FOSSILE DIRECTEUR
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CAN WE IDENTIFY ANY *FOSSILE DIRECTEUR* IN THE EPIGRAVETTIAN?

Zdeňka Nerudová

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Abstract: In the last few years, there have been studies showing that the issue of Late Upper Palaeolithic (LUP) industries located in and around Moravia (Czech Republic) are much more complex than previously thought. Focusing on Epigravettian/Epiaurignacian and Magdalenian, one of the possible solutions is the detailed study of knapping technology. Initial studies indicated that Epigravettian units can be distinguished from the Magdalenian collections. By applying the study of knapping technology to unclear collections, their culture can be determined to some extent, if it is not demonstrated in another clearer way. Analogies indicate that the knapping technology defined for Moravian LUP units may have a wider regional validity.

INTRODUCTION

General overview shows, after Willendorf-Kostienki phase (23 ky uncal BP) and before arrival of Magdalenian peoples (18 kyr) Moravia (Czech Republic) was occupied by two groups of peoples: Epiaurignacians and Epigravettians (*Nerudová/Neruda 2015*; *Škrdla et al. 2015a*) with unclear their mutual relation. The visualisation of data showed settlement density of Moravia region during the Last Glacial Maximum (*Nerudová/Neruda 2015*; *Nerudová/Neruda/Hamrozi 2021*) and differentiation in settlement strategies between Epiaurignacian and Epigravettian. The general problem is existence of numerous sites, but only a few of them are well excavated. Both cultures (or techno-complexes) are represent by some similarities in theirs lithic staff, though are obvious also some differences.

According to actual state of our knowledge of Moravian collection(s), Epiaurignacian is generally characterised as a culture with:

- highly reduced cores which are typical;
- bipolar anvil core for Sagaidak-Muralov microliths;
- Aurignacian tool types (polyhedral and multiple burins prevail; endscrapers and carenoidal endscraper-like cores, Sagaidak-Muralovka microliths);
- by prevalence of erratic flint, occasionally is supplemented by local quartz and rock crystal;
- sites are concentrated on the eastern slopes of Drahany, longer to the water courses;
- fauna generally contain reindeers and horses;
- chronologically Epiaurignacian slightly precedes Epigravettian (22–18 ka uncal BP);
- the technology of knapping include bipolar anvil core applied for quartz and rock crystal and soft stone hammer applied for erratic flint;
- the character of butts is plain, punctiform, dihedral and linear (*Škrdla et al. 2015b*).

Epigravettian in Moravia is characterised by following details:

- typical are unipolar blade cores;
- the lithic staff have no Aurignacian-like tools and no microliths, frequent are different types of burins, the presence of backed tools is sparse;
- use different raw materials;

- settlement strategy is characterised by open-air sites, usually refugia near (small) water courses;
- in fauna mammoths significantly prevails, reindeers (mammoth-fauna species);
- ^{14}C data 18–15 ka uncal BP;
- technology of knapping use soft stone (mineral) hammer;
- typical is punctiform butt (*Nerudová/Moník 2019*).

Details mentioned above showed not only technological and typological differences between Epiaurignacian and Epigravettian. In the wider chronological context, concrete differences between the technology of the Magdalenian, Gravettian and Epigravettian were already mentioned by *J. Mozola* (*2013*). The differences lay in the exploitation of local cherts, absence of striking platform abrasion and the presence of punctiform and plain butts in the Epigravettian (*Mozola 2013*, 57), as opposed to Gravettian and Magdalenian ones. This trend has been evidenced in the broader geographical context of Late Upper Palaeolithic industries where soft hammers (wood, antler, bone, ivory…) were complemented with soft hammerstones, related to changes in knapping technique.

In the past, we successfully tried to re-analysed part of lithic collection from the Kůlna Cave, seemingly according to ^{14}C date associated with the Epigravettian (*Nerudová/Moník 2019*). Our analysis based on technology of knapping and presence of *en éperon* technology confirmed Magdalenian association entire collection from Layer 5 and 6 in the Kůlna Cave (*Nerudová/Moník 2019*).

In this study, we focus on a previously less presented aspect of butts on blanks (flakes and blades) from the site Brno-Štýřice IIIa and unanalysed butts from the Švédův stůl Cave (Magdalenian layer) to test our hypothesis. As additional sites for analyses, we selected Bratčice III open-air Epigravettian site and Rozdrojovice. Brno-Štýřice IIIa open-air site was generally omitted from the wider comparisons due to its unclear cultural classification. The neighbouring site Brno-Štýřice III is associated with the Epigravettian (*Nerudová 2016*), the detail cultural classification of Brno-Štýřice IIIa remains unclear, although there are evidence for Magdalenian rather than other LUP complex (*Nerudová et al. 2012*). Švédův stůl Cave represents multi-layer cave occupation, archaeologically excavated in the mid-20th century. The modern excavation was carried out in 2019 (*Nejman et al. 2020*). We analysed small collection of artefacts stored in Moravian Museum, excavated by archaeologist *B. Klíma* (*1962*).

