 cal. BP. A second sample from a charcoal lens 20cm higher yielded an age of 41,350 ± 840 cal. BP. The results are in stratigraphic order which eliminates the possibility of postdepositional disturbance. It is very likely that these new dates provide an age for V. Savych’s layer IV. Most importantly, they statistically overlap with the large probability distribution of the Moravian Bohunician (Škrdla et al. 2016, Fig. 5).

The results of morphological analysis, refitting, and new dates demonstrate a similarity between Kulychivka, layer IV, and the Moravian Bohunician (Sytnik, Koropets’kyi 2010; Škrdla, Nikolajev 2014). Škrdla et al. (2016) concluded that the artifact bearing horizon of both layers III and IV were not exhausted during Savych’s excavation and advocated for the re-opening of the Kulychivka site to conduct new field work using modern excavation techniques. It is undoubtedly a key site for the Middle to Upper Paleolithic transitional period in Eastern Central Europe.

**3.5.5. Bulgaria**

The cave Temnata dupka (Dark Hole) is located in a karstic area near Karlukovo village in northern Bulgaria (Photo 3.17). Temnata Dupka is in a limestone cliff (Lakatnik Rocks) above the Iskar River, near the entrance to the large Prohodna Cave tunnel. The site was excavated by a Bulgarian-French-Polish team in the 1980s (Kozlowski et al. 1989; Ginter et al. 1998). The assemblage with an evolved Levallois technique was excavated in sector TD-I, layer 4, and sector TD-II, Layer VI and interpreted as a MP/UP transitional industry. It was dated to an age range of 50–45 ka (Ginter at al. 1998; Sitlivy, Zięba 2006; Tsanova 2012). The

*Photo 3.17. Temnata Cave.*
material from the above mentioned excavation, currently deposited in the National Archaeological Institute with Museum in Sofia, was briefly studied by the author in 2014 (Photo 3.18).

Generally, the cores show bidirectional reduction, some of them possessing a frontal crest. However, Levallois points and other blanks with facetted striking platforms are rare. The technology seems slightly different from the technology we know from Stránská skála, Boker Tachtit and Kulychivka. It is still bidirectional, however, the opposed platforms were not utilized to shape a core frontal face in a triangular shape necessary for the removal of a Levallois point. Sometimes it seems that the opposed platforms were used separately – i.e. a sequence of blanks from a secondary (opposed) platform was produced independently of removals from the primary platform and the removals were not aimed at forming the core front shape necessary for Levallois point production. It is different to Bohunician bidirectional shaping where blanks are removed in order to shape the frontal face of the core into an elongated triangular form ready for the removal of a subsequent point. As a result of this technological variation, the Levallois points mostly possess a convergent dorsal scar pattern. Some blanks with bidirectional dorsal scars are still present. Facetting of striking platforms is coarser compared to the Bohunician and often not concave or *chapeau de gendarme* prolonged shape. In addition, the material from transitional levels is somewhat homogeneous, but some limited mixing with Upper Paleolithic material has probably occurred (steeply retouched tools and artifacts with dorsal edge abrasion between core platform and core frontal face).

It is difficult to compare it with the Emiro-Bohunician in greater detail because of missing refittings. I can conclude that some characteristic IUP attributes are present in the Temnata assemblage, however, there are also distinct differences when compared to the classic Bohunician technology. On the other hand, we do not know the degree of variability between IUP collections in such a large territory.
3.6. Distant analogies (Map 3.8)

3.6.1. Israel – Boker Tachtit

The site of Boker Tachtit is located on the Nahal Zin River terrace, in hilly terrain intersected by deep wadis in the Avdat/Aquev area of the central Negev desert. The locality is situated almost at the bottom of the valley. The Negev desert is a region rich in good quality lithic raw materials. The material from Mark’s excavation was refitted by P. Volkman (Marks, Volkman 1983; Volkman 1983) and recently reinvestigated by the author (Škrdla 2003b)(Photo 3.19). While the refitted sequences from Levels 1 and 2 document serial production of Levallois points in a similar way as in the Bohunician, in Level 4, significant differences were observed. The pointed products were removed from single platform cores and the preparation of the striking platform occurs at distinctly lower frequencies. The pointed shape of the artifacts (of which some are morphologically similar to Levallois points, see Marks, Kaufman 1983) is the result of distal convexity and the convergence of the frontal face of the core (see Marks, Monigal 1995 275). Pointed artifacts are produced from ridges shaped by previous blade removals. These ridges were created at different times at different places within the core volume (see core cross-sections; Škrdla 2003b, Figs. 15, 18–19).

The presence of both Middle (e.g. Levallois points, side scrapers, notches and denticulates) and Upper Paleolithic tools (e.g. end scrapers, burins) characterizes the typological spectra of the Boker Tachtit industry (Marks, Kaufman 1983). This phase of the operational sequence also shows differences along the stratigraphic sequence. The typological spectra of Levels 1 and 2 are quite similar. Burins account for ca. 30% and end scrapers ca. 20% of the retouched tools. Notched and denticulate pieces occur relatively frequently (ca. 30%). Emireh points account for approximately 10% of the tools. Other tools in the assemblages include sporadic side scrapers, perforators, truncated pieces, and a ventro-distally retouched point. In comparison to Levels 1 and 2, Level 4 is characterized by a significant increase in end scrapers, and a decrease in burins along with notched and denticulate pieces. Retouched points are frequent, mainly on blades, with variable location and intensity of retouch, while Emireh points are absent. Other tools represented include truncated and partly backed pieces, and composite tools. The tools were produced on points, blades, and flakes, all manufactured using the described technology, with no other type of reduction sequence identified. The site was re-excavated in 2015 in order to obtain new and more relevant radiocarbon dates, however, the results are not available as yet (Photo 3.20).

3.6.2. Lebanon – Ksar Akil

The Ksar Akil rock shelter is located 10km northeast of Beirut above a coastal plain in the foothills of the Lebanon Mountain range. The site is situated at the base of a high limestone cliff on the north bank of the Antelias River Valley (Ohnuma, Bergman 1990). Ohnuma and Bergman (1990) separated two phases of occupation at the beginning of the Upper Paleolithic. The earlier phase is characterized
by opposed platform cores with parallel sides from levels XXV-XXIV. The second phase is characterized by numerous single platform blade cores with faceted platforms and converging sides (the triangular shape of the cores resulted in the production of blanks morphologically similar to elongated Levallois points) from levels XXIII-XXI. Marks (1983) compared material from levels XXIII-XXI to Boker Tachtit, Level IV. An atypical Emireh point was discovered in levels XXV-XXIV (Copeland 2001, Fig. 2: 1). In addition, AMH fossil remains were recovered from the IUP levels. The age determinations recently obtained by Douka (et al. 2013) for the beginning of the IUP at the site is at around 42–41 ka cal. BP.

3.6.3. Turkey – Üçağizli

Üçağizli Cave, excavated by S. Kuhn at the beginning of the 21st century is located on the Mediterranean coast in the Hatay province of south-central Turkey. The cave deposits cover a time span of 41-29 ka ¹⁴C BP and the sequence documents the technological transition between Initial Upper Paleolithic and Ahmarian (Kuhn et al. 2009). The earliest assemblages correspond with the Initial Upper Paleolithic (‘Emirian’) and are comparable with Boker Tachtit, Level 4. The IUP assemblages are characterized by blanks with broad faceted platforms and with predominantly unidirectional parallel or convergent dorsal scars highly reminiscent of the Levallois method (Kuhn 2004). The excavations also yielded a collection of ornaments with beads or small pendants made from marine and freshwater mollusc shells (Stiner et al. 2013).

3.6.4. Russian Federation, Altai Republic – Kara-Bom

Kara-Bom is a multilayered site in the Altai Mountains at an altitude of over 1,000m (Derevianko et al. 2000). It is situated near an active spring at the foot of a black rock wall (Photo 3.21). The source of a high quality raw material – a subvolcanic rock is situated in the above mentioned black rock wall and nearby gravels. Layers 5 and 6 dated by radiocarbon to 50–37 ka cal. BP produced an evolved Levallois industry attributed to the Middle to Upper Paleolithic transitional period (Derevianko et al. 2000). The assemblages from these layers are characterized by the production of elongated blanks and bidirectional cores with concavely faceted striking platforms. In contrast to the western Eurasian sites, the Kara-Bom assemblage has a more distinct bladelet/microbladelet component (Photo 3.22), recently studied in detail by N. Zwyns, who presented a whole reduction sequence (Zwyns et al. 2012, Fig. 14). In a similar way, a bladelet burin-core on a massive Levallois flake was also refitted by P. Volkman in Boker Tachtit, layer 1 (Škrdla 2003b, Fig. 11c).

3.6.5. China – Shuidonggou

The Shuidonggou site cluster (localities 1–12) is situated on the banks of Border River (tributary of the Yellow River) in the transition zone between the Maowusu Desert and the Loess Plateau in northern China (Pei et al. 2012, 3614). The archaeological material was excavated from fine sand and several occupational horizons from Paleolithic to Neolithic periods were recorded (Gao et al. 2011). J. Svoboda (2001, 35) noted the similarity of a portion of this industry with the Levallois-leptolithic technology. Artifacts from localities 1 and 9 showing characteristic features including Levallois artifacts and bidirectional cores (Gao et al. 2011, 55, 76) have recently been dated to ~41 ka cal. BP (Morgan et al. 2014). A detailed technological analysis and comparison to similar sites (e.g., Kara-Bom) is an important area of research for the future.

3.7. Concluding remarks

3.7.1. Settlement strategy

Although a preference for elevated locations in the landscape is a characteristic feature of the Bohunician settlement strategy, it is also characteristic for other IUP/EUP techno complexes (see Škrdla 2002). The limited number of sites representing each IUP/EUP techno complex does not allow the separation of specific Bohunician, Szeletian, and Aurignacian settlement strategy characteristics, which has led to the formulation of the palimpsest hypothesis: artifact assemblages collected from elevated positions in the landscape, often dominant and strategic positions over the landscape, can represent accumulation of material left at the site after subsequent visits by bearers of different techno complexes (cf. Škrdla et al. 2011a). The location of the key Bohunician sites show differences – while Stránská skála and Bohunice are hilltop (close to the summit in terms of distance and elevation) sites at 280m and ~300m, Tvarožná X is on a north-facing slope above a small stream at a height of 265–270m, and Ořechov IV is on a southwestern-facing slope at a height of 330–335m. Stránská skála and Bohunice allow control of the Brno Basin as well as a view towards the Svatka River Valley, Ořechov allows view of the Svatka River Valley, and Tvarožná X is located at the entrance to the Vyškov Gate. Currently available dates indicate the possibility of repeated occupation of the same site (although the uncertainties inherent in dating techniques present an alternative interpretation). The most important is Ořechov IV which was occupied at least twice during the Bohunician period (dates from structured hearths, although a chronological position of Late Bohunician occupation has not been determined with certainty). Stránská skála and Bohunice also have similarly large time ranges for the human occupation. The bearers of the Bohunician favoured such locations for reasons that played an important part in their subsistence and other strategies, and that are invisible today due to landscape and cultural transformations. A similar pattern was documented in the Pavlov Hills area that was repeatedly occupied during the Gravettian period.
3.7.2. Raw material procurement

In terms of utilized raw material, the Bohunian lithic economy at key sites is characterized by the utilization of Stránská skála-type chert supplemented by infrequent imports. The chert of the Stránská skála-type was probably collected from natural outcrops on top of the weathered limestone rock or in limestone scree covering the slopes of the cliff. However, high quality chert blocks were observed in sediments underlying the Bohunian deposits at Stránská skála IIIb (Svoboda 1993) and quarrying these blocks for procurement (also documented in the same period in north Africa; Vermeesch ed. 2002) cannot be excluded. The Krumlovský les-type chert is present in different proportions in all key collections. It was probably collected in local gravel accumulations in the Brno Basin and its vicinity (det. by A. Příchystal), rather than at primary outcrops in the Krumlovský les ridge. Cretaceous spongolite chert was also collected in local gravels as indicated by the pebble surfaces. Orthoquartzite outcrops are located in the Drahany Upland. The actual imported materials are therefore only radiolarite, erratic flint, Troubky/Zdislavice-type chert, and limnic siliceous rock. Radiolarite was imported from the White Carpathians (distance to the nearest source is 100km) rather than from Danube gravels. Erratic flint was imported from northern Moravia and lower Silesia (distance to the nearest deposit is ca. 120km). Troubky/Zdislavice-type chert was imported from Litenčice Highland (distance to the nearest source is 40km). Limnic siliceous rocks (documented only in Tvarožná) were imported from northern Hungary or southern Slovakia.

The proportion of Stránská skála-type chert in the Bohunian collections decreases rapidly in a radial pattern away from the source (i.e., away from the Stránská skála rock outcrop; Škrdla, Rychtaříková 2012, Fig. 4). It demonstrates that its area of distribution was limited to the nearest vicinity of the Brno Basin; further away from the Brno Basin, its use decreases and local raw materials are used instead.

Levallois technology (hallmark of the Bohunician) was applied not only to Stránská skála-type chert (contra Oliva 1986; 2016), but to a broad range of other raw materials including orthoquartzite, Krumlovský les-type chert, Moravian Jurassic cherts, radiolarite, Cretaceous spongolite chert, limnic siliceous rock, and erratic flint.

Two types of colorants were documented – while low-quality, yellow and red iron ore from Tertiary marine deposits (nearest outcrops are directly at Stránská skála) were utilized at Stránská skála and Tvarožná (i.e. eastern group of sites), another low-quality iron ore characterized by a high content of silica originating in Devonian basal clastics was utilized in Bohunice and Ořechov (i.e. western group of sites).

3.7.3. Technology

A detailed technological description based on the Stránská skála refitted cores (Škrdla 2003a, b; Škrdla, Rychtaříková 2012) made it possible to specify characteristic features of the Bohunian technology. These features may be used as a litmus test for assigning individual assemblages to the Bohunian techno complex. The most important features are elongated Levallois blanks (both points and blades), precise and concave facetting of the striking platform, bidirectional (including opposed directional) dorsal scar pattern, presence of crested blades, and bidirectional cores.

Ořechov IV assemblage is characterized by ubiquitous microblades and bladelets (529 items in total). In addition, several artifacts classified as Levallois points are similarly miniaturized with dimensions of bladelets. Such artifacts are very rare in collections from other sites.

