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**Multiple perspectives on lithic studies in Central and Eastern Europe**

**Adrián Nemergut – Ivan Cheben – Katarzyna Pyżewicz  
(editors)**

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# EPIAURIGNACIAN INDUSTRY WITH SAGAIDAK-MURALOVKA-TYPE MICROLITHS INDUSTRY IN THE SOUTH OF EASTERN EUROPE AND EASTERN CENTRAL EUROPE AND ITS LITHIC ARTEFACT FOSSIL TYPES

**Yuri E. Demidenko – Petr Škrdla – Joseba Rios-Garaizar –  
Jaroslav Bartík – Tereza Rychtaříková**

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**Keywords:** Eastern and Central Europe, LGM, Epiaurignacian, lithic artefact fossil types

**Abstract:** In the article, Eastern and Central European Last Glacial Maximum (LGM) specific Epiaurignacian industry with Sagaidak-Muralovka-type microliths (EASMM) is discussed in terms of its lithic artefact fossil types. The proposed fossil types are carinated atypical endscraper-cores and Sagaidak-Muralovka-type microliths. These two lithic artefact types with some other techno-typological features of the considering EASMM industry type make it distinct within the LGM Early Late UP archaeological context in both Eastern and Central Europe.

## INTRODUCTION

The onset of LGM *sensu lato* with Heinrich Event 2 (HE-2), ca. 26.5–23.5 ka cal BP, and Greenland Interstadial-2 (GI-2), ca. 23.5–23 ka cal BP (Clark *et al.* 2009; Rasmussen *et al.* 2006; 2014), before the start of LGM *sensu stricto* (Mix/Bard/Schneider 2001), ca. 23–19 ka cal BP, with only Greenland Stadials-2c and 2b (GS-2c and GS-2b) with its harsh climatic conditions not only significantly changed the environment and climate in Europe but it also had a great impact on the continent archaeological industrial techno-complex and industry type structure. It is the time when the long-lasting Pan-European Gravettian techno-complex with its various industry types had either already disappeared or was about to disappear (e.g. Maier/Zimmermann 2017), and new techno-complexes and assemblages started appearing from HE-2 and GI-2. In Western Europe, new artefact assemblages are mainly represented by Solutrean and Badegoulian techno-complexes (Ducasse 2012; Renard 2011; Zilhão/Aubry/Almeida 1999). In Eastern and Central Europe, the newly appeared artefact assemblages are basically associated with Epigravettian (e.g. Lengyel 2018; Nuzhnyy 2015; Olenkovskiy 2008). From our point of view, however, Epigravettian is not the sole techno-complex present at the beginning of LGM *sensu lato*, not even mentioning here some variable industry types within the Epigravettian. At least two more techno-complexes in Central Europe and one more techno-complex in Eastern Europe are known in addition to Early Epigravettian for the considered time period. One of the techno-complexes is so-called Epiaurignacian and in particular the Epiaurignacian with Sagaidak-Muralovka-type microliths (EASMM) industry type being known in both the south of Eastern Europe and Eastern Central European (Demidenko/Škrdla/Rios-Garaizar 2016; 2018; 2019). Specifically, the EASMM and its lithic fossil types will be analyzed in the present article, also testifying to a not industrially uniform but diverse archaeological picture for the start of the LGM.

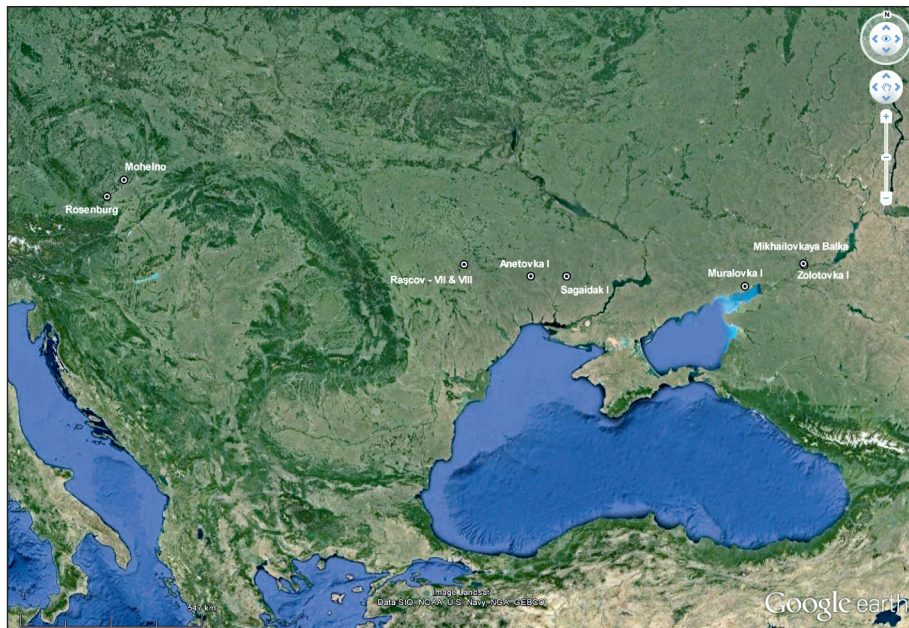


Fig. 1. Map of Central and Eastern Europe with EASMM sites. Created in Google Earth, Image source Lansat, captured 12/14/2015. A view from 2257.98 km.

## MATERIAL AND METHODS

Indeed, one of the basic problems with the LGM archaeological context is an industrial-chronological understanding of the Epigravettian techno-complex by different archaeologists. In contrast to all known chronologically earlier European Early and Middle Upper Palaeolithic (UP) techno-complexes primarily defined through strictly recognized industrial techno-typological criteria for lithic artefacts (e.g. Chatelperronian, Uluzzian, Szeletian, Bohunician, Aurignacian, Gravettian), the Epigravettian techno-complex is very often and especially in Central Europe understood in an off way mainly ignoring the strict artefact characteristics. In fact, it is usually proposed to see it as chronologically a sort of post-Gravettian assemblage package, containing varying industry types.

In Central Europe, the approach started in the early 2000s when J. Svoboda and M. Novák (2004, 473) underlined that “the term ‘Epigravettian’ ... is only based on the chronological setting (i.e., industries following the Gravettian in terms of time)”.

Such a really non-industrial approach for Epigravettian is further under development now for Central Europe by G. Lengyel (e.g. 2018). He eventually grouped all the known Carpathian Basin LGM UP assemblages under the single “Early Epigravettian umbrella”. Accordingly, the “unifying approach” started almost 20 years ago has now reached its climax when it has not actually paid any real attention to LGM industry type variability.

From our point of view, at least five industry types are known particularly for the LGM Eastern Central Europe, instead of Lengyel’s merely “Early Epigravettian”. These are namely the EASMM industry, two Early Epigravettian industry types (Kašov I and Ságvár), Early Badegoulian with the Kammern-Grubgraben industry type and the Stránská skála IV-type assemblages. All the industry types need to be analyzed thoroughly and in detail, and some first steps in this direction have been already undertaken (e.g. Škrdla et al. 2021). The EASMM industry, the only one identified with certainty so far among the noted five industry types also for Eastern Central Europe, in the south of Eastern Europe, can serve as a good example for further studies of the LGM Early Late UP industries. The EASMM industry’s basic lithic techno-typological data and also fossil artefact types will be summarized for showing the EASMM distinct industrial affiliation within the UP context of both Eastern and Central Europe.

## EASMM INDUSTRY AND ITS SITES IN EASTERN EUROPE IN RESEARCH SINCE 1950S

Seven sites not fitting into the Mid UP–Late UP record with various Gravettian and Epigravettian industry types were studied in the south of Eastern Europe between the late 1950s and late 1990s (Demidenko 2007; 2008; Demidenko/Škrdla/Rios-Garaizar 2019). These are Raşkov VII and VIII in Transnistria (Moldova); Sagaidak I and Anetovka I in the western part of the North Black Sea region (Southern Ukraine); Muralovka, Zolotovka I and Mikhailovskaya Balka in the eastern part of the Sea of Azov and Lower Don River (Southern Russia; Fig. 1). Geochronologically, these sites have been always associated with the LGM and now they are more precisely related to ca. 25.5–23 ka cal BP, HE-2 and GI-2.

