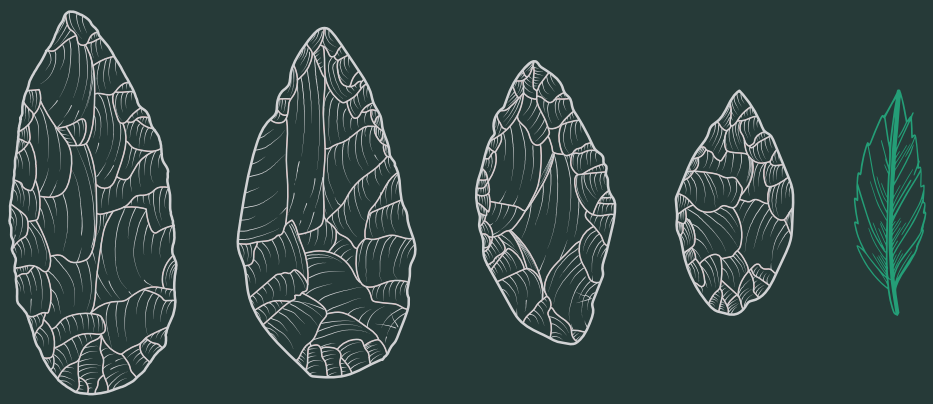
From tea leaves to leaf-shaped tools

STUDIES
IN HONOUR OF ZSOLT MESTER
ON HIS SIXTIETH BIRTHDAY



LITIKUM KÖNYVTÁR 2

EDITED BY
ATTILA KIRÁLY

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Editor:

Attila Király

ELTE
EÖTVÖS LORÁND
UNIVERSITY

LITHIC RESEARCH ROUNDTABLE

INSTITUTE OF ARCHAEOLOGICAL SCIENCES,
ELTE EÖTVÖS LORÁND UNIVERSITY,
BUDAPEST, HUNGARY,

2023

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LITIKUM KÖNYVTÁR 2 • LITIKUM BOOKS 2

Publisher:
Lithic Research Roundtable
Institute of Archaeological Sciences,
ELTE Eötvös Loránd University, Budapest, Hungary

Responsible publisher / Felelős kiadó:
Attila Király – editor, Litikum – Journal of the Lithic Research Roundtable
3524 Miskolc, Jósika M. u. 20. • attila@litikum.hu • https://litikum.hu

Responsible editor, series editor, layout editor:
Attila Király

ISBN 978-963-489-662-3 (PDF)
ISBN 978-963-489-661-6 (Softcover)
ISSN 2786-3751 (Online)

The volume was created in FR4 format using the fonts Source Sans Pro and Source Serif Pro, which fall under the SIL Open Font license. | The publication is available in *print-on-demand* form from the responsible publisher or from the Litikum editorial office.

CONTENTS

The Lincombian-Ranisian-Jerzmanowician with new sites in South Moravia and the Initial Upper Palaeolithic record of East-Central Europe

5

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Abstract. This study proposes a new look at the Lincombian-Ranisian-Jerzmanowician (LRJ) industry based on four recently excavated open-air sites in South Moravia, (Líšeň / Podolí I, Želešice III / Želešice-Hoynerhügel, Líšeň I / Líšeň-Čtvrtě and Tvarožná X / Tvarožná, 'Za školou'), and two cave sites in Bohemia (Nad Kačákem Cave) and South Moravia (Pekárna Cave), in the Czech Republic. We suggest considering the LRJ as a late Initial Upper Palaeolithic (IUP) industry starting from the period right before Heinrich Event 4 (HE-4) and the Campanian Ignimbrite (CI) super-eruption event, ca. 42–40 ka cal BP. We propose that the LRJ was made by *Homo sapiens* as an 'industrial result' of a smooth, and mainly technological transition from Bohunician into LRJ. As a result, a place of origin for the LRJ industry is seen in Moravia, in East-Central Europe, from where modern humans (*Homo sapiens*) spread all over the vast northern altitude territory in Central and Western Europe. Thus the IUP "Bohunician package" did not disappear in Europe but did give rise to another IUP industry successfully adapted for the contemporary steppe-tundra belt in Northern Europe. Finally, to the long-lasting tripartite archaeological division of the IUP period (Bohunician, Szeletian, Proto-Aurignacian) with a duration of ca. 6–8,000 years in East-Central Europe, the LRJ industry should be added. This is a late IUP industry geochronologically coeval with the Proto-Aurignacian, and post-dating both the Bohunician and the Szeletian.

Keywords: Initial Upper Palaeolithic, Lincombian-Ranisian-Jerzmanowician, East-Central Europe

Cite as: Demidenko, Y. E., & Škrdla, P. (2023). The Lincombian-Ranisian-Jerzmanowician with new sites in South Moravia and the Initial Upper Palaeolithic record of East-Central Europe. In A. Király (Ed.), *From tea leaves to leaf-shaped tools. Studies in honour of Zsolt Mester on his sixtieth birthday* (pp. 95–119). Lithic Research Roundtable & Institute of Archaeological Sciences, ELTE Eötvös Loránd University, Budapest, Hungary. https://doi.org/10.23898/litikumsi02a05

1. Introduction

The Initial Upper Palaeolithic (IUP) period in East-Central Europe was always considered by us in a rather traditional way, with the presence of three Upper Palaeolithic (UP) techno-complexes, Szeletian, Bohunician and Aurignacian, the latter of which was represented by the initial Proto-Aurignacian industry (Škrdla, 2017; Demidenko *et al.,* 2017; Demidenko et al., 2021). In geochronological terms, the IUP represents a period between ca. 48–46 and 40 ka cal BP, between Greenland Interstadials (GI) 13/12 and 9, preceding the pronounced geochronological markers of Heinrich Event 4 (HE-4) and the Campanian Ignimbrite (CI) super-eruption at the beginning of Greenland Stadial (GS) 9, ca. 39.85 ka cal BP (Giaccio *et al.,* 2017).

One of the most important recent development in the study of the region's IUP is a change in Szeletian geochronology and its origin in archaeological terms (Tostevin, 2012; Škrdla, 2017; Demidenko & Škrdla, 2022). Presently, it is well established that the beginning of the Szeletian and the Bohunician geochronologically coincide in GI-13–GI-12, ca. 48–46 to 45 ka cal BP. This chronology has an important implication for the long-lasting ideas about the role of Middle Palaeolithic (MP) Mousterian / Micoquian Neanderthal acculturation to Aurignacian *Homo sapiens* in the cultural genesis of the Szeletian (e.g., Prošek, 1953; Valoch, 1968; Kozłowski, 1988). Now it is clear that the first Proto-Aurignacian assemblages in East-Central Europe, at ca. 42–40 ka cal BP (GI-10–GI-9), are predated by both Szeletian and Bohunician assemblages, this is why the Proto-Aurignacian *Homo sapiens* had no chance to meet Szeletians (whatever types of humans they were). However, Szeletians could meet *Homo sapiens* in Central Europe, the bearers of the archaeologically valid IUP artefact-making tradition, the Bohunician. Indeed, Szeletian "*is now recognized as chronologically overlapping with the early appearance of the Bohunician*" in South Moravia where "*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*" (Škrdla, 2017, pp. 34–35). Thus, if *Homo sapiens* newcomers had "archaeologically progressive influence" on local late Neanderthals of the Szeletian in Central Europe, that happened through the Bohunician, not the Proto-Aurignacian.

The mentioned tripartite archaeological scheme of the IUP period with a duration of ca. 6–8,000 years in East-Central Europe seemed "crowded" enough to prevent the addition of more possible industries. However, a new research topic of one author concerning Moravian UP studies is the recognition of so-called Lincombian-Ranisian-Jerzmanowician (LRJ) industry sites and the inclusion of this industry in the East-Central European IUP record. This paper aims to review our LRJ data from Moravia and their significance in the reconsideration of this industry's status.

2. The LRJ industry: an overview

The LRJ is a European UP industry with the longest research history accounting for almost 200 years since it was first discovered in England, with the help of the most characteristic lithic artefact type recognized then, the distinct leaf points on blades or blade points bearing partial dorsal and ventral retouch. "*The first blade point to be preserved from a British find-spot comes from Kent's Cavern (S. Devon). It was found by Mac Enery in 1825 or 1826*" (Jacobi, 1990, p. 272). However, the LRJ was finally acknowledged to be an Early UP (EUP) industry only after ca. 150 years of sporadic research in the 1960s–1970s, after the consideration of the

stratigraphy and absolute dates from Ilsenhöhle (Germany) and Nietoperzowa (Poland) cave sites (Hülle, 1977; Chmielewski, 1961), and the re-evaluation of the relevant find material from Great Britain and Belgium (Campbell, 1977, 1980; Otte, 1979, 1981). Also, only after the publication of Chmielewski's book in 1961, many colleagues started naming the industry's distinct points "Jerzmanowice-type point" or "J-type point" using the Nietoperzowa Cave as a reference site. Here it is worth citing R.M. Jacobi on the J-type points from the Beedings site in England, and the different names that were proposed for this tool.