An unresolved issue of the Bohunician technology is the presence of the bifacial component including leaf points, flat-retouched tools, and bifacial thinning flakes (BTFs) at the Bohunice type site assemblages and in dozens of surface collections with questionable homogeneity (e.g. Líšeň, Mohelno, Ondratice), where leaf points and artifacts produced using the Bohunician Levallois technology have been reported. The bifacial component is missing at Stránská skála sites, Tvarožná X, and Ořechov IV. Oliva (1981; 1984a) asserted that leaf points in Bohunician assemblages, frequently made on imported raw materials, represent imports from Szeletian workshops. However, Tostevin and Škrdla (2006) demonstrated that bifacial reduction
took place in situ at Bohunice, and was also applied to Stránská skála-type chert. Similarly Svoboda (1987a) described a series of leaf points made from Stránská skála-type chert at Lišen-Čtvrtě. All generated hypotheses have been summarized and tested by Tostevin and Škrdla (2006) using material from the Bohunice 2002 excavation, excavated using modern methodological standards:

A) ‘Excavation Bias’ hypothesis: Excavation bias in the original collection resulted in the mixing of otherwise geologically and vertically discrete Szeletian and Bohunician occupations at the locality, resulting in the addition of Szeletian foliate points into an otherwise Bohunician context.

B) ‘Traded Point’ hypothesis: Oliva (1981) hypothesized that the foliates in the original collection could be the result of trade between the Szeletian and Bohunician knappers, where points were exchanged for other products or services.

C) ‘Pedogenic’ hypothesis: Geological and pedogenic mixing of otherwise temporally discrete Szeletian and Bohunician occupations produced an assemblage which, when excavated, looked to be a single occupation.

D) ‘Sequential Occupation’ hypothesis: The stable land surface represented by the lower soil of the Last Interpleniglacial paleosoil complex allowed the sequential occupation of the locality by different flintknappers of both Szeletian and Bohunician traditions to associate their respective toolkits spatially into the same sedimentary matrix which eventually buried the artifacts.

E) ‘Landscape’ hypothesis: Hominins who utilized the typically Bohunician core reduction strategies also engaged in the production, use, and discard of foliate points, but in other parts of the landscape than the Stránská skála hillside, i.e. at Brno-Bohunice. According to this hypothesis, no geological process is required to explain the artifact associations seen in the collection.

Testing of these hypotheses has led us to reject both the ‘Excavation Bias’ and the ‘Traded Point’ hypotheses. Two recently excavated diagnostic collections – Tvarožná X (Škrdla et al. 2009) and Ořechov IV (Škrdla et al. 2017) – with no leaf points or BTFs present an opportunity to develop expectations to test the ‘Landscape’ hypothesis. The ‘Pedogenic’ and ‘Sequential Occupation’ hypotheses cannot be currently rejected. It can be concluded that there are pure Bohunician (Levallois without a bifacial component) and pure Szeletian (bifacial without a Levallois component) stratified collections (i.e. with no traces of the other technology). The only exception to this pattern is the Bohunice type site which may be behaviorally different to other Bohunician sites, or mixed with the Szeletian techno complex. More stratified collections with more detailed microarchaeological data, specifically from the surface sites that yielded collections with both technologies (Levallois and bifacial) are needed.

3.7.4. Typology

The Bohunician toolkit was described as a combination of MP (side scrapers, points, notched and denticulated tools) and UP (end scrapers, burins, retouched blades, splintered pieces) elements (Valoch 1976; Svoboda 2003b). The most diagnostic Bohunician artifact is the Levallois point (guide fossil), often unretouched. In stratified assemblages, the most abundant tool types are end scrapers made on both flake (including Levallois points) and blade blanks. The end scrapers are prevailinglly flat; steeply retouched items are rare. Other common tool types include side scrapers, notched and denticulated tools. A higher proportion of burins was documented only in Bohunice. Burins occur rarely, or are not present at all, at other sites. The other tool types including retouched blades, truncated blades, splintered pieces, bores, becs, points (other than Levallois points), and others are represented by a few pieces each. The typological spectra in the surface collections is more complex (cf. Svoboda 1980; 1987), however, the attribution of all tool types without a stratigraphic context to the Bohunician techno complex cannot be made unequivocally.

3.7.5. Chronology

The largest series of currently available dates was obtained from charcoal samples using radiocarbon techniques. The luminescence techniques were tested on several occasions only – Thermoluminescence in Bohunice (Richter et al.
According to the currently available radiocarbon dates, and in accordance with the luminescence results, the Bohunician is documented in Moravia during GI(13?)12–11. Ořechov IV radiocarbon dates (western concentration, 2017 excavation) suggest the possibility of a chronologically younger phase (GI-9 or earlier), which is also consistent with the technological classification. Unfortunately, the two dated samples resulted in age estimates that do not overlap and an attempt to date more samples produced Holocene dates. A useful aim of a future

Fig. 3.21. Widths (left) and l/w ratio (right) of Stránská skála (all sites) and Ořechov IV – west Levallois points.
excavation in Ořechov would be obtaining more charcoal samples for dating. It is uncertain whether this will be possible because the last excavation reached limits of the intact artifact concentration in three of the four directions.

Some relevant questions that need to be asked regarding the presence of younger dates is what role (if any) is played by contamination of the dating material, and to what extent is the large chronological range affected by methodological bias.

3.7.6. Variability

A decade ago, it was possible to compare only Stránská skála and Bohunice site clusters. The only sources of variability within the Bohunician techno complex were the presence of bifacial leaf points in Bohunice (and in surface assemblages) and raw material preferences. Currently, two new sites – Tvarožná X and Ořechov IV – have entered the arena and allow a more complex study of questions concerning the level of homogeneity/heterogeneity of this techno complex. Although the analysis and dating programs are ongoing, the first preliminary results are available. With increasing distance from the Brno Basin the proportion of Stránská skála-type chert within the collection decreases and is supplemented by locally available raw materials. The Levallois technology was applied to all the raw materials. Typological variability is not so high – tho most common tool types are Levallois points (often unretouched) and end scrapers. The Ořechov IV assemblage displays a tendency towards miniaturization (the graph comparing lengths of Stránská skála and Ořechov Levallois points offers a good demonstration; Fig. 3.21) and the presence of the microblade/bladelet component. More variability was observed in the treatment of red ochre. While sites on the eastern margin of the Brno Basin (Stránská skála, Tvarožná) utilized ochre from local outcrops, the sites on the western margin (Bohunice, Ořechov) utilized different ochre from different outcrops (probably also local).

The Bohunician techno complex displays a high degree of industrial variability that reflects all chronological, behavioral, territorial, and subsistence aspects.

3.7.7. Terminological confusion

A general consensus on the definition of the Bohunician industry does not currently exist. Z. Nerudová (1999, 28) revitalized the term ‘Szeletian of Levallois facies’ for surface sites with a strong Szeletian component and M. Oliva (2016) recently defined a new term – the ‘Szeletian paradox’ – pointing to technological similarities of Szeletian and Bohunician assemblages, raw material preferences, negative correlation between Levallois points and leaf points and the high-status function of the leaf point. Oliva (2016) also proposes a hypothesis that we are dealing with a highly variable, but single techno complex.

This situation has recently become even more complicated by the appearance of a new industrial type that combines Levallois and Upper Paleolithic technology in a different way yet again – the Lišen/Podolí I-type industry.

3.7.8. Directions for future research

Detailed analyses of Tvarožná X and Ořechov IV assemblages and dating projects are ongoing. When completed, G. Tostevin’s attribute analysis will allow comparison with other Bohunician assemblages as well as with the Lišen/Podolí I-type industry.

The search for new stratified sites is ongoing and will continue in the Brno Basin and Bobrava area with a greater focus on the Ondratice and Mohelno areas. The excavation of more sites is needed for testing the leaf point hypothesis and the role of the microlithic elements. A new dating project is needed to improve the chronological definition of the Bohunician techno complex.
This site was previously reported as Bohunian by M. Oliva (1981), but the analysis of recent material from the 2010, 2015 & 2016 excavations shows significant differences to the classical Bohunian so this industry can no longer be classified as Bohunian. The assemblage combines technological and typological features of all three previously described IUP and EUP techno complexes (i.e. Bohunian, Szeletian, and Aurignacian), but cannot be assigned to any of those. Therefore the industry from the site Lišen/Podolí I is classified separately as a specific new EUP industrial type.

4.1. Location

The eastern margin of the Brno Basin is flanked by a chain of elevated topographic features (Maps 4.1, 4.2). The most important are Stránská skála rock and Čtvrtě, an extensive elevation (331m at the highest point). A rich surface artifact cluster was found on the Čtvrtě summit plateau. It is described in the Bohunian chapter (as Lišen I). The Čtvrtě “central” artifact cluster is separated by an area of isolated finds from other smaller clusters. Two of them were published by M. Oliva as Podolí I (Oliva 1981) and Podolí II (Oliva 1985). Geographically, both sites are located on the ridges protruding from Čtvrtě towards the southeast and are separated from each other by a deep gully. Although the sites are located close to the Podolí village, administratively they belong to Lišen – part of Brno city. As Oliva (1981) labeled this site Podolí I, we use the label ‘Lišen/Podolí I’ to name this site. In a previous publication the site was labeled Lišen – Hrubé podsedky based on the local field name (Škrdla et al. 2011b). Oliva (2016) used the name Lišen VII – Hrubé podsedky in his latest publication.

The Lišen/Podolí I surface artifact cluster is located on the summit of a ridge, on a shallow, southeast facing slope ca. 500–800m from the Čtvrtě elevation marker, at a height of 295–315m. The distance from Stránská skála rock – the principal raw material outcrop – is 2.2–2.5km in a straight line (east-northeast of Stránská skála, but not visible from the site itself). There is a good view to the southern Moravian river valleys with Pavlov Hills in the background (35km in a straight line to the south).

4.2. History of research

The site Lišen/Podolí I was discovered before World War II and surveyed by brothers R. and P. Ondráček, R. Klíma and others (Oliva 1981; Svoboda 1987a). Later, the site was surveyed by M. Oliva, who introduced this site to the broader scientific public in 1981 (Oliva 1981). Since 2009, the whole area (central artifact cluster Čtvrtě and surrounding concentrations) has been intensively surveyed with the aim of discovering new stratified sites (Škrdla et al. 2016b). During these surveys ca. 400 artifacts from Lišen/Podolí I were recorded using a GPS hand-held device. Spatial analysis of recorded finds and their attributes identified two concentrations of calcium carbonate-coated artifacts within the site. Those areas were selected for test pitting. In winter 2010, one of these test pits yielded in situ artifacts (Škrdla et al. 2011b). The charcoal sample from
this test pit produced an age of 38,400 ± 700 \(^{14}\)C BP (Poz-37344). Subsequently, a nearby excavation (3m\(^2\)) in summer 2010, slightly downslope of the above-mentioned testpit, produced a collection of 158 lithics supplemented by one fossil (Tertiary) shell (Škrdla et al. 2011b). The analysis of excavated lithics identified artifacts with faceted striking platforms and bidirectional dorsal scars in combination with a steeply retouched end scraper and a blade (Škrdla et al. 2011b, Fig. 2). Due to the presence of a fossil shell and a favourable radiocarbon date, the site was selected for further excavation. Grant funding allowed two excavation seasons in 2015 and 2016. The extremely dry and hot summer of 2015 hardened the sediments and made it more difficult to interpret the stratigraphy and planigraphy. It was not possible to locate the boundaries of previous excavation pits precisely. The site of the new excavation was placed in the general area of the previous test pits. In the 2016 season the excavation continued in a southerly (downslope) and easterly direction. A previous test pit was detected in subsquare K16c of our grid system. The 2010 trench was not detected in the excavated area and according to GPS coordinates it is located several meters downslope. During the 2015 and 2016 field campaigns a total area of 46.5m\(^2\) was excavated. In addition, a small test pit (called “Sklípek 2015”) was excavated several meters to the north from the main excavation in order to follow an artifact bearing horizon behind the plateau edge (sloping into a gully). The elevation of the excavated area ranges between 297–300m.

4.3 Stratigraphy

The site is located on a gentle southeasterly slope in an agricultural field. The stone artifacts on the surface (an indicator of disturbed sub-surface artifact-bearing deposits) can be collected over a larger area including the area of our test pits and excavations (Map 4.2). The concentrations of artifacts that include those with a calcium carbonate crust follow the margins of the east-west ridge line (where the ridge summit plateau suddenly falls away towards the gullies) and indicate intensive destruction of intact sediments with in situ artifacts. Therefore the excavated area was located close to the surface artifact (with calcium

Map 4.1. Location of Lišen/Podolí I site. Graphic J. Bartík.
carbonate crust) concentration, but not directly within it. All test pits and excavated areas display the same stratigraphy; top soil separated by a sharp boundary from the underlying intact sediments. The sharp boundary indicates intensive erosion and continuing destruction of sub-surface deposits. Sediment underlying the top soil is a calcareous paleosoil up to 40cm thick (Fig. 4.1). In previous times a layer of loess (now eroded away) was overlying the paleosoil and it served as a source of secondary calcium. The distribution of artifacts within the paleosoil was not homogeneous. Only very few artifacts were recovered from the upper part of the paleosoil. The main artifact-bearing horizon is the lower part of the paleosoil. The main artifact-bearing horizon was homogeneous, i.e. without a possibility of subdivision into additional sub-horizons. The vertical distribution of finds was studied in 1m wide zones oriented with the slope (along Y axis). There is no difference in the distribution of large (over 1.5cm) and small (screened) finds. The analysis of refitted artifacts (refitted lines) is also consistent with the assertion that the assemblage is homogeneous. We can conclude that a single homogeneous artifact bearing horizon was excavated within the area excavated during 2015 & 2016 (and probably in the 2010 excavation and all test pits).

Map 4.2. Lišeň surface artifact cluster and the location of excavations. Google Earth image.

Fig. 4.1. Stratigraphy. Graphics T. Rychtaříková.
A charcoal sample collected from a charcoal concentration in test pit PT03/10, sub-square K16c, was used for the first radiocarbon date. All charcoal found during the 2015 & 2016 excavations was collected for dating purposes, but the number of charcoal samples and the total weight were still small. In 2015, only 13 samples of scattered charcoal were collected. Five of these samples were dated resulting in a wide time span covering a period from LGM to GI-8 with no significant probability overlap (Škrdla 2016b, Fig. 1). Therefore, another 12 charcoal samples were collected in 2016. In contrast to samples collected from the 2015 excavation, half were collected from charcoal lenses with artifacts (Photo 4.1), i.e. higher probability that they belong to a cultural context. Six of the 12 samples were dated. The resulting time range subsumed GI-9 to GI-12. All of the charcoal samples from the 2015 & 2016 excavations were identified as Larix/Picea sp. (by J. Novák). As the samples were small and of insufficient weight to satisfy the ABOx/SC pretreatment protocol, all samples were dated using ABA pretreatment at the Poznań Radiocarbon Laboratory (Tab. 4.1, Fig. 4.2).

The interpretation of dating results needs to take two basic observations into account:
A) The artifact-bearing horizon was located directly below the plow soil, often separated up to 10–40cm of intact sediment. Therefore contamination by younger material from the overlying sediments (animal holes, drying cracks, fertilizers) cannot

Fig. 4.2. Calibration of dates.
be excluded, especially in the case of scattered charcoal.