The industry can be characterized by lithic artefacts (organic artefacts have not yet been recovered) as follows. Technologically, it is basically a flakey industry with the additional presence of elongated chips and microblades, while blades are of occasional reduction origin (except the Sagaidak I assemblage with serial tools on the blades). The small-sized debitage blanks were mainly produced from carinated atypical endscrapers-cores (Fig. 2A: 1–10) and only some of them were flaked from elongated chip and microblade cores (Fig. 2A: 11, 12). Some flake cores served for the detachment of blanks for both carinated endscrapers-cores and so-called domestic tools. Typologically, the small-sized debitage pieces were often transformed into “hunting projectile weaponry” – a sort of pseudo-Dufour, but really morphologically distinct and metrically tiny Sagaidak-Muralovka-type microliths bearing dorsal marginal abrasion retouch and having slightly incurvate, non-twisted profiles (Fig. 2B: 1–38). At the same time, “domestic” UP tool types (simple-endscrapers, various non-multifaceted burins, truncated pieces) were represented only by a single very specific type, a transversal non-multifaceted burin on a lateral retouch (Demidenko/Škrdla/Rios-Garaizar 2019, fig. 3: 43–46; 5: 28–34; 6: 18–26; 7: 7–10; 8: 5–10).

Regarding subsistence practices within the LGM periglacial steppe and grass-herb steppe, EASMM humans hunted bison, reindeer and horse, with also occasional occurrence of rhino and mammoth bone remains. The latter species’ presence probably can be explained by scavenging, bone collecting and/or hunting of ill – naturally trapped large-sized animals.

Moreover, all these sites and their finds have been analyzed for many years, almost 60 years since the Raşkov VII site discovery in the late 1950s, only within the Eastern European UP archaeological context due to their occurrence only in this part of the continent and nowhere else in Europe.

## EASMM SITES IN CENTRAL EUROPE REVISITED

However, the discovery in 2013 and since then ongoing excavations at the Mohelno-Plevovce site (Southern Moravia) headed by one of our team members (Škrdla *et al.* 2016) has radically changed the situation with the considered Epiaurignacian industry now being represented in Central Europe too. Moreover, our 2015 survey of already known LGM sites in Central Europe did lead us to recognition of one more such site, Rosenburg, in Lower Austria, situated only ca. 50km to the south-west of Mohelno-Plevovce within the same Bohemian Massif, excavated in 1988 by G. Trnka and then published as an Epigravettian site by one of his students (O# 1996). The data on the two Central European sites are very similar one to another and can be summarized in the following way (Demidenko/Škrdla/Rios-Garaizar 2019). First of all, it is indeed needed to state here the very similar character of the Moravian and Austrian assemblages (Fig. 3; 4) to the East European assemblages having the same elongated chip and microblade cores (Fig. 3A: 1–3), carinated atypical endscrapers-cores (Fig. 3A: 4–6; 3B: 1–5), Sagaidak-Muralovka microliths (Fig. 3A: 7–30; 4: 1–36) and even transversal burins on the lateral retouch (Fig. 3B: 7). Moreover, the Mohelno-Plevovce refit of a secondary burin spall to the transversal burin on the lateral retouch shows multiple and consistent practice to make transversal burins on the lateral retouch repeatedly for one and the same piece (Fig. 3B: 6, 7). The only seemingly single technological difference for the Central and East European assemblages is the use of bipolar anvil core reduction in Central Europe (Demidenko/Škrdla/Rios-Garaizar 2019, fig. 11: 7–10; 15; 16), even for some microlith production.

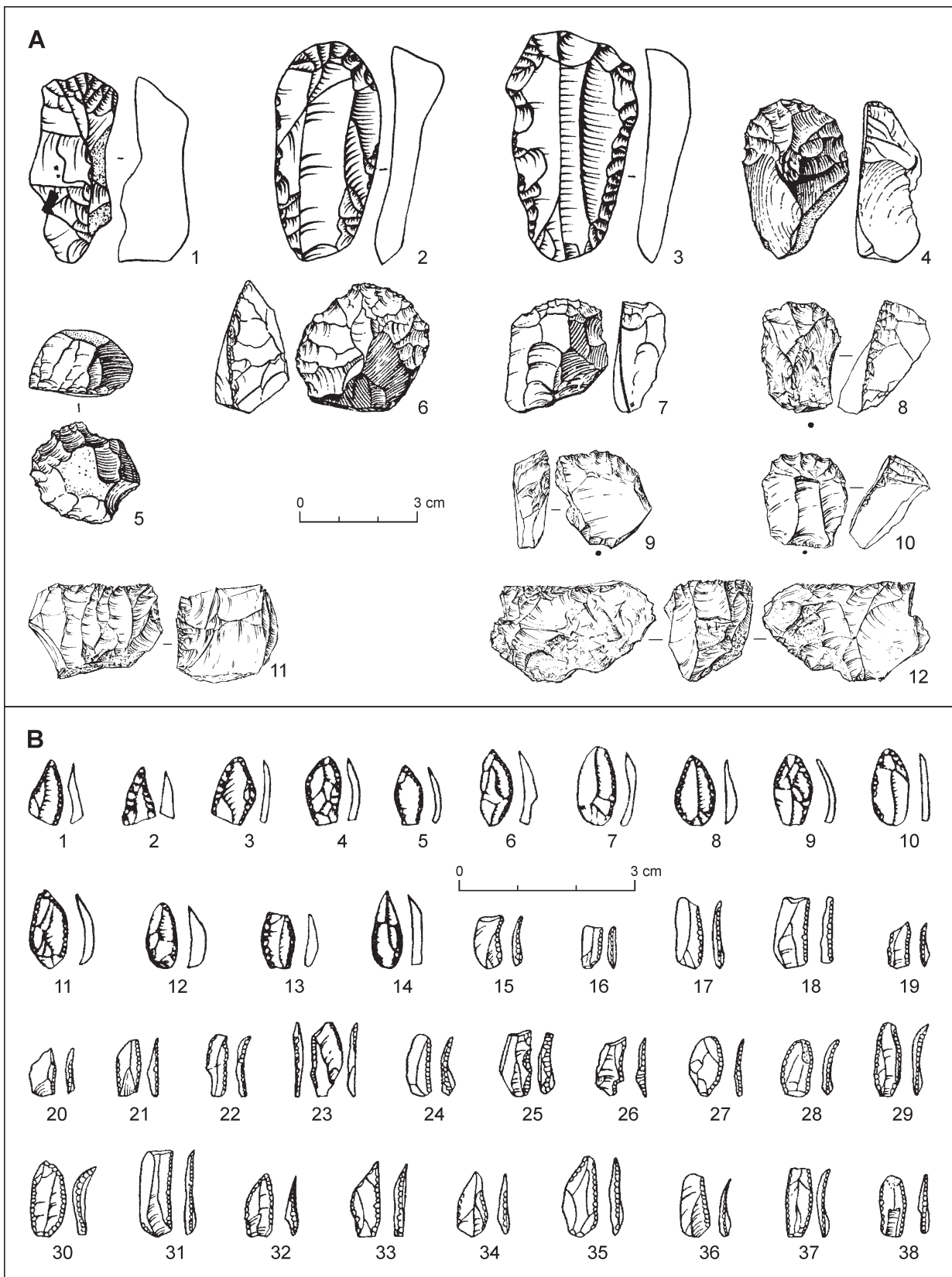


Fig. 2. EASMM Eastern European site lithic artefacts. A – 1–10 – carinated atypical endscraper-cores; 11, 12 – elongated chip/microblade micro-cores; B – 1–38 – Sagaidak-Muralovka-type microliths. A – 1–3; B – 1–14 – Sagaidak I site (modified after *Smol'yaninova* 1990); A – 4–7; B – 15–38 – Muralovka site (modified after *Praslov* 1972); A – 8–12 – Anetovka I site (modified after *Demidenko/Škrdla/Rios-Garaizar* 2019).