"*All of the leaf-points from Beedings take the form of what I have elsewhere (1990) termed simply 'blade points' (cf,* pointes lamellaires*: Chmielewski 1961). These are what other workers have called partially bifacial leaf-points (*pointes foliacées partiellement bifaciales*: Bordes 1961, pl. 49),* 'Jerzmanowice points*' (Bordes 1968, 183), unifacial leaf-points (Campbell 1971; 1977), points with partial inverse flat retouch (*pointes à retouches plates inverses partielles*) or points with flat retouch, group B (*pointes à retouches plates, groupe B*: Otte 1974),* 'pointes de Spy*'(Otte 1979, 275),* 'Lincombe points*' (Campbell 1986, 13), unifacial leafpoints (Allsworth-Jones 1986), unifacial blade points (*pointes laminaires à face plane*: Desbrosse and Kozlowski 1988, 35), incompletely retouched leaf points (Debénath & Dibble 1994, 120) or blade leaf-points with partial flat bifacial retouch (*pointes foliacées laminaires à retouches plates bifaciales partielles*: Flas 2000-2001, 167)*" (Jacobi, 2007, p. 245).

Regional studies led to the recognition of three similar local EUP industries or "cultures" in England ("Lincombian", the name proposed by J. B. Campbell after Lincombe Hill, Torquay in southwestern England, where Kent's Cavern is located), Germany ("Ranis-Mauern" and then "Ranisian", the name originated after Ilsenhöhle in Ranis town in eastern Germany, according to Kozlowski & Kozłowski, 1979; Kozłowski, 1983; Desbrosse & Kozłowski, 1988) and Poland ("Jerzmanowician", the name was introduced by W. Chmielewski referring to Jerzmanowice village where the Nietoperzowa Cave is located in southeastern Poland). At the same time, related finds from Spy Cave in Belgium did not get a special industry name being simply called a "*blade leaf-points industry*" comparable to Lincombian and Jerzmanowician (Otte, 1979, 1981). On the whole, adding also some more work done on the three industries' sites and finds (e.g., Jacobi 1999, 2007; Otte, 1990, 2000), all the related sites and their assemblages from the northern belt of Europe (North European Plain) stretching from Great Britain in the west to Poland in the east were understood as having the same cultural unit, the best known today as "Lincombian-Ranisian-Jerzmanowician" (after Kozłowski, 1983; Desbrosse & Kozłowski, 1988). The LRJ site distribution in northwestern Europe led to hypotheses about LRJ adaptation to cold environments with resource exploitation of '*steppe-tundra or tundra of the Lowlands*' in Europe and the respective production of '*improved kinds of hunter's weapons*' (Kozłowski & Kozłowski, 1979, p. 23). This site distribution also resulted in ideas on the origin of the LRJ artefact-making tradition in this part of Europe and neighbouring Germany. Even today, opinions vary about its origins between the various Late Middle Palaeolithic (LMP) industries with bifacial leaf points, such as the Evolved Mousterian in Belgium, and the Altmuehlian in Germany (e.g., Chmielewski, 1961; Allsworth-Jones, 1986; Flas, 2000–2001; Kozłowski, 1990; Otte, 1990, 2000; Ulrix-Closset, 1995), although a recent re-evaluation of the "Altmuehlian" makes it a part of the southern German Late Micoquian (Richter, 2008–2009).

Recently, D. Flas has reviewed the discussion of the EUP "Lincombian-Ranisian-Jerzmanowician" industry in a series of detailed studies (Flas, 2006, 2008, 2011, 2012, 2014, 2015), in which he usually

uses the shortened "LRJ" name for the industry, that we also adopted. Today, almost all colleagues, including ourselves, use the Flas publications as one of the basic reference datasets for the understanding of the LRJ.

However, despite its long research history and a great amount of published hard data from several sites and their find assemblages in Europe, the LRJ remain to be rather poorly and uncertainly understood. The three main issues with the LRJ industry are the following. First, most LRJ sites were excavated before modern field research standards, often in the 19th century. Second, many old excavated sites are multi-layered with the presence of different Palaeolithic techno-complexes and/or industries within their artefact-bearing sediments. These sites often contain archaeologically mixed LRJ assemblages, as one would expect. Third, the techno-typological characteristics of the probably homogeneous LRJ assemblages are based upon a limited set of artefact classes and types. It is frequently represented by leaf-shaped blade points, such as, for example, the recently published material from Kirchberghöhle in Bavaria, Germany (Uthmeier *et al.,* 2018). The latter "artefact type lacuna" problem is strongly connected to the type of habitation of all (*sic!*) LRJ sites. They are usually ephemeral hunting camps, mostly caves, grottos or rock-shelters, including the Glaston open-air site in England, a horse hunt's killing and butchering station, which was also a hyena's den (Cooper *et al.,* 2011). The only "regular" LRJ living site known for a long time was the Beedings open-air site in England. However, after we analysed all its published data (Jacobi, 2007; Pope *et al.,* 2013) we propose that it was again a short-term hunting station. Its strategic topographical location enabled periodic visits by LRJ hunters, who tracked and hunted ungulate herds at nearby streams and consumed the killed animal (ungulate?) bodies (Demidenko & Škrdla, 2023).

All in all, LRJ sites are characterized by limited on-site lithic production, mostly rejuvenation or re-shaping, and production of J-type points on blades brought to the site. Besides, some blades bear irregular retouches and probably served for dismembering carcasses after a successful ungulate hunt near the site. Rarely, on-site primary flaking is attested by the presence of a few cores, which were usually probed and prepared before they were brought to the site; except for this, both core and debitage data are scarce. As a result, the LRJ industry's main flaking processes are still rather poorly understood. Thus, the EUP LRJ industry appears to be the only known UP industry in Europe and probably in the entire Old World (*sic!*), which was defined based on ephemeral or short-term hunting camps, without workshops, site workshops, and "regular" living stations. Without exaggeration, this makes the LRJ a unique industry in the European EUP. On the other hand, the series of morphologically and typologically distinct points on usually large and elongated blades still allow us to propose a discrete taxonomic status for the LRJ within the European EUP.

Recognizing the issues concerning the LRJ industry, we have thoroughly and critically analysed all the available published data. In our study, the above-mentioned lithics from the Beedings site served as a reference assemblage for the entire LRJ industry. In conclusion, we propose the LRJ to be viewed in the following way.

Geochronologically, the LRJ covers a period before (from ca. 44–43 ka cal BP) and after (maximum up to ca. 36 ka cal BP) the HE-4 and the CI event, from the GS-12/GI-11 to the GI-8/GS-8 (see data in Jacobi *et al.,* 2006; Jacobi, 2007, pp. 278–307; Flas, 2011, pp. 608–609; Cooper *et al.,* 2011, pp. 83–85, 88–90; Krajcarz *et al.,* 2018, pp. 396–398; Kot *et al.,* 2021). Thus the LRJ was partly coeval with the Proto-Aurignacian, the only Aurignacian which began in the IUP. As such, the LRJ is also considered an IUP industry.

Technologically (see data in Jacobi, 2007; Flas, 2011), the LRJ demonstrates several primary reduction methods. The main one is aimed at the serial production of long and wide blades, that were generally used for the distinct J-type points. The blade technology is based upon the central *lame à crête* technique and permanent faceting of the striking platforms. The platforms were often abraded due to opposed-platform bidirectional flaking, as the core tablet technique was unknown yet. Two supplementary *ad hoc* bladelet reduction methods are evidenced by cores on flakes or truncated-faceted pieces, and burin-cores (but no true bladelet cores on nodules or chunks). The resulting bladelets have been used probably for cutting, not for hunting as projectiles. Thus, LRJ primary reduction methods correspond to some Eurasian industries archaeologically bracketing the time range from the Early MP / Middle Stone Age (MSA) to a time no later than the IUP.