B) The dates from the samples collected within the same charcoal lens and identified as the same species (Larix/Picea sp.) subsume a time span of up to 3,000 years. Therefore the earliest dates are more credible, while the younger dates may have been affected by contamination.

The two youngest ages dating to the LGM period can be excluded as it is clear that this industry is EUP. The same argument can be used for excluding one or two other dates overlapping with GI-6 and GI-7, when Moravia was occupied by early Gravettian, or late Aurignacian people. The fifth age dates to GI-8, but it is a single result only so the probability that it relates to the occupation is statistically low. All other dates are distributed in the time span from GI-9 to GI-12 with significant overlap in probability distributions. It is important to note that those dates are from the 2016 excavation (6 dates) and one date from the 2010 test pit. Only one date (35,500 ± 600 14C BP) from the 2016 season (from sub-square N16d) does not relate to the above-mentioned charcoal lenses; it is also the youngest of all obtained dates. Samples of all other dates are from charcoal lenses - two from the main artifact concentration in the southeastern corner and four from the eastern end of the excavated area. As mentioned above, the charcoal lenses were distinctive charcoal layers that also contained artifacts (some burnt) so these samples date human occupation more securely than other samples. Two samples from the southeastern corner collected ca. 50–70cm apart (one of them is from the 2010 test pit) resulted in ages of 38,400 ± 700 14C BP and 37,100 ± 800 14C BP and their probability distributions overlap. Four charcoal samples from the western part of the excavated area yielded dates ranging from ca. 36 to 39 ka 14C BP (35,800 ± 600, 36,900 ± 600, 37,900 ± 700, 39,400 ± 1000; all 14C BP), again with all probability distributions overlapping. Three of them were collected within ca. 40cm of each other and the fourth (37,900) ca. 1.5m from them.

We can conclude that the most relevant dates for dating human presence in Líšeně/Podolí I were taken from two charcoal lenses located in two opposite

<table>
<thead>
<tr>
<th>Lab no.</th>
<th>14C BP</th>
<th>Std.</th>
<th>Year</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poz-37344</td>
<td>38,400</td>
<td>±700</td>
<td>2010</td>
<td>PT03/10, charcoal concentration</td>
</tr>
<tr>
<td>Poz-76152</td>
<td>16,050</td>
<td>±240</td>
<td>2015</td>
<td>scattered charcoal</td>
</tr>
<tr>
<td>Poz-76153</td>
<td>32,800</td>
<td>±1200</td>
<td>2015</td>
<td>scattered charcoal</td>
</tr>
<tr>
<td>Poz-76199</td>
<td>29,000</td>
<td>±300</td>
<td>2015</td>
<td>scattered charcoal</td>
</tr>
<tr>
<td>Poz-76201</td>
<td>18,300</td>
<td>±210</td>
<td>2015</td>
<td>scattered charcoal</td>
</tr>
<tr>
<td>Poz-76202</td>
<td>30,100</td>
<td>±500</td>
<td>2015</td>
<td>scattered charcoal</td>
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<td>37,100</td>
<td>±800</td>
<td>2016</td>
<td>lens</td>
</tr>
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<td>Poz-87128</td>
<td>36,900</td>
<td>±600</td>
<td>2016</td>
<td>lens</td>
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<tr>
<td>Poz-87131</td>
<td>35,500</td>
<td>±600</td>
<td>2016</td>
<td>scattered charcoal</td>
</tr>
</tbody>
</table>

Tab. 4.1. Overview of radiocarbon dating. All dates are from charcoal identified as Larix/Picea.
Fig. 4.3. Spatial distribution of finds.
parts of the excavated area. We received two series of dates from two archaeological contexts (charcoal lenses) and probabilities of all dates show significant overlap, generally covering a large time span from GI-9 to GI-12. As the samples collected from the same contexts show differences and with respect to the contamination argument, we prefer earlier dates as more reliable so we presume that the occupation took place during GI-11 or GI-12.

4.5. Spatial distribution of finds

Three dimensional right-handed Euclidean grid that was not fixed to any absolute map datum was created over the excavated area. The positive X coordinate was oriented to the magnetic north. In addition, the excavated area was divided into $1 \times 1$m squares that were sub-divided into four $0.5 \times 0.5$m sub-squares (labeled a, b, c, d). The artifacts that were found during troweling (often over 1.5cm in size) were recorded in 3D coordinates. All of the excavated sediments were wet-sieved. A 3mm mesh size was used for wet sieving. Each find was labeled with its sub-squares and spit (3–5cm thick). The above mentioned methodology allowed spatial distribution analysis of all finds in the same coordinate system (Fig. 4.3).

The excavated area can be divided into two parts based on the horizontal distribution of finds – a larger, low density area and a smaller area with a much greater density of finds. The latter is located in a southeastern sector of the area. It was excavated at the end of the 2016 season when it was not possible to continue the excavation in this perspective area. The analysis of refitting lines indicates prevailing direction following the slope suggesting a possibility of post-depositional movement downslope. The patterning of production sequences and breaks does not show any significant difference in the direction of refitting lines and several lines cross the prevailing direction. The redeposition of the artifact bearing horizon due to solifluction probably does not explain this pattern. The analysis of distribution of ochre lumps and fossil molluse shells displays specific patterning – a negative correlation. While over one half of mollusces were found on the margin of the area densest in lithics, most of the ochre lumps were distributed in the area of low density lithics. The vertical projection of finds and refitting lines along the Y axis shows two things – the mollusce shells occur throughout the artifact-bearing horizon and refitting lines connect the upper and lower parts of the artifact-bearing horizon, i.e. the hypothesis of a homogeneous and single cultural layer is supported.

4.6. Artifacts

The following description is focused primarily on assemblages from the 2015 & 2016 excavations. When the material from the test pits and the 2010 excavation is referred to in this text, it is treated separately from the material excavated in 2015 & 2016. The 2015 & 2016 excavations yielded 613 lithic artifacts recorded in 3D coordinates and often over 1.5cm in size, supplemented by 2,964 small lithic artifacts found during wet-sieving.

4.6.1. Raw materials

Raw materials were analyzed only for 3D recorded artifacts (over 1.5cm). The most common raw material is Stránská skála-type chert from nearby outcrops located ca. 2.5km from the site (89.2%). Other raw materials can be treated as local and include quartzite (black, red and yellow in color; 2.9%) originating probably from the nearby Drahany Highland or Devonian basal clastic sediments in the Moravian Karst, and Cretaceous spongolite chert (2.1%) with pebble cortex (narrowing down its source to nearby gravel terraces rather than the primary outcrops in Boskovice Furrow). The raw materials imported from more distant sources include radiolarite (2.3%; red colored varieties are slightly more frequent than green colored varieties) and one end scraper made on erratic flint. The remaining artifacts are burnt pieces (1.1%) and other rocks including sandstone and local pebbles (1.1% in total).

4.6.2. Technology

The assemblage (excluding wet-sieved finds) includes flakes from all stages of reduction (48.0%), blades and blade fragments (30.8%). Three blades and blade fragments are partly retouched (0.5%). Other categories include tools (5.5%), fragments (5.5%), bladelets and their fragments (4.7%), cores including pre-cores, core fragments and a micro-
-core (together 4.7%), and micro-flakes (chips, smaller than 1.5cm; 0.3%).

The collection consists of 16 cores, two prepared cores, nine core fragments and a micro-core. Six of the most diagnostic cores were illustrated. The first core (Fig. 4.4: 18) was decorticated by centripetal flake removals from front and back surfaces all along its circumference resulting in a crested core. Two opposed plain striking platforms were prepared and several short flakes (probably unsuccessful) were removed from each platform. Similar bifacial preparation was applied to another core with one short flake removed from a plain striking platform (Fig. 4.4: 19) and a core fragment (not illustrated). One core resembles Bohunician technology – bidirectional reduction of pointed removals from two opposed facetted striking platforms (Fig. 4.4: 21). Another bidirectional core was damaged by frost and was not completely reconstructed (Fig. 4.4: 22). Based on the scars, the reduction process ended with a non-pointed flake with a dihedral butt removed from the upper platform and another flake (similar in shape) removed from the lower platform (plain with dorsal abrasion). Another bidirectional core was also damaged by frost and only one half of it was reconstructed (Fig. 4.4: 23). The scars probably indicate pointed flake removals suggesting a Levallois point struck from the lower facetted platform with an abraded dorsal edge and additional small flakes removed from this edge. The opposed platform is facetted. The only core made from radiolarite (all others are from Stránská skála-type chert) was refitted with two artifacts – a crested blade and a flake (Fig. 4.4: 20). The core was made on a prismatic block and was reduced from the narrow edges. A notch on its edge suggests an atypical burin busqué. As a similar core (not illustrated) made from Stránská skála-type chert prismatic block with two removals from a narrow edge with similar notch was found, those artifacts are classified as cores. Another core fragment (not illustrated) is half of a core discoidal in cross section. The striking platform is plain and almost perpendicular to the flaking surface covering the entire perimeter. The edge between the platform and the flaking surface is abraded on the flaking surface. Bladelet scars cover all of the flaking surface, i.e. are all along core’s circumference.

Analysis of striking platforms of removed artifacts indicates prevailing plain butts (35.4%) over faceted butts (28.0%), followed by cortical (13.1%), dihedral (10.8%), punctiform (9.0%), and linear butts (3.7%). Analysis of dorsal scar patterns on removed artifacts documents significantly prevailing unidirectional dorsal scars (56.0%) over bidirectional dorsal scars (19.4%), followed by cortical (11.9%), crested (7.5%), centripetal or multidirectional (5.0%), and a single Janus-type flake.

The crested blades (Fig. 4.5: 13; 4.4: 15–17) indicate preparation of cores with a frontal crest. The atypical tablet flakes (Fig. 4.5: 23; 4.4: 12, 13) document preparation of platforms by large flake removals which is characteristic feature of the Upper Paleolithic knapping technology.

The presence of Levallois and respectively Bohunician technology is documented on both flakes (including points triangular in shape) and blades with facetted striking platforms (Fig. 4.4: 1–11). However, in many cases the facetting is combined with dorsal abrasion or small scar removals on the dorsal side along the butt. Although several cores were prepared by removals reduced from both faces into atypical discoidal cores or “coarse bifaces”, no bifacial thinning on artifacts, nor bifacial thinning flakes were documented.

The characteristic feature of this industry is the presence of microblades and bladelets. Although in the database of 3D recorded finds only 29 items were classified as bladelets and their fragments, 348 more items were identified in the screened material. Approximately one third are distal fragments, another third are medial fragments, and another third proximal fragments. Only 8.7% are complete pieces. Width measurements show that most are between 5–10mm wide.

An important category of artifacts that were mostly recovered from wet-sieved material are retouched flakes, some of which originate from large tools (end scrapers, Jerzmanowice-type points?), which were not found.

4.6.3. Typology

There are 33 tools (5.5% of the artifacts recorded in
3D – i.e. excluding screened artifacts). End scrapers are the most common tool type (13 items) and they are produced on both blade and flake blanks (Fig. 4.5: 28–30, 32–39; Fig. 4.4: 9), supplemented by an end scraper fragment (Fig. 4.5: 19). End scrapers were also found in the 2010 excavation (Škrđla et al. 2011b, Fig. 2: 1) and test pit “Sklipek 2015” (Fig. 4.5: 31). Two end scrapers are made on cortical blanks (Fig. 4.5: 30, 36), one on a semicortical blank (Fig. 4.5: 32), and three on crested blades (Fig. 4.5: 34, 35, 39). Two end scrapers are laterally retouched (Fig. 4.5: 39, Škrđla et al. 2011b, Fig. 2: 1) and two are partially retouched on lateral edges (Fig. 4.5: 28, 36). One end scraper has a faceted striking platform (Fig. 4.5: 33) and another has an abraded striking platform (Fig. 4.5: 37). Although most of the end scrapers are thick, none can be classified as carinated, or as any other Aurignacian type. The second important tool type is the point. The most noteworthy point is ventro-distally retouched, on a massive blade with a plain striking platform with dorsal abrasion (Fig. 4.5: 42). Although most dorsal scars are unidirectional, the small removals near the distal tip were reduced from the opposed platform. Ventro-distal flat retouch covers one third of the artifact suggesting a partly retouched unifacial leaf point. Additional retouch (scalar with semi-steep angle) is placed on the dorsal surface near the opposed (proximal) end. The artifact is classified as a Jerzmanowice-type point. Two other artifacts show partial retouch near the proximal end and can be classified as Jerzmanowice-type points as well (or semi-finished forms). One of them is bifacially retouched (Fig. 4.5: 43) and another is only partially retouched on its ventral surface (both tips are broken; Fig. 4.5: 44). The fourth point, which could be of any type, is a distal fragment of a convergently retouched point (Fig. 4.5: 24).

Only four artifacts were classified as Levallois points. The first is a small asymmetrical point, with bidirectional dorsal scars, a faceted striking platform, and additional abrasion (chipping) on the dorsal proximal end (Fig. 4.4: 1). Another point has unidirectional dorsal scars, a coarsely faceted striking platform and dorsal abrasion (Fig. 4.4: 2). Another is probably bidirectional, has a broken tip and a coarsely faceted striking platform (Fig. 4.4: 3). Another is a proximal fragment with a characteristic ‘Y-arrete’ dorsal scar pattern, unidirectional dorsal scars and a faceted striking platform (Fig. 4.4: 4). Thus, two of the four Levallois points display peculiar dorsal abrasion near their striking platforms.

Two dihedral angle burins are made on small flakes and the intentionality of the burin blows is not clear (Fig. 4.5: 17, 18). The remaining tools include three splintered pieces (Fig. 4.5: 22; 4.4: 26), two laterally retouched blades with partial dorsal retouch (Fig. 4.5: 25, 40), two fragments of laterally retouched blades (Fig. 4.5: 25, 27), a notched piece (Fig. 4.5: 26), and a truncated artifact. Another bilaterally retouched blade was found in the 2010 excavation (Škrđla et al. 2011b, Fig. 2: 2).

Additional tools were identified in the screened artifacts. This group includes a laterally retouched blade fragment with marginal continuous dorsal retouch (Fig. 4.5: 15), a fragment of a bilaterally retouched blade with marginal continuous dorsal retouch (Fig. 4.5: 11), three retouched artifact fragments (Fig. 4.5: 20), a truncated blade fragment (Fig. 4.5: 16), and a proximal fragment of a bilaterally retouched bladelet (?) (Photo 4.2).

4.6.4. Heavy-duty (coarse) industry

This category is represented only by fragments and flakes, mostly made from orthoquartzite and quartzite of black, reddish and yellowish-brown varieties. The complete pebbles, blocks or hammerstones were not found. The raw material was most probably collected at nearby outcrops in Drahany Upland and in basal Devonian clastic sediments in the Moravian Karst.