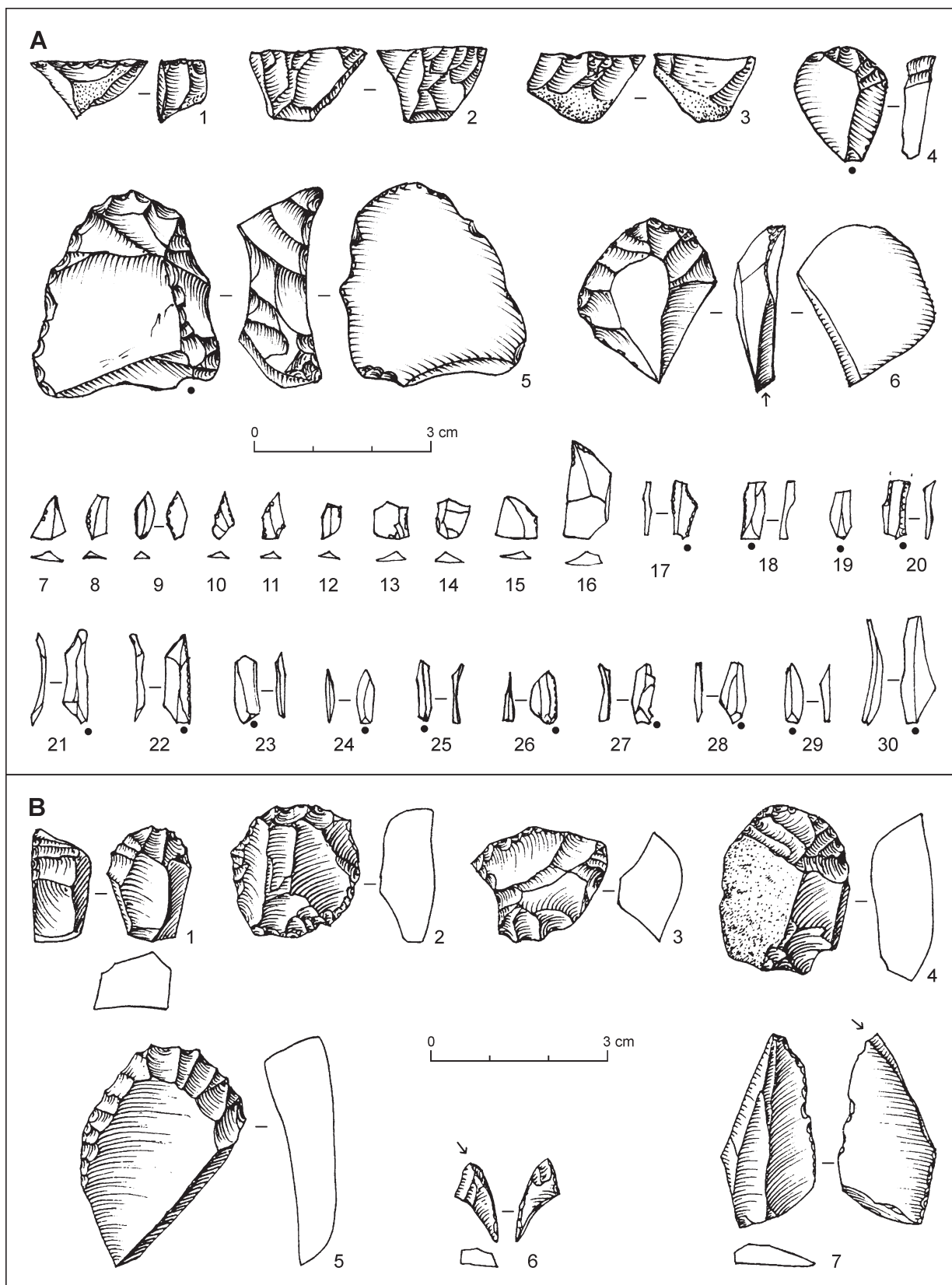


Fig. 3. EASMM Central European site lithic artefacts. A – 1–3 – elongated chip/microblade micro-cores; 4–6 – carinated atypical endscraper-cores; 7–30 – Sagaidak-Muralovka-type microliths; B – 1–5 – carinated atypical endscraper-cores; 6, 7 – secondary burin spall refitted onto transversal burin on lateral retouch. A – Rosenberg site (modified after *Ott 1996*); B – Mohelno-Plevovce KSA site (modified after *Demidenko/Škrdlá/Rios-Garaizar 2019*).

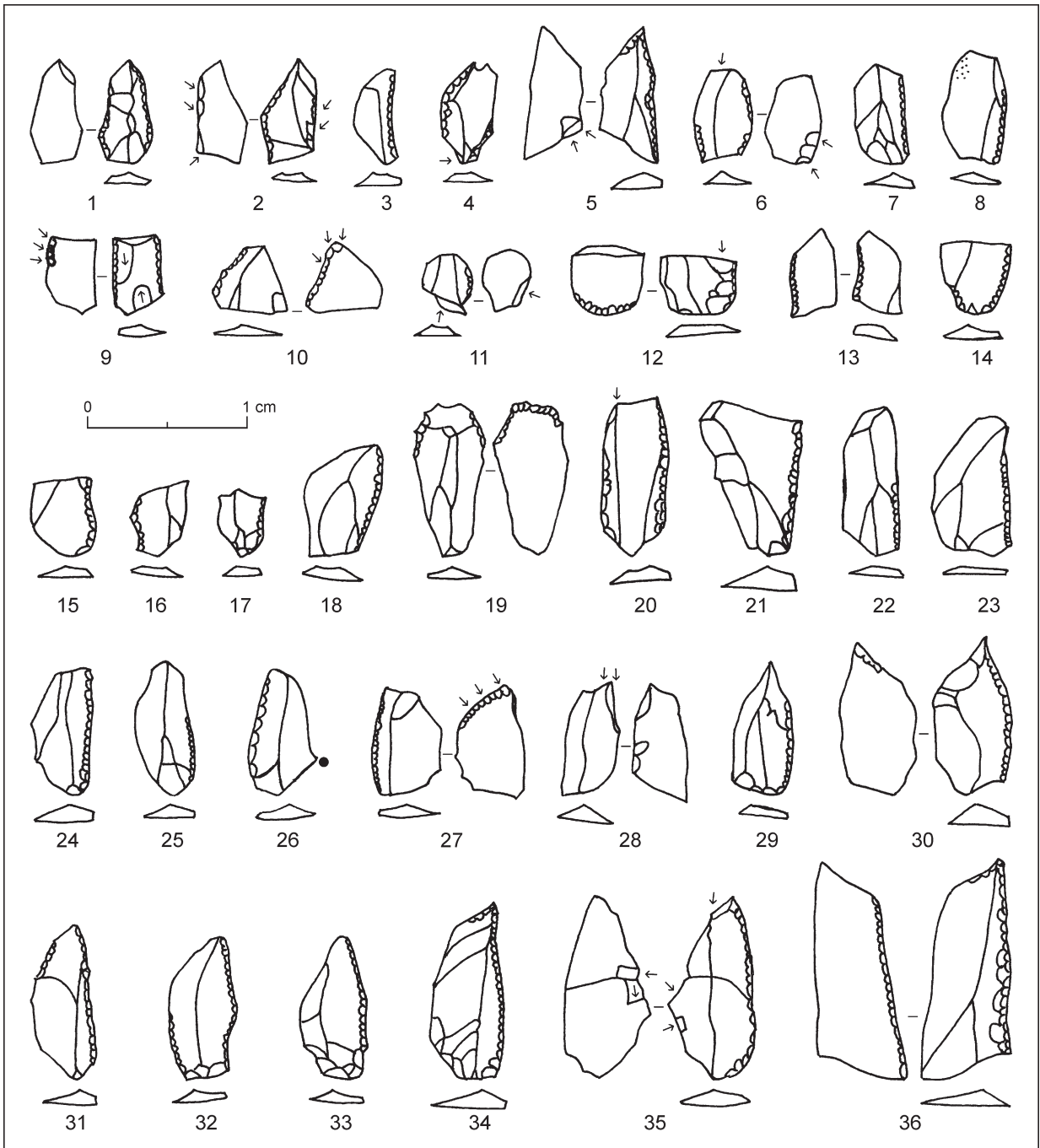


Fig. 4. EASMM Central European site lithic artefacts. 1–36 – Sagaidak-Muralovka-type microliths; Mohelno-Plevovce KSA site (modified after Demidenko/Škrdla/Rios-Garaizar 2019).

