# USE OF OBSIDIAN DURING THE LGM: CASE STUDIES FROM THE PEBBLE GRAVETTIAN SITES IN HUNGARY

## AZ OBSZIDIÁN FELHASZNÁLÁSA A KAVICSGRAVETTI LELETEGYÜTTESEKBEN: ESETTANULMÁNYOK AZ UTOLSÓ HIDEG MAXIMUM IDEJÉBŐL

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### *Abstract*

*The few obsidian sources in continental Europe are found in the Carpathian basin: in eastern Slovakia, north-eastern Hungary and the Transcarpathian Ukraine. In archaeological context, after the questionable data from the Lower Palaeolithic, the use of this raw material is securely known from the last Interglacial period.*

*During the last Würmian Pleniglacial and in a few millennia after it large part of Central Europe was more or less depopulated: very few traces of the human occupation were identified from the areas lying north of the Carpathians and the Alps. In Hungary, however, important sites of the Pebble Gravettian industry are known: at Ságvár, south of the lake Balaton two discrete artefact-bearing layers, at Mogyorósbánya in the NE part of the Transdanubia three relatively well preserved settlement spots were excavated. The lithics from Szob, lying in the Ipoly valley in the Danube bend give supplementary data about this industry.*

*The studied obsidian artefacts are mainly of the Slovakian variant, imported to the sites from more than 200 km; the Tolcsva and Mád types are represented only by single pieces. The majority of the artefacts are linked to the bladelet production, used as blanks for backed pieces. The bladelets were partly removed from cores, but burins of various forms are also considered as cores in technological point of view. Finally some larger pieces were seemingly imported to the sites as ready-made tools (convergent scraper and end-scrapers).*

### *Kivonat*

*A szárazföldi Európában obszidián-forrásokat kizárólag a Kárpát-medencéből: Kelet-Szlovákiából, Északkelet-Magyarországról és Kárpátaljáról ismerünk. Régészeti környezetben a vitatható alsó paleolitikus adatoktól eltekintve az utolsó interglaciálistól biztosnak tekinthető a nyersanyag használata.*

*Az utolsó hidegmaximum idején és az azt követő néhány évezred során Közép Európa jelentős része többé-kevésbé elnéptelenedett, mivel az Alpoktól és a Kárpátoktól északra eső területeken nagyon kevés emberi megtelepedésre utaló nyomot ismerünk. Ugyanakkor Magyarország területéről fontos kavicsgravetti lelőhelyeket ismerünk: a Balatontól délre fekvő Ságváron két jól elkülönült kultúrréteg, a Dunántúl északkeleti részén, Mogyorósbányán három elkülönült települési folt került feltárásra. Végül a Duna-kanyari Szob kőeszközei egészítik ki az iparról alkotott képet.*

*A vizsgált obszidián eszközök jórészt szlovákiai obszidiánból készültek, melyek forrásai a lelőhelyektől több mint 200 km-re esnek. Ugyanakkor a tolcsvai és mádi változatok csak szórványosan fordulnak elő a leletanyagokban. A leletek zömmel a tompított eszközök kialakítására használt mikropengék előállításához kapcsolódnak, melyeket részben magkövekről, részben (technológiai szempontból szintén magkőként értelmezett) árvésőkről választottak le. Ezek mellett néhány eszközt kész formában hoztak be a lelőhelyekre.*

KEYWORDS: OBSIDIAN, PEBBLE GRAVETTIAN INDUSTRY, BURIN-CORE

KULCSSZAVAK: OBSZIDIÁN, KAVICSGRAVETTI IPAR, ÁRVÉSŐ-MAGKŐ

## *Obsidian sources in the Carpathian basin*

In the continental part of Europe obsidian sources are known exclusively from the Carpathian basin, where this volcanic glass is found in perlite, rhyolitic tuff, slope sediment or alluvial formations. In archaeological literature the use of this raw material, generally easy to recognise with a bare eye was reviewed several times (e.g. Rómer 1867; Jansák 1935; Gábori 1950; Biró 1984; 2014; Kaminská 1991).

The geological description of the classical obsidian sources in the southern part of the Hegyalja region was performed by J. Szabó (1867) and Gy. Szádeczky (1886) in the 19th century.