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Photo 4.2. A proximal fragment of a bilaterally retouched artifact. Photo L. Zahradníková.
Fig. 4.4. Selected artifacts.
4.6.5. Ochre lumps

Most of the ochre lumps are red ochre (hematite), often only several millimeters in dimension (38 items). The largest piece was just 18mm long. Only 6 ochre lumps are of a yellowish-brown variety. Both color varieties originate from local sources and they are similar to the ochre from Stránská skála Bohunician workshops.
4.6.6. Faunal remains

Several dozen small bone fragments collected during wet sieving were burnt. Although the species could not be determined, some of them were placed into categories based on animal size (by M. Nývltová Fišáková): large-sized mammal (2 items), middle-sized mammal (4 items), and small-sized mammal (5 items). Several molar fragments were identified as a horse (*Equus germanicus*). The most important bone fragment is a 28mm long fragment of a large-sized animal with a series of parallel grooves oriented perpendicularly to the edge (Photo 4.3). However, the surface is weathered and the intentionality of the ornament cannot be demonstrated unequivocally.

4.6.7. Loess molluscs

Fifteen complete loess mollusc shells were found during wet sieving of excavated sediments. The shells were identified by Š. Hladilová as *Trichia* cf. *Hispida*, *Trichia* sp. and *Oxychilus inopinatus*.

![Photo 4.3. Bone fragment with cut marks. Photo L. Zahradníková.](image)

4.6.8. Tertiary shells

Mollusc shells are the most significant category of finds. The total number including complete specimens and fragments is 36 (Photo 4.4). Geologically, these finds are not of local origin and may have been imported from Tertiary sediment sources. The mollusc shells were studied by Š. Hladilová (detailed publication is in preparation), who identified two source areas of the Líšeň/Podolí I molluscs: Sarmatian sediments of the Vienna basin (nearest outcrop is ca. 40km to the south) and Badenian sediments (occur in the Brno Basin and other locations in southern Moravia). The use of at least two different sources indicates not only systematic collecting of molluscs for non utilitarian purposes, but also good knowledge of geological outcrops within a large territory. The identified taxonomic groups include various sub-species of prevailing *Pirenella* (Sarmatian) and three items of *Ancilla glandiformis* (Badenian). The species determination of 6 items is not clear (include possible *Cepaea* sp., *Euthria* sp., *Nassarius* sp., *Turitella* sp., and a fragment of an unidentified bivalve). Two molluscs were perforated and 4 other pieces were probably perforated (the perforations are often broken). As the mollusc surfaces are weathered, the perforation technology cannot be studied in detail. Only one small fragment shows a deep cut on its surface.

The analysis of mollusc surfaces using a Raman spectrometer realized by J. Petřík (publication in preparation) indicate two substances – first, red in color, was identified as hematite (on 6 molluscs) and second, black in color, as manganese oxides precipitated from surrounding sediments. In contrast to the manganese oxides, the hematite is not of local origin and was brought to the site (from Stránská skála?).

The spatial distribution of molluscs indicates a cluster within a lithic artifact concentration in the southeastern part of the excavated area. Vertically, the molluscs were distributed randomly throughout the artifact bearing horizon.

4.7. Discussion

Spatial data and analysis of surface finds need to be addressed before discussion of the industrial type can begin. The Líšeň/Podolí I surface artifact cluster is part of a large and rich artifact cluster that covers an area of ca. 5km² (Líšeň cadastral territory only). The Líšeň/Podolí I surface artifact cluster covers an area of 1km². As the two techno complexes with similar settlement strategies – Bohunician and Aurignacian – were well documented in stratified sites located on the eastern margin of the Brno Basin (i.e. surrounds of Líšeň/Podolí I) and given the large area of the site,
the site may represent a palimpsest and the surface collection may represent a mixture of both (or more?) occupations. This hypothesis is supported by Oliva’s (1981) analysis of the surface collection where elongated and bidirectional Bohunician Levallois points (Oliva 1981, Abb. 1: 1–3, 7) are present with bifacial and unifacial leaf points (Oliva 1981, Abb. 6: 1–4), various side scrapers and end scrapers including nosed and carinated end scrapers (Oliva 1981, Abb. 2: 8, Abb. 9: 1). The remainder of Oliva’s surface collection shows similar morphology to the 2015 & 2016 stratified collection, including bidirectional cores, some with dorsal preparation (Oliva 1981, Abb. 1: 1, 2, Abb. 8: 2, 3), and a large variety of Jerzmanowice-type points (e.g. Oliva 1981, Abb. 1: 2, 3, Abb. 9: 2-4). Due to the surface nature of the collection, the microlithic component was not identified in the 1970s. M. Oliva (1981) classified the surface collection based on the Levallois component as Bohunician, but also discussed the presence of the Szeletian (bifacial leaf points) and Aurignacian (carinated end scrapers) elements. J. Svoboda (1987) published a series of Jerzmanowice-type points and bifacial leaf points that were labeled as coming from Liščí – according to M. Oliva (1985) these artifacts are from a surface collection, mostly from Podolí I and II.

The raw material spectrum of the 2015 & 2016 stratified collection is characterized by the dominance of Stránská skála-type chert supplemented by other local rocks. Long distance imports are represented by a small number of implements from radiolarite (probably from White Carpathian sources) and erratic flint from northern Moravia / southern Poland. The technology of the 2015 & 2016 stratified collection can be characterized as a combination of Levallois and Upper Paleolithic reduction. Elements of the former include bidirectional reduction and faceting of striking platforms of Levallois blanks. The latter is represented by unidirectional reduction, plain, linear and punctiform striking platforms, dorsal abrasion, or preparation near the butt instead of faceting, and microblade/bladelet production. The typological spectrum of the 2015 & 2016 stratified collection is characterized by prevailing end scrapers that are often made on massive blanks, and steeply retouched but not carinated – i.e. cannot be unequivocally linked to the Aurignacian. Other tool types are not common and include several items only. The various points (including Levallois points, leaf points and Jerzmanowice-type points) are possible type fossils that can link a particular industry with a defined techno complex. The most important is the Jerzmanowice-type point (Photo 4.5)(and two semi-finished products) that may link the Liščí/Podolí I industry with the chronologically contemporaneous northern European Lincombian-Ranisian-Jerzmanowician techno complex (Flas 2011b). The second group of points consists of Levallois points that are usually associated with the Bohunician techno complex in Moravia. In contrast to the types in Oliva’s surface collection, bifacial leaf points or bifacial thinning flakes/chips resulting from leaf point reduction were not found in the excavated material.

**Affinities of the Bohunician techno complex**

The surface collection from this site was classified as Bohunician supplemented by elements derived from a Szeletian context (Oliva 1981). In the first reports that described the Liščí/Podolí I test pits and a small-scale excavation from 2010 (Škrdla et al. 2011b), and in other preliminary reports, it was assumed that this is a Bohunician site, although the presence of some unusual elements was noted (Škrdla 2016b; Rychtaříková et al. 2017). In

*Photo 4.5. Jerzmanowice-type point. Photo L. Zahradníková.*
contrast to Bohunician stratified sites (Stránská skála, Bohunice, Tvarožná X, and Ořechov IV), the Líšeň/Podolí I assemblage shows an increasing proportion of Upper Paleolithic elements at the expense of Levallois technology. The steeply retouched end scrapers are not a characteristic tool type in the Bohunician (although they have been reported, cf. Svoboda 1987a). The microblade/bladelet technology and dorsal abrasion have not been documented at any Bohunician sites except for Ořechov IV. Isolated ventroterminally retouched artifacts were reported only from Stránská skála IIa (Svoboda 1991, Fig. 9: 10) III, IIIa (Svoboda 1987a, Fig. 24: 4, 26: 12), and Tvarožná X (Fig. 3.8: 40). Although the Líšeň/Podolí I assemblage features Levallois technology, it differs from other stratified Bohunician sites technologically and typologically. The technological differences to classical Bohunician are too great to classify the Líšeň/Podolí I assemblage as Bohunician and they cannot be simply attributed to different site function, or behavioral differences. However, some Bohunician elements still maintain a presence and the radiocarbon dates also overlap with dates for classical Bohunician sites.

*Lincombian-Ranisian-Jerzmanowician techno complex traits*

The LRJ techno complex is known from mainly isolated occurrences and it is spatially limited to the North European Plain, although it also occurs at sites in nearby southern Poland (Photo 4.6) (Flas 2011). The technology is characterized by prevailing opposed platform cores and bidirectional reduction supplemented by unidirectional cores. According to Flas (2011, 612), blade knapping is usually performed with an organic soft hammer, based on the relative thinness of blade platforms (less than 5mm, with an average of around 3mm) and the frequent presence of a lip. Facetted striking platforms and dorsal abrasion were not reported (cf. Flas 2011). In contrast to LRJ, lips are missing at Líšeň/Podolí I, striking platforms are frequently facetted, and dorsal abrasion is present. Bladelet technology was present (Flas 2011, 612), but not common. Besides Jerzmanowice-type points, Upper Paleolithic toolkits commonly occur in the LRJ. The presence of personal ornaments is not a characteristic feature of the LRJ (one possible exception was found at Ranis, Germany - currently missing; Flas 2011, 613). The LRJ techno complex is currently accepted as Late Middle Paleolithic that was most probably created by Neanderthals (Flas 2011). LRJ chronologically overlaps with the Líšeň/Podolí I dates and the possibility of typological influence cannot be excluded.

*Szeletian techno complex traits*

Although M. Oliva (1981) published bifacial leaf points collected on the surface within the Líšeň/Podolí I surface cluster (and the leaf points are also known from other locations in the Líšeň cadastral territory, e.g. Svoboda 1987a), actual Szeletian occupation had not been documented on the eastern margin of the Brno Basin at the time. On the other hand, Jerzmanowice-type points had been documented in stratified Szeletian collections at Vedrovice V (Valoch 1993a) and Želešice III (Škrdla et al. 2014). The Szeletian end scrapers are often made on massive blanks, being steeply retouched, but not carinated – which is similar to the Líšeň/Podolí I industry. In addition, a few
artifacts made from Stránská škála-type chert were documented in the Želešice III assemblage (Škrdla et al. 2014). However, the Szeletian lithic economy is based on heavy utilization of Krumlovský les-type chert and the technology is much more flakey (not Upper Paleolithic) with irregular cores, although some regular blades as well as isolated blanks with faceted striking platform do occur. Dorsal abrasion was not documented. The new dating results predate the Szeletian occupation to GI-12 (Škrdla 2017), however, a series of previously published dates overlap with the subsequent GI-11, which indicates a possible chronological overlap, or hypothetical techno-typological influence of the Líšeň/Podolí I industry.

4.8. Conclusion

One can use the argument that Líšeň/Podolí I is a palimpsest assemblage combining characteristic features of different techno complexes, covering techno-typological behavior of the time span ca. from 45 to 35 ka cal BP. The large distribution of obtained radiocarbon dates is also consistent with this hypothesis. On the other hand, the features characterizing different techno complexes do occur several times on the same artifacts, e.g. the dorsal abrasion is combined with faceted striking platform on cores as well as on blanks, an end scraper is made on a blade with a faceted striking platform, or unidirectional blades possess a faceted striking platform. Although the Levallois technology is well documented, the characteristic Bohunician elongated Levallois points are missing. The Jerzmanowice-type points are present, but the technology (prevailing unidirectional reduction over bidirectional, no lips resulting from organic hammer) differs from the LRJ techno complex. A series of steeply retouched end scrapers are present, but none is carinated. Microblade/bladelet technology is well documented, but the retouched microliths are missing (one exception). All above mentioned arguments support the integrity of the collection and allow rejection of the palimpsest hypothesis. Therefore a new industrial type was defined for this specific assemblage rather than try to force it into one of the previously defined techno complexes. New excavations aimed at enlarging the artifact collection and determining its chronological position with greater precision will be necessary for testing the hypothesis of a new industrial type.

In light of the definition of the Líšeň/Podolí I-type industry presented above, the 2009 excavation of nearby site Líšeň I (Čtvrtě) needs to be mentioned (Škrdla et al. 2010). The small excavated collection was described as Aurignacian (see chapter Aurignacian) based on Upper Paleolithic cores and one radiocarbon date. Various similarities are apparent between this assemblage and the 2015 & 2016 assemblage. These similarities include raw material (dominance of Stránská škála-type chert), technological unidirectional and bidirectional core reduction, dorsal preparation, bladelets, and typological (end scrapers on massive blades, but not carinated). In addition, the same gastropod species (Pirenella picta sp.) covered by red ochre was found in the artifact bearing horizon. The dating was aimed at the gastropod shell context so a small charcoal sample that was located closest to a gastropod shell was dated. With respect to the large probability distribution and a number of failed dates, the relevance of a single date for Líšeň I should be questioned. However, as the site has repeatedly been published as Aurignacian, it is described in the Aurignacian chapter. Only by expanding the excavated area and the discovery of more artifacts and more reliable dates can the cultural affiliation of this site be determined with greater certainty.
5. Aurignacian

5.1. Introduction

The Aurignacian is generally characterized as a fully developed Upper Paleolithic techno complex with Upper Paleolithic style blade reduction on crested unidirectional cores (Upper Paleolithic type), the production of microliths from carinated (or nosed) end scraper-cores (or burin-cores), bone tools including points, and personal ornaments.

The Aurignacian and its definition has been a subject for broad discussions in the last decades (Bar-Yosef, Zilhao eds. 2006). Recent dates from the Swabian Jura caves and Wachau Gate suggest the presence of Early Aurignacian as early as GI-11 (Nigst 2012, 343) and its chronological overlap and necessary interactions with Middle Danubian transitional techno complexes including Bohunician and Szeletian (cf. Škrdla 2017). While the Aurignacian from neighboring countries had recently been the subject of new summarizing publications, e.g. N. Teysandier (Teysandier 2007; Teysandier et al. 2006), Jöris et al. (2010) and P. Nigst (Nigst 2012; Nigst, Haesaerts 2012), the Moravian Aurignacian (cf. Oliva 1987; Svoboda 2006a; Škrdla 2010b), has not experienced such attention until very recently (cf. Demidenko et al. 2017). This is because the majority of Moravian sites are surface site lacking any chronological and stratigraphic data.

Although M. Oliva (1993a) has characterized the Moravian Aurignacian as having ‘the highest concentration of Aurignacian sites east of France’, ‘most assemblages are surface collections that are potentially mixed’. Only five stratified sites (some of them consisting of more than one location) have been documented in Moravia to date. The available archaeological record consists of exceptional human skeletal finds (Homo sapiens) with bone tools (including massive-base Mladeč-type points) and personal ornaments from Mladeč Caves. Stone artifact assemblages, ochre and a small number of faunal remains have been recovered from the Stránská skála site cluster (Ila, IIla, IIIB, IIIc, and IIIf), Lišeň site cluster (I and VIII), Napajedla III, Milovice I, and Vedrovice Ia. The industry from these stratified sites is characterized by prevailing carinated (or nosed) end scraper-cores, retouched blades, occasional burins and bladelets). However, the intensity of Aurignacian occupation is manifested in the hundreds of surface collections that lack stratified contexts.