#### “PREHISTORIC VICISSITUDES OF ORIGIN FATE” OF THE EASMM INDUSTRY TYPE: VARIOUS SUGGESTIONS

Before the discovery and recognition of the EASMM sites in the Bohemian Massif of Central Europe, the particular LGM industry type origin in the south of Eastern Europe, at that time described as an “Aurignacoid industry”, has been always considered by Russian and Ukrainian archaeologists (e.g. Gvozdover/Ivanova 1969; Praslov 1972; Stanko 1982; Stanko/Grigor’eva/Shvaiko 1989) to be the result of a Late Aurignacian human group move from Central Europe, taking into consideration an Aurigna-

cian assemblage of the Góra Puławska II site in Poland having both carinated typical endscrapers and dorsally retouched microblades (*Krukowski 1948; Sachse-Kozłowska 1978*). In 1999, an alternative name, “North Black Sea Region Epiaurignacian of Krems-Dufour type” was proposed for the discussed industry due to its both a basic similarity to the also LGM former Aurignacian V in Western Europe and still a possible generic connection to Evolved Aurignacian Góra Puławska II materials with pseudo-Dufour microliths (*Demidenko 1999*). Also, aside from more details proposed for defining the sites and lithics of the Epiaurignacian industry type, it has also been proposed that the reason Late Aurignacian humans probably moved to the south of Eastern Europe is because these vast territories were almost unpopulated during the preceding LGM Middle Upper Palaeolithic/Gravettian time period (*Demidenko 2007; 2008*).

Nevertheless, new data for the above-noted new sites of the Epiaurignacian industry type in Central Europe made it possible to recognize the EASMM industry type and its site occurrence in both parts of Europe, as well as increasing the understanding of the Góra Puławska II assemblage and adding some additional, similar materials recently found served for recognition of the Evolved Aurignacian industry type with Góra Puławska II-type microliths (*Demidenko/Škrđla/Nejman 2017; Demidenko/Škrđla/Rios-Garaizar 2016*). These new data have forced the team to reject the previously proposed Late Aurignacian generic background for the EASMM.

That is mainly related to the fact that the Evolved Aurignacian and EASMM industry types are separated by an almost 10,000-year chronological gap, enveloping the entire Gravettian *sensu stricto* in these parts of Europe.

Accordingly, EASMM possible industrial “generic roots” are now under consideration using chronologically a bit earlier, ca. 26–25 ka cal BP/HE-2, Western European Aurignacian V/Terminal Gravettian/Proto-Solutrean industry type (*Demidenko/Škrđla/Rios-Garaizar 2016; 2018; 2019*). The industry is also recognized as an “industrial-chronological transitional bridge” between Late Gravettian and Solutrean in the West of Europe (see *Almeida 2000; Aubry/Detrain/Kervazo 1995; Verpoorte et al. 2019; Zilhão/Aubry/Almeida 1999*). In core reduction technology, it has serial bladelet and microblade production from “regular” blade and bladelet cores, and from both carinated endscrapers (both typical and atypical) and especially thick nosed endscrapers. In typology, “micro-debitage” was used for the production of microliths bearing mainly marginal and sometimes thin backed retouch. Still having some lithic artefact differences with EASMM industry, the occurrence of EASMM sites in Central Europe is notable at the time when Lower Solutrean already replaced Aurignacian V/Terminal Gravettian/Proto-Solutrean industry in Western Europe. Accordingly, it is possible to put forward a hypothesis that under harsh LGM climate conditions a part of the western industry’s humans moved into Central Europe giving a direct rise of the EASMM industry type or an indirect complex trans-cultural diffusion/stimulus diffusion “generic process”.

Finally, concerning EASMM’s “industrial fate”, there are not yet any reasonable hypotheses for the industry in Eastern Europe, although some ideas are now under consideration for Central Europe. A possible generic connection has been suggested between the EASMM industry and the Badegoulian of the Kammern-Grubgraben type in Central Europe (*Demidenko et al., in press*).

#### EASMM TWO LITHIC ARTEFACT FOSSIL TYPES

The LGM EASMM industry type has been always recognized in both Eastern and Central Europe through the serial presence of two lithic artefact types: carinated atypical endscraper-cores and tiny Sagaidak-Muralovka-type microliths. These two distinct features clearly distinguish the industry type among all pre-LGM, LGM and post-LGM UP industries. Moreover, despite the fact that the two lithic types were systematically found at all the EASMM sites, except for Mikhailovskaya Balka, the best recovered respective lithic samples come from the Mohelno-Plevovce site in Southern Moravia, which is still under field investigation. That is because it is the only EASMM site where all artefact bearing sediments have been wet-sieved, providing the best objective samples on retouched microliths and unretouched tiny debitage items, additionally allowing the only EASMM refitting done yet of some of them onto their primary flaking reduction objects, carinated atypical endscraper-cores. Conformably, the Moravian site data will be the core ones for the most detailed two lithic fossil types descriptions and analyses, although data from other sites will serve as basic data material.

### Carinated atypical endscraper-cores

The lithic type, as an endscraper-core, was first properly recognized by N. D. Praslov in the early 1970s during a lithic artefact analysis after his investigations of the Muralovka site in the 1960s (Praslov 1972). He literally technologically connected “thick-formed endscrapers” (ca. 30 items), serving mainly as cores, with “miniature retouched bladelets and points” (158 items). He paid special attention to the following endscraper morphological features (Fig. 2A: 4–7): “made on thick short flakes”, “their working edges were formed on the most massive flake’s parts”, “most of the endscrapers working edges are uneven, denticulated”, “facet removal negatives deeply come onto the tools surface and correspond to the shapes of bladelets and chips used for manufacture of the Muralovka-type miniature retouched bladelets and points”, while “such facet removal negatives are absent on cores” (Praslov 1972, 75). As a result, N. D. Praslov (1972, 75) came to the conclusion that “most of the blanks for the miniature items were received during treatment of these particular endscrapers”. Along with this, Praslov did not establish a unified term for the endscraper type, using terms like “thick-formed endscrapers”/“core-like endscrapers”/“keeled endscrapers”/“high core-like endscrapers” equally for the same thing (see also Praslov/Filippov 1967; Praslov/Ivanova/Malyasova 1980). Namely, the work of Praslov then allowed his Ukrainian and Moldovan colleagues to understand in a correct way materials similar to those from Muralovka from their own excavated sites (see Ketraru/Grigor’eva/Kovalenko 2007; Stanko/Grigor’eva 1977).

Understanding the lithic type terminology problem, it was proposed more than 10 years ago that the term “carinated atypical endscraper” be used for the considered “Epiaurignacian” industry type in the south of Eastern Europe (Demidenko 2004; 2008). This was based on the endscrapers’ basic morphological features bearing non-lamellar, rather short but actually elongated chip-like removal negatives on their fronts/flaking surfaces. Such a definition fits well into the classic definition of “grattoir careen atypique”, “si les facettes d’enlèvement sont larges et non lamellaires ou si le profil est mal dessiné” (Sonneville-Bordes/Perrot 1954, 332, fig. 1; 3; 12). The newly applied 2000s term also made it possible to put the industry type in the concrete LGM “Epiaurignacian” context, escaping its usual industrially uncertain “Aurignacoid” status in Eastern European Palaeolithic archaeology. Very recently, accentuating the technology, the considered endscrapers’ definition was finally a little re-modified into proper endscraper-cores, “carinated atypical endscraper-cores” (Demidenko/Škrdla/Rios-Garaizar 2019). At the same time, the gross excavation methods applied to the EASMM Eastern European sites in the late 1950s–1990s and fine excavations of actually redeposited sediments at Anetovka I site in 2005–2006 by one of our team members (Yu. D.) do not permit real *chaîne opératoire* technological reconstructions, not to even mention possible refitting attempts here. However, as was pointed out above, the newly recovered Mohelno-Plevovce site materials offer a unique first chance for the EASMM assemblages to realize both refits and *chaîne opératoire* approach studies for the endscraper-cores and microliths.

Mohelno-Plevovce first excavated stony structure (KSA) lithic assemblages in the total number of ca. 985 items revealed the presence of both 5 carinated atypical endscraper-cores and 47 microliths, exclusively produced/flaked from very distant for the site erratic flint. Three of the endscraper-cores got refits with mainly microliths and a few non-elongated, tiny chips. They can be listed briefly as follows.

1. Double carinated atypical endscraper-core with refitted onto its wider front/flaking surface of 8 microliths (Fig. 3B: 1; 5).



Fig. 5. EASMM Central European site lithic artefacts. Refit of carinated atypical endscraper-core and 8 Sagaidak-Muralovka-type microliths; Mohelno-Plevovce KSA site (modified after Demidenko/Škrdla/Rios-Garaizar 2017).