MATERIALS

Bratčice III site is located in a small village situated less than 20 km south-south-west of Brno, in the proximity of the eastern slopes of the Krumlovský les (Krumlov Forest) Area. Numerous Palaeolithic sites are known from the cadastre of Bratčice, especially sites from the EUP period – the Szeletian culture (*Belcredi et al. 1989*). One of these – Bratčice III – is situated on the right bank of the small stream of Šatava, 1.5 km to the south-east of the village centre. The open-air site faced north-north-east at an elevation of 224 m above sea level, 18 m above the valley floor. The materials from the Bratčice III site contains 8 lithic artefacts, 14 bones and 23 fragments of mammoth molars. The detail publication and evaluation of finds from Bratčice III is in preparation.

Brno-Štýřice IIIa site is situated approx. 60 m toward west from the well-known site Brno-Štýřice III. The site was unearthed during the rescue archaeological excavation in 2009. The archaeological layer with lithic artefacts was preserved only in the area of 94–95/M-N m with maximal concentration of finds in squares 94/M and 94/N. Probably significant (northern) part of the site was disturbed in the past by the construction of house Kamenná 184/11. In the eastern direction was the site disturbed by solifluction and by sub-recent horticulture (?) activities. The lithic industry was situated in the same stratigraphic position as in site Brno-Štýřice III. Under the B-horizon, in the upper part of the orange loess-like sediment. The artefacts were *in situ* position, without significant re-orientation (*Nerudová et al. 2012*, fig. 5). Raw material is composed of erratic flint (97%), occasionally supplemented by cretaceous chert (spongolite; 1%), chert of type Olomučany (0.2%), Moravian jurassic chert (1%), burnt (0.3%) and undetermined material (0.5%).

Rozdrojovice I (Brno-venkov district) lies northwest of Brno, not far from the Brno Dam recreational area. K. Valoch carried out research here with R. Musil in 1953. Only a few retouched palaeolithic artefacts were found despite several probes. The artefacts were found at a depth of 50–60 cm below the

surface in the B-Horizon formed during the Holocene. Some of the findings can be reliably associated with Szeletian, the remaining part of the artefacts are associated with the Gravettian or Epigravettian (*Nerudová 2016*).

Švédův stůl Cave is situated in the southern part of the Moravian Karst, near the village of Ochoz u Brna (10 km north-east of the Brno). Cave is situated 11 m above the valley of Říčka Creek and 334 m a. s. l. Švédův stůl Cave has been excavated by many archaeologists and amateurs several times. The first excavation started here in 1886, later in 1905 a student found part of a human (Neanderthal) mandible in the rear part of the cave. B. Klíma classified lithic industry obtained during the excavations as Mousterian, Aurignacian and Magdalenian (*Klíma 1962*), together he excavated (in 1953–1955) a rests of *in situ* sediments inside the cave (for detail overview see *Nejman et al. 2020*).

METHODS

The technology of knapping and type of hammer used were determined on the basis of authors experience and with the help of known literature (*Pelegrin 2002*; *2012*; *Pelegrin/Texier 2004*). The type of hammer used in site Brno-Štýřice III was described by traceologist during the use-wear analyses (*Pyżewicz/Nerudová 2020*). The butts were observed by naked eye and by stereo microscope Nikon SMZ645 using 8x–50x magnification. The collections from Brno-Štýřice IIIa (Epigravettian?, Magdalenian?), Bratčice III (Epigravettian), Rozdrojovice (Epigravettian?) and Švédův stůl Cave (Magdalenian) were used for comparison. A number of criteria for distinguishing the technique and manner of knapping were used in the analysis. Knapping techniques include percussion and pressure (direct percussion using a stone hammer, direct percussion using an antler billet, indirect percussion by antler punch or wooden billet, indirect percussion by counterblow, pressure with a short pelvic crutch and pressure in hand). The strike should be realized with either a soft (mineral or organic) or hard (stone) hammer (*Andrefsky Jr. 1998*, 11; *Inizan et al. 1995*, 30; *1999*, 30). Characteristic traces on butts of blanks or even cores can distinguish between the various ways of striking the core and detachment of blanks (*Andrefsky Jr. 1998*, 137; *Inizan et al. 1995*, 74 ff.; *1999*, 73 ff.). For example, a soft stone hammer usually creates thin pointed butts, which are impossible to measure precisely (*Klaric 2003*). Contrary to soft stone hammer, an organic hammer (like wood – boxwood – or antler) penetrates the material and active point of contact between the hammer and the striking platform lies several millimetres behind the point of impact (*Pelegrin 2002*). The resulting butts have an elliptical shape and thickness of 2–3 mm. The use of soft hammers is generally expected for the Upper Palaeolithic in Europe (*Inizan et al. 1995*, 75; *Lengyel/Chu 2016*). For blanks removed by a soft hammer is characteristic morphological marker described as the lip (*Inizan et al. 1999*, 144). During the Late Upper Palaeolithic organic soft hammers and soft stone hammers were used for different types of blade products (*Pelegrin 2002*).

DEFINITION OF A BUTT AND DIFFERENT BUTT TYPES

The butt is a part of a core striking platform and is detached through a strike or pressure. Its morphology and dimensions depend upon the knapping technique used (direct, indirect), the type of hammer used and whether a striking platform was prepared. According to *M.-L. Inizan et al.* (*1995*, 163; *1999*, 136), ten basic butt types can be distinguished: 1. cortical, 2. plain (prepared with one strike), 3. dihedral, 4. facetted (with more detachments) 5. *chapeau de gendarme* type (characteristic for Levallois products), 6. winged, 7. pecked, 8. spur (*en éperon*), 9. linear and 10. punctiform.