5.2. Key sites

As key sites that are mentioned include those stratified and excavated sites that yielded characteristic Aurignacian artifacts supplemented be reliable dates (Map 5.1).

5.2.1. Mladeč Caves

Mladeč Caves are located in the Javoříčko Karst near the town of Litovel in Northern Moravia. The caves are located in a valley drained by Rachavka Creek, ca. 300m from its opening into Upper Morava River valley drained by the Morava River. Entrance to the caves is at the foot of the southern slope of Třesín Hill (344.9m). Třesín Hill is an important elevation well visible from most parts of
the Upper Morava River Valley. The entrance to the cave system is at an elevation of 260m, ca. 25m above the current level of the Morava River.

Mladeč Caves were excavated at the end of 19th century by J. Szombathy (1882; 1925), later by J. Knies (1906), J. Fürst (1922), and J. Jelínek (1987). However, small-scale limited fieldwork has continued to the present day (Svoboda 2006; Valoch, unpublished excavation). The site yielded skeletal remains of Homo sapiens, accompanied by bone points with a wide base that were later called Mladeč points, awls, perforated teeth of various animals, varied partially worked and/or ornamented bones, and about 20 lithic artifacts (Oliva 2006) (Fig. 5.1). The association between the human remains and specific archaeological artifacts is unclear. The cultural attribution of the recovered artifacts was never clear, although Aurignacian affiliation was usually suggested (e.g. Oliva 1987). The Mladeč bone points are quite similar (but not the same) to D. Peyrony’s ‘Aurignacien II pointe losangique aplatie’ (Peyrony 1933, Fig. 11, 2). The only culturally diagnostic lithic artifact is the Aurignacian nose-shaped scraper found in the entrance area (Oliva 2006, 55; cf. Skutil 1938). The material from Szombathy’s excavation is currently deposited at the Vienna Naturhistorisches Museum. Some of the Mladeč material is in the Museum in Olomouc and in the Moravian Museum in Brno. The material originally deposited in the Moravian Museum in Brno was destroyed by a fire in Mikulov Chateau at the end of World War II.

As the finds were recovered deep in the cave system (called ‘Dome of Death’) close to the foot of a sediment cone formed by exogenous material falling through the chimney from the outside, J. Svoboda (2006b with ref.) proposed the ‘burial cave’ hypothesis proposing that in the Paleolithic the access was through a chimney and it was used as a burial site only. K. Valoch and M. Oliva (2006 with ref.) present a contrasting hypothesis, arguing that the chimney was inaccessible during Aurignacian times and the cave was entered by people through a natural entrance in the valley and used as a residential or ritual place. Although in 2007, K. Valoch opened a trench in the area of

Fig. 5.1. Mladeč Caves. Selected artifacts. 1, 2, 6, 7, 13–19: bone artifacts; 8–12: perforated teeth; 3: a blade (Naturhistorisches museum Wien); 4, 5: stone artifacts according to J. Skutil (1938).
the expected location of the chimney to test his hypothesis, the results including a detailed location of his trench intended to locate the chimney, and the stratigraphy with dated sediments, have not been published. However, M. Oliva (2016, 58) stated that the trench proved the hypothesis that the chimney was clogged during the Upper Paleolithic. J. Svoboda’s study of site accumulation processes and dating of the site in the 1990s focused on residual layers of calcium carbonate still present on the cave walls (Svoboda et al. 2002). The calcium carbonate probably covered the sediments with cultural finds as recorded by J. Szombathy. Residues of calcium carbonate are still visible on the human skulls (Mladeč 1). Therefore the calcium carbonate crust probably postdates the accumulation of human remains. The calcium carbonate layers were sampled for \(^{14}\text{C}\) dating ages of around 34–35 ka \(^{14}\text{C}\) BP. Simultaneously, the positions of visible traces of calcium carbonate crust were recorded and analyzed using 3D modeling software Surfer. The resulting DEM of the cave interior was overlain by a layer bearing known locations of finds and analyzed. The result of the analysis suggests exogenous material and is consistent with the burial cave hypothesis.

More recently, the Mladeč material from Szombathy’s excavation currently deposited in Naturhistorisches Museum in Vienna was redated (Wild et al. 2006). Three dates have produced ages between 30,6–31,3 ka \(^{14}\text{C}\) BP. After excluding samples that were probably contaminated or not unassociated with the target material, the time window for Aurignacian occupation falls into the time span 36–34 ka cal. BP (two sigma confidence level). This age is slightly younger than the date from the calcium carbonate crust which is older than the Aurignacian occupation (the calcium crust underlies the find horizon as reported by Szombathy 1925), or it is contaminated by old carbon.

5.2.2. Stránská skála site cluster

The isolated Jurassic limestone rock of Stránská skála is an important elevation shaping the eastern margin of Brno Basin. Its current summit (originally probably higher, but quarried since Medieval times) reaches an elevation of 310m. While the north facing edge is formed by steep rocky slopes (“cliff”), the southern slope is gentle and covered by eolian deposits. The Jurassic limestone and weathered deposits (scree) in the lower parts of the rocky outcrop were used as a source of Stránská skála-type cherts.

Stránská skála is the most important Aurignacian site within the Brno Basin micro-region. The first surface artifacts were collected as early as the 1920s by H. Stika on top of the outcrop (Valoch 1954) within the currently grassed area of the water treatment facility (site II). Surface artifacts were later collected by K. Schirmeisen, K. Valoch and V. Gebauer (see Svoboda, Valoch 2003) and their finds are deposited in the Moravian Museum. The first stratigraphic observations at this site were made at the end of World War II by K. Valoch, who collected several artifacts from intact sediments within the grenade or bomb crater (Svoboda 1987b, 376). During the 1980s and 1990s the Pleistocene sediments on top of Stránská skála were systematically explored first using test pits and then followed by systematic excavations by K. Valoch and J. Svoboda. A number of sites within this site complex were excavated over several fieldwork seasons including IIIa (1984–1985), IIa (1986–1987), IIIb (1988–1989), IIIc, f (1997–1999)(Fig. 5.2).

Stránská skála II and IIa

Site II is located directly on the top of Stránská skála outcrop and followed the south-facing slope (IIa). The site elevation ranges from the summit (310.0m) to the 300m contour line (site II) and 290m (site IIa). Site II is a surface site lacking intact sediments (artifacts found in the above mentioned bomb crater had a stratigraphic context prior to the explosion – the exact location of the crater is unknown) and currently inaccessible for surveys. Site IIa is in close proximity to site II on its south-eastern margin and this area is currently a plowed field. The site was discovered by J. Svoboda, who found stratified artifacts in the walls of a trench dug for powerline construction. During two consequent field campaigns (1986–1987) an area of 52.5m² was excavated (Svoboda 1991). Overlying the Bohunician layer, two Aurignacian layers strongly affected by frost and slope processes were identified.
Fig. 5.2. Stránská skála. Selected artifacts. Adopted from J. Svoboda 2003.
The lower Aurignacian layer (4) overlying a limestone scree layer was strongly influenced by frost processes (cell structures consisting of limestone blocks; Photo 5.1) with analogies in current arctic regions (reported by T. Czudek). Inside the structure an irregularly shaped hearth was discovered. It was affected by slope processes. The charcoal sample yielded a result of 32,350 ± 90 ka 14C BP (GrN 14829; Svoboda 2003a). The excavated artifact assemblage numbers 4,472 items (including microchips and microfragments). A large part of the collection was damaged (cracked) by frost. The main site activity at the site was primary processing of local Stránská skála-type chert which is the main raw material used for knapping. Other types of raw material including Krumlovský les-type chert, radiolarite, Cretaceous spongolite chert and quartz constitute only 3% of the assemblage. Most artifacts in this collection are products of primary processing of raw material – prepared raw material, prepared cores, failed cores, and débitage including frequent cortical flakes. The cores are often prismatic and reduced from one (or two – but not opposed) platforms. The retouched tools represent 16% of the assemblage, which is a high percentage given that this site is considered to be mainly a primary workshop. The most common tool type is the end scraper, including carinated forms, followed by burins, and a small number of side scrapers, notched and denticulated tools, and others. Microliths were not found.

The upper Aurignacian cultural horizon (3) was situated in the lower part of a loess layer overlying an interplenioglacial soil that contained the lower Aurignacian horizon. Although a radiocarbon date is not available, given its geological position and the 14C age for the second (underlying) Aurignacian level, the expected age of the upper Aurignacian level is less than ca. 36 ka cal. BP. The excavated artifact assemblage consists of 534 items (including microchips and microfragments). The raw material (imported rocks account for 4% of the assemblage) and technological spectra are similar to the lower horizon. In comparison to the lower Aurignacian assemblage, the artifacts are smaller overall and the proportion of retouched tools increases to 18%. The end scrapers still prevail over burins, and they are supplemented by small-sized side scrapers, retouched blades, and others.

Stránská skála IIIa

In 1983, J. Svoboda dug 5 test pits in the field to the west of site III and in the following year he opened an excavation in an area with finds determined by test pitting. An area of 39m² was excavated and the site was labeled IIIa (Svoboda 1987a). Underlying the upper loess were two interplenioglacial soils. The upper soil was dark brown with Aurignacian artifacts, and the lower soil was more orange-


Photo 5.2. Líšeň VIII. Profile.
brown in color containing Bohunician artifacts. This was the first time that Bohunician and Aurignacian layers were interstratified at the same location which directed further research at the palimpsest hypothesis (Škrdla et al. 2011a) and gave impetus to the reclassification of many of the surface assemblages that may be mixed (e.g. Slatina-Podstránská, Lišeň-Čtvrté).

Only a single hearth 30 cm in diameter was identified and a charcoal sample from this hearth was used for dating. The resulting date was 30,980 ± 360 ka 14C BP (GrN 12605; Svoboda 2003a). A charcoal feature (hearth?) was damaged by frost processes (vertical movement caused by cryoturbation).

During two excavation seasons (1984 and 1985), a collection of 814 artifacts (including microchips and microfragments) were recovered. Local Stránská skála-type cherts were knapped almost exclusively at this site. The Krumlovský les-type chert, radiolarite, Cretaceous spongolite chert and quartz were represented only by one item each. The main technological type was debitage so the site is interpreted as a primary workshop for processing chert nodules and blocks from nearby outcrops. Retouched tools account for 4% of the assemblage. The Aurignacian-type end scraper is the main type followed by burins. Also present are side scrapers, notched and denticulated tools, and truncated blades. Microlithic tools were not found.

Stránská skála IIIb

Under the auspices of the UISPP congress held in 1989 in Kraków, an area of 39m² was excavated (1988–1989) in a field between locations IIa and IIIa (Svoboda 1991). Currently, the area is inaccessible because it is private property. The excavation was aimed at correlation of the two profiles. The site was labeled IIIb. The profile was composed of loess overlying a complex of interpleniglacial soils overlying a layer of limestone scree with an irregular surface. Sediments infilling the depressions between limestone boulders yielded accumulations of osteological material. Similarly as in IIa and IIIa, the upper part of the interpleniglacial soil complex contained thinly distributed Aurignacian artifacts, with Bohunician artifacts in the lower part. A charcoal sample collected from the Aurignacian horizon yielded a date of 32,600±1700–1400 ka 14C BP (GrN 16918; Svoboda 2003a).

Stránská skála IIIc, f

The site labeled IIIc, located in the north eastern immediate vicinity of site IIIa, was excavated over two seasons (1997 and 1999; Svoboda, Valoch 2003). The area of 15m² furnished a very similar stratigraphic situation as the nearby IIIa. In contrast to IIIa, the Aurignacian artifacts were thinly distributed only within the upper part of the interpleniglacial soil complex. The charcoal sample yielded a date 33,030 ± 620 ka 14C BP (AA41479; Svoboda 2003a). An important context was documented in a small pit (1m²) labeled IIIf, located between IIIa and IIIc. The trench produced a hearth vertically disturbed by cryoturbation and a collection of artifacts. The charcoal sample from the hearth yielded a date of 29.020 ± 440 ka 14C BP (AA41472; Svoboda 2003a).

5.2.3. Lišeň I, ‘Čtvrté’

Lišeň-Čtvrté is a well-known and very rich Paleolithic surface artifact cluster with mainly Bohunician, but also Aurignacian, and possibly Magdalenian/Epi-Gravettian industry (e.g. Valoch 1962a; Svoboda 1987a; Škrdla 2000). During the 2000s, P. Matějec collected a series of fossil horse tooth fragments and artifacts covered by calcium carbonate on the peripheries of the surface finds cluster (Škrdla, Matějec 2009). Therefore we dug a series of test pits during the fall and winter of 2008 and documented artifacts within intact layers (Škrdla, Matějec 2009, Fig. 7). The regular excavation of the site was realized during two weeks of August 2009 and an area of 18.5m² was excavated (Škrdla et al. 2010).

While artifacts over 1.5 cm in size were horizontally distributed regularly throughout the excavated area, the small finds did not show regular patterning (Škrdla et al. 2010, Fig. 5). Vertically, the artifacts are dispersed within a homogenous layer up to 40 cm thick (Škrdla et al. 2010, Fig. 5). As the refitting lines connecting broken artifacts are longer than refitting lines of frost fractured artifacts, we can deduce that postdepositional movement was minimal.
Fig. 5.3. Líšeň I, 2009 excavation. Selected artifacts.
The collection of excavated stone artifacts consists of 63 items (Fig. 5.3) recorded in three coordinates supplemented by 94 small artifacts screened from wet-sieved aggregate samples, recorded in 50×50cm blocks horizontally and 4cm vertically (ca. 10 liters of sediment).

Raw material type was determined for the 63 artifacts recorded in three coordinates and those larger than 1.5cm. Artifacts screened from aggregate samples, often smaller than 1.5cm, were too small for reliable determination. The dominant raw material (87%) was Stránská skála-type chert from the nearby slopes and summit of Stránská skála outcrop (minimum distance is ca. 1.7km). Only a small number of artifacts were made on imported rocks – 2 artifacts were made from erratic flint, 2 from Drahany-type quartzite, 1 from Cretaceous spongolite chert, and 1 from indifferent Moravian Jurassic chert. It was not possible to determine the raw material type of 4 burnt artifacts.

The 63 artifacts recorded in three coordinates were classified into technological categories. Most of the wet-screened artifacts were microchips and microfragments apart from two cores reconstructed from two frost affected fragments (Fig. 5.3: 12). The classified artifacts include 25 flakes, 13 cores, 4 blades, 8 blade fragments, 4 fragments, 3 blocks of raw material with traces of knapping, 2 microchips, a microblade, and 3 tools – end scrapers.