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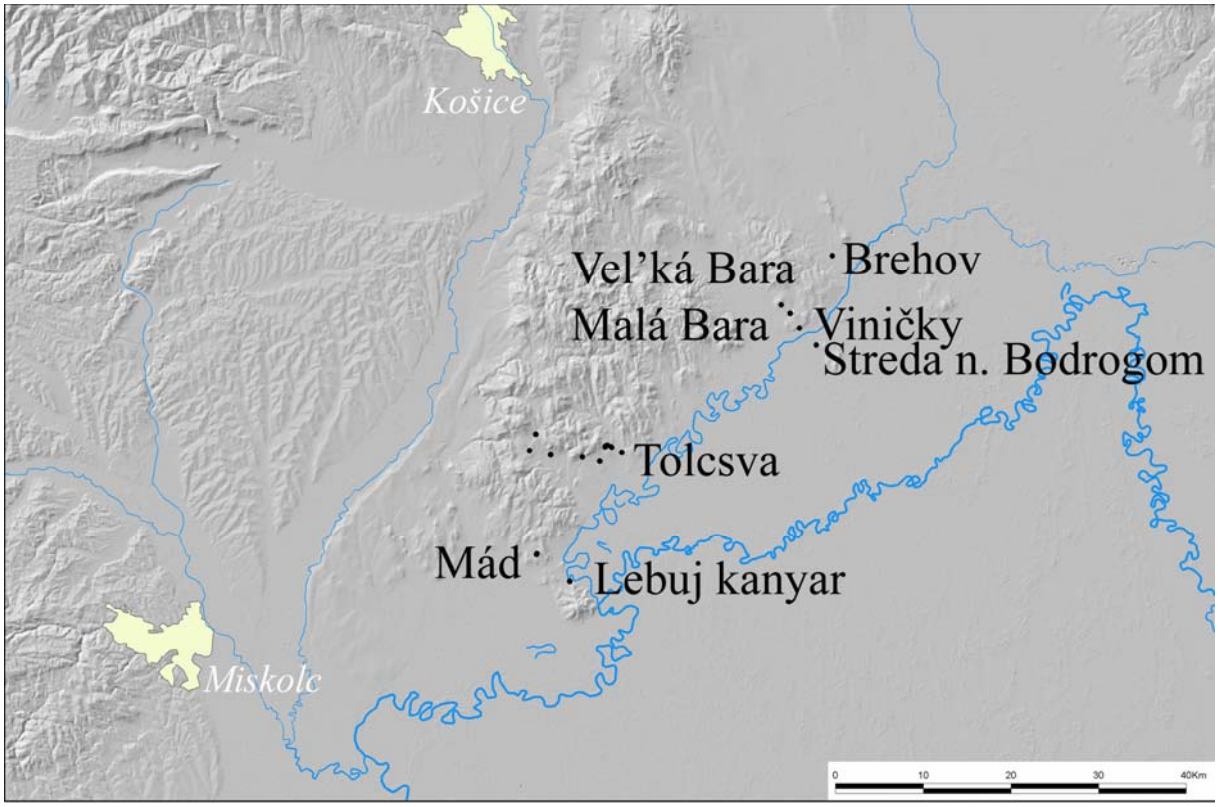


**Fig. 1.:** The obsidian sources in Slovakia and Hungary
**1. ábra: O**bszidián források Szlovákiában és Magyarországon

The rich outcrops from the northern part of the Tokaj-Prešov hills (Ivan, 1964), and in the region of the Transcarpathia (Petrun', 1972) were summarised in the second half of the 20th century.

Since the 1970s the term 'Carpathian obsidian' was introduced (Nandris et al. 1977), which became generally accepted and used today. Regrettably, in the recent paper by Rosania et al. (2008) the same term was used for a number of volcanic glasses, including perlite too. Bearing in mind the terminological problems pointed out by Biró et al. (1986, note 1) and Biró (2014, 49-50), in this paper instead of 'Carpathian' we use the term 'Slovakian obsidian' for the best quality, transparent-translucent variants (former Carpathian I or C1). The classical outcrops of this type, similar to the raw material of the archaeological artefacts from the vast region of Central Europe are found in the north-eastern part of the 'obsidian region', at Viničky, Streda nad Bodrogom, Vel'ka Bara and Malá Bara (all in Slovakia). For the time being the most important source of the Slovakian obsidian is localised in the alluvial source near Brehov first described by Janšák (1935, 56-57, see: Přichystal & Škrdla 2015, **Fig. 1.**).

In the southern part of the Hegyalja region two main macroscopic groups could be distinguished (Hungarian or Carpathian II or C2 variants).The non-transparent black or the exceptionally rare 'mahogany' coloured Tolcsva-type (Carpathian 2T or C2T) is typical for the southern slopes of Szokolya hill. As the same type is also collected in the vicinity of Erdőbénye, for the grey coloured obsidian we refer as the Mád-type (instead of Erdőbénye-Mád, Carpathian 2E or C2E type).

The interest of this paper is clearly of archaeological nature; for the results of the recent scientific investigations of each macroscopic type the paper by Kasztovszky et al (2017) is recommended.

## *The Pebble Gravettian industry*

Since the 1950s two Late Upper Palaeolithic industries were recognised in the uppermost loess layers in Hungary. These artefact-bearing levels are generally found in two embryonal soil horizons, marked as the $h_1$ and $h_2$ horizons by Pécsi (1975) and correlated with the Laugerie and Lascaux climatic oscillations by Gábori-Csánk (1978). During the archaeological excavations, dominantly reindeer and horse remains were found, typical for the Pilisszántó faunal phase (Late Würmian period).

The 'Pilismarót group' or the Epigravettian entity, known mainly from the Danube bend and more recently from the northern part of the Great Hungarian Plain is characterised by rather typical blade industry (Dobosi 1996).