Should the Magdalenian staff from Švédův stůl Cave, it should comprise of butts typical for this culture, i.e. *en éperon* type (*Barton 1990*; *Cheynier 1956*; *Karlin 1972*). These originate as follows: an isolated point is prepared with a series (2–3) of small elaborate strikes on the surface of – and stemming from – a core striking platform, aiming at more precise blade detachment (*Inizan et al. 1995*, 163; *Surmely/Alix 2005*). The resulting beak on the blade's butt appears as a peculiar curved shape resembling the keel of ancient ships (*en éperon*).

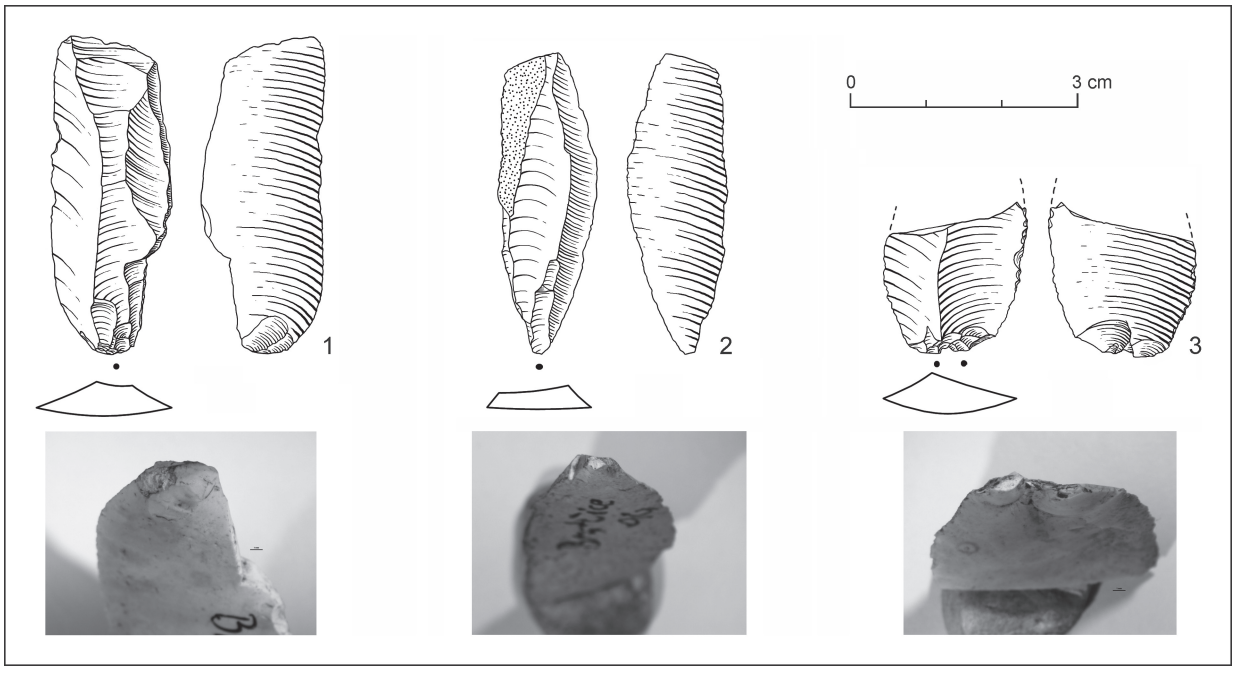

Fig. 1. Bratčice III. Characteristics punctiform butts (drawing by T. Janků, micro photo by M. Kmošek).