The cores are often exhausted or abandoned due to knapping accidents as some of the material is of lower quality (inhomogeneities, cracks). In two cases (Fig. 5.3: 16, 21), an exhausted chert nodule still fixed in the parent rock (limestone) may indicate quarrying of raw material somewhere on the Stránská skála outcrop. However, collecting in stone debris along the foot of Stránská skála rock also cannot be excluded. The cores were exploited often from a single platform, however, the scars on cores indicate changed orientation or repreparation (rejuvenation of distal convexity) from opposed platforms (Fig. 5.3: 13, 18). Core platforms were often prepared by a core-tablet flake. Facetting of striking platform was not documented on cores or removed artifacts. A core found in the wet-sieved fraction is a wedge-shaped core for microblades with prepared frontal crest and thinned back (Fig. 5.3: 12).

Several uncharacteristic artifacts indicate possible traces of Bohunician technology – medial blade fragments with opposed dorsal scars (Fig. 5.3: 6, 7), a quartzite flake (Fig. 5.3: 14), and cores with opposed directional scars in front and with a prepared back (Fig. 5.3: 13, 18, 19). Although those artifacts cannot be unequivocally classified as Bohunician, the excavated site lies on the colluvial sediments on the margin of a large and rich Bohunician site so some degree of contamination by Bohunician material cannot be completely excluded.

Only three tools – end scrapers – were documented. One end scraper is slightly nosed on a fragment of a flat blade and made on erratic flint (Fig. 5.3: 10). Two others are steeply retouched on thick blades of Stránská skála-type chert (Fig. 5.3: 8, 9).

The charcoal sample (scattered) yielded an age of 31,300 ± 800 ka 14C BP (Poz-33038).

The presence of mostly single-platform cores, Aurignacian end scrapers and microblades allows us to classify the industry in accord with radiocarbon dating as Evolved Aurignacian.

One item is a manuport – a sandstone pebble fragment that was possibly used as a hammerstone or a grinder. Seven lumps of yellowish-brown ochre (limonite) were found in the wet-sieved fraction. The same ochre was previously documented at the site of Stránská skála (III, IIIa, IIlc), however, in a Bohunician context (cf. Přichystal et al. 2003, 64).

A shell of the marine gastropod species Pirenella picta spp. is a significant discovery. It is a fossil of Tertiary, most probably Sarmatian age (about 12.7–11.6 million years), that was collected by the inhabitants of the Lišeň-Čtvrtě site, and transported by them to this locality. The upper part of the spira is broken off, the body whorl is probably partly also mechanically damaged, but the aperture is evidently of anthropogenic origin (modification for suspension?).

The layer with stone artifacts contained intensively damaged fragments (fretted by soil acids) of osteological material, which is typical for other local interstadial sites. This material includes bone fragments from horse (Equus germanicus), 8 bone fragments of a large-sized mammal, 1 bone
fragment of a medium-sized mammal, and 3 bone fragments of a small-sized mammal (fox-size), and 37 unidentifiable bone fragments.

5.2.4. Líšeň VIII, ‘Nad výhonem’

The site is located on an elongated crest approximately 900m southeasterly of Líšeň-Čtvrtě at an altitude of 275m. The first Paleolithic artifacts from this locus were reported by M. Oliva (1985, as Podolí Ia) from the surface. At the beginning of 21st century, the Podolí village housing estate expanded and a new street (Nad výhonem) with residential houses was built. Walls of house foundation pits (located exactly on the cadastral boundary between Podolí and Líšeň) were inspected in August 2010 by P. Matějec, who discovered 15–20cm thick soil sediment within a loess (as GPS recorded coordinates indicate that the find spot is several meters inside the Líšeň cadaster, the site was labeled Líšeň-Nad výhonem). Because the sediment included Paleolithic artifacts and charcoal, we cleaned the profile (Photo 5.2) and conducted a small-scale salvage excavation (2.5m² in total; Škrdla et al. 2011b). The excavation yielded 125 stone artifacts. Due to the salvage character of this excavation, only a portion of the excavated sediments was screened which resulted in additional 160 artifacts, mostly microchips. The eleven artifacts (both broken artifacts and production sequences) were refitted which indicates on-site knapping and minimal redeposition. The most important refitting is a débordante/lateral flake in combination with an end scraper-core (Photo. 5.3). All artifacts were produced exclusively from local Stránská skála-type chert and debitage products including flakes, microflakes, blades, microblades and their fragments, other fragments, raw material fragments, and a core. There are only four tools in the collection: three carinated end scraper-cores (Fig. 5.4: 18–20) and a retouched microlith (Fig. 5.4: 1). A small lump of red ochre and a stone slab were found. The charcoal sample yielded an age of 32,500 ± 400 ka ¹⁴C BP (Poz-37346). The dating of a second charcoal sample failed.

In March 2011, P. Matějec discovered a hearth in a loess layer in another house foundation pit ca. 80m to the southwest from the one discussed above (this time located on the cadastral territory of Podolí). The profile was cleaned and a charcoal sample collected from the hearth yielding an age of 33,500 ± 800 ka ¹⁴C BP (Poz-51616; Škrdla et al. 2013c). Two undiagnostic tooth fragments and two undiagnostic artifacts (one of them burned) were excavated from the hearth. Additional artifacts coated with calcium carbonate pointing to an origin in calcareous (intact) sediments were collected from nearby piles of removed sediments. Some of these artifacts found outside their context show Levallois technology and are classified as Bohunician (they are likely to be from an older stratigraphic context.
as is the case at nearby Stránská skála IIa and IIIa; cf. Svoboda 2003a). This find spot suggests that the Nad výhonem site covers over 1ha.

5.2.5. Napajedla III, ‘Zámoraví’

This site is located within Napajedla Gate, a narrow passage (500m at its narrowest point) connecting upper and lower Morava River valleys in eastern Moravia. The site is on the western slope of Maková elevation, which reaches 338m at its highest point and forms Napajedla Gate from the west. The site is in a modern-day quarry (Photo 5.4). The artifact bearing sediments are situated at the bottom of a slope between elevations 205–220m (25–40m above the current level of Morava River) where they were probably redeposited in whole blocks by landsliding.

A salvage excavation in a colluvial sediment quarry in the field of Zámoraví on the cadastral territory of the town of Napajedla was realized during intensive quarrying in 2004–2006 (Škrdlá et al. 2005; 2006; Škrdlá 2007c). Due to the salvage nature of the excavation, only a limited area was excavated using trowels and only a portion of the sediments were sieved. An important collection of lithics was obtained nevertheless with chronological information. The site is not exhausted and salvage excavations will continue with future quarrying.

Two collections from this site are described separately:

A – excavated artifacts from the dated layer (within a grayish layer in central part of the site);

B – artifacts from the brickyard wall up to 35m upslope and from test pits 15m downslope from A; undated).

Terminology used in following classification was adopted from Demidenko et al. (in press).

A: The collection of artifacts from the dated layer consists of 70 items longer than 1.5cm and 639 microchips/microfragments. The prevailing raw material is erratic flint, supplemented by isolated pieces of radiolarite, quartz, and silicified sandstone. Several burnt artifacts were probably also manufactured from erratic flint. The most important tools are different types of nosed end scrapers (Fig. 5.5: 8, 10–13, 22), double nosed end scraper-cores (Fig. 5.5: 17, 21), a nosed and carinated end scraper-core (Fig. 5.5: 9), an end scraper combined with a nosed end scraper (Fig. 5.5: 15), a thick shouldered (not carinated) end scraper-core (Fig. 5.5: 17), a sub-rounded end scraper-core (Fig. 5.5: 14), a carinated burin-core (Fig. 5.5: 23), a burin combined with a laterally retouched edge (Fig. 5.5: 19, 20), a double sided scraper (Fig. 5.5: 18), a bilaterally retouched blade (Fig. 5.5: 7). The collection of knapped artifacts is supplemented by a quartz hammerstone (Škrdlá et al. 2006, Fig. 19: 20). The wet-sieved fraction consists of microblades (Fig. 5.5: 3–5) and bladelets, three of them retouched into microliths (the following description is from Demidenko et al. in press). The first microlith (Fig. 5.5: 1) can be classified as a Dufour type based on the location of retouch – bilateral alternate retouch. The blank can be characterized as a non-cortical, complete, small microblade. It has converging shape, on-axis orientation and slightly incurvate medial profile. Fine, marginal, dorsal, partial retouch extends from the distal tip down to ca. middle of the length of the left lateral edge and the same fine marginal, but ventral partial retouch extends from the butt almost to the distal tip on its right lateral edge. The second microlith (Fig. 5.5: 2) is a so-called pseudo-Dufour as it has bilateral dorsal retouch. The blank is a non-cortical complete microblade with a converging shape, right asymmetrical axis orientation and incurvate medial profile. It has fine, marginal, dorsal, partial retouch extending from the distal tip to the center of the left lateral edge and also fine, marginal, dorsal, partial retouch along the right lateral edge on its distal segment.
Fig. 5.5. Napajedla III. Selected artifacts.
but not reaching the distal tip. The third microlith (Fig. 5.5: 6) possesses partial lateral dorsal retouch and can still be considered as pseudo-Dufour. It has been used for retouching a non-cortical complete bladelet (1.5cm long, 0.7cm wide, 0.2cm thick) with a converging shape, left asymmetrical axis orientation and incurvate medial profile. The retouch is partial, fine, marginal and dorsal located on the left lateral edge near the distal end.

Seven grams of small charred bone fragments were recovered during wet-sieving. This material and charcoal samples were sent to Groningen and Oxford radiocarbon dating laboratories. The resulting AMS dates (around 30 ka \(^{14}C\) BP) are consistent with the technological and typological character of the industry. This stratified and dated collection may be used as an Aurignacian reference collection for other collections in the surrounding microregion (cf. Oliva 1987).

B: The collection of artifacts from the northern part of the brickyard (undated) consists of 241 items longer than 1.5cm and an additional 80 small microchips/microfragments. The most common raw material type is erratic flint, followed by radiolarite, hornstone, quartz, and silicified sandstone. Burnt artifacts are probably from erratic flint.

The most important tools are nosed end scrapers (Fig. 5.5: 25, 27), a double nosed end scraper-core (Fig. 5.5: 37), a triple nosed end scraper-core (Fig. 5.5: 40), a nosed end scraper combined with burin on a crested blade (Fig. 5.5: 33), an end scraper on a wide flake (Fig. 5.5: 43), a double side scraper (Fig. 5.5: 41), a burin on lateral retouch (Fig. 5.5: 29), a laterally retouched blade (Fig. 5.5: 30, 35), a bilaterally retouched blade fragment (Fig. 5.5: 28), a pointed blade (Fig. 5.5: 34), a burin on a broken blade (Fig. 5.5: 36), a burin on oblique retouch combined with a laterally retouched edge (Fig. 5.5: 42), a bilaterally retouched blade (Fig. 5.5: 32), and a small, finely, laterally retouched bladelet (Fig. 5.5: 39).

Lithic pieces from other parts of the quarry lack diagnostic artifacts. Only 4 items from the uppermost part of the quarry suggest affinity with the Gravettian industry, which is consistent with previous claims made by M. Šnajdr (cf. Oliva 1998).

This important assemblage of Aurignacian artifacts was obtained by excavation of undisturbed colluvial sediments and also through surface surveys of sediments which have been previously disturbed by quarrying. In terms of raw materials, the assemblage is characterized by its use of imported erratic flint. Prevailing tool-type form is the nosed end scraper. A collection of microblades and bladelets was recovered from the wet-sieved fraction. Three of them are retouched microliths. One of them can be classified as Dufour-type and two can be classified as pseudo Dufour-type. The closest analogies (not only geographical) to the described assemblage have been found at sites in the vicinity of Napajedla Gate, namely in the cadastral territories of Nová Dědina and Žlutava villages (cf. Oliva 1987). The prevalence of erratic flint in the raw material spectrum, the prevalence of Aurignacian end scraper tool forms, and the presence of bladelets including Dufour forms are all comparable to the collection described. A detailed analysis of assemblage allowed comparison with the industry from Willendorf II, AH 4 (Nigst 2012). Both industries are very similar techno-typologically as well as chronologically and represent the same Aurignacian II/Middle Aurignacian (Demidenko et al. 2017).

5.2.6. Vedrovice Ia, ‘Vanecka’

The site is located on the southeastern slope of Krumlovský les ridge, close to the rich outcrops of Krumlovský les-type cherts. The find spot was discovered and surveyed by V. Effenberger from 1950s onwards and is located on a small plateau (ca. 285m) above the Vedrovice village. Later, M. Oliva documented artifacts covered with calcium carbonate within redeposited sediments during inspection of a telephone cable pit. An excavation was conducted (1991–1994), but detailed results have not been published. Rudimentary results can be found only in Oliva’s reports and notes (Oliva 1987; 1993b; 2016). Four levels with Aurignacian artifacts were identified in the profile. Layer 1 is a loessic layer disturbed by slope processes and layer 2 is a loess. The most important horizons (layers 3 and 4) are situated in an interpleniiglacial soil of the Bohunice-type (Oliva 2016, 296). The osteological material consists of horse teeth and bone remains. A horse tooth yielded an ESR date of 36 ± 2 ka BP (Nejman et al. 2011). The artifacts are made
exclusively from local chert (Oliva 2016, 61). The technology was reconstructed on the basis of very complex refittings as a blade reduction technology using unipolar prismatic cores and the site can be interpreted as a primary workshop site (Neruda, Nerudová 2005). Unfortunately, no relevant data has been published about typology.

5.2.7. Milovice I, ‘Mikulovsko’

This site is located on a northeastern slope in a small, dead-end side valley penetrating into the Mikulov Highlands from the Dyje River Valley. The altitude of the site reaches 225–240m. Its upper part is forested and was not accessible during excavations conducted by M. Oliva in the 1980s. The site is known for its Gravettian occupation, but the Gravettian horizon underlies a layer of interplaniglacial soil sediment (up to 60cm thick) disturbed by slope processes. This soil sediment yielded Aurignacian artifacts. The excavated material has not been published in detail and only some data is available. The prevailing raw material includes unspecified cherts, supplemented by erratic flint and radiolarite (Oliva 2016, 219). In the retouched tools (flat end scrapers, often simple burins, retouched blades, notched and denticulated tools, small side scrapers, and abruptly retouched flakes), both carinated and nosed end scrapers with bladelet-like retouch were documented (Oliva 1989b, 268). Microliths were not reported. A similar situation where older artifacts underlie the Gravettian horizon has also been documented at the nearby sites Pavlov (Svoboda et al. 2016, 47) and Dolní Věstonice.

5.3. Isolated stratified occurrences

Kostelec na Hané

An isolated Mladeč-type bone point was found on the surface in Kostelec na Hané, to the south of Velký Kosíř Hill and in a side valley of the Upper Morava River valley. The find spot is on an elevated ridge shaped by Romže River to the south and Český Creek to the north. The site is located 19 km to the south of Mladeč Caves. The find was originally published using the name of the neighboring village Hluchov (cf. Oliva 1987; Valoch 1993b). As the artifact was plowed up from intact sediments, the area was repeatedly surveyed and a collection of six Upper Paleolithic artifacts (a blade, a bladelet and three flakes) was collected in the same area (Škrdla, Mlejnek 2012). The artifacts were thinly dispersed over a large area in the vicinity of an elevation marker 339.66m. Although plowing of loessic sediments on the surface of the field was documented in this area, no osteological material was located. This site has future potential for surveys.