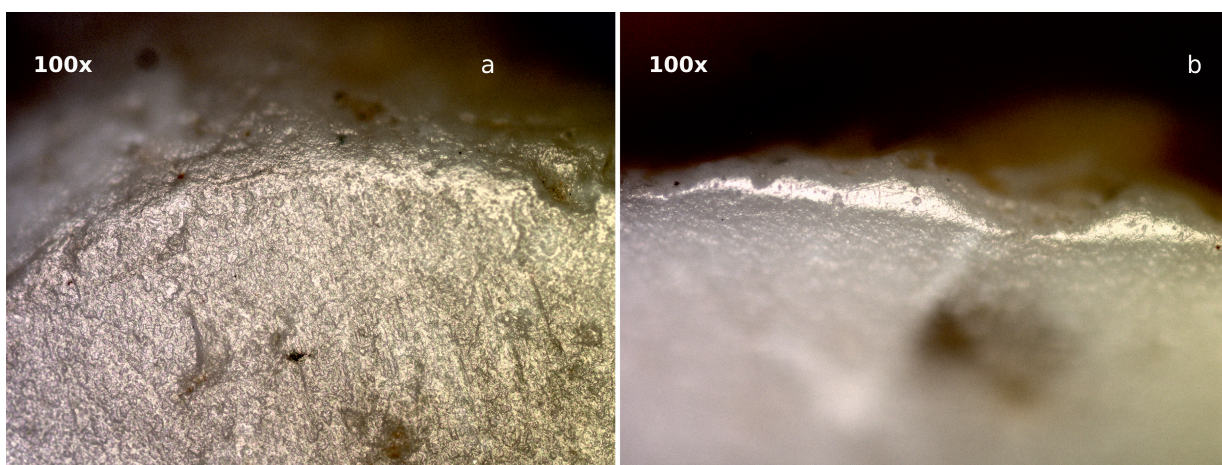


Fig. 6. EASMM Central European site lithic artefacts. Mohelno-Plevovce KSA site carinated atypical endscraper-core with a dry hide (a) and hard organic material (b) scraping traces.

2. Carinated atypical endscraper-core with refitted onto its front/flaking surface one microlith and one chip (Fig. 3B: 4).
3. Carinated atypical endscraper-core with refitted onto its front/flaking surface one microlith, two chips and one fronto-lateral maintenance flake (Fig. 3B: 5).

Although the site's refitting program, data and illustrations will be forthcoming in more studies and illustration realization, the already existing data still allow some basic *chaîne opératoire* technological observations to be made.

Flakes ca. 1.5 cm thick have been serving as blanks for carinated atypical endscraper-cores. The endscraper-cores' convex fronts/flaking surfaces were usually formed by some lateral chip removal negatives. Then, the proper microlith-blanks were serially detached mostly in a convergent order from the central convex area of the prepared front/flaking surface. The flaking surfaces' rejuvenation processes were going on only sporadically by removing specific fronto-lateral maintenance flakes that were cleaning the surface for one more possible primary reduction cycle. At the same time, the core tablet technique was never noted to be applied during re-preparation of the carinated atypical endscraper-cores. The technique's absence is connected to the thinness of these reduction objects of no more than 1.5 cm, the reason a detachment of almost any, even 3–4 mm thick core tablet would make the flaking surface too short for a microlith-blank detachment. It is also worth noting the absence of the *lame à crête* technique here. Accordingly, the carinated atypical endscraper-core reduction was almost never long and/or really multiple as most of traditional primary flaking objects, like various large-sized cores were. These endscraper-cores were, however, "short-lived" and rather simple in the creation of reduction objects.

Such short/limited reduction characteristics of the endscraper-cores have also an important "subsistence implication" pointing out that these pieces were certainly not "vitally important" so-called curated items, which Late UP humans would carry with them from one to another site for a recurring flaking at each site. In fact, most likely, flake cores, reduction objects for getting thick flake-blanks for then on-site formation and primary flaking of carinated atypical endscraper-cores, were such curated items. The latter suggestion finds additional support in the fact that real flake cores are either absent or represented by very few pieces at each EASMM site, although some morphologically unidentifiable core fragments and/or residues were in reality such flake cores, but fully exhausted at their last time flaked site.

Finally, the recently conducted use-wear studies of Mohelno-Plevovce carinated atypical endscraper-cores (Rios-Garaizar/Škrdl/Demidenko 2019) definitely indicated that some of these items were used after serving for core reduction as actual tools. For example, one of the KSA endscraper-cores (Fig. 3B: 2; 6: a, b) bears scraping traces on a dry hide (Fig. 6: a) and a hard organic material (Fig. 6: b) use. Accordingly, the double term "endscraper-cores" indeed reflects the dual functionality of these specific EASMM fossil type pieces.

### Sagaidak-Muralovka-type microliths

One more EASMM fossil type also received more understanding with Mohelno-Plevovce lithic analyses (Fig. 4).

#### Microlith type recognition

The serial tiny microliths found bearing a marginal, not true backed retouch at the EASMM sites in Eastern Europe called for their typological classification. Their definition as a class started with the pioneering studies of Praslov in the late 1960s and the early 1970s with the differentiation between convergently retouched items, called “micro-points”, and laterally/bilaterally retouched specimens, called “retouched bladelets/microblades” (Fig. 2B: 15–38). It is important to note here that the latter non-pointed pieces have been always much more numerous than pointed pieces in Eastern European EASMM sites and it is also noted for the newly recognized Central European EASMM sites. The common agreement between Soviet Palaeolithic archaeologists on the EASMM microliths was probably summed up by a Ukrainian archaeologist S. P. Smol’yaninova in her 1990 book. The “micro-points” were called “Sagaidak-Muralovka-type micro-points” (Fig. 2B: 1–14) produced on “*thin, incurvate, with sub-triangular shape endscrapers chips*” where the micro-point type’s name was based on two samples of such pieces from Muralovka and Sagaidak I sites (Smol’yaninova 1990, 89). At the same time, other microliths were merely called simple laterally/bilaterally retouched microliths. One of our team members (Yu. D.), being aware of the truly common morphological, metrical and retouch features for both pointed and non-pointed microliths for the discussed Eastern European sites, later proposed defining all these microliths collectively as “Sagaidak-Muralovka-type microliths with a fine dorsal marginal abrasion bilateral and lateral retouch on chips and metrically shortened microblades” (Demidenko 2007, 69). As a result, the microlith type (Fig. 2B: 1–38) was used later during the recognition of the EASMM industry type for both Eastern and Central European sites (Demidenko/Škrdla/Rios-Garaizar 2019).

#### Microlith-blank type recognition

It was in the beginning of 1970s when again Praslov viewed the Muralovka site microliths found by him as “*diminutive bladelets with retouched lateral edges*”, being, however, cautious to consider them true bladelets due to their morphology: “*they are very tiny, amorphous, with no parallel edges and not well-developed dorsal scar patterns*” (Praslov 1972, 71). Accordingly, he proposed to define the microliths’ blank type as “*chips*”, linking their primary flaking with the so-called “*high endscrapers*” because “*a great majority of blanks for the diminutive pieces were received during treatment of namely such endscrapers*” (Praslov 1972, 71, 75). Most of the Praslov’s colleagues, however, preferred calling the Sagaidak-Muralovka-type microliths’ blanks “*microblades*” or “*diminutive bladelets*” and not chips (e.g. Stanko/Grigor’eva 1977, 43, 45–47). Moreover, later Praslov himself virtually dropped the term “*chip*” when describing the Zolotovka I assemblage: “*high endscrapers of the so-called Aurignacian type are actually often specific cores for microblade production and then the microblades were transformed by a secondary treatment into tiny micro-points*” (Praslov/Ivanova/Malyasova 1980, 172). The 1980 definition was used more recently by Shchelinsky when he published the Zolotovka I 1996 excavation lithics, and referred to “*diminutive retouched bladelets of the Muralovka type*” (Praslov/Shchelinsky 1996, 64). This lack of agreement on the terminology for the Sagaidak-Muralovka-type microliths’ blanks in the East European assemblages continued, and it actually prevented a more precise technological and typological definition of these important pieces.