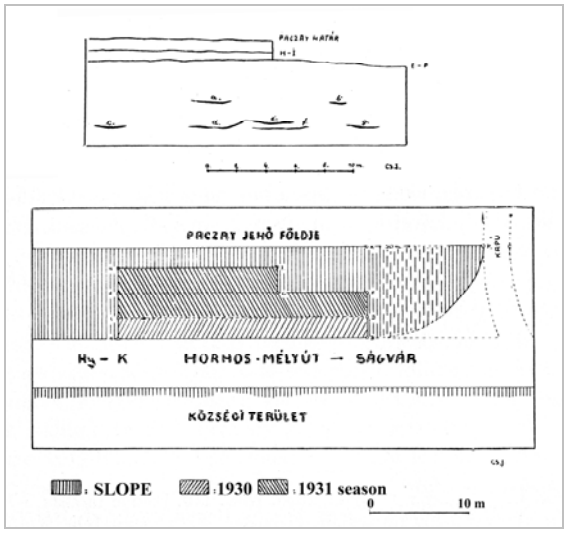


**Fig. 2..** Ságvár: the 1930-31 excavations (after Csalagovits et al. 1931, modified)

**2. ábra:** Ságvár: az 1930-31. évi ásatások (Csalagovits et al. 1931 nyomán, módosítva)

The most important traits of several assemblages are the predominant use of the pebble raw material and the production of short blanks (e.g. Gábori 1964, 32-34). For a long time the most important locality of this pebble using industry was Ságvár, lying south of the Lake Balaton in the Transdanubia. At this site, excavated by D. Laczkó, S. Gallus and J. Hillebrand between 1922 and 1945 and by M. Gábori from 1957 until 1959, two discrete artefact-bearing layers were documented (**Fig. 2.**). The recent analysis of the lithic assemblages, however, proved direct refits among the artefact-bearing layers basically from the last excavations. This led Gy. Lengyel (2010) to suppose that a single occupation was disturbed during or after the sedimentation and the excavated layers were formed by taphonomic processes, e.g. the activity of the powerful roots of arboreal vegetation (Lengyel 2010, Fig. 4.).

In fact, however, the field reports on the last excavations (Gábori 1959; 1964; 1965; Gábori & Gábori 1958) clearly show, that the upper layer (with two dwelling structures, numerous postholes and fireplaces, and several large antler artefacts excavated in horizontal position) was rather well preserved and in the little sound exposing the lower layer only a few and not characteristic lithics were found. Moreover, during the stratigraphic studies (Gábori & Gábori 1957; Krolopp & Sümegi 2002) of the exposure no important disturbances were detected and as V. Gábori-Csánk (1978, 7) reported, at Ságvár

*"Les traces des racines indiquent une végétation steppeique et elles sont remlies le plus souvent de cristaux calcaires. Les courbes granulométrique n'indiquent pas non plus la lehmification; elles se présentent sous forme des lignes presque droites comme celles des loess typiques".*

Finally, the difference of 1100 year between the radiocarbon ages of the two layers (**Table 1.**) separated by a 1.2 m thick loess layer clearly indicate the in situ character of both the sediment and the excavated archaeological features. This way, in our view all the available data suggest, that two well defined and rather well preserved artefact-bearing layers were excavated at Ságvár and the mixing of the artefacts could only have been happened between the end of the last excavations (1959) and the inventorying of the lithic artefacts (1973).

Because of these serious problems and the nearly total lack of field documentations we suggest that the term 'Ságvárian industry' (Tolnai-Dobosi 2001) is not adequate for this archaeological entity. Instead, we use 'Pebble Gravettian', referring to the characteristic raw material of these assemblages.

The multi-layer site of Szob – Ipoly-part in the Danube bend was discovered and excavated by Horváth, A. J. before 1945. In 1963-1966 M. Gábori during his rescue excavations could document a single artefact-bearing layer (most probably the upper unit by Horváth). Unfortunately no radiocarbon dates are known from this locality.

Obsidian artefacts were found only in the 'Lower layer' excavated in the 1930s and 1940s, from where only 129 lithics including 25 tools are stored today in the Palaeolithic collection of the Hungarian National Museum. In spite of the low number of the artefacts, the character of these artefacts clearly point to the same industry as the Ságvár assemblage (Markó 2007).

On the site Mogyorósbánya – Újfalusi-dombok (**Fig. 3**.) three discrete settlement units were excavated by V. Dobosi between 1984 and 2009 (Dobosi 1992; 2002; 2011; 2016). The in situ documented part of spot I and II reached 40 and 30 square meters, while spot III is the largest and richest Upper Palaeolithic settlement unit in Hungary with more than 300 excavated square meters and around 5600 lithic artefacts (**Table 2.**).

The more than 8000 lithics, 90 fossil mollusc, foraminifera and coral skeletons and a piece of amber, found in a clear stratigraphic position, associated by two 20-19 thousand years old not calibrated radiocarbon dates (**Table 1.**) and the remarkable large mammal fauna make possible the complex analysis of this site of Central European importance. The detailed analysis of the assemblages started in 2016.

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**Table 1.:** Radiocarbon data from the studied sites

**1. táblázat:** A vizsgált lelőhelyek radiokarbon adatai

| lab. code | $^{14}$C date (BP) | cal BC (95.4)[1] | excavated unit | material | feature | reference |
|---|---|---|---|---|---|---|
| GrN-1959 | 17.760±150 | 19.936 – 19.089 | Ságvár - Lyukas domb, upper layer | charcoal | dwelling structure | Vogel & Waterbolk 1964 |
| GrN-1783 | 18.900±100 | 21.077 – 20.541 | Ságvár - Lyukas domb, lower layer | charcoal | fireplace | Vogel & Waterbolk 1964 |
| Deb–8821 | 19.770±150 | 22.229 – 21.468 | Ságvár, „cultural layer” | charcoal | | Krolopp & Sümegi 2002 |
| Deb–8822 | 18.510±160 | 20.775 – 19.984 | Ságvár, „cultural layer” | mollusc shell | | Krolopp & Sümegi 2002 |
| Deb-1169 | 19.930±300 | 22.837 – 21.237 | Mogyorósbánya II | charcoal | fireplace, square M/1 | Dobosi 1992 |
| Deb-9673 | 19.000±250 | 21.560 – 20.449 | Mogyorósbánya III | charcoal | fireplace, square ß/18 | Dobosi & Szántó 2003 |