Typologically (see data in Chmielewski, 1961; Hülle, 1977; Richter, 2008–2009; Jacobi, 2007; Flas, 2011, 2012), the LRJ is poorly "equipped by tools" due to the short-term and ephemeral character of the industry sites as hunting stations. That's why most of the tools are J-type points with partial retouch both on the dorsal (flat or semi-steep retouch) and ventral (flat retouch) surfaces of blade supports (mostly 9–10 cm long, 3 cm wide, 1 cm thick blanks, see Flas, 2011, p. 610). These were most likely projectile points, probably a blade variant of the Levallois-type Emireh point. Instead of purposefully made bifaces, most of the few bifacial points could be significantly reworked or repeatedly rejuvenated blade points. At the same time, "domestic tools" are represented by a few simple endscrapers and burins, as well as slightly more frequent retouched blades and flakes including notches and denticulates. Accordingly, the LRJ tool-kits are rather neutral in typological terms if the J-type blade points and bifacial points are not considered, the latter of which attest to certainly not MP but UP technological characteristics. This typology again places the industry to the IUP archaeologically.

The absence of bone tools and personal ornaments in LRJ assemblages (Flas, 2011, p. 613) should be probably explained by the hunting station site function and not by the "primitive" nature of the industry.

Concerning the human species creating the LRJ industry, Neanderthals at Spy Cave in Belgium (e.g., Otte, 1990, pp. 248–249; Jacobi, 1999, p. 37; Flas, 2011, pp. 616–618; Hublin, 2015, pp. 198–200) or *Homo sapiens* at Kent's Cavern in England (e.g., Swainston, 1999, pp. 41–42; Higham *et al.,* 2011) are both discussed. This discussion once again underlines the early IUP attribution for the LRJ, with statistically identical AMS dates as the GS-12–GI-10 period, clearly preceding HE-4 and the CI event. We believe that the LRJ "anthropological puzzle" can be resolved only through more archaeological data.

Based on the data we are aware of, the LRJ industry can belong to the late IUP in archaeological and chronological terms, thus its origins should lie in earlier IUP industries, not LMP industries as was proposed earlier.

The LRJ certainly needs more research. Besides several complex and multi-disciplinary studies of the already known LRJ sites and their results, two more topics give us perspective on the LRJ. First, the re-evaluation of possible LRJ sites that were later removed from the site list (e.g., Flas, 2011, p. 608). Second, a search for LRJ sites that indicate more than just hunting, namely, sites with actual traces of occupation and on-site activities, including domestic artefact types, can bring us about a full-range of data for the LRJ. These two study directions became the key approaches in our UP studies in South Moravia, Czech Republic. Besides, we made additional observations about some assemblages in other Central European regions.

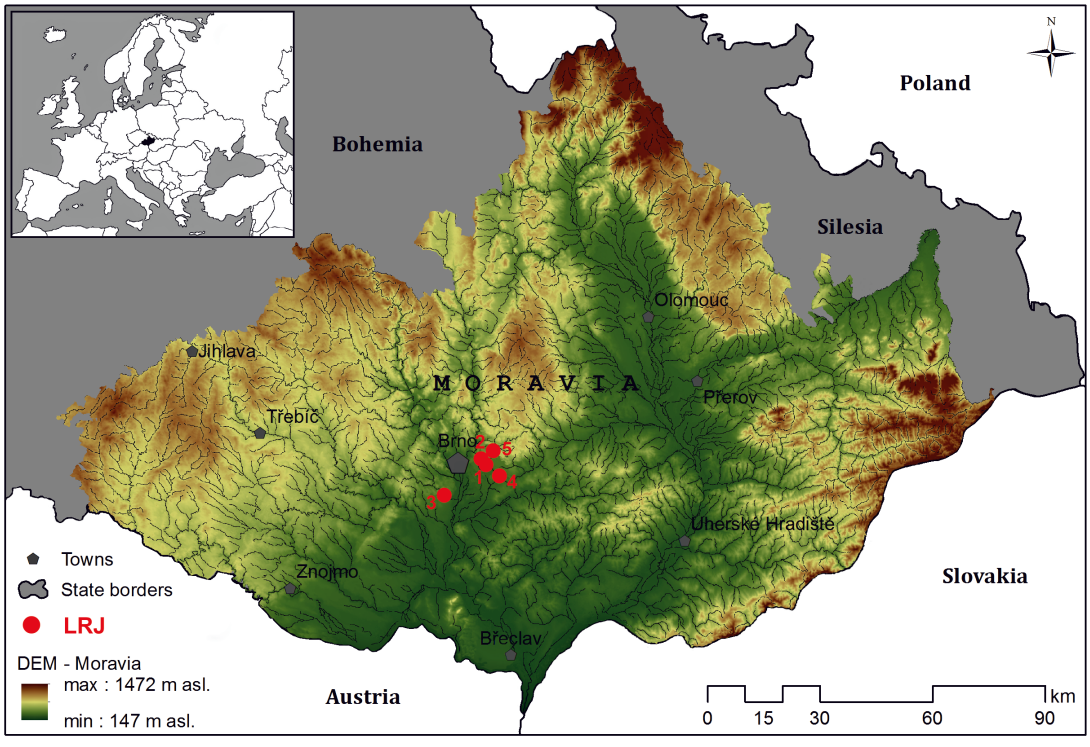

Figure 1. Map of Moravia with the location of LRJ sites in South Moravia mentioned in the article: 1 – Líšeň / Podolí I, 2 – Líšeň I / Líšeň–Čtvrtě, 3 – Želešice III / Želešice-Hoynerhügel, 4 – Tvarožná X, "Za školou", 5 – Pekárna Cave. Prepared by the authors.

3. New IUP and EUP studies in South Moravia in the 21st century

Since 2005, one of us (P. Š.) conducts new research on the IUP and EUP in South Moravia, the southeastern part of the Czech Republic, which continues today. The region is well-known for ca. 100 Szeletian (Oliva, 1991), ca. 100 Aurignacian (Oliva, 1993) and ca. 10 Bohunician (Svoboda *et al.,* 2002) loci with, however, not stratified but almost exclusively only surface lithic artefacts. This wealth of surface sites together with less than 10 (!) *in situ* sites for the three techno-complexes indicated a good perspective for more research on the IUP and EUP in South Moravia, with a focus to find stratified sites near the surface find spots. Accordingly, a respective project started together with G. Tostevin in 2005. After 10 years of field surveys "*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*" (Škrdla, 2017, p. 15). Thus, less than ten survey seasons in Moravia resulted in more than the double of *in situ* IUP and EUP sites that were known before. Our success in the field was mainly due to a new method for finding new stratified sites in South Moravia (e.g., Škrdla *et al.,* 2011a, 2011b, 2016a). The project was further continued after Tostevin left and started Palaeolithic research in Montenegro in 2016, with new excavations at the Líšeň/Podolí I and Ořechov IV sites in 2015–2018 (e.g., Škrdla *et al.,* 2017).

The other author of the present article (Yu. D.) joined P. Škrdla's Moravian UP research in 2015,

aiming at the study of the LGM "Epi-Aurignacian" (e.g., Demidenko *et al.,* 2016, 2018a, 2019), the Aurignacian (e.g. Demidenko *et al.,* 2017), and also a specific late EUP industry with both Aurignacian-like and Szeletian-like techno-typological features (Demidenko *et al.,* 2018b). At this stage of research, a book was published summarizing the current developments with the Moravian IUP and EUP, with an emphasis on the results of new investigations in the past 12 years (Škrdla, 2017).

Of course, the IUP and EUP research continued since then. Besides the topic called Aurignacian *sensu lato*, we compared South Moravian IUP, Szeletian, and Bohunician materials, together with a strange-looking assemblage from the newly excavated Líšeň/Podolí I site (e.g., Demidenko *et al.,* 2021). Furthermore, during the lithic analysis of the Líšeň I/Líšeň-Čtvrtě site, interpreted as Aurignacian (Demidenko *et al.,* 2017, pp. 10–14), we noticed technological features not fitting into the known characteristics of the Aurignacian (Fig. 1). Thus, an idea of Moravian LRJ has arisen using both recently found and excavated sites, together with some previously received lithic materials.

4. Some LRJ-like finds discovered in the 20th century in the Czech Republic

Flas already mentioned isolated J-type points in two caves, "*pointes de Jerzmanowice isolées en grotte*" (Flas, 2008, p. 184) in the Czech Republic, "*for which chronocultural attributions are debated (Nad Kačákem and Pekárna Caves)*"; also, in connection with the "*surface collections from Dubicko, Ondratice and the Brno region*", he was equally doubtful (Flas, 2011, pp. 607–608).