Dolní Věstonice III, unit 2, lower layer

In 1995, during an excavation of the Gravettian site Dolní Věstonice III, unit 2, a lower layer with several Aurignacian-like artifacts was discovered stratigraphically underlying the Gravettian horizon (Škrdla et al. 1996). The artifacts were excavated within interplaniglacial soil sediment infilling a small, probably erosional gully. Raw material spectrum is characterized by a high proportion of Krumlovský les-type chert and Cretaceous spongolite chert supplemented by the black-grayish translucent chalcedony with a black pigment and grayish pieces (3.1%) originating probably from the vicinity of Ústí nad Orlicí in Eastern Bohemia. Erratic flint and unspecified Moravian Jurassic cherts are also present. Excavations in 1995 yielded 130 artifacts and additional 81 microchips were screened. The dating attempt was unsuccessful, but the site has potential for future excavations.

5.4. Surface collections

As previously mentioned, Oliva (1993a) has asserted that the density of Aurignacian sites in Moravia is very high. As the number of known surface sites adds up to several hundred, they cannot all be individually listed in this work. Several issues regarding these surface sites have been discussed in literature: Early Aurignacian, Morava-type Aurignacian versus Míškovice type, Aurignacian with leaf points, and Late Aurignacian / Epi-Aurignacian.

K. Valoch proposed an Early Aurignacian presence based on finds from Kupařovice (Valoch et al. 1985), but he found no support for this hypothesis after excavating this site.
Aurignacian artifacts in association with leaf points have been collected in Upper and Lower Morava River valleys, in some cases they were triangular-shaped which suggests Streletsian (cf. Anikovich 2003). B. Klíma (1978) labeled those industries Morava-type Aurignacian and later M. Oliva (1990) introduced the term Miškovice type. Other Aurignacian assemblages with leaf points have been reported, but stone leaf points have never been found in association with the Aurignacian (Škrدلa 2016a). Recently, Y. Demidenko analyzed material from a small salvage excavation in Hlinsko-Kouty (Škrďla 2007d) and refitted four thinning chips onto a triangular leaf point which indicates on-site leaf point production (pers. comm.). In addition he refitted a bladelet to a flat-faced carinated burin. Unfortunately, the site yielded no dateable material. However, the association is still uncertain and there is good reason to believe that more stratified sites will be found.

Questions also surround the Late Aurignacian/Epi-Aurignacian. All Moravian Aurignacian dates cover the time span 38–32 ka cal. BP, i.e. GI-8–GI-5 (Škrďla 2017), then being followed by Early Gravettian. As there are surface assemblages with prevailing carinated burins over carinated end scrapers (Oliva 1996), their chronological position is not clear. An industry with tiny microliths produced from carinated atypical end scrapers-cores was documented in Mohelno-Plevovce ca. 23 ka cal. BP. The chronological gap between Aurignacian sites and Mohelno is too large for any developmental continuity, however, it indicates that isolated occurrences of Aurignacian-like implements can occur over a wide time span from ca. 32 ka cal. BP till the LGM peak around 22–19 ka cal. BP.

5.5. Concluding remarks

When the stratified Aurignacian sites are considered together with surface clusters, the definition of the Aurignacian techno complex becomes unclear. All these sites occur in the same general region along the main Moravian river valleys including Dyje-Švratka River Valley, Jihlava River Valley, Morava River Valley (both Lower and Upper), and Bečva River Valley. The sites were located on elevated positions allowing control over the valley as well as parts of the neighboring highlands, which is a common IUP/EUP settlement strategy. The caves were unoccupied, but the material from Mladeč Caves indicates some use (ritual?) of rock cavities. The technological spectrum at sites within the Brno Basin is influenced by proximity to raw material sources (Stráňská skála-type chert), which is indicated by an increase in preparation stage products and core preforms. The reduced cores represent different types of polyhedral and prismatic cores, supplemented by Upper Paleolithic crested cores and other core types including irregular forms (Škrďla 2003d). The cores were not frequently rejuvenated (with changed orientation). Some of the cores resemble flake cores. Massive blanks allowing production of carinated tools are known from Western Europe (cf. Chiotti 2012; Michel 2012; Bolus 2012). Similar cores were excavated at Lišeň sites. At Napajedla, in contrast to the sites in Brno Basin, the siliceous rocks (erratic flint, radiolarite) were imported from a minimum distance of around 45–60km. The large cores are missing while small cores often made on flakes used for bladelet production are present. Data from other sites are not available. While the attempt to refit material from Stráňská skála (IIa and IIIa) was not successful, several sequences were refitted from Vedrovice la assemblage (Neruda, Nerudová 2005). The reconstructed technology is characteristic Upper Paleolithic crested single platform core technology. The platforms are flat or dihedral (not faceted) and repeatedly rejuvenated by the removal of tablet flakes.

Photo 5.5. Napajedla III. Dufour-type micro blade. Length 11.8mm. Photo L. Zahradníková.
The Aurignacian typology at Stránská skála (the only site published in detail) is characterized by prevailing steeply retouched end scrapers including characteristic carinated forms, supplemented by infrequent simple burins, side scrapers, retouched blades, notched and denticulated artifacts, and other tools (cf. Svoboda 2003b, Table 10.2). Similar tools were identified at the recently excavated sites.

The specific feature characterizing Aurignacian assemblages in different parts of Europe are microliths (e.g. Mellars 2005; Bordes 2003; Theysandier 2007; Nigst 2012). Microliths do not commonly occur in the Moravian assemblages (Photo 5.5) presenting a contrast to the assemblages reported from neighboring countries. This can be explained by the surface nature of collections (cf. Oliva 1987) and coarse-grained excavation techniques lacking screening of excavated sediment in the last century (Svoboda 2006a, 263; Nigst 2012, 306). Another possible explanation for the lack of bladelets is the specific context of the Stránská skála assemblages – their location directly at the raw material source. However all three above mentioned sites excavated in the last few years have yielded a series of microblades and bladelets including retouched microliths. Those categories of artifacts were collected during wet-sieving of excavated sediment and therefore I favor the excavation bias hypotheses for explaining the absence of microblades, bladelets, and microliths in older Moravian excavations.

From the techno-typological viewpoint, the Moravian Aurignacian can be separated into two facies (Demidenko et al. 2017). The first facies is Evolved Aurignacian (with sites Stránská skála II, IIa, IIIa, and IIIb, Liščí I and VIII) characterized by removal of large blades from unipolar prismatic cores and by the presence of carinated end scraper-cores with a wide frontal face and lamellar (microblades and bladelets) removals (Demidenko et al. 2017). Carenoidal burins are often not present. The microlithic component is characterized by pseudo-Dufour microblades (symmetrical or slightly asymmetrical, non-twisted) with dorsal, marginal abrasion retouch. Such microliths were excavated at Góra Puławska II (Krukowski 1939–1948; Sachse-Kozłowska 1978) so the label ‘Góra Puławska II-type microliths’ was proposed (Demidenko et al. 2017). In Central Europe, this industry was documented at Góra Puławska II in Poland, Alberndorf I in Lower Austria, Breitenbach in eastern Germany. In Eastern Europe, Kostienki 14, ‘volcanic ash layer’, and Kostenki 1, layer III in Central Russia and Kulychivka, layers III & II in Eastern Ukraine were documented. This facies characteristic for Central and Eastern Europe is not present in Western Europe (Demidenko et al. 2017).

In contrast to the sites described above, the material from Napajedla III that is characterized by a significant presence of nosed end scraper-cores made on short and thick flakes is significantly different and represents a second facies. Based on both techno-typology and chronology, this assemblage has strong similarities to Aurignacian II/Middle Aurignacian (Demidenko et al. 2017). Miľovice I is also very similar. The most important occurrence is in Willendorf II, AH 4 in Wachau Gate, Lower Austria (Demidenko et al. 2017).

All stratified and dated Moravian Aurignacian sites currently known are chronologically younger than the Campanian Ignimbrite eruption and overlap with GI-8–GI-5, i.e. 37–32 ka cal. BP. Based on currently available chronological evidence, the beginning of the Upper Paleolithic in Central Europe is characterized by an earlier phase prior to CI (with Bohunician, Szeletian, Aurignacian 0/Proto-Aurignacian and Aurignacian I/Early Aurignacian), and a younger phase after CI (with Aurignacian II/Middle and Evolved Aurignacian). Chronostratigraphically, this suggests that the CI (or HE-4) event had a significant impact on the Central European populations.
6. Concluding remarks

The previous chapters aimed to summarize the current state of knowledge regarding the period from 50 to 35 ka cal. BP, i.e. the period when the last Neanderthals were most probably confronted and eventually replaced by incoming AMHs. This process can be studied from many viewpoints, including biology (on a genomic level), archaeology (settlement geography, social and raw material networks, lithic studies), chronostratigraphy (dating methods), and cultural anthropology (social aspects). Most of the available data from Moravia belongs to the category of archaeology.

6.1. Where? – the settlement geography and settlement strategy

As already noted in the introduction, on a continental scale Moravia presents a unique region where the main central European communication corridors that also served as dispersal routes intersect. Its location directly on the main trajectory of the AMH dispersal, upstream along the Danube River, probably played an important role in the early appearance of AMH on the European continent. Moravia was also subject to influences from the Northern European plains, where the LRJ techno complex (probably Neanderthal) has been documented for the IUP/EUP period (Fig. 6.1). The Middle Paleolithic Micoquian occupation probably lingered on (according to a series of relatively recent dates) until the IUP/EUP period. Following the genome-derived scenario hypothesizing the first emergence of AMH in Europe ~50–45 ka cal. BP, Moravia, with its strategic location acted as a ‘zone of contact’ in the ‘time of contact’ of late Neanderthals and first AMHs. According to this hypothetical scenario, Moravia may have been a nodal point where different hominins bearing different traditions met, resulting in a melting pot and generating new traditions. In contrast to other regions, the IUP/EUP period in Moravia is archaeologically characterized by the appearance of several different technological traditions that chronologically overlap and mutually influence each other – the most pertinent is the recently discovered Liščín/Podolí I-type industry.

In contrast to the local Middle Paleolithic that was documented in the caves and highland environments, the IUP/EUP techno complexes preferred open air environments following the edges of the Carpathian Foredeep. Although the number of discovered open air Middle Paleolithic sites has increased over the last decades, the number of open air IUP/EUP sites is still significantly higher. In contrast, no IUP/EUP cave sites have been discovered recently. The IUP/EUP settlement pattern is strongly contingent on the locations of raw material outcrops – the

Fig. 6.1. Schwabedissen’s geographical sketch. Adopted from Schwabedissen 1943.
sites are often concentrated in areas rich in local raw materials, e.g. in the vicinity of Stránská skála (Brno Basin), Krumlovský les, Bořitov and Ondratice areas. The small number of key sites for each of the IUP/EUP techno complexes does not permit definitive inferences about differences in settlement patterns within the landscape. Significant differences in settlement strategies in the techno complexes have also not been detected from analyses of surface sites. Generally, all IUP/EUP techno complexes preferred elevated positions (the elevations often ranging from 250 to 350m) within a landscape, often on the hilltops, or on ridges protruding from hilltops. Such positions allowed control of large parts of the landscape, both river valleys and surrounding highlands. On the one hand, this standardized settlement strategy is helpful when searching for new sites, but it also causes complications. The first complication concerns the loss of intact sediments through erosion which results in surface sites – artifacts on the surface devoid of stratigraphic context. The second complication is related to the first – as the same locations were favoured at various times and may have been repeatedly occupied by bearers of different techno complexes, the resulting lithic collection sometimes represents a mixture of techno-typological behaviors covering the whole IUP/EUP time span. In addition, as the sedimentation during the IUP/EUP period was limited on elevated positions, excavated collections can also be the result of repeated occupations and can represent a mixture of different technological behaviors that cannot be archaeologically or geologically separated. Those observations led to the formulation of the ‘Palimpsest hypothesis’ (or ‘Sequentional Occupation hypothesis’) predicting the occurrence of mixed assemblages (in both surface sites and stratified sites).

6.2. When? – The chronostratigraphic background

The increase in the number of available radiocarbon dates from both old and new excavations and originating from well defined stratigraphic contexts obtained during last two decades allow a refinement of the chronological positions of the IUP/EUP techno complexes. With respect to uncertainties in the radiocarbon method during the period of interest where it is close to its useful limit (a very small amount of contamination can result in an age several thousand years younger), the older dates are preferred over more recent dates in the interpretation of a particular techno complex. Unfortunately, a significant chronostratigraphic marker dated to 39/40 ka cal. BP known from southern and eastern Europe – Y-5 tephra resulting from Campagnian Ignimbrite (CI) eruption (Phlegrean fields, Naples, Italy) has not been detected in Moravia. Bohunic (test pit 3) and Ondratice/Želeč I (test pit 4) profiles were sampled for this marker (Davies et al. 2015).

Longer stratigraphic sequences found in different parts of the continent where different techno complexes are interstratified have not been

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**Fig. 6.2. Overview of calibrated radiocarbon dates for the Bohunician, Szeletian, Lišeň/Podoli I, and Aurignacian industries.**

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documented in Moravia. The only exception is interstratification of Bohunicean and Aurignacian layers documented by J. Svoboda (2006a, Fig. 1) at Stránská skála. The Aurignacian horizon was overlying the Bohunicean horizon at SS-IIa, IIIa, and IIIb.

The chronological position of the Szeletian, Bohunicean, Lišeň/Podolí I-type and Aurignacian industries are discussed in the following paragraphs (Fig. 6.2). Questions regarding their interstratifications are also discussed.

The probability distribution plot of calibrated radicarbon dates for the Szeletian covers a time span from 46 to 40 ka cal. BP, i.e. GI-12 – GI-11. Older (GI-12) dates were recently received for Vedrovice V, where a series of younger (GI-11) dates were obtained previously. A similar situation was documented in Želešice III, where both earlier and younger dates were received from the same context. Thus the relatively long time span for the Szeletian occupation can be questioned with the contamination issue in mind. If the younger dates are contaminated, the age of the Szeletian could be shortened to GI-12 only. On the other hand, the Szeletian in Moravia is not a uniform phenomenon (technologically, typologically) and shows a high degree of variability that cannot be oversimplified by interpreting it in terms of different site functions only. In fact, the diversity documented in the lithic assemblages may be consistent with the wide spread of the radiocarbon dates. Another question is the earliest appearance of the Szeletian as the lower limit for Szeletian radiocarbon dates is ~46 ka cal. BP. Considering the contamination issue, an earlier appearance cannot be excluded. The available OSL dates for the artifact bearing horizon and an underlying layer at Vedrovice V and Moravský Krumlov IV do not statistically overlap each other (cf. Nejman et al. 2011). An earlier appearance of the Szeletian as early as GI-13 cannot be excluded entirely.