**Table 2.:** Some data of the Mogyorósbánya settlement spots

**2. táblázat:** A mogyorósbányai települési foltok főbb adatai

| | **Mogyorósbánya I** | **Mogyorósbánya II** | **Mogyorósbánya III** | **Total** |
|---|---|---|---|---|
| excavated area (square meters) | 40 | 30 | 330 | **400** |
| number of excavated lithics | 1409 | 1016 | 5606 | **8029** |
| Slovakian (C-1) obsidian | 33 | 72 | 135 | **240** |
| Mád-type (C-2E) obsidian | | 3 | 1 | **4** |
| Tolcsva-type (C-2T) obsidian | | 1 | 6 | **7** |
| **Total obsidian artefacts** | **33** | **76** | **142** | **251** |
| **%** | **2.34%** | **7.48%** | **2.53%** | **3.13%** |

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**Fig. 3..** Mogyorósbánya: the excavated settlement spots
**3. ábra:** Mogyorósbánya: a három feltárt települési folt

The 145 refit groups documented until now show that both the preservation of the artefact bearing layers and the methods of the excavations were sufficiently good for a detailed analysis of the Pebble Gravettian industry. In this paper we discuss the aspects of the studies on the obsidian artefacts excavated from this site.

## *Obsidian in the Pebble Gravettian assemblages: Ságvár, Szob and Mogyorósbánya*

The presence of obsidian from Ságvár was first reported by M. Gábori (1964, 38). During the early archaeometrical projects several pieces were analysed by destructive methods (e.g. obsidian hydration dating and electron energy dispersive X-ray spectroscopy: OHD and EDS); the results of seven analyses of the Carpathian I group were published by Biró and her colleagues (1986). The remaining samples of three flakes, unfortunately from unknown layer are stored in the Lithotheca collection (under the inventory numbers of L.88/25 and L.97/290). Moreover, from the material of the 1930 excavations two flakes were submitted to the University of Michigan, Ann Arbor in 1970 and another piece to the Consiglio Nazionale delle Ricerche Instituto per le Technologie Applicate, Rome in 1984. Today only a heavily reduced end-scraper of Slovakian (Carpathian I) obsidian excavated during the same season is found in the collection of the Hungarian National Museum (**Fig. 4.**).

At the same time, several pieces published as made of obsidian (Gábori 1964, 32, I. tábla 25; Csongrádiné Balogh 2000,5, II. tábla 10; 19, XXIII. tábla 7; Biró 1984, Fig. 8, 8-9) was recently studied by PGAA and proved that they are made of siliceous rocks (radiolarite and flint). As a summary we suggest that

1. in 1930 at least four obsidian artefacts were excavated in the northern part of the Ságvár site, in the lower layer (c.f. Csongrádiné Balogh 1997, 20),

2. each analysed piece, collected during the same season at the same part and the same layer of the site, partly in unknown places belong to the Slovakian (Carpathian I) obsidian, and finally

3. the presence of chips and flakes in the excavated assemblage, destroyed during the sample preparation but published on drawings by Takács-Biró (1981, 141, Fig. 2, 6a-c) prove the local manufacturing or rejuvenation of the artefacts made of this extralocal raw material.

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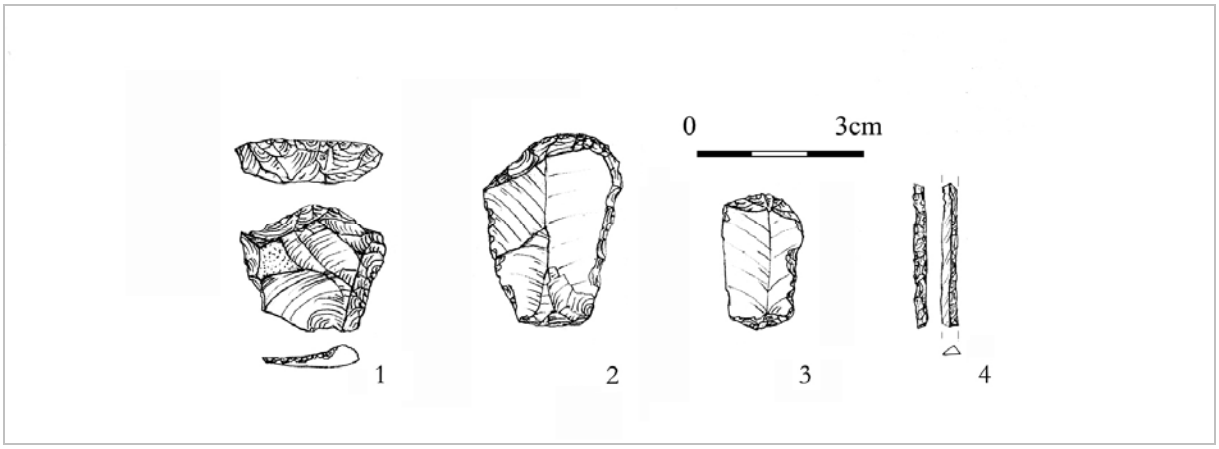


**Fig. 4.:** Ságvár: tools of obsidian (1), flint (2) and radiolarite (3-4) (drawings by K. Nagy)
**4. ábra:** Ságvár: obszidián (1), tűzkő (2) és radiolarit (3-4) eszközök (Nagy K. rajza)

In the little assemblage of the lower layer of Szob as a total of 7 obsidian artefacts were found, five of them, including a single-platform core, a short end-scraper, a retouched flake and a burin spall were made of the Slovakian (Carpathian 1) variant. The raw material of a convergent tool and a burin was the Tolcsva (Carpathian 2T) type obsidian.