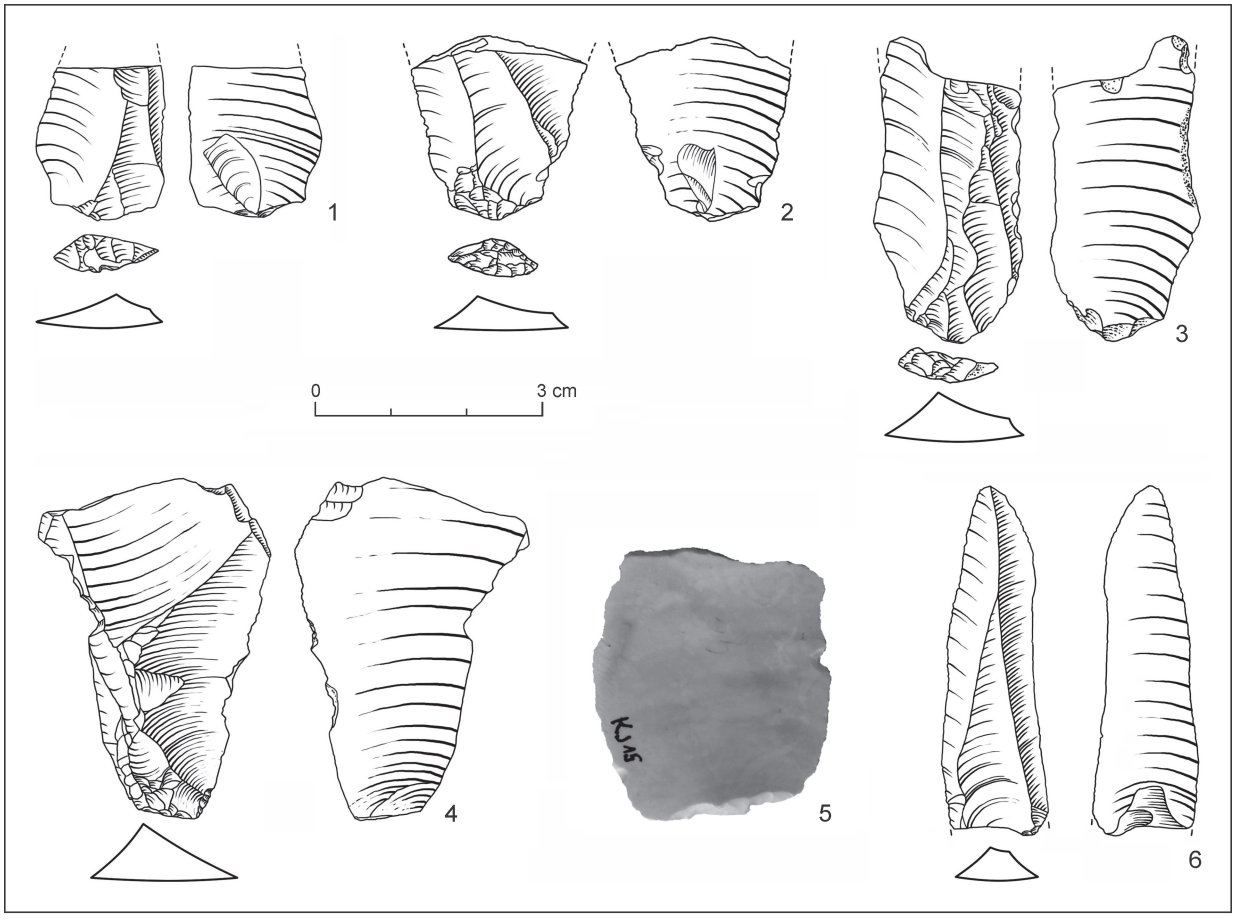

Fig. 2. 1, 2 – Brno-Štýřice IIIa; 3, 4, 6 – Rozdrojovice; 5 – Stadice (drawing by T. Janků, micro photo by M. Kmošek).

Table 1. Studied sites and types of butts (Σ in pcs). Legend: Nat. surf – with natural surface; Punc. – punctiform; Und. – undiagnostic/not preserved; * – not monitored.

Site	Datation	Cortical	Dihedral	Nat.surf.	Linear	Plain	Facetted	Punc.	Und.	*En éperon*	Σ	References
Bratčice III	EPIGR	1	0	0	0	1	0	3	3	0	8	this issue
Brno-Štýřice III	EPIGR	98	258	132	172	448	59	577	899	0	2643	*Nerudová 2016*
Brno-Štýřice IIIa	EPIGR	8	23	14	*	76	6	72	394	0	597	this issue
Rozdrojovice	EPIGR	3	5	3	0	10	2	10	11	0	44	this issue
Stadice	EPIGR	39	99	38	64	146	33	333	*	0*	752	*Nerudová/Moník 2019*
Kůlna Cave, Layer 5	MAGD	8	9	1	1	36	5	27	99	1	187	*Nerudová/Moník 2019*
Kůlna Cave, Layer 6	MAGD	5	14	3	1	25	3	56	146	3	256	*Nerudová/Moník 2019*
Loštice I	MAGD	9	42	10	21	43	2	139	1379	18	1663	*Neruda/Nerudová 2008*
Balcarka Cave	MAGD	3	26	6	3	38	5	81	8	6	176	*Nerudová/Neruda 2010*
Švédův stůl Cave	MAGD	1	2	0	5	8	0	21	22	3	62	this issue
Kůlna Cave, Layer 3	EPIMAG	14	4	0	*	72	3	80	180	*	353	*Moník 2004*
Kůlna Cave, Layer 4	EPIMAG	11	9	0	*	100	11	168	210	*	509	*Moník 2004*

RESULTS – REDUCTION STRATEGY AND TYPES OF BUTTS

Bratčice III is too small a collection for detailed technology studies. There are no retouched tools, knapping technology (punctiform butts) or soft mineral hammers usually connected with the Epigravettian industry (Fig. 1). The classification corresponds to the stratigraphic distribution of the artefacts and the radiocarbon date.

The method of knapping in Brno-Štýřice IIIa focused on obtaining long, regular blades, which are mostly not preserved on the site. The primary core preparation had to be carried out in other places, outside the actual locality, as indicated by the preserved types of butts among the blanks. The most common types of butts in Brno-Štýřice IIIa are plain and punctiform butts; dihedral butts appear much less frequently (Table 1). Dorsal abrasion of artefacts is present. Certainly, some artefacts were knapped with a soft mineral hammer, as seen on the butts of the artefacts and the presence of characteristic splinters on their ventral area. The cores cannot be described because they have been preserved only in either a fragmented form or a greatly reduced form in this collection. The negatives of the blades, however, indicate a unipolar method of knapping. At least two artefacts from Brno-Štýřice IIIa are similar to butts of the *en éperon* type (Fig. 2: 3), however, on closer examination, they don't fully meet the criteria. The only specific artefact is a fragment of the bladelet (probably dynamically broken) with a blunted side, which could be classified as a microlithic point with à dos (*Nerudová 2016*, fig. 30). Although the butt edges of some artefacts do not exclude the possibility that they were knapped with a soft hammer, the knapping technology does not correspond to the Magdalenian, but rather the Epigravettian.