The Mohelno-Plevovce case has definitely helped with the definition of the microliths-blanks. The site’s KSA final microliths sample is comprised of 47 items (Fig. 4). Before (Demidenko/Škrdla/Rios-Garaizar 2019) it was noted 49 microliths for KSA but then two pairs of the fragmented items had been conjoined that made the discussed stony structure’s final microlith number with 47 now. Complete microliths (27 items) have the following mean metrical data: 0.85 cm long, 0.4 cm wide, 0.1 cm thick. Metrically, the fragmented microliths (20 items) are very similar to the complete pieces. They have such mean indices: 0.67 cm long (fragmented length), 0.41 cm wide, 0.1 cm thick. Their actual metrics are also in such dimensions: 0.6–1.2 cm long, 0.3–0.5 cm wide. Only two fragmented pieces have thickness of greater than 0.2 cm (Fig. 4: 21, 36), while the other 45 microliths are only 0.1 cm thick. Taking into consideration the metrics of the great majority of the Mohelno-Plevovce microliths, it is proposed here to name them “*elongated chips*”. All of the microliths are less than 1.5 cm long and it

is the usual size limit for chips in UP assemblages (e.g. *Demidenko 2012a*, 104), while their rather small width (0.3–0.5 cm) make them of some elongated chip character. Namely, the demonstrated elongation did lead to their often being called microblades and bladelets. Also, the above-noted Mohelno-Plevovce fragmented retouched bladelet and microblade were, high likely, selected for retouching in the already fragmented condition because in this way they corresponded well to the elongated chips' "ideal metrical standards". It is also worth noting that the already published East European data on such microliths correspond well to the Mohelno-Plevovce microliths' blanks metrics. Indeed, numerically few more elongated and wider microliths are present on formally bladelets and microblades (e.g. *Demidenko 2012a*, 96), and most of them were probably chosen for retouching when already fragmented. In such a way, the term "elongated chips" fits perfectly for most of the Sagaidak-Muralovka-type microliths. It can be additionally noted that these "elongated chips" were the basic product of carinated atypical endscraper-cores and the microliths-blanks then, whereas some microlith-blanks can also include bladelets and microblades flaked from "true" bladelet-microblade cores on nodules/chunks. Some further research might indicate a possible link between the availability of high quality raw material sources and the greater use of bladelets and microblades obtained from the "true" cores for microlith production.

### **Microlith morphology and function**

As was shown above, Soviet archaeologists agreed about the presence of some real convergently retouched items among the EASMM microliths in Eastern Europe, even giving them the new established term "Sagaidak-Muralovka points". Now, after studies of Central European EASMM microliths and coming back to the published and unpublished data on the Eastern European EASMM microliths, there is no confidence about the presence of a distinct micro-point type items within the discussed industry type. First, the pointed items have been indeed numerically rare microliths. Second, taking a closer look at the pointed items, a partial convergent bilateral retouch is actually mostly seen at best (Fig. 4: 1, 2, 5, 30–32, 34, 36). As a result, from a strict morpho-typological point of view, most or almost all of the so-called pointed microliths are not in fact points. Moreover, taking all the EASMM microliths, it is again seen that a great deal of them only have a single retouched edge, therefore falling typologically into a laterally retouched microlith type with a continuous marginal abrasion dorsal retouch. At the same time, there are many microliths that often bear some retouch-like facets for another lateral edge, for which they are still usually classified as bilaterally retouched microliths. However, such retouch-like facets are really of irregular and/or partial character, being projectile damage facets – "diagnostic impact fractures" as demonstrated by the use-wear analyses conducted (Fig. 4: 6, 9, 10, 27, 28, 35; 7; *Rios-Garaizar/Škrdla/Demidenko 2019*). The microliths' "diagnostic impact fractures" showed a combination (Fig. 7) or a separate occurrence of axial fractures (burinations, spin-off fractures) and lateral oblique damage. The latter damage can be regarded as the most commonly occurring and such lateral damage always appears in the edge opposed to the retouched back suggesting that namely the retouched back was the inserted edge while the non-retouched edge was the exposed part of a complex organic point. That is why there was actually no need to have regularly and continuously retouched both lateral edges on the microlith-blanks, elongated chips. Hence, these microliths were laterally positioned inserts within projectile organic points of darts/arrows. Although axial fractures are less abundant, they also indicate direct, axial damage was caused, which is the reason some of the armatures were also pointed. Nevertheless, the question still remains open for further studies, if microliths used as tips for organic points were morpho-typologically convergently retouched points or not.

All in all, the newly realized EASMM microlith studies have indeed demonstrated the very dominant use of microliths as projectile weapon armatures. It is one more modern step in the EASMM microlith studies remembering that their exclusive domestic scraping/cutting functions had previously been claimed (e.g. *Filippov 1977*).

### **Microlith production and use efficiency rate**

Following below, the Mohelno-Plevovce KSA and KSB stony structures' assemblage data allow two more studies of the EASMM microliths to be conducted.

First, it is related to some production efficiency data and only the KSA data will be used for this particular study. There are 47 retouched microliths, 22 unretouched complete elongated chips, 6 bladelets and

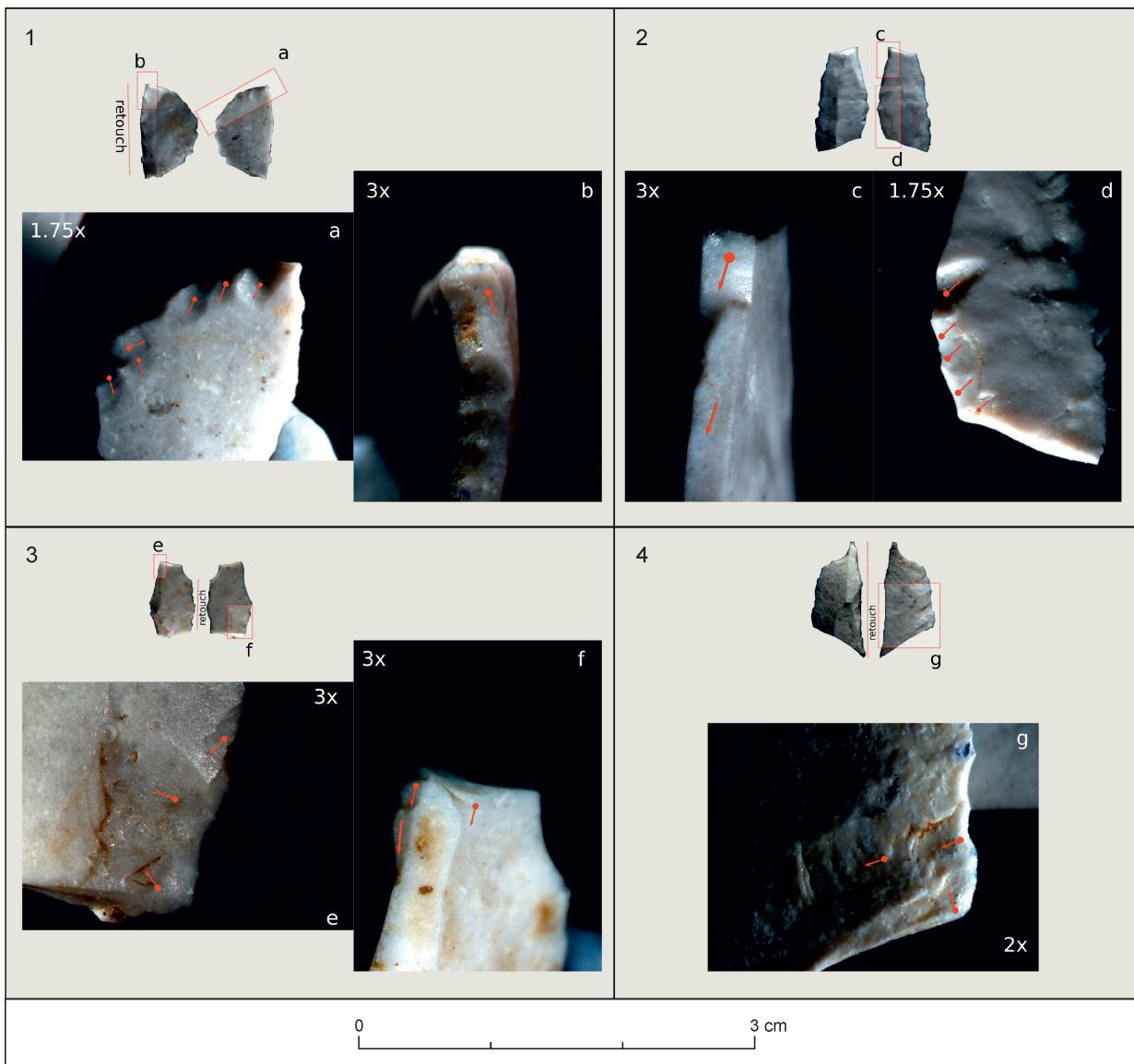


Fig. 7. EASMM Central European site lithic artefacts. Mohelno-Plevovce KSA site Sagaidak-Muralovka-type microliths with diagnostic impact fractures (DIF; modified after *Rios-Garaizar/Škrdla/Demidenko 2019*).