The richest assemblages were excavated in Mogyorósbánya, where certain spatial information is also available, even if the base maps are not completed yet. In settlement spot I 33 pieces of obsidian, exclusively of Slovak variant were excavated (**Table 2., 3.**). Two little find concentrations were observed in the western and middle part of the excavated trench with eight and seven obsidian artefacts. In the first one (in square G5) a single platform core (**Fig. 5/7**), a retouched blade (**Fig. 5/8**) and the atypical burin of refit group 69 (**Fig. 5/4**) was documented, in the later one (squares G3 and H11) a retouched and a backed bladelet (**Fig. 5/10-11**) and some blades were found.

During the excavations of settlement spot II 47 obsidian artefacts were collected in the southern part of the trench (squares M1-10), 21 of them in the south-eastern corner, around the radiocarbon-dated fireplace.

Finally, in settlement spot III a relatively dense concentration of obsidian bladelets and chips was documented in the eastern part of the excavated surface (19 pieces in square β/8).

The typological composition of the obsidian assemblages from Mogyorósbánya (**Table 3.**) reflect the strong preference of bladelet production and the importance of retouched and backed pieces. Characteristic forms are the notched-backed bladelets (**Figs. 5/11 and 6/1**), the pieces modified at their base (**Fig. 6/10**) and wearing fine marginal retouch along the edges. Importantly, some burin spalls with twisted profile were retouched also, suggesting that some burins, forming the most numerous groups of the formal tools on typological ground might have served as bladelet cores.

Typically, a burin from Mogyorósbánya I (**Fig. 5/2**) and two other ones from the southern part of Mogyorósbánya III (**Figs. 7/5-6.**) in technological point of view are little exhausted cores, made on flakes or flake fragments. A burin-core made on a cortical flake was found on the north-eastern part of the same settlement spot (**Fig. 7/2.**). This later form is rather characteristic for the Pebble Gravettian industry, as it is known of several raw material types from Mogyorósbánya, as well as from Ságvár and Szob assemblages (Markó in press).

The on-site removal of burin spalls from an end-scraper of obsidian is documented by refit group 71 (**Fig. 6/6.**) with the elements excavated in the SE corner of the Mogyorósbánya II surface. For a closer look, the scars observed on the proximal part of the end-scraper show that the manufacturing history of this piece did not end with the removal of the burin spall bearing the part of the retouched end-scraper edge on the distal part. In technological point of view these spalls could create the convexity of the flaking surface of the micro- or nano-blade cores (made on formal tools, i.e. end-scrapers), similar to the distal crest on the typical blade and bladelet cores. As burin spalls, removed from end-scrapers are known not only of obsidian (**Fig. 6/7.**) but also of flint and radiolarite, these pieces are regarded as characteristic elements of the industry too (see: Markó in press).

**Table 3.:** Obsidian artefacts from Mogyorósbánya

**3. táblázat:** Mogyorósbányai obszidián leletek

| | Mogyorósbánya I | Mogyorósbánya II | Mogyorósbánya III | Total |
|---|---|---|---|---|
| end-scraper | 2 | 1 | 1 | **4** |
| burin | 4 | 1 | 6 | **11** |
| end-scraper-burin | | 1 | | **1** |
| retouched blade | 2 | 4 | 2 | **8** |
| truncated blade | | 1 | | **1** |
| retouched/backed bladelet | 2 | 6 | 12 | **20** |
| retouched/backed burin spall | 1 | 5 | 5 | **11** |
| retouched flake | | 2 | | **2** |
| fragment of a retouched tool | | | 1 | **1** |
| **Total tools** | **11** | **21** | **27** | **59** |
| core | 2 | | | **2** |
| blade and fragments | 5 | 8 | 26 | **39** |
| bladelet and fragments | 3 | 13 | 8 | **24** |
| burin spall | 3 | 6 | 10 | **19** |
| flake | 2 | 8 | 17 | **27** |
| chip | 7 | 20 | 54 | **81** |
| **Total** | **33** | **76** | **142** | **251** |

Refit groups 69 and 70 prove the on-site reduction of rather atypical transversal burins (**Figs. 5/1, 5/4**.). Importantly, the refitted pieces are not burin spalls in morphological point of view; however, the classification of the tools as burins or burin-cores is rather evident. The intensity of the burin spall removal or bladelet reduction is illustrated by the fragmentation of refit group 72 (**Fig. 6/5.**).

The elements of these refit groups were found in the same excavation units (trench and square meter), documenting the intactness of the artefact-bearing layer. The pieces of refit group 53 depicted on **Fig. 7/3.** were also excavated in neighbouring squares, and however, a recently identified element of the same group was found several meters away, suggesting that the piece was transported between the removals of the blanks.

As no sieving was practiced during the excavations, the thin and less than 1cm long, transparent burin spalls or bladelets were probably not found in every case during the field works. This way, our hypothesis about the use of certain burins as cores should be tested by the analysis of the pieces of local raw materials of the Mogyorósbánya assemblages.