Two caves, Nad Kačákem, in the Bohemian Karst, western Czech Republic (Prošek, 1947; Ernestová, 2006), and Pekárna Cave, in the southern part of Moravian Karst, South Moravia (Valoch, 1960, 1999), are known for their Magdalenian finds, the latter of which is a key Magdalenian site in Moravia (Svoboda, 2000, p. 182). At the same time, some typical J-type blade points were also found in these two caves. The now lost but published and illustrated flint J-type point from Nad Kačákem Cave (Fig. 2: 1) was extracted together with a yellow limnoquartzite blade from loess sediment in the late 1940s by F. Prošek (1947, pp. 9–11; Obr. 13). Besides, Valoch (1999, Obr. 4, 8–10, 14) illustrated which we recognize as four J-type points (Fig. 2: 2–5) among Magdalenian lithics, excavated by K. Absolon in the Pekárna Cave in the 1920s. Unfortunately, the typologically distinct J-type points cannot be associated with other possible LRJ lithics in the two cave assemblages. However, these points are no less LRJ types than several similar blade points in northwestern Europe, accepted by many of our colleagues as such. Therefore, the two Czech caves should be included in the list of LRJ sites in Europe.

Surface find spots in Moravia were always a problem due to their often multi-component UP artefact composition. Regarding the LRJ, pieces looking like J-type blade points are the only typological indicators of the industry's presence at such sites. These points were indeed noticed in Moravian UP surface sites, such as the loci situated in Bobrava River Valley in South Moravia – Ořechov (Valoch, 1956, Tab. III, p. 25), and Želešice I (Valoch, 1956, Tab. VI, pp. 78–79), Želešice (Hahn, 1977, Tafel 133, p. 12); the Ondratice I–X sites in the Olomous region of Moravia – Ondratice IV-Syrovátky (Valoch, 1967, Tab. V, 2, 4); Ondratice (Svoboda, 1980, Obr. 39, 9; Allsworth-Jones, 1986, Fig. 39, 2); the Neslovice sites in South Moravia, ca. 15 km to west-southwest of Brno (Valoch, 1958, Tab. VIII, 1, 3). The most noteworthy are two sites, Podolí I and Líšeň in the vicinity of Brno, attributed previously to the Bohunician industry (Valoch, 1962, Tab. VII, 4; Oliva, 1981, Abb. 5, 2–3, 7; 9, 2–4, 8; Svoboda, 1987, Obr. 32, 1–12; 33, 1, 4; 34, 14). These are of particular interest, as they have a series of proper J-type-looking points, account-

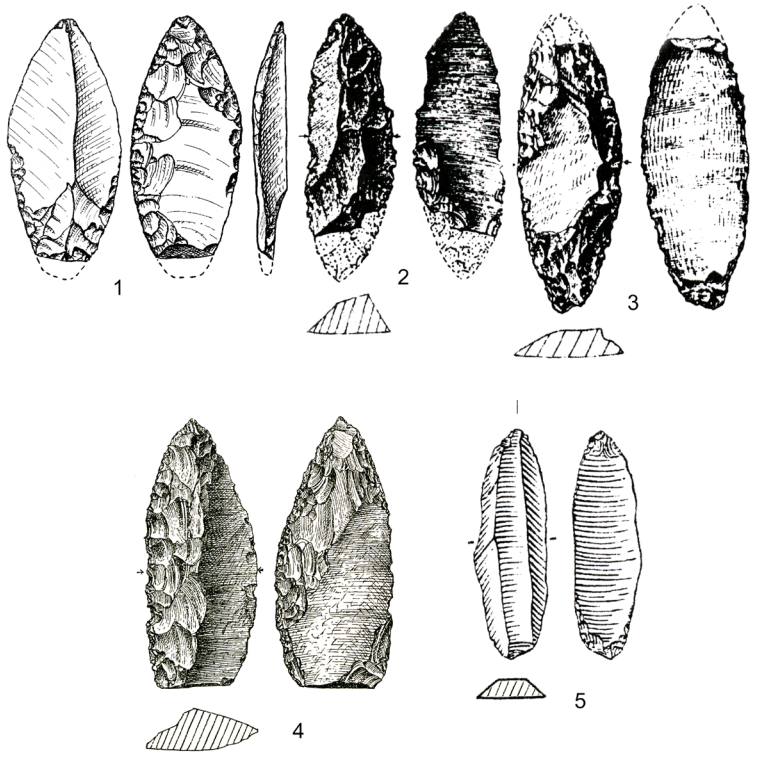

Figure 2. Nad Kačákem Cave, Bohemian Karst, Bohemia, Czech Republic: 1 – J-type blade point (modified after Prošek, 1947); Pekárna Cave, southern part of the Moravian Karst, South Moravia, Czech Republic: 2–5 – J-type blade points (modified after Valoch, 1999).

ing for no less than 4 pieces in Podolí I and at least 20 pieces in Líšeň – Figs. 3 and 4. J. Svoboda called them more than 30 years ago as proper J-type points, "čepelové hroty s ventrální retuší omezenou na bazální a terminální část. Tyto artefakty označuje W. Chmielewski (1961) jako hroty typu Jerzmanowice" (Translation: "*blade points with ventral retouch restricted to their proximal and distal ends. W. Chmielewski (1961) determined those artifacts as Jerzmanowice-type points*") (Svoboda, 1987, p. 86).

The Podolí I and Líšeň J-type points were, however, considered by Moravian archaeologists as integral to the Bohunician and Szeletian techno-complexes, and not to a proper LRJ industry in the region. M. Oliva (1981) used the Podolí I finds as the key assemblage for the identification of the Bohunician in South Moravia. Comparing the Líšeň surface lithics, which we consider a mixture of Bohunician and Evolved Aurignacian artefacts, to the *in situ* and industrially homogeneous Bohunician lithic assemblages from the nearby Stránská skála III and IIIa, excavated by Svoboda in the 1980s, Svoboda (1987, p. 86) also noted that the *in situ* assemblages only contained a single atypical J-type point at Stránská skála IIIa (Svoboda, 1987, Obr. 26, 12). However, that particular piece is not a J-type point in our view, but

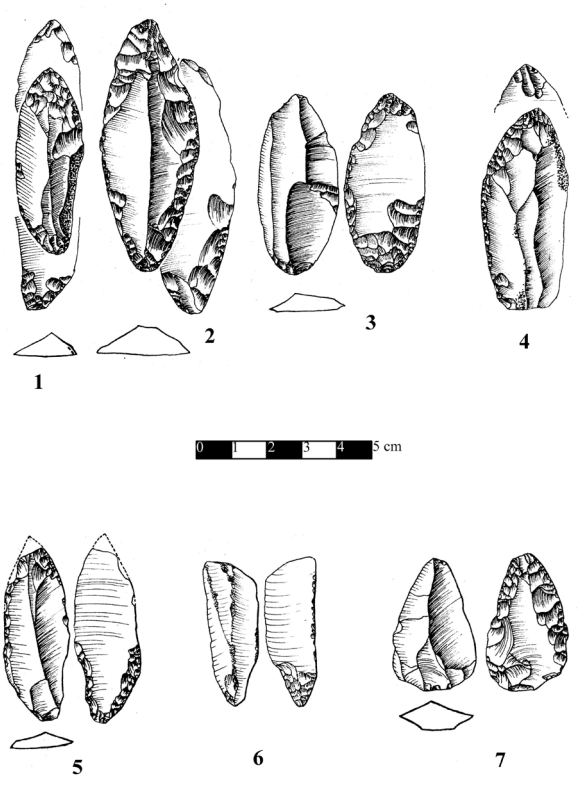

Figure 3. Líšeň surface loci, South Moravia, Czech Republic: 1–4– J-type blade points (modified after Oliva, 1981); Podolí surface loci, South Moravia, Czech Republic: 5–7 – J-type blade points (modified after Oliva, 1981).

a Levallois point with ventral-terminal retouch (Svoboda, 1987, Obr. 24, 4). Furthermore, no Stránská skála III Bohunician site contained any more pieces similar to J-type points either (Valoch *et al.,* 2000). Thus, the homogeneous Bohunician find material does not contain any proper J-type points in the Stránská skála – Podolí/Líšeň site cluster. The same inconsistency in the presence or absence of J-type points in Bohunician surface find spots and *in situ* lithics have been noticed long ago (Kozłowski, 1990, p. 132).

Thus, the role of J-type points in the Moravian IUP or EUP techno-complexes and industries is not clear and Flas was correct more than 10 years ago, to be careful with J-type points in Czech sites and surface loci.

5. LRJ sites and assemblages found and excavated in the 21st century in South Moravia

After an intensive 4-weeks artefact study of some recently discovered and excavated South Moravian IUP and EUP *in situ* sites in 2019 in Brno, we propose that four sites and their finds represent LRJ "living" sites, in addition to the Pekárna Cave and Nad Kačákem Cave (Fig. 1). Two sites are already informative enough to us (Želešice III / Želešice-Hoynerhügel and Líšeň / Podolí I), while the two other sites (Líšeň I / Líšeň-Čtvrtě and

Tvarožná X / Tvarožná -'Za školou') are less informative yet, due to different reasons. All the available artefact data for these four South Moravian LRJ sites are published in another article (Demidenko & Škrdla, 2023) and here we present a summary.