The collection from Rozdrojovice I is very small, only 45 pieces were analysed (Table 1). It is dominated by three unipolar cores made of imported Silicite from the Kraków-Częstochowa Jura (*Nerudová 2016*, fig. 53). Their bases are prepared in one stroke (the typical preparation for knapping with the *en éperon* technique is missing). The angle between the base of the core and the tensile surface of the core is very sharp. However, the corresponding products for these cores are missing on the site. On the other hand, fragments of several blades from radiolarite are noteworthy in the silicite component (Fig. 2: 6). In addition to the mineral hammer, in Rozdrojovice roughly the same number is represented by an organic hammer and at least two or three butts of the type cf. *en éperon* (Fig. 2: 1, 2). In the collection, there is a striking short endscraper and one fragment of the blade morphologically

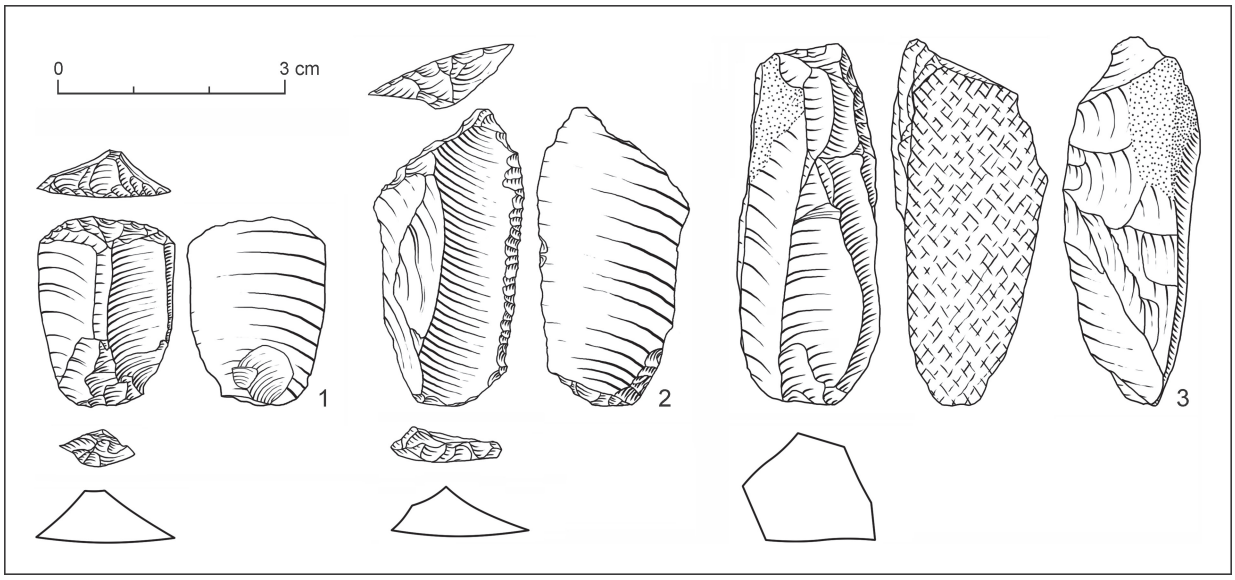

Fig. 3. Švédův stůl Cave (drawing by T. Janků).

very similar to the endscraper (however, the typical retouch is missing). However, microliths or other elements typical of Magdalene are not present. The raw material and technological collection is more like the Gravettian/Epigravettian.

ŠVÉDŮV STŮL CAVE

Since a detailed techno-typological analysis will be the content of another study, we will limit ourselves here only to the characteristics of the knapping. The analysed stratified collection from Švédův stůl Cave contains 62 pieces of flakes and blades and three cores (Fig. 3: 3). Among the butts, the most common type was punctiform butts, less commonly plain butts and linear butts (Table 1). If we follow the knapping methods, there are signs of a soft mineral hammer with punctiform butts (very rarely with dorsal preparation), eventually ventral flakes, and features typical for an organic hammer. An organic hammer was observed in a total of 11 cases. In five products, the butt was straight, wide (thick) with dorsal preparation of the proximal part, six products had the butt slightly concave, the broad and dorsal preparation of the proximal part of the artefact was not visible. Nevertheless, both options correspond to the results of direct knapping with an organic hammer (*Inizan et al. 1995*). At the same time, however, it is necessary to take into account that none of the specified objects, with some exceptions, correspond to the archaeological definition of the "final" product. The collection mostly contains preparatory flakes and blades and not many retouched types. In three cases, in the collection from the Švédův stůl cave, there are *en éperon* type butts, always on a regular retouched blade (formal tool; Fig. 3: 1, 2).

DISCUSSION

Distinguishing between Magdalenian and Epigravettian industries lies in the identification of knapping technique, preparation of striking platforms, and the presence or absence of butts of *en éperon* type, the preparation of dorsal surface of blanks, the presence of long regular blades, and the angle between the butts and ventral surfaces of artefacts (*Maier 2015*, 33; *Wiśniewski 2015*). These criteria, however, have to be applied with care and, if possible, in combination with one another. Most authors, however, consider the *en éperon* butts to be indicative of direct percussion from elaborately prepared cores, using an organic (or soft stone) hammer (above all in the Central European area; *Floss/Weber 2012*,

Table 2. Technological characteristics of the Magdalenian, Epigravettian and Epiaurignacian regarding the sites referred in the text.