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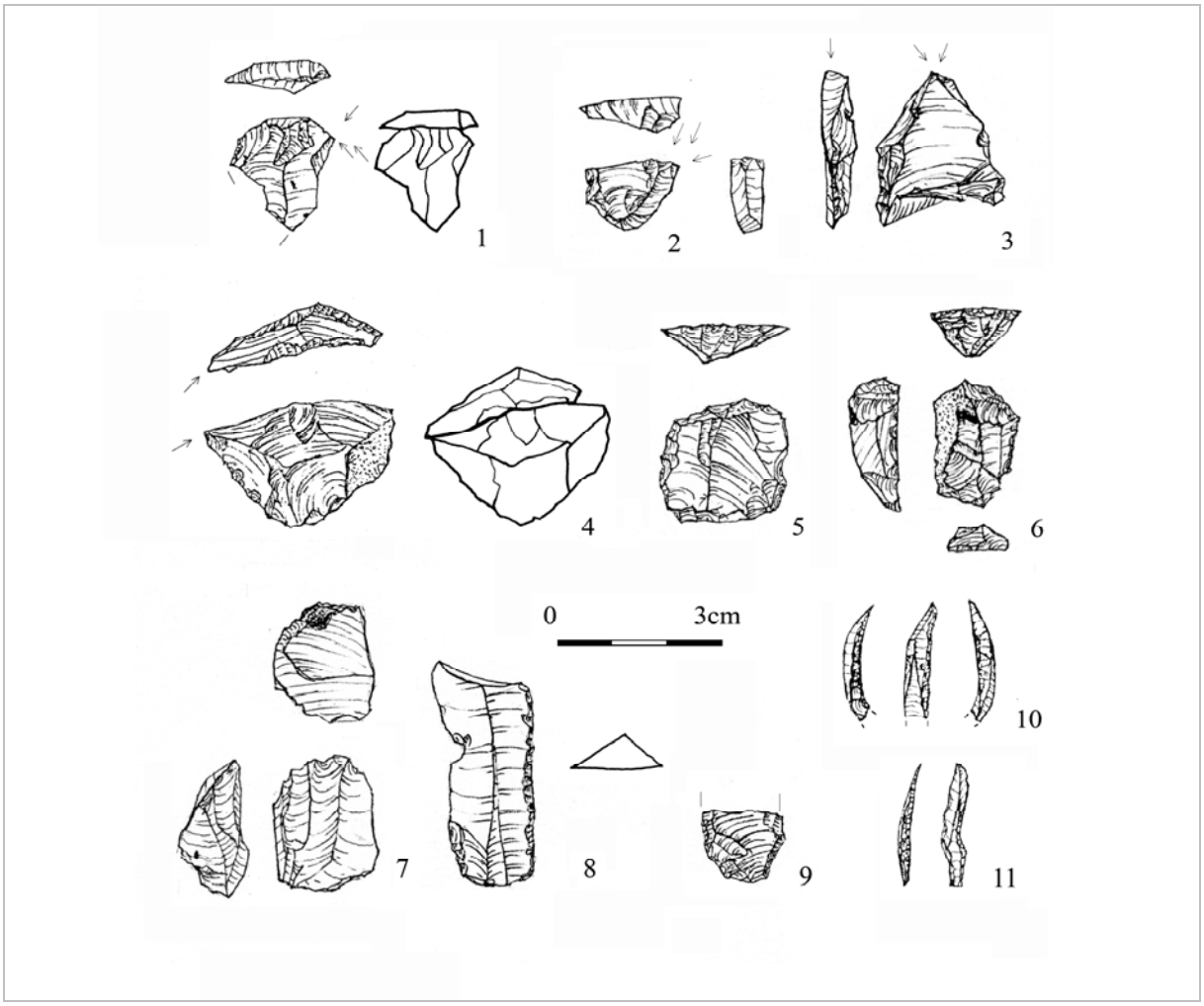


**Fig. 5.:** Mogyorósbánya I: obsidian artefacts (drawings by K. Nagy)

**5. ábra:** Mogyorósbánya, I. települési folt: obszidián leletek (Nagy K. rajza)

Beside these burin-cores, a single-platform core (**Fig. 5/7.**) and a core fragment with separate flaking surfaces are found in the Mogyorósbánya I obsidian assemblage. Importantly, a surface collected blade like flake was refitted to the former piece (refit group 145), illustrating the local blank production of this extralocal raw material.

Finally, the characteristic Upper Palaeolithic group of formal tools, the end scrapers made on short blanks (**Figs. 5/5-6.**), generally regarded as typical for the industries of the LGM are similar to the pieces of Ságvár (**Fig. 4/1, 4/3.**) and Szob (Markó, 2007, 12, Fig. 3, 6), however, the pieces from the settlement spot II and III are made on typical blade fragments (**Figs. 6/3., 7/1.**).

## *Obsidian in the Pebble Gravettian assemblages: conclusions*

During the LGM period an important group of sites are classified as belonging to the Pebble Gravettian industry, characterised by the intense use of locally available raw material types, dominantly collected from secondary sources. In the studied assemblages of Ságvár, Szob and Mogyorósbánya obsidian, imported from a distance of more than 230 km (**Table 4.**) is also represented, basically by the Slovakian (C-1) variant.

Unfortunately, in the case of the first two sites there are several problems with the excavations, documentations and the curation of the artefacts.