Previously, two sites (Líšeň / Podolí I and Tvarožná X / Tvarožná, 'Za školou') were attributed to the Bohunician, Želešice III / Želešice-Hoynerhügel to the Szeletian, and Líšeň I / Líšeň-Čtvrtě to the Evolved Aurignacian. Except for Líšeň I, each of the other three sites had several J-type points. Based on some similarities, surface lithic sites with heterogeneous composition and secondary position were often attributed to the Bohunician and Szeletian. In these assemblages, J-type points often escaped attention and were considered part of the Bohunician or the Szeletian.

The Líšeň / Podolí I site example represents a trick with Bohunician techno-complex recognition. The techno-complex was defined following the excavations of the Brno-Bohunice site in the 1970s. Previously, this techno-complex was named "*Szeletian of Levallois facies*" (Valoch, 1976a), after several surface sites with Levallois cores and points, together with bifacial leaf points (e.g., Valoch, 1962). However, the Brno-Bohunice *in situ* site itself was a palimpsest of both Bohunician and Szeletian artefacts in the same archaeological layer (Tostevin & Škrdla, 2006; Škrdla, 2017, pp. 91–92; Demidenko & Škrdla, in preparation). Then, the Podolí I surface spot was said to be the Bohunician type-site (Oliva, 1981). In this latter assemblage, we recognize Bohunician Levallois bidirectional cores and points, bifacial tools and LRJ J-type points. Thus identifying a type-site for the Bohunician is not straightforward today. From our point of view, the recently investigated Ořechov IV site with "living occupation characteristics" would be the best representative for Bohunician, considering the workshop character of the famous Stránská skála Bohunician sites. At the same time, our 2019 re-evaluation of the Líšeň / Podolí I assemblage from the *in situ* site allowed us to consider it to belong to the LRJ.

Our data show that the Tvarožná X site contains a few possible Bohunician Levallois cores and points, while all other artefact features, including several J-type points, render the assemblage into the LRJ.

The Želešice III *in situ* site was related to Szeletian due to the presence of some possible bifacial shaping/thinning flakes and chips indicating on-site bifacial tool production. The occurrence of several definite J-type points here was still considered to be a regular part of both Bohunician *in situ* (Stránská skála sites) and surface (Líšeň-Čtvrtě) sites, and the Szeletian *in situ* Vedrovice V site (Škrdla *et al.,* 2014, pp. 99–100). However, the unexpectedly high number of blades, some of them with faceted butts, and other characteristics of the assemblage set Želešice III apart from other *in situ* Moravian Szeletian sites. As was noted above, the Stránská skála *in situ* Bohunician sites do not contain proper J-type points. The Líšeň-Čtvrtě surface sites are characterized by both Bohunician Levallois elements and LRJ J-type points in addition to some bifacial leaf points and Aurignacian carinated endscraper-cores and burin-cores. In the Vedrovice V *in situ* Szeletian material J-type points are missing but Szeletian partially bifacial leaf points are present (Valoch, 1993, Abb. 24, 1, 5–6; 25, 3). Thus, these data remove J-type points from Bohunician and Szeletian archaeological contexts, leaving no other option for us than to restrict their presence only to the LRJ in Moravia.

The Líšeň I / Líšeň-Čtvrtě site was first attributed to Evolved Aurignacian (Demidenko *et al.,* 2017), mainly due to the absence of J-type points in that *in situ* assemblage. The absence of typical Bohunician Levallois cores and points, as well as the presence of double-platform bidirectional cores and bidirectional debitage pieces in the col-

lection, propelled us then to recognize a technologically peculiar Aurignacian assemblage in the context of the Evolved Aurignacian Stránská skála and Líšeň-Čtvrtě site cluster. However, our 2019 re-evaluation testified to the similarity between this assemblage and the Líšeň / Podolí I site.

All four assemblages are technologically similar concerning cores and debitage pointing towards bidirectional core reduction. These artefacts confused us during the initial interpretation of the two Bohunician sites (Líšeň / Podolí I and Tvarožná X), and the one site with an Aurignacian affiliation and some possible Bohunician admixture (Líšeň I). This example should be taken seriously when thinking about the industrial attribution of IUP and EUP assemblages in Moravia, including the possible LRJ sites. To some extent, it is what was done in northwestern Europe, Belgium and Great Britain when the LRJ was carved out of the Aurignacian (Flas, 2009).

6. The LRJ in the Moravian IUP and EUP industrial-chronological context

Having the LRJ industry established in Moravia, now we need to place it in the regional IUP and EUP industrial and chronological context, to find room for it among the Bohunician, Szeletian and Aurignacian "crowd". Indeed, LRJ artefacts are often mixed with lithics of the other three techno-complexes in Moravian surface sites, which implies a tight position of the now four archaeological units in the region.

Geochronology. Radiocarbon dates for Líšeň / Podolí I and Želešice III sites put the Moravian LRJ in the period of ca. 42 ka cal BP, preceding the HE-4 or CI event at 40 ka cal BP (GI-11–GI-10). This means that the Moravian LRJ should be included in the regional IUP record and not the EUP. At the same time, a series of new absolute dates render the *in situ* Bohunician and Szeletian sites in South Moravia earlier than we thought before. Both of them start in the GI-13 and/or the GI-12, at ca. 48–46 ka cal BP, and last possibly until GI-10, at ca. 42–40 ka cal BP. However, at the Ořechov IV site, some late radiocarbon dates, if not contaminated, may indicate an Upper Bohunician during GI-9, at ca. 40 ka cal BP (Škrdla, 2017, pp. 129–130). If our proposed geochronology is right, then the LRJ should be considered a late IUP industry both in South Moravia and East-Central Europe.

Industrial features. On one hand, the LRJ is very different from the Szeletian both technologically and typologically (see Valoch, 1993; Neruda & Nerudová, 2009; Nerudová & Neruda, 2017). On the other hand, it shows clear techno-typological similarities to the Bohunician. Interstingly, bifacial leaf points are not documented in Moravian *in situ* LRJ sites yet, although some bifacial tools were collected at the Líšeň surface loci (Svoboda, 1987, Obr. 31, 1–4, 6–10; 33, 2–3, 6). These tools can be associated with the LRJ and not the Szeletian, however, more research on this topic are needed. The following comparison between the Moravian LRJ and Bohunician technological and typological data demonstrates some different and similar traits.

Technologically, the LRJ does not feature *sensu stricto* Levallois methods, instead, it is characterized by parallel unidirectional and bidirectional reduction, targeting rather large and elongated flakes or blades. However, many blades were technologically supplementary debitage items within the Bohunician Levallois bidirectional pointed blade technology. At the same time, the *lame à crête* technique was applied in both industries for core preparation and re-preparation. The absence of the core tablet technique both in the Bohunician and the LRJ suggests an IUP status for the latter as well. The presence of striking platform edge abrasion, bipolar-on-anvil core splitting method and bladelet core technology in the LRJ testifies to significant differences in the main

reduction methods between the Bohunician and the LRJ.

Typologically, besides the regular presence of true J-type points in the LRJ, and the occasional presence of retouched true Levallois points in the Bohunician, there are no significant differences between LRJ and Bohunician tool classes or types.

Thus, the main difference between the LRJ and the Bohunician is the LRJ point concept which presumes bidirectional blade reduction from opposed-platform cores, although the two additional core reduction methods (bipolar-on-anvil and bladelet cores), missing in the Bohunician, are also notable. However, some similarities remain between the two industries which hinder their differentiation. These are a shared toolkit, the occasional absence of J-type points in LRJ assemblages, and common bidirectional core reduction methods with striking platform preparation.

The Moravian LRJ is considered an IUP industry closer to ca. 42–40 ka cal BP which coincides well with the beginning of the European LRJ established before the HE-4 / CI event. At the same time, the Moravian LRJ is further characterized by numerous common features with the Bohunician.

7. The Moravian LRJ and its comparison with the European LRJ.

The Moravian LRJ settlement pattern. In addition to the previously known J-type points at Nad Kačákem and Pekárna caves in Bohemia and South Moravia, exemplifying the northern European LRJ, the four open-air sites in South Moravia represent long-awaited *in situ* "living sites". Data from these four sites also enable us to differentiate site functions and evaluate their variability in the South Moravian landscape.