3 microblades in the Mohelno-Plevovce KSA assemblage. Remembering the tiny size of these retouched and unretouched pieces, it is clear that part of the unretouched items was simply lost after their detachment from mostly carinated atypical endscrapper-cores. Such a loss of unretouched tiny pieces also can indirectly explain why many namely retouched microliths were refitted onto carinated atypical endscrapper-cores. Also, some more microliths were probably taken away from the site within the “repaired” and/or newly made hunting projectile weaponry darts/arrows. Accordingly, the retouching rate for the elongated chips and a few bladelets/microblades was very high when almost all potential microlith-blanks were retouched. At the same time, carinated atypical endscrapper-core reduction was also very productive, taking into account the presence of 5 such primary reduction objects and 78 microliths taken together with all their possible blanks, with the mean ratio 1 to 15.6. As a result, although the carinated atypical endscrapper-cores were not curated pieces, they were indeed simple and easy flaking objects for an efficient and serial microlith-blank reduction.

Second, by studying UP microliths, it is also important to analyze a correlation between unretouched complete microlith blanks and all, including the fragmented items, the retouched microliths. In a case of really tiny microliths, only those UP assemblages can be used for such a study when the sites’ artefact-



bearing sediments have been thoroughly dry screened/wet sieved during excavations. One of our team members (Yu. D.) has already realized such studies for Siuren I Aurignacian assemblages excavated in the 1990s in Crimea, Ukraine (*Demidenko 2012b*). Siuren I Proto-Aurignacian and Late/Evolved Aurignacian assemblages demonstrate varying correlation data for microliths and unretouched complete *lamelles*. The Siuren I Units H and G Proto-Aurignacian record with a dominant Dufour sub-type microlith use as lateral component inserts for organic projectile points shows the basic prevalence ratio of microliths over complete blanks, 1 complete blank vs 2.59 retouched microliths. Directly opposite, the Siuren I Unit F Late/Evolved Aurignacian data, being mainly characterized by Roc de Combe sub-type microlith functioning as binary tips of arrow heads, display the presence of much fewer microliths in comparison to complete blanks, 1 complete blank vs 0.18 retouched microliths.

Again, of all the currently known EASMM sites, only Mohelno-Plevovce can be used for such a study after wet sieving its entire artefact bearing sediments, although Rosenburg site sediments were also wet sieved but only partially. The so-far classified lithic artefacts of Mohelno-Plevovce, two stony structures KSA and KSB, are characterized by similar ratios of blanks (mostly complete elongated chips and a few bladelets/microblades for each stony structure) to microliths, 1 vs 1.52 for KSA, 1 vs 1.65 for KSB. These Mohelno-Plevovce EASMM microliths to blanks ratios correlate well enough with the Siuren I Proto-Aurignacian data and might indirectly indicate the already suggested predominant use of the EASMM microliths as lateral inserts of projectile organic points but more work on the subject would be desirable on this point.

## CONCLUSION

The above-represented Eastern and Central European LGM EASMM industry type data allow us to propose the following few considerations.

The discussed carinated atypical endscraper-cores and Sagaidak-Muralovka-type microliths on elongated chips are indeed EASMM lithic artefact fossil types. Moreover, the two technologically interconnected artefact types make EASMM a distinct Early Late UP industry type. At the same time, EASMM does not have any Epigravettian lithic artefact features, like systematic blade, blade/bladelet or bladelet core reduction and truly backed microlith manufacture on bladelets. Conformably, EASMM cannot be regarded as a separate facies or industry type within Early Epigravettian *sensu stricto* in both Eastern and Central Europe either. At the same time, neither Early Epigravettian assemblage of Kašov I, upper layer nor Ságvár industry types in Eastern Central European have the serial and fundamental presence of both EASMM carinated atypical endscraper-cores and Sagaidak-Muralovka-type microliths. Of course, there are a few similar items there, like any Palaeolithic assemblage having a few weird lithics, but they are just “random noise specimens” against the truly Epigravettian background in the sites’ lithic collections of Kašov I, upper layer and Ságvár industry types.

Here, it is also worth remembering the excavation recovery subject for the EASMM microliths in Eastern Europe. Before one of our team members (Yu. D.) undertook field work with a double dry screening of all artefact bearing sediments at the Anetovka I site in 2005–2006, all excavations at 6 EASMM sites, aside from the just excavated test pits at the Mikhailovskaya Balka site, were conducted last century with no dry screening/wet sieving procedures, although (*sic*) these still thorough excavations did lead to the discovery of serial tiny microliths at all the sites. The best example of such non-screening/sieving but fine excavations is Praslov’s work at the Muralovka site in 1964 and 1967 when he and his team still found 158 retouched microliths composing more than 40% of all found tools (*Praslov 1972; Praslov/Filippov 1967*). Of course, systematic dry screening/wet sieving would lead to the recovery of more microliths than but still good excavations with just knives have been enabling these tiny tools’ good series discovery. Accordingly, the sediment screening/sieving that was not conducted at true Early Epigravettian sites excavated some years ago cannot serve as an indirect argument for claims on the still possible hypothetical presence of Sagaidak-Muralovka-type microliths within the Epigravettian assemblages.

Finally, the above-described endscraper-cores and microliths data can have some implications for our understanding of the Late UP human use of EASMM sites. Some significant variability appears in the use of various raw material types and their artefact categories at different sites and their particular loci. The best example for such a study so far is also the Mohelno-Plevovce site.

On the one hand, when sites are located far away from the outcrops of the basic raw material used, as is the case with the Mohelno-Plevovce KSA assemblage where erratic flints (very distant for the site's raw material) reach up to ca. 70% of all artefacts and all carinated atypical endscraper-cores and microliths are of this raw material, curated erratic flint pieces brought to the site, were cores and pre-cores. Also, some hunting projectile weaponry with microliths inside darts/arrows and a few domestic tools (like transversal burins on lateral retouch rejuvenated in the same manner multiple times; Fig. 3B: 6, 7) were also among the pieces brought. Cores mainly served for flake reduction producing blanks for both carinated atypical endscraper-cores (aiming to manufacture then some more microliths to “repair” and produce some new hunting equipment) and “domestic” tools used during processing of killed ungulates. Some local raw materials also supplied a little for these on-site lithic treatment processes. After a short stay at the KSA loci, humans were moving away taking with them again the most important curated pieces, cores/pre-cores, and in addition hunting projectile weaponry and a few domestic tools. Accordingly, such EASMM lithic exploitation system could be named “circulating/residential mobility system” (e.g. Marks/Freidel 1977) that is logical for the LGM sites.

On the other hand, the Mohelno-Plevovce KSB assemblage represents some differences for the lithic exploitation system with the same EASMM artefacts used. There is no more than ca. 10% of all pieces of distant erratic flint, while up to ca. 70% of all artefacts are of local rock crystal. So, it is like a reverse order of the raw materials used in comparison to the KSA assemblage. There microliths are on both erratic flint (mostly brought to the site within darts/arrows) and rock crystal being very mostly produced from bipolar anvil cores. And it looks like KSA was the first EASMM loci at Mohelno-Plevovce and KSB was next in the time loci when EASMM humans already knew about local rock crystal outcrops. There is already one such rock crystal source identified ca. 400 m from the site. So, KSB shows still the same “circulating/residential mobility system” but with much more supply for lithic reduction on the part of local raw materials.

The materials of the two more EASMM stony structures already found at the Mohelno-Plevovce site where one of them was also excavated (KSE) “open more doors” for further research on basic and specific lithic exploitation EASMM industry type data and their humans’ life styles in Eastern Central Europe.