Magdalenian	Technological feature	Epiaurignacian	Epigravettian
+	Preparation of core striking plattform	–	–
+	Dorsal abrasion proximal part of blank	Not frequent	Not frequent
+	Long regular blades	Not frequent	+/Not frequent
+	Butts *en éperon*	–	–
+	Mineral (soft stone) hammer	+	+
+	Organic (antler) hammer	–/Albendorf?	–
+	Direct percussion	+	+
–	Specific reduction strategy focused on microliths	+	–

235; *Maier 2015*, 33; *Pelegrin 2002*; *2012*; *Pigeot 2004*; *Valentin/Pigeot 2000*). According to A. Maier, butts of the *en éperon* type are most common between 16 and 14 thousand years cal BP where they represent 12–69% of the total in assemblages from Bohemia, Poland and Thuringia. This period is marked by relative techno-typological uniformity in these regions. Later, between 14 and 13 thousands years cal BP, *en éperon* butts decrease in number. Mineral percussions are now used instead of organic ones, and different tool types begin to predominate (mostly projectiles; *Maier 2015*, 158). Apart from the chronological aspect, regional differences are observable in the intensity of the application of *en éperon* butts throughout the Magdalenian world.

Although the technology of knapping is usually not precisely described and analogies are rather scattered, when we compare Magdalenian knapping technique with the Epigravettian technique (or LUP in generall) some striking differences are obvious (Table 2).

In Brno-Štýřice III, most of the butts show signs of knapping with a soft mineral hammer, i.e. dorsal abrasion of artefacts and punctiform butt (*Nerudová 2016*), whereas *en éperon* butt types are missing completely, which is concordant with the preparation of preserved cores. Similar situation can be observed in the Epigravettian site at Stadice where punctiform and plain butts predominate significantly (Fig. 2: 5; Table 1) and the technology used is characteristic of a soft mineral hammer. No evidence of *en éperon* butts is present there; among the faceted butts three pieces remind one of *en éperon* butts, but they are by no means typical (*Nerudová/Moník 2019*). In Mohelno-Plevovce KSA was also applied soft stone hammer and butts are plain, punctiform, dihedral and linear (*Škrdla et al. 2015b*).

The material from Rosenburg am Kamp (Austria) was analysed in detail by I. Ott. The author noticed plain and punctiform butts, the not numerous cores are unipolar as well as bipolar. Between sporadic tools, backed bladelet significantly prevails (*Ott 1996*). A very specific situation can be observed in the Grubgraben site and there was a question about whether to include this site. The collection is so unique that it has no analogy in the narrower Central European space. The knapping is significantly influenced by the input size of the raw material, which is rather smaller in size. Much of the production was carried out off-site, with specific production of microliths and carenoidal endscrapers (*Montet-White 1990*; *Neugebauer-Maresch et al. 2016*).

The site Albendorf (Germany) provided typical and atypical carinated tool-types, bladelets and microliths. Cores for formal blanks are reduced in unidirectional way; many of blanks have a very small butts (punctiform) and traces of dorsal reduction. The second reduction strategy was focused on the microlithic bladelets. For theirs production the carinated tools were used as cores. None of them has other forms of platform preparation like edge rounding or faceting. Contrary to the character of lithic staff, in Albendorf was identified according significant traces of use at the distal edge, one fragment of ivory as a soft hammer for flint-knapping (*Steguweit 2010*).

Nitra III (Slovakia) provided mostly unipolar blade cores before bipolar ones. The butts of blanks are often unprepared, linear or punctiform. Between the tools, short endscrapers prevail over burins, truncated blades and backed tools (*Kaminská/Nemergut 2014*).

From Sowin 7 in Poland are unipolar blade cores with simple preparation of cores striking platform. The products have flat butts, blades are short, between the tools burins and backed pieces prevail

(*Wiśniewski et al. 2012*). Detailed examination of the lower layer from Sowin 7 has shown technological differences from Magdalenian layers. The striking platform of cores was oval and prepared with one strike. The edges of striking platforms are abraded, similar to Gravettian ones. The blades have plain butts and are curved in their distal parts (*Wiśniewski et al. 2012*). In Targowisko slightly prevail double platform cores over single platform ones. Both flakes and blades have the butts usually plain or cortical, dihedral (edge) and punctiform butts are less common. On blanks is occasionally present dorsal abrasion and a characteristic lip. Between the tools, endscrapers and burins prevail over other types, like are backed bladelets (*Wilczyński 2009*). Very similarly is described the character of lithics and technology in the site Święte 9 in South-East Poland (*Łanczont et al., in press*).

Technology of knapping in Esztergom–Gyurgyalag (Hungary) was focused on the direct soft hammer percussion. The single blade core is reduced in unidirectional way. On the blanks significantly prevail plain butts. As a specific feature of the collection from Esztergom–Gyurgyalag is unusual proportion of backed tools (altogether more than 60%; *Lengyel 2014*). For bladelets unfortunately is not describe mode of reduction strategy. Similar situation in blade production is present also in Arka, Bodrogkeresztúr, Hidasnémeti, Sajószentpét or Ságvár (for more details see *Lengyel 2018*).