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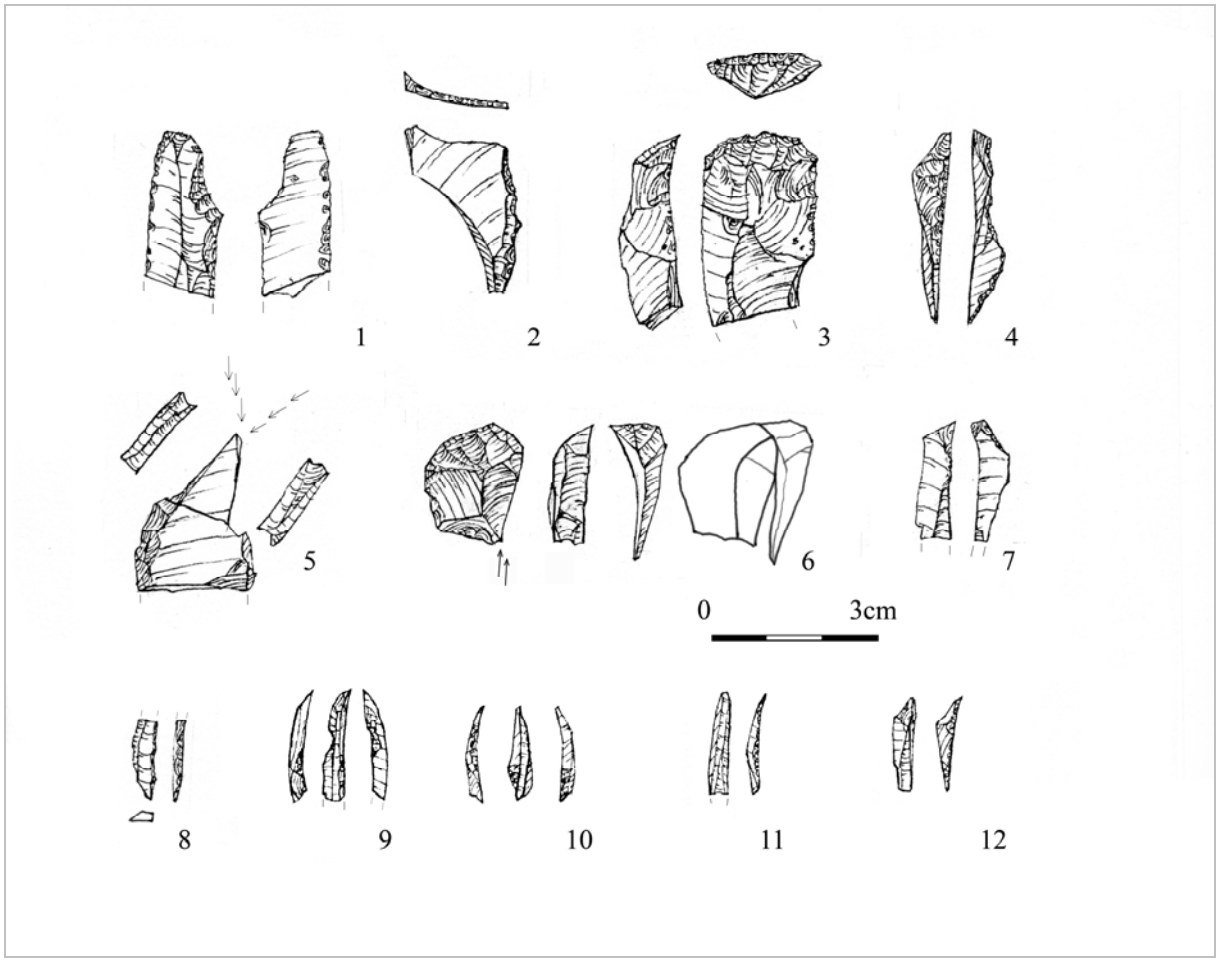


**Fig. 6.:** Mogyorósbánya II: obsidian artefacts (drawings by K. Nagy)
**6. ábra:** Mogyorósbánya, II. települési folt: obszidián leletek (Nagy K. rajza)

However, the available data may suggest that obsidian artefacts were found only in the lower layers of these sites. M. Gábori (1959, 10) explained the typological differences observed among the end-scrapers found in Ságvár before the WW II (when mainly in the lower layer was excavated) and after it (when the typical pieces were found in the upper layer) by stratigraphic arguments. The presence or absence of obsidian artefacts may show further differences between these two stratigraphic units. The analysis of the obsidian artefacts from the classical Epigravettian locality of Pilismarót - Öregek-dűlő (Biró 1984, 20) and our not published observations on the contemporaneous assemblages of Pilismarót – Bitóc and Diós as well as from Nógrádverőce suggest, that nodules were completely worked on the sites. Based on the observations of the well documented Mogyorósbánya material the obsidian artefacts were introduced to the site as retouched tools and cores, or probably as large blades.

On the other hand, the presence of large cortical flakes (**Fig. 8**.) with a maximum length of 4.8 cm in the Mogyorósbánya assemblages may suggest that nodules or larger cores could have been also manufactured on the site, however, a characteristic trait of this industry is the burin made on cortical flakes (Markó in press).