Two of the sites are connected to Stránská skála-type chert outcrops. Líšeň / Podolí I was a residential base camp, and Líšeň I was mainly a workshop for blade production and their "export" to special task camps, e.g. hunting stations. Personal ornaments (pierced mollusc shells) were recovered in abundance in Líšeň / Podolí I, where probably their production also took place. The presence of one such item in Líšeň I may indicate that somebody lost it accidentally at the site. The third site, Želešice III, could be a hunting station near a Krumlovský les-type (KL) chert outcrop with a lot of lithics from primary and secondary flaking activity. The function of the fourth site, Tvarožná X, is not yet clear due to the preliminary character of its lithic collection analysis. However, the unique location of the site should be mentioned. It was some distance (ca. 7 km) from the lithic raw material outcrop they used most, Stránská skála, in a rather hidden topographic location near a stream, at a relatively high elevation than, near the entrance to the Vyškov Gate connecting the Brno Basin with the northern areas, such as the Moravian Gate. Therefore, Tvarožná X could be a task-specific site, which we can establish with more certainty after the lithic study. The location of the Pekárna Cave in the southern part of the Moravian Karst, ca. 7.7 km northeast of Stránská skála III, with its four J-type points made of an unrecognised raw material, indicates a hunting station, like many other LRJ sites in Europe. In sum, there is a sort of logistic / foraging / radiating mobility settlement pattern (e.g., Marks & Freidel, 1977; Binford, 1980), with functionally variable LRJ sites connected to the Svratka and Bobrava River valleys in South Moravia, ca. 25 km away from the Brno Basin and the southern part of Moravian Karst in the north, and the Bobrava Highland in the south, as the crow flies. Furthermore, a certain network of relations between the LRJ industry's different human groups had to exist in South Moravia.

Industrial similarities and differences between the European and Moravian LRJ assemblages. The Moravian LRJ sites and their artefact assemblages should certainly demonstrate differences from lithic artefacts of the European LRJ "hunting sta-

tions". Furthermore, the European LRJ toolkits almost exclusively consist of J-type points and some bifacial leaf points, whereas "domestic tools" are well represented in South Moravian LRJ open-air sites.

Technological similarities and differences. The primary blade reduction and all its technological supplementary features (a central *lame à crête* technique, permanent faceting of striking platforms and frequent edge abrasion, and the absence of the core tablet technique) make the two industry facies similar, although Beedings burin-cores are not recognized yet in Moravia, and Moravian proper bladelet cores are unknown in the European LRJ. However, there the two blade core reduction schemes differ in some aspects. While a few LRJ Beedings cores on nodules are opposed-platform bidirectional cores for blades, the Moravian LRJ cores on nodules are more frequently single-platform unidirectional, not opposed-platform bidirectional cores, the latter of which results in numerous flakes beside blades. So, in the Moravian LRJ, parallel flake cores for elongated flakes and unidirectional blade cores are quite common. The core characteristics correlate well with debitage data in South Moravia. Here, flakes outnumber blades and unidirectional scar pattern prevails over bidirectional both on flakes and blades, although exact data on this feature has not been calculated yet. This observation resonates with our 2016 opinion about double-platform cores from Líšeň I, namely, that "*all double-platform cores experienced a 'double single-platform reduction'*" (Demidenko *et al.,* 2017, p. 11). This means that proper bidirectional flaking, with alternating detachments from the opposed striking platforms, is not characteristic at the site. Thus, the Moravian core and debitage data seemingly differ from the European LRJ data (bidirectional blade supports for J-type points) but taking site data from Moravia into consideration, the differences become diminished between the two facies.

The Moravian open-air sites are characterized by easily available local cherts for core reduction, which prevented the South Moravian LRJ humans to execute long reduction sequences for each particular core. Instead, short reduction sequences were realized in many cases, which resulted in numerous single-platform unidirectional cores, often with flake detachment negatives. However, both facies show an intensive reduction of some secondary flaking artefacts, cores on flakes / truncated-faceted pieces, and splintered pieces / bipolar-on-anvil cores. Some bladelet cores on nodules in Moravia testify to the importance of proximity to raw material outcrops for the "Czech LRJ humans".

In sum, "subjective factors" may have had some influence on primary flaking processes both at Moravian and European LRJ sites, but their significant similarity is still evident.

Typological similarities and differences. A basic difficulty in typological comparison is the paucity of "domestic tools" in European LRJ toolkits. Nevertheless, the "absence criteria" is worth noting for some of such tool categories, classes and types. First, the almost total absence of MP tool classes, and the absence of both Aurignacian and Gravettian tool types can indeed serve as typological markers placing the LRJ after the MP and before the EUP period, that is, to the IUP period. The presence of a few simple endscrapers, non-multi-faceted burins and some general retouched blade and flake types correlates well with an IUP typological status for the European LRJ. Simple endscrapers, together with other UP types represented by only a few pieces in the Moravian toolkits correspond to the European LRJ "domestic tool" data. Bifacial leaf points, known from a few European LRJ sites are not useful for comparison with the Moravian LRJ sites. However, the above-mentioned bifacials from the Líšeň sur-

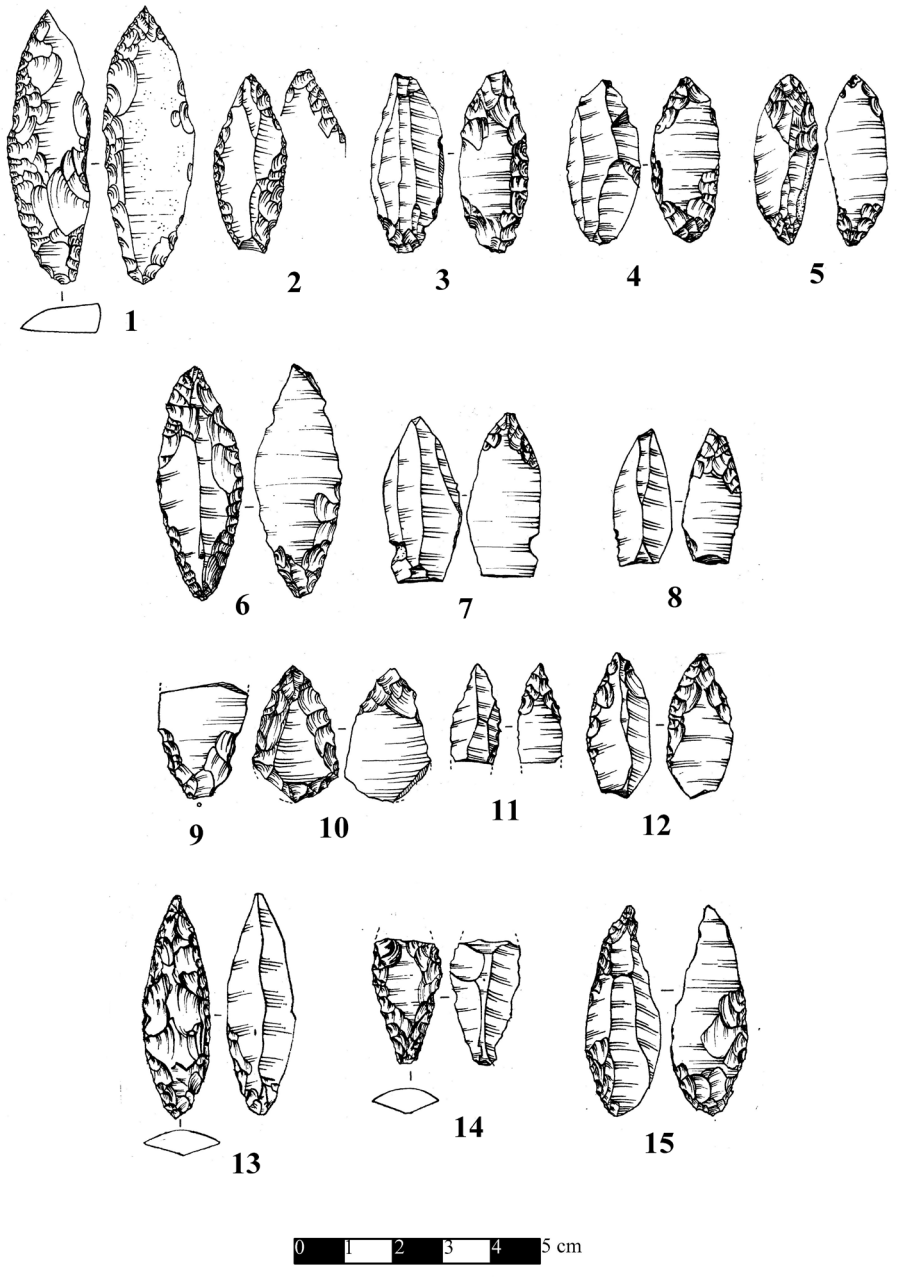

Figure 4. Líšeň surface sites, South Moravia, Czech Republic: 1–15 – J-type blade points (modified after Svoboda, 1987).