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## Epiaurignacká industrie s mikrolity typu Sagaidak-Muralovka v období posledního glaciálního maxima na jihu východní Evropy a ve východní části střední Evropy a její vůdčí artefakty

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### Souhrn

Poslední glaciální maximum (LGM), které započalo s Heinrichovým eventem (HE) 2 přibližně 26,5 ka cal BP a skončilo 19 ka cal BP, mělo výrazný dopad nejen na klima a environment, ale i na osídlení Evropy. V té době mizí pan-evropský gravettský technokomplex a je nahrazován novými technokomplexy. V západní Evropě solutréenem a badegouliem, ve východní části se tyto nové technokomplexy obecně zahrnují pod pojem epigravettien. Jedním z těchto technokomplexů objevujících se na počátku LGM *sensu stricto* je epiaurignacien s mikrolity typu Sagaidak-Muralovka (EASMM). Tento technokomplex a zejména jeho vůdčí typy (*fossile directeur*) jsou detailně analyzovány na následujících řádcích.

Studium LGM industrií je ovlivněno různými pohledy archeologů. Obvykle je posuzováno v chronologickém smyslu jako postgravettské industrie (*Svoboda/Novák 2004*), případně časný epigravettien (*Lengyel 2018*). My ale v současnosti rozlišujeme nejméně pět typů industrie v období LGM ve východní části střední Evropy – EASMM, dva typy epigravettských industrií (jmenovitě Kašov I, svrchní vrstva, a Ságvár), časný badegoulien s industrií typu Kammern-Grubgraben a blíže nespecifikovanou industrií typu Stránská skála IV.

EASMM industrie byly nejdříve popsány ve východní Evropě (*Demidenko 2007; 2008; Demidenko/Škrdla/Rios-Garaizar 2019*) a zahrnují lokality Raškov VII a VIII v Podněstří (Moldávie); Sagaidak I a Anetovka I v západní části severního Přičernomoří (Ukrajina); Muralovka, Zolotovka I a Mikhailovskaya Balka ve východní části Azovského moře a na spodním toku Donu (Rusko; obr. 1). V poslední dekádě došlo k objevu téměř identických industrií ve východní části střední Evropy, konkrétně na lokalitě Mohelno-Plevovce (*Škrdla et al. 2016*) a k technokomplexu byla taktéž přidána (*Demidenko/Škrdla/Rios-Garaizar 2019*) lokalita Rosenberg (*Ott 1996*), již v roce 1988 zkoumaná G. Trnkou.

Vůdčí typy EASMM industrií představují atypická karenoidální škrabadla-jádra a mikrolity typu Sagaidak-Muralovka.

### Atypická karenoidální škrabadla-jádra

Tento typ poprvé rozpoznal *N. D. Praslov (1972)* na základě analýzy materiálu z lokality Muralovka. Popsal vysoká škrabadla, která sloužila jako jádra na miniaturní retušované čepelky a hrůtky. Bohužel *Praslov* nezavedl jednoznačný termín pro tento typ artefaktu. *Yu. E. Demidenko (2004; 2008)* proto navrhl termín atypické karenoidální škrabadlo, které později, s ohledem na technologické aspekty, modifikoval na atypické karenoidální škrabadlo-jádro (*Demidenko/Škrdla/Rios-Garaizar 2019*). Materiál z Mohelna-Plevovců, kde byl na rozdíl od předchozích výzkumů podobných lokalit veškerý sediment plaven, se podařilo přiložit retušované mikrolity typu Sagaidak-Muralovka I i neretušované karenoidální úštěpy na tato škrabadla. Hypotéza, že tato škrabadla sloužila nejen jako škrabadla (řada z nich sloužila po vyčerpání jako skutečná škrabadla – stopy po opracování suché kůže a tvrdého organického materiálu, *Rios-Garaizar/Škrdla/Demidenko 2019*), ale i jako jádra na polotovary mikrolitů, byla potvrzena.

### Mikrolity typu Sagaidak-Muralovka

Těchto mikrolitů si všiml již *N. D. Praslov (1972)*, který rozlišoval mikrohroty a retušované čepelky, později *S. P. Smol'yaninova (1990)* zavedla termín mikrohroty typu Sagaidak-Muralovka. Později navrhl *Yu. E. Demidenko (2007)* zahrnout všechny tyto mikrolity do společné kategorie mikrolity typu Sagaidak-Muralovka s jemnou dorsální okrajovou abrazivní retuší, laterálně nebo bilaterálně, vyrobených na úštěpících a zkrácených (metricky) čepelkách. Ačkoli již *N. D. Praslov (1972)* správně rozpoznal, že tyto mikrolity byly vyráběny na úštěpících z vysokých škrabadel, byl to až materiál z Mohelna-Plevovců, který umožnil bližší analýzu polotovarů těchto mikrolitů. Metrická data pro celé mikrolity ze struktury KSA jsou následující: průměrná délka 0,85 cm, průměrná šířka 0,40 cm, průměrná tloušťka 0,1 cm. Technologicky jde o prodloužené úštěpky, které většinou pochází z atypických karenoidálních škrabadel-jader, ale využity byly i čepelky (často již ve zlomeném stavu) těžené s čepelkových mikrojad. V budoucnu bude zajímavé sledovat vazbu zmíněných polotovarů na kvalitu použité suroviny. Analýza tvaru mikrolitů ukázala, že charakteristických mikrohotů je v souboru poměrně málo a mnohé jsou neúplně charakteristické, pouze částečně

konvergentně retušované. Převládají tedy nehrotité exempláře. Traseologická analýza ukázala (*Rios-Garaizar/Škrdla/Demidenko 2019*), že některé fasety představují odštípnutí po impaktu – buď axiálního, nebo šikmo na hranu anebo jejich kombinaci. Tyto mikrolity tak lze interpretovat jako laterálně vsazené součásti komplexních hrotů z organického materiálu.

Analýza jednotlivých kamenných struktur naznačila jisté rozdíly mezi soubory ze zkoumaných kamenných struktur (KSA a KSB) a zahrnutí dalších, dosud detailně nezpracovaných souborů (KSE a KSD) jistě otevře více otázek pro studium EASMM industrií ve východní části střední Evropy.

Obr. 1. Mapa střední a východní Evropy s lokalitami EASMM. Vytvořeno v Google Earth, zdroj Landsat, uloženo 12/14/2015. Pohled z výšky 2257,98 km.

Obr. 2. Artefakty EASMM ve východní Evropě. A – 1–10 – karenoidální škrabadla-jádra; 11, 12 – mikrojádra na produkci prodloužených úštěpů/mikročepelí; B – 1–38 – mikrolity typu Sagaidak-Muralovka. A – 1–3; B – 1–14 – Sagaidak I (modifikováno podle *Smol'yaninova 1990*); A – 4–7; B – 15–38 – Muralovka (modifikováno podle *Praslov 1972*); A – 8–12 – Anetovka I (modifikováno podle *Demidenko/Škrdla/Rios-Garaizar 2019*).

Obr. 3. Artefakty EASMM ve střední Evropě. A – 1–3 – mikrojádra na produkci prodloužených úštěpů/mikročepelí; 4–6 – karenoidální škrabadla-jádra; 7–30 – mikrolity typu Sagaidak-Muralovka; B – 1–5 – karenoidální škrabadla-jádra; 6, 7 – sekundární rydlový odpad přiložený na příčné rydlo na laterálně retušované hraně. A – Rosenberg (modifikováno podle *Ott 1996*); B – Mohelno-Plevovce KSA (modifikováno podle *Demidenko/Škrdla/Rios-Garaizar 2019*).

Obr. 4. Artefakty EASMM ve střední Evropě. Mohelno-Plevovce KSA. 1–36 – mikrolity typu Sagaidak-Muralovka (modifikováno podle *Demidenko/Škrdla/Rios-Garaizar 2019*).

Obr. 5. Artefakty EASMM ve střední Evropě. Mohelno-Plevovce KSA. Osm mikrolitů typu Sagaidak-Muralovka přiložených k atypickému karenoidálnímu škrabadlu-jádru (modifikováno podle *Demidenko/Škrdla/Rios-Garaizar 2017*).

Obr. 6. Artefakty EASMM ve střední Evropě. Mohelno-Plevovce KSA. a – atypická karenoidální škrabadla-jádra s pracovními stopami po opracování suché kůže, b – tvrdý organický materiál.

Obr. 7. Artefakty EASMM ve střední Evropě. Mohelno-Plevovce KSA. Mikrolity typu Sagaidak-Muralovka s diagnostickými lomy následkem impaktu (DIF; modifikováno podle *Rios-Garaizar/Škrdla/Demidenko 2019*).

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