Piastra Neamţ open-air site (Romania) is associated with the Gravettian and Epigravettian occupation. From the Epigravettian Layer 2, dated between 17,000–19,000 BP are documented unipolar blade cores, with surface prepared by one (single) strike. The cores were used for exploitation of large blades. The second reduction strategy is focused on micro-blades, which are knapped from unipolar "burin-shaped" cores. In the collection endscapers and burins significantly prevails, numerous are also cf. Dufour bladelets, carenoidal elements and microliths. The faunal assemblage contains mostly reindeers, less horse. Among unique finds is a human bone (*Cârciumaru et al. 2006*; *2010*). According the lithic composition this staff can be associate rather with Epiaurignacian than Epigravettian, nevertheless this classification was not accepted (E. Ch. Nitu, pers. com).

In Šandalja II (Croatia), the early Epigravettian Layer C/d dated 20,750 ±400 years have the industry with the blades with often lipped butts. Use is direct soft-hammer percussion technique and blade core (one is present in the assemblage) is large and prismatic with a single striking platform. Between the tools are frequent endscrapers, backed bladelet and micro-Gravettes (*Karavanić et al. 2013*).

Blades from the Epigravettian site Sant-Antoine in Italy possessed plain or abraded butts in 49% of cases, knapped with soft mineral hammer (*Bracco et al. 1997*).

Rather distant analogy are known from Russia. Eliseevitchi 1 open-air site, dated between 17–12 ky uncal BP provided blades and bladellets with dorsal preparation. According to analyses, for knapping both soft mineral and hard hammer were used. In second site, Eliseevitchi 2, dated around 15 ky uncal BP were short blades knapped from bipolar cores by soft mineral hammer. At the site are frequent burins and backed bladelets. In the Eliseevitchi 2 also organic hammer for knapping was probably used (*Eskova 2019*). According to oral presentation of D. Eskova, in Late Gravettian site Khotylevo 2 is not clear continuity between Gravettian, the lithic staff and technology is more similar to the Moravian Epigravettian collections (*Eskova 2019*).

CONCLUSION

Despite the seeming heterogeneity of the late Palaeolithic collections, it is possible to observe some unifying elements in a wider regional context, particularly evident in the methods of knapping (technology) of stone chipped industry. According to actual state of knowledge, we can characterise the technological *fossile directeur* for LUP (Epiaurignacian, Epigravettian) collections as soft mineral hammer for knapping (Table 2). Typical are unipolar, less bipolar blade cores; in some of the sites is specific bipolar anvil technique as alternative way how to obtain micro-blades, in same of the sites are alternatively for production of micro-blades used "burin-shaped" or "endscrapers" cores (Albendorf, Eliseevichi, Mohelno-Plevovce, Piastra Neamţ). Contrary to the Magdalenian, there is no evidence for antler hammer (excluding direct evidence in Albendorf) and no evidence for *en éperon* butts. Cores' striking platforms are without preparation or are only simply prepared by one strike. Dorsal preparation of blanks is not frequent and typical are punctiform butts (excluding the sites in Hungary, where are generally typical plain butts). For a number of collections it's clear that a large part of the knapping took place off-site. Various stone materials are frequent, indicating broad territorial contacts, often over long distances.

Similar technological characteristics are described from wider area of Slovakia, Austria, Germany, Poland, Hungary, Romania, Croatia or Russia.

After some technological stability presented by Magdalenian, the trend to abandon techno-typological stability and turn towards mineral hammers is evident in the trend to abandon techno-typological stability and turn towards mineral hammers (*Maier 2015*). This trend is also observable in the Late Palaeolithic layers 4 and 3 of Kůlna Cave. Plain and punctiform butts predominate, particularly in layer 4.

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Je možné nalézt *fossile directeur* pro epigravettien?

Zdeňka Nerudová

Souhrn

Jednou z možností, jak studovat a případně rozlišit pozdně mladopaleolitické soubory (LUP) epigravettienu, epiaurignacienu a případně magdalénienu, je prostřednictvím technologie jejich sbíjení. První práce naznačily, že lze takto poměrně spolehlivě odlišit celky epigravettienu od souborů magdalénienu. Aplikací studia technologie sbíjení na nejisté soubory lze do určité míry determinovat jejich kulturní příslušnost, pakliže ji není možné prokázat signifikantnějším způsobem a pokud dochází k překryvu radiokarbonových dat (epigravettien a magdalénien). Jako klíčové se do budoucna jeví rozlišení epiaurignacienu od epigravettienu, neboť obě kultury mají velmi podobné složení kamenné industrie.

V současnosti je epiaurignacien na Moravě reprezentován značně redukovanými jádry, aurignacienskými typy nástrojů, mikrolity typu Sagaid-Muralovka a převahou eratických silicitů. Lokality v oblasti Drahanské vysočiny jsou situovány dále od vodních toků, v lovené fauně dominují koně a sobi. Technologie sbíjení zahrnuje i dvoupodstavová jádra těžená na kovadlině a měkký minerální otloukač. Patky produktů jsou nejčastěji bodové, hladké nebo lomené (*Škrdla et al. 2015*).

Zcela jinak je charakterizován epigravettien na Moravě. Pro něj jsou typická jednopodstavová čepelová jádra, absence aurignacienských elementů mezi nástroji, absence mikrolitů, naopak jsou velmi početná různá rydla; elementy s otupeným bokem jsou spíše vzácné. Lokality jsou situovány v refugiích nejčastěji u vodních toků. V lovené fauně dominuje mamut, pro sbíjení je užíván měkký minerální otloukač a na produktech dominuje bodová patka (*Nerudová/Moník 2019*).