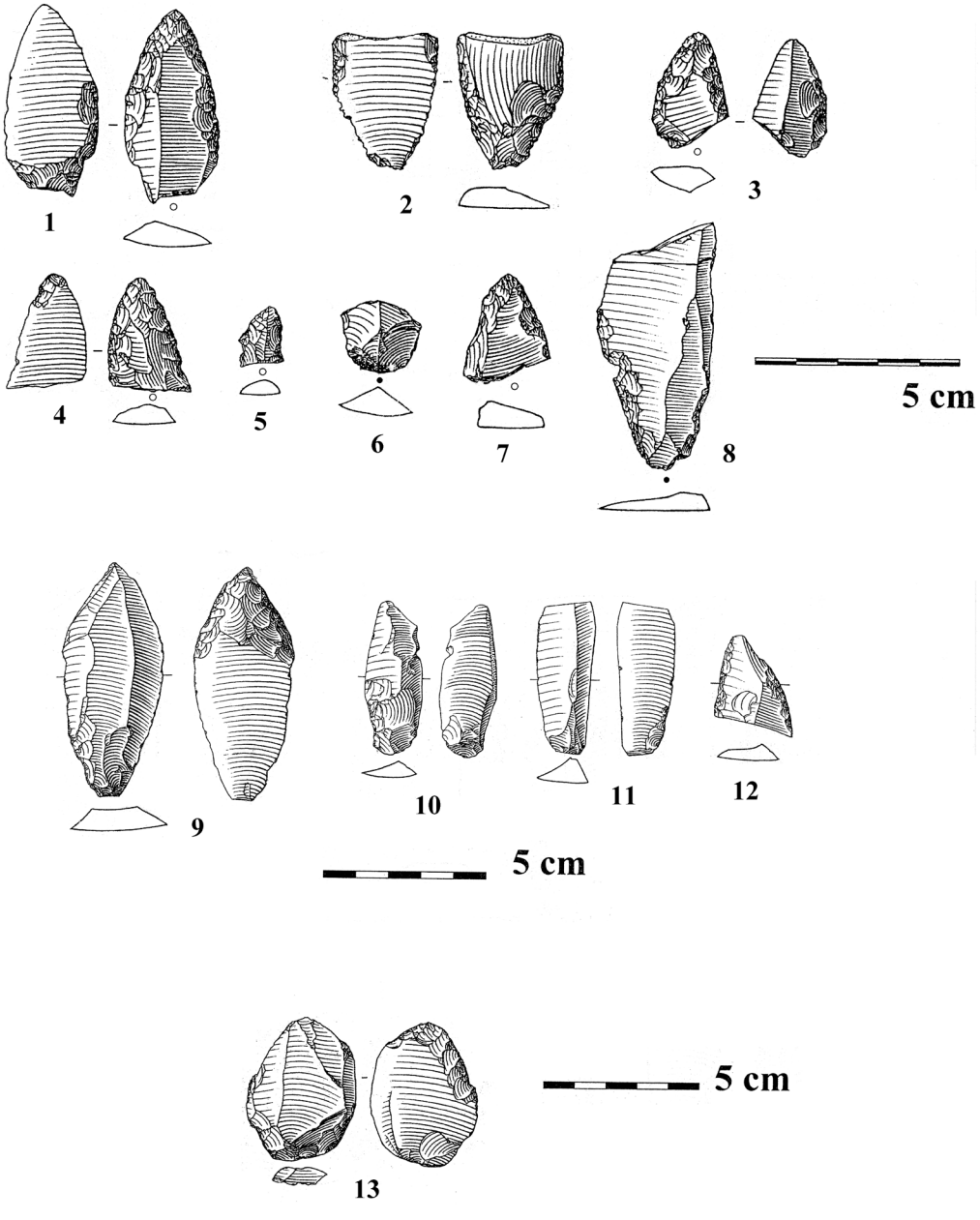

Figure 5. Želešice III / Želešice-Hoynerhügel site, South Moravia, Czech Republic: 1–8 – J-type blade points; Líšeň / Podolí I site, South Moravia, Czech Republic: 9–12 – J-type blade points; Tvarožná X, "Za školou", South Moravia, Czech Republic: 13 – J-type blade point (modified after Škrdla, 2017).

Figure 6. Líšeň / Podolí I site, South Moravia, Czech Republic: J-type blade point with two refitted chips (modified after Škrdla, 2017).

face sites keep a "door open" for such research in Moravia.

Overall, the only comparable tool type in the South Moravian open-air and European LRJ sites is the industry's "*fossile directeur*", the J-type point. Again, there are some problems with it. While most of the European J-type point fragments were very likely broken during use as hunting projectile weaponry, many of the Moravian J-type point fragments (Fig. 5: 2–7, 12) were broken during on-site point production (see the Líšeň/Podolí I site – Škrdla, 2017, Fig. 4.5, 24, 43–44; the Želešice III site – Škrdla *et al.,* 2014, 12, 1, 23, 29), although some J-type point fractures in Želešice III could also be "hunting damage" (Škrdla *et al.*, 2014, 12, 3–5) (Fig. 5: 1, 3–4). This is why the latter Moravian site is regarded as a hunting station at a Krumlovský Les chert outcrop. Of all 13 *in situ* J-type points and their semi-products from three Moravian open-air sites (Fig. 5: 1–13), their breakage prevents precise recognition of the used blanks' scar pattern. The scar patterns of the three complete J-type points (Fig. 5: 1, 9, 13) are bidirectional in two cases (Škrdla, 2017, 4.5, 42 – Líšeň/Podolí I site; 3.8, 40 – Tvarožná X site), and unidirectional in one case (Škrdla *et al.*, 2014, 12, 5). At the same time, two almost complete semi-finished J-type points from Líšeň/Podolí I have unidirectional scar patterns (Škrdla, 2017, 4.5, 43–44) (Fig. 5: 10–11). Two J-type points, which broke during their manufacture, have unidirectional-crossed (Škrdla *et al.,* 2014, 12, 7) (Fig. 5: 2) and unidirectional (Škrdla *et al.,* 2014, 12, 23) scar patterns (Fig. 5: 8). Thus, whereas the European J-type points almost always have bidirectional scar pattern, the Moravian J-type points possess a variety of scar pattern types. At the same time, the European J-type points were produced on blades at least in 99% of the cases, as the name variant "J-type blade points" describes. Also, all Moravian J-type points were made on blades in cases where the support can be recognized, except a point on a flake in Tvarožná X, which is bidirectional. Also, the blade blanks used for J-type point production at the Moravian sites are usually the largest blades in the debitage. Adding to the blanks' morphological and metrical data, the retouch characteristics of the European and Moravian J-type points are also similar. Most blade blanks were retouched dorsally and ventrally at the proximal and distal ends to achieve a general leaf shape of the points. Our refits of retouch chips onto J-type points from Želešice III and Líšeň/Podolí I (Fig. 6) confirm this characteristic retouch. The lateral edges of the blade blanks were barely or lightly retouched. Heavy scalar and/or even wide stepped retouch on the lateral edges which expands to the centre of the surface, are significant corrections of blank shape and irregular thickness. Furthermore, intensive retouch can be the result of re-shaping and rejuvenation. In this regard, it has to be underlined once again that J-type points from two Moravian sites were probably never used (Líšeň/Podolí I, Tvarožná X) and only a part (!) of the

J-type points from Želešice III were used for hunting. This explains the rather light retouch of the Moravian J-type points in comparison with J-type points from many European LRJ sites. So, considering again some J-type points' "subjective data" on their production and/or use, some differences in scar patterns, overall size, length, and retouch may be explained by site function in Moravia and other European sites. In Moravia, points were produced on-site, including the parallel detachment of blades and elongated flakes. In the European sites, only the best and largest finished points were brought to the camp, which were then used in short hunting events near the site. Thus, these are the same point types in both cases, with almost identical *chaînes opératoires* in their primary (debitage blank production) and secondary (retouch treatment peculiarities) stages of production.

Overall, the above-discussed typological data and interpretation allow us to include the presented toolkits from Moravian open-air sites in the European LRJ toolkits without hesitation.

8. The possible origin of the LRJ in Europe using the South Moravian IUP data: short preliminary suggestions and their implications

Regarding the LRJ origin hypotheses out of northwestern European late MP industries with bifacial leaf points, and the proposed makers of the LRJ, the Neanderthals, the new South Moravian LRJ material allow us to propose a "reverse geographical order" for the origin of LRJ in Europe.

A straightforward "birth" of the LRJ from the MP is doubtful since no MP techno-typological features are known on artefacts from the Moravian LRJ open-air sites and the European LRJ sites. Moreover, this scenario would have been possible only if *Homo sapiens* groups, bearing IUP / EUP artefact-making traditions, had some acculturation/trans-cultural diffusion/stimulus diffusion effect on the MP Neanderthals when they arrived in northwestern Europe. An IUP / EUP industry like that should have several MP artefact traits. Therefore, an MP "generic base" for the IUP LRJ in northwestern Europe does not seem convincing to us.