The composition of the studied obsidian assemblages suggest for a bladelet industry with blanks removed from both single platform cores and burin-cores. These later pieces were partly manufactured on retouched artefacts belonging to the mobile toolkit, i.e. end scrapers and retouched blades, partly on cortical flakes. The local bladelet production is documented by refits, not only of obsidian artefacts but also of other raw material types. The presence of chips in the Mogyorósbánya and possibly the Ságvár assemblages indicate the on-site core preparation and tool manufacture too.

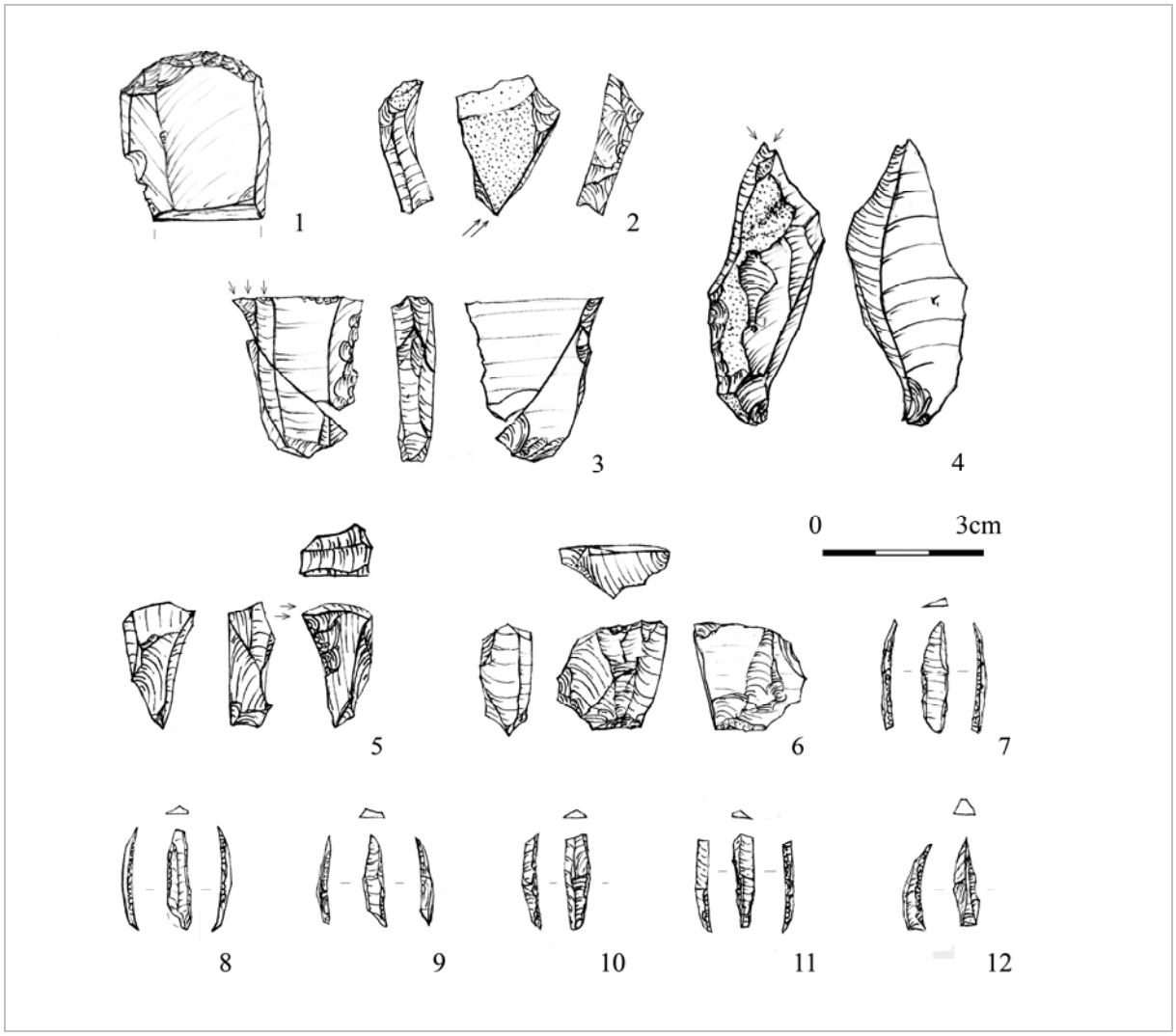


**Fig. 7.:** Mogyorósbánya III: obsidian artefacts (drawings by K. Nagy)
**7. ábra:** Mogyorósbánya, III. települési folt: obszidián leletek (Nagy K. rajza)

**Table 4.:**: Distance of the studied sites from the obsidian occurrences
**4. táblázat:** A vizsgált lelőhelyek távolsága az obszidián forrásoktól

| | **Slovakian (C1)** | **Tolcsva-type (C2T)** | **Mád-type (C2E)** |
|---|---|---|---|
| Ságvár | 335 km | | |
| Szob | 229 km | 198 km | |
| Mogyorósbánya | 251 km | 220 km | 210 km |

**Fig. 8.:** Mogyorósbánya III: cortical obsidian artefacts (photo by J. Kardos, HNM)

**8. ábra:** Mogyorósbánya, III. települési folt: kérges obszidián leletek (Kardos J. fotója)

Finally, based on the high number of retouched and backed bladelets we suppose that hunting played an important role on the sites. In any cases, the analysis of the Mogyorósbánya assemblages should be completed by the locally available raw material types too.

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[1] Using IntCal 14.13c CALIB radiocarbon calibration program, version CalibRev 7.0.4.