Zmíněné rozdíly lze pozorovat i v širším geografickém a chronologickém kontextu (gravettien, epiaurignacien, epigravettien, magdalénien; *Mozola 2013*). Analýza technologie sbíjení byla úspěšně aplikována na soubor artefaktů jeskyně Kůlna, které mohly být na podkladě radiokarbonového data spojovány s epigravettienem. Technologie sbíjení a přítomnost patek typu *en éperon* ale přesvědčivě doložila jejich spojitost s magdalénienem (*Nerudová/Moník 2019*). V této studii byly testovány další, v některých případech ne zcela jednoznačně kulturně klasifikované soubory (obr. 1).

Technologie sbíjení a použitý otloukač byly identifikovány na základě autorčiných zkušeností a za použití dostupné literatury (*Pelegrin 2002*; *2012*; *Pelegrin/Texier 2004*), použitý otloukač na lokalitě Brno-Štýřice III byl identifikován trasologem (*Pyżewicz/Nerudová 2019*). K pozorování byl použit také stereo mikroskop Nikon SMZ645 za použití 8x–50x zvětšení. Analýzami bylo zjištěno, že soubory z Bratčic III a Brna-Štýřic IIIa lze spojovat s epigravettienem, Rozdrojovice I surovinově a technologicky odpovídají spíše gravettienu/epigravettienu, příslušnost artefaktů ze Švédova stolu k magdalénienu nebylo nutné zpochybnit (obr. 2; 3). Širší srovnání potvrdilo podobné znaky u kulturně identických souborů (tabela 1).

Technologie sbíjení v magdalénienu, která je odlišná od výše zmíněných kultur epigravettienu a epiaurignacienu, byla velmi podrobně popsána (*Maier 2015*, 33; *Wiśniewski 2015*). Za chronologicky významné může být považováno sbíjení způsobem *en éperon*, které je nejčastější v období mezi 16. a 14. tis. lety kalibrovaně BP, kdy je zastoupeno 12–69 % v kolekcích v Čechách, Polsku a Duryňsku, zatím co o tisíciletí později přítomnost patek *en éperon* v souborech rapidně klesá (*Maier 2015*, 158).

Zatím co rozdíly v technologii sbíjení mezi magdalénienem a epigravettinem jsou uvedené v tabelách 1 a 2, lze naopak v širším geografickém rámci lze pro epigravetien a epiaurignacien pozorovat některé shodné rysy. Ty jsou zjevné zejména ve způsobech sbíjení (technologii) kamenné štípané industrie. Ke zevšeobecnění byla použita řada analogií (Albendorf, Grubgraben, Nitra III, Rosenburg, Sowin 7, Stadice, Arka, Bodrogkeresztúr, Eliseevitchi 1, Eliseevitchi 2, Esztergom-Gyurgyalag, Hidasnémeti, Khotylevo 2, Piastra Neamţ, Sajószentpét nebor Ságvár, Sant-Antoine, Šandalja II, Targowisko), na jejichž podkladě můžeme definovat technologický *fossile directeur* pro pozdně mladopaleolitické (LUP) soubory epiaurignacienu a epigravetienu (tabela 2).

Pro sbíjení je typický měkký minerální otloukač, typická jsou jednopodstavová čepelová jádra, dvoupodstavová jsou méně běžná. Na některých lokalitách je užito sbíjení na kovadlině pro získávání mikročepelí nebo jsou mikročepele získávány z kýlovitých rydel či kýlovitých škrabadel (Albendorf, Eliseevichi, Mohelno-Plevovce, Piastra Neamţ). Na rozdíl od magdalénienu zatím není žádný doklad pro parohový otloukač (výjimka je Albendorf) a důležitá je absence patek typu *en éperon*. Podstavy jader jsou preparovány jedním úderem, produkty (čepele) obvykle nemají dorzální preparaci a typická je pro ně bodová patka (s výjimkou souborů v Maďarsku). U mnohých souborů je uváděno, že výrazná část sbíjení probíhala mimo vlastní lokalitu. Časté jsou různorodé suroviny, naznačující široké územní kontakty, mnohdy i na velké vzdálenosti. Podobné technologické charakteristiky lze pozorovat v širší oblasti Česka, Moravy, Slovenska, Rakouska, Německa, Polska, Maďarska, Rumunska nebo Ruska.

Obr. 1. Bratčice III. Charakteristické bodové patky (kresba T. Janků, mikrofoto M. Kmošek).
Obr. 2. 1, 2 – Brno-Štýřice IIIa; 3, 4, 6 – Rozdrojovice; 5 – Stadice (kresba T. Janků, mikrofoto M. Kmošek).
Obr. 3. Jeskyně Švédův stůl (kresba T. Janků).

Tabela 1. Studované lokality a typy patek (Σ v kusech). Legenda: Nat. surf. – s přirozeným povrchem; Punc. – bodová; Und – nediagnostická/nedochovaná; * – nebylo sledováno.
Tabela 2. Technologické charakteristiky magdalénienu, epigravettienu a epiaurignacienu s ohledem na lokality zmiňované v textu.

doc. Mgr. Zdeňka Nerudová Ph.D.
Centrum kulturní antropologie MZM
Zelný trh 6
CZ – 659 37 Brno
znerudova@mzm.cz