Instead, we propose another scenario for the origin of the LRJ and its status in Europe, using new LRJ data from Moravia.

1) As was already argued before (e.g., Flas, 2011, 2014), our Moravian data indicate that the beginning of the LRJ just precedes the HE-4 / CI event, ca. 42–40 ka cal BP, thus it falls in the IUP time range.

2) By all archaeological criteria, the LRJ is an IUP industry which correlates to its geochronological position.

3) Several technological and typological similarities are observed between the Moravian LRJ and the Bohunician. This suggests the development of the LRJ from the Bohunician, with the following single basic artefact change. The Bohunician Levallois point concept for the production of projectile hunting weaponry was replaced by the J-type point concept for the same hunting purpose in the LRJ. It was not a radical conceptual change. The bidirectional Levallois core reduction for the production of pointed blade elements in the Bohunician does not differ fundamentally from the non-Levallois *sensu stricto* unidirectional/bidirectional blade technology in the LRJ. The latter was based on several Bohunician-like techniques, together with an organic soft-hammer technique that often caused edge abrasion on the cores' striking platforms. Compared to the somewhat wasteful Levallois point production in the Bohunician, this technological shift resulted in more targeted products, namely, elongated flakes or blades, in the LRJ. So, it was a matter of improving core reduction efficiency for the new LRJ industry. Further technological developments in the

LRJ are seen with the appearance of bladelet core production and bipolar-on-anvil core technology. At the same time, almost the same tool classes and types are present in the two industries. So far, the only difference in this respect is the presence of thick non-carinated endscrapers in the LRJ. The fine Bohunician Levallois point method produced thin blanks which were used for tool making, whereas the non-Levallois LRJ elongated flake/blade method often produced more robust blanks. Some of them with thick terminations were also transformed into endscrapers. The supposed smooth Bohunician–LRJ technological transition would have been beneficial for people in the northern latitudes, where most of the European LRJ sites are known. Here, in the open steppe-tundra landscape, efficient lithic technology and projectile weaponry facilitated quick movement. Furthermore, the LRJ social network could be responsible for the appearance of personal ornaments (pierced mollusc shells), with which they could easily identify different human groups in this harsh environment. If so, then it is understandable why the "newborn" LRJ industry with its humans and sites is well represented in Northern Europe. That was the suitable natural environment for the survival of LRJ people, who probably pursued targeted hunting of large-sized ungulates. This distribution is especially valid if we take a look at more southern regions of Europe, where the Proto-Aurignacian, then, after the HE-4 / CI event, Early Aurignacian *Homo sapiens* groups became widespread. Considering this scenario, it appears that the "advanced Bohunicians", i.e., the LRJ groups, had no other choice than to move to more northern territories and master the circumstances there.

4) The suggested IUP Bohunician "industrial roots" for the LRJ and its late IUP status have significant implications in terms of their makers. Only *Homo sapiens* are assumed to represent IUP Emiran and Emiran-like industries in Eurasia, including, of course, the Bohunician (e.g., Škrdla, 2017, pp. 9–11, 133; Hublin *et al.,* 2020). This is why we propose *Homo sapiens* as the makers of the LRJ artefacts as well.

5) There is another consequence of the Bohunician–LRJ succession. After its appearance in Central and Eastern Europe (with the Kulychivka "Stránská skála twin site" in Western Ukraine, see Demidenko & Usik, 1993a; Demidenko, 2018, p. 271; Škrdla & Nikolajev, 2014; Škrdla *et al.,* 2016b; Škrdla, 2017, pp. 83–86), the Bohunician had transformed into the LRJ and distributed all over the northern territories of Central and Western Europe up to Great Britain, thanks to its newly developed adaptation to cold and open environments. As a result, the IUP Bohunician with its *Homo sapiens* did not disappear in Central Europe but left the LRJ after itself.

6) Of all known LRJ sites including the presented Czech ones, half of them are found in Great Britain. This distribution may represent the culmination of the LRJ, the end of the road of its northern expansion. To us, comparable cases are prevalent in Palaeolithic and Prehistoric archaeology. One is the Early Aurignacian/Aurignacian I, the sites of which are known best from the industry's westernmost distribution area, in the European "cul-de-sac", France. Another example is the Tripolye-Cucuteni Chalcolithic culture (e.g., Menotti & Korvin-Piotrovskiy, 2012), known for the vast territories of present-day Romania, Moldova and Ukraine. This culture reached the climax of its development and prosperity in its easternmost region, Ukraine, characterized by so-called giant settlements. LRJ site distribution may have the same character, i.e., the industry's place of origin is at the opposite end of its range from its best-represented area.

9. Some concluding considerations

The presented overview of the LRJ industry with its lithic artefact data, site characteristics, as

well as its distribution in Europe, geochronology and the issue of its makers, either Neanderthals or *Homo sapiens,* allow us to conclude the following. First of all, the limited data set of the industry comes almost exclusively from ephemeral/temporary hunting stations with really restricted artefact information. The LRJ is the only European UP industry identified and characterized with the help of these specific sites and the one-sided information they provide. At the same time, it is still clear that the LRJ represents an IUP industry following the late MP but preceding the EUP Early Aurignacian.

With this background, we conducted an intensive analysis of four open-air sites which were recently investigated in South Moravia. We presented their geochronology, lithic artefacts (in a preliminary fashion but with enough data for their technological and typological characterization), lithic raw material use, and settlement pattern. We propose the recognition of these as LRJ sites related to the IUP right before the HE-4 / CI event, ca. 42–40 ka cal BP. In addition, we attribute the previously known J-type points at Nad Kačákem Cave in the Bohemian Karst, and Pekárna Cave in the southern part of the Moravian Karst to the LRJ industry. Altogether we propose six sites with LRJ artefacts in the Czech Republic that would now compose ca. 13% of all the known 46 LRJ sites in Europe. The most important is that the newly recognized Moravian open-air sites are *in situ* stations with traces of habitation, not just hunting. These occupation characteristics are variable and allowed us to propose a logistic / foraging / radiating mobility settlement system with the following site types: a sort of residential base camp near a Stránská skála-type chert outcrop (Líšeň/Podolí I site); a workshop near a Stránská skála-type chert outcrop for blade production, aiming at blade "export" to some special task camps, e,g, hunting stations (Líšeň I / Líšeň-Čtvrtě site); a sort of hunting station by a Krumlovský Les chert outcrop (Želešice III / Želešice-Hoynerhügel site); a special task site near the entrance to the Vyškov Gate (Tvarožná X / Tvarožná -'Za školou' site), and finally, an ephemeral hunting station in the Moravian Karst area (Pekárna Cave). During our study, we noticed many technological and typological features in the Moravian LRJ assemblages that are similar to the Moravian IUP Bohunician assemblages. After a direct comparison of these two industries, we propose a smooth and mainly technological transition from the Bohunician to the LRJ, based on mostly a conceptual change in a single artefact type (from Levallois points to J-type blade points). As a result, a Central European, Moravian origin of the LRJ is also proposed, from where the bearers of this industry, the modern humans (*Homo sapiens*) dispersed all over the vast territories in the northern latitudes of Central and Western Europe.

Finally, the LRJ industry is added to the long-lasted tripartite archaeological composition (Bohunician, Szeletian, Proto-Aurignacian) of the IUP period with a ca. 6–8,000 years duration in East-Central Europe. The geochronological age of the LRJ industry is late IUP, thus it was coeval with the Proto-Aurignacian and post-dates both the Bohunician and the Szeletian.

Our Moravian studies are still in the preliminary stage. We plan to analyze and publish data site by site, with more emphasis and details on their artefact assemblages. Accordingly, we hope to gain new information about these first European LRJ assemblages and the adaptation of their *Homo sapiens* makers in the IUP environment. Lastly, more LMP and IUP materials in East-Central Europe deserve a re-evaluation in terms of their attribution and relation to the LRJ. These are Korolevo II, layer II in Ukrainian Transcarpathia (Gladilin & Demidenko, 1989) and the so-called Jankovichian assemblages (Gábori-Csánk, 1993; Markó, 2013, 2019), which seem promising candidates of LRJ representation in the

region. Eventually, more work connected to the LRJ in various regions of East-Central Europe is hoped to be realized soon.

Acknowledgements and statements

Data availability statement. The authors confirm that the data supporting the findings of this study are available within the article.

Disclosure statement. No potential conflict of interest was reported by the authors.

Funding statement. Preparation of the actual article was realized under institutional support RVO: 68081758 – Czech Academy of Sciences, Institute of Archaeology, Brno.

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