The probability plot of calibrated radiocarbon dates for the Bohunicean subserves a very long interval from 48 to 39 cal. BP, i.e. period GI-12 – GI-9 or CI. As in the case of Szeletian, the possibility of contamination by younger material may constitute a good reason for excluding some of the younger dates. The Upper Bohunicean was defined at Ořechov IV (west) on a technological level however, the related dates are recent. Although the samples were collected from remains of the same cultural activity (a hearth and a possible ‘boiling’ pit nearby) their statistical probabilities did not overlap which indicates possible contamination for one or both of them. It suggests that Ořechov IV occupation may be older and more samples need to be dated using a more suitable pretreatment technique (only very small charcoal samples are available). Two charcoal samples from hearth No. 5 that was extraordinarily rich in charcoal (identified mostly as larch) were dated using two different pretreatment protocols. The date obtained using ABOx-SC protocol (42,309 ± 980 14C BP; ANU-52429) was older compared to the second date using the ABA protocol (41,500 ± 1,000 14C BP; Poz-87124). The difference between both dates is 800 years. It upholds the usefulness of using ABOx-SC pretreatment protocol for Moravian dates from the IUP/EUP period. Hearth No. 5 in Ořechov was exceptional in the amount of charcoal recovered; amounts of charcoal recovered from IUP/EUP artifact bearing horizons are usually too small (often tiny fragments weighing several miligrams) for the utilisation of the ABOx-SC pretreatment protocol. So far only one Moravian sample has been tested with both pretreatment methods so it is too early to accept the superiority of ABOx-SC (cf. Haesaerts et al 2013). Similarly, as the nature of the described difference between the two pretreatments has not been precisely defined and statistically tested, it is not possible to simply add about 500–1000 years systematically to ABA dates to obtain calendar dates. However, a move to earlier ages for all new IUP/EUP dates that will be received using ABOx-SC pretreatment protocol cannot be excluded. The lower limit of the Bohunicean time span was also investigated using luminescence techniques. The most important is a TL date – a weighted mean from 11 heated flints from Bohunice 2002, that yielded a result 48.2 ± 1.9 ka 14C BP (Richter et al. 2008). The TL result indicates an older age for the Bohunicean when compared to the radiocarbon results and this is consistent with 14C results using the ABOx-SC pretreatment protocol.

Bohunice 2002 and Stránská skála IIIc were also dated by OSL (Richter et al. 2009; Nejman et al. 2011). OSL dating of Tvarožná is under way. The dates from the Bohunicean artifact bearing horizon
range from 64 to 38 ka BP, which is not unexpected and may reflect cryoturbation documented in the lower part of the Bohunician layers at both sites. To summarize OSL dating attempts at both sites, the dates from the same horizon show higher dispersion than expected. It is necessary to study the sediments micromorphologically in order to understand the nature of such scattering in the OSL results.

As the TL date and some of the OSL dates predate the radiocarbon results, the lower age limit for the first Bohunician appearance in Moravia could belong to GI-13.

A set of radiocarbon samples from Lišč/ Podoli I site was dated. However, the spread of resulting dates covers a period from GI-12 to the LGM. Therefore some of them were excluded because they do not relate to the cultural layer in question (see detailed discussion in chapter 4). Dates from two charcoal lenses containing artifacts and located in opposite parts of the excavated area were selected as relevant. The differences (up to 3 ka) recognized within the same charcoal lens can be interpreted as contamination; the find location of the samples was close to the modern (plowed) soil. Six selected charcoal samples from both charcoal lenses (4 + 2) yielded dates ranging from ca. 36 to 39 ka $^{14}$C BP with significant probability distribution overlaps. This time span fits with a long period from GI-12 to GI-9. As the dates collected from the same context slightly differ probably due to contamination, the earlier ages are more reliable and the time span for Lišč/ Podoli I site may be shortened to GI-12–GI-11, or even a shorter period.

The Aurignacian techno complex – Aurignacian II – Middle and Evolved Aurignacian was documented in Moravia after the CI, i.e. in the time span GI-8–GI-6.

Currently available radiocarbon dates suggest the presence of both Szeletian and Bohunician during GI-12–GI-11. However, both techno complexes may have already appeared during the preceding GI-13 as suggested by the TL age result from Bohunice and the oldest radiocarbon dates. The upper chronological limit for the Szeletian is GI-10 and GI-9 for the Bohunician. The younger ages may have been affected by contamination from younger material. The Upper Bohunician known only from Ořechov IV (west) is currently not well chronologically defined, but it is probably younger than the classical Bohunician documented at Stránská skála and Bohunice site clusters. The upper chronological limit for the Upper Bohunician is GI-9, but an earlier age is more probable. The Lišč/ Podoli I-type industry tends to be slightly younger than the classical Bohunician and Szeletian. Currently, the most probable age (with a significant probability overlap) for that industrial type is GI-11 (GI-12 is also possible).

Early Aurignacian known from the nearby Austrian site Willendorf II, AH-3 (located in the Danube Valley, ca.130km in direct line from Brno) and the Proto-Aurignacian have not been documented in Moravia as yet. The significant chronological marker separating an earlier ‘MP/UP transitional’ phase from the fully UP phase is the Campagnian Ignimbrite eruption. Only the Aurignacian has been documented in Moravia after the CI event – the Szeletian, Bohunician and the Lišč/ Podoli I-type industry seem to disappear after the CI event.

6.3. What? – Archaeological remains and main trends in lithic industry

By and large, lithic artifacts are by far the most commonly occurring cultural material, and among cultural remains from the IUP/EUP period, they are often the only cultural material preserved. The methods utilized for comparisons of particular collections, sites and techno complexes are based on raw material, technological and typological studies.

Raw material procurement revolves around the utilization of local raw materials during the entire IUP/EUP period. Human occupation is often concentrated directly at the raw material outcrops and the surroundings, while export to more distant areas is limited. This behavior was analyzed by J. Svoboda (1987a) who proposed a model of ‘exploitation areas’. The use of Krumlovský les-type chert, Cretaceous spongolite chert, and orthoquartzite is not limited to the primary outcrops as they can be collected in many gravel terraces at some distance from the primary sources.
The most important raw material type for testing a distribution model is the Stránská skála-type chert, which can be found at only one place – the Stránská skála rock. The area of Stránská skála (eastern part of the Brno Basin in general) is distinguished by the Bohunician and Aurignacian techno complexes, as well as the Lišeň/Podolí I-type industry. All collections are characterized by the dominant use of Stránská skála-type chert supplemented by up to 10% of imported rocks. In the case of Bohunician sites several kilometers away from Stránská skála rock, the proportion of Stránská skála-type chert decreases by up to 50–90%, and tens of kilometers away it decrease to as little as 10%. This raw material has not been registered in Bohunician collections outside of Moravia. No Aurignacian sites outside the Brno Basin have been found except for Napajedla III (data for Milovice I and Vedrovice Ia are not available) where Stránská skála-type chert was not documented (although it is present in surface Aurignacian assemblages of the lower Morava River valley, e.g. Boršice/Buchlovice site, Škrdla 2005). The Napajedla III artifacts are made almost exclusively from imported erratic flint and locally available raw materials were not utilized much (they are present as single items only). Several artifacts made from Stránská skála-type chert were documented in the Szeletian Želešice III collection. In contrast to the prevailing local raw materials, the rocks imported from distant areas including erratic flint (Northern Moravia – Southern Poland) and radiolarite (White Carpathians) were marginally utilized by all techno complexes and bearers of the Lišeň/Podolí I-type industry. In the Tvarožná X collection, a single tool made from limnic siliceous rock originating from Slovakia or Hungary was identified. Other exotic rocks were reported from surface sites where techno complex affiliation is unclear (Nerudová 1997).

Lithic technologies during the IUP/EUP period are generally characterized by evolved Levallois technology in the Bohunician, bifacial reduction in the Szeletian and UP technology, with microlithic elements in the Aurignacian.

The refitted material from Stránská skála III, IIIa, and IIIc workshop sites allowed a detailed analysis of Bohunician Levallois technology which was aimed at serial production of elongated Levallois points from opposed platform UP cores with a frontal crest. In contrast to workshop sites, the refitting of collections from other sites including the Bohunice site-cluster, Tvarožná X, and Ořechov IV yielded results that are not as complex. Generally, the Bohunician technology can be reliably detected by the presence of elongated blanks (both flakes and blades) with facetted striking platforms and bidirectional dorsal scars. Such products are not present in other techno complexes.

The bifacial reduction was reconstructed on material from Moravský Krumlov IV workshop, where several sequences documenting shaping and thinning of leaf points from nodules were refitted. Technology utilized for core reduction was not reconstructed by refitting.

Although the Levallois technology and bifacial reduction are different technological concepts characteristic for different techno complexes, there is one stratified site (and a series of surface collections) where both concepts were combined within the same assemblage – the Bohunice-type site. The hypotheses to explain this phenomenon were presented in detail in chapter 3. The Bohunice homogeneity problem remains unresolved. Currently the presence of Bohunician sites without bifacial reduction (‘pure Bohunician’) in the Stránská skále site cluster, Tvarožná X, and Ořechov IV favors the heterogeneity hypotheses (Pedogenic or Sequential Occupation hypotheses). However, the likelihood that a new industrial type (i.e. the Lišeň/Podolí I-type industry) has been discovered in recent years indicates that the situation may be more complicated than previously thought. The discovery of more stratified sites where both Levallois technology and bifacial reduction are present is necessary for testing the proposed hypotheses.

An important developmental trend in technology is microlithization evident from the diminution of cores, blanks and tools over time and the appearance of bladelets, microblades, and retouched microliths. A decrease in size of cores and blanks in the Bohunician was documented at Ořechov IV – west, where all blanks including Levallois points are smaller compared to Stránská skála points (Fig. 3.21). The bladelet and microblade production was not documented in the Szeletian. It was not
documented in Bohunician sites including where excavated material was wet-sieved i.e. Bohunice 2002 and Tvarožná X. It was documented only at Ořechov IV – west assemblage that is probably not classic Bohunician, but Upper Bohunician, i.e. younger than other Bohunician sites. Although the number of bladelets and microblades is high, retouched microliths were not found. Similar bladelets have been described from other IUP sites including Boker Tachtit and Kara Bom. The bladelet and microblade component was documented in the Lišen/Podoli I-type industry, where only one proximal fragment is bilaterally retouched on its dorsal surface. Bladelets, microblades and microliths (including Góra Puławska-type and Dufour-type specimens) are common in screened Aurignacian assemblages. Comparison of bladelet and microblade widths between Ořechov IV – west Upper Bohunician, Lišen/Podoli I-type industry, and Napajedla III Aurignacian assemblages (these include all currently available assemblages relevant to this analysis) shows differences in frequency distribution (Fig. 6.3), which probably indicates differences in the production process and function. The time consuming, detailed analyses of Ořechov IV – west and Lišen/Podoli I bladelets and microbladelets including refitting and traceology is necessary for understanding the production sequence and utilization of those artifacts.

A very important aspect is the appearance of personal ornaments (colored and perforated mollusc shells) that were documented only in the Lišen/Podoli I-type industry. No personal ornaments were found at Bohunician sites Bohunice 2002, Tvarožná X, and Ořechov IV even though all were screened. Their absence at these Bohunician sites can probably be explained by the general poor preservation of organic materials at these sites. Similarly, personal ornaments were not found at the Aurignacian site Napajedla III where some of the sediments were screened, but they are known from Mladeč Caves where preservation of osteological material is much better. The fact that the mollusc shells were preserved at Lišen/Podoli I, but not at other sites will be addressed using micromorphological and spectral analyses.

Fig. 6.3. Bladelet and microblade width histograms for Ořechov IV, Napajedla III and Lišen/Podoli I assemblages.
6.4. Who? – Neanderthals and AMHs: who were the creators of particular techno complexes?

The Szeletian (Moravian Early Szeletian in particular), a techno complex rooted in the local MP both technologically and typologically, most probably represents the last archaeological signature of the local Neanderthals. As the Szeletian techno complex had a local predecessor (Central European Micoquian), it exemplifies techno-typological continuity of the LMP industries (‘Blattspitzen’) on a more general scale. It completely lacks any clear evidence for personal ornaments and the hypothesis that this techno complex was created by AMH can very likely be rejected.

In contrast to the Szeletian, the Bohunician techno complex had no local predecessor in Moravia and on a broader scale in the Middle Danube area, i.e. it is intrusive to the region. The Bohunician-like technology at Ořechov IV shows trends (diminution, presence of bladelet/microblade technology) towards bona fide UP. No unequivocal evidence for personal ornaments has been found yet, but this line of argument is also problematic because personal ornaments have also not been found in the Szeletian and Aurignacian open air sites. Therefore, poor organic preservation potential of paleosoils may also be a factor. On a wider regional scale, the Bohunician is an IUP techno complex spreading across Eurasia during the time span 50–35 ka cal. BP. It has been hypothesized that an early wave of migrating AMH expanded into this region during this time so the Bohunician in Moravia may be the first manifestation of AMH in the European interior.

The recently discovered Líšeň/Podolí I-type industry is EUP both technologically and typologically, but it also bears resemblances to earlier techno complexes including LRJ, Szeletian, and Bohunician. Líšeň/Podolí I-type industry is rich in personal ornaments, it chronologically overlaps with the Early Aurignacian on the Upper Danube, and it was very probably created by AMH. On the other hand, it may represent a technological transfer from Early Aurignacian in the Danube Valley to local populations (that could have been either AMH, or Neanderthals).

The Aurignacian in Moravia was the first established AMH culture as indicated by Mladeč AMH skeletal remains and the associated personal ornaments.

Although it is not clear who were the first incoming AMH in Moravia, the bearers of the Bohunician techno complex are currently a hot candidate. The research is continuing....
The goal of this book is to present the reader with state of the art knowledge regarding a period in prehistory when, in the wider Eurasian context, the Anatomically Modern Humans replaced the Neanderthals. This event is particularly monitored in the territory of Moravia, which is known for its high density of archaeological sites from this period, as well as for its systematic research of these sites. It was also necessary to consider the record from the surrounding regions and place the Paleolithic record in the context of the fast evolving research concerning global climatic trends. Information that has accumulated over several generations of Moravian Paleolithic research resulting in a large body of research results published in a variety of local periodicals and books is reviewed and presented in this book. A hypothetical cultural evolutionary model based on state of the art knowledge is also presented. It is a scientific hypothesis based on current knowledge and not necessarily an accurate reflection of past events. Its main aim is to summarize current research issues and suggest directions for future research. In this pursuit, I wish my successors all the best.
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