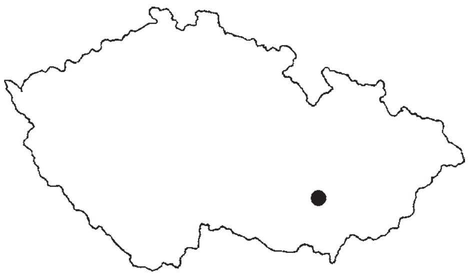
ŠTUDIJNÉ ZVESTI ARCHEOLOGICKÉHO ÚSTAVU SLOVENSKEJ AKADÉMIE VIED 72 (1), 2025, 1–17

RE-EXCAVATION OF DISCARDED DEPOSITS FROM ŠVÉDŮV STŮL CAVE (MORAVIAN KARST, CZECH REPUBLIC) AND THEIR ARCHAEOLOGICAL POTENTIAL

Petr Škrdla – Jaroslav Bartík – Ladislav Nejman – Antonín Přichystal – Ondřej Mlejnek – Miroslav Králík – Matěj Kmošek



DOI: https://doi.org/10.31577/szausav.2025.72.1

Keywords: Moravian Karst, Middle Paleolithic, Magdalenian, Caves, Re-excavation, Agricultural Prehistory

Many caves worldwide, including those with significant archaeological deposits, have attracted excavators since the end of the 19th c. This has often resulted in caves being partially, or entirely, emptied of sediments. The 'coarse' methodology used during earlier excavations has resulted in many finds being missed, which usually resulted in their discard onto nearby spoil heaps along with the sediments. Švédův stůl Cave, in the southern part of the Moravian Karst, is a typical example. It is also one of only three caves in Moravia that have yielded Neanderthal skeletal remains. Artefacts belonging to the Middle Paleolithic through to Medieval periods were recovered in Švédův stůl Cave during earlier excavations. The re-excavation of a tiny proportion of the discarded deposits outside the cave has produced a similar number of lithic artefacts as in all of the excavations added together. In addition, several specific artefacts, previously unknown from Švédův stůl Cave, were also discovered. The results of the re-excavation indicate a significant archaeological potential still hidden within the sediments dumped in the spoil heap outside the cave. These discoveries show promising potential for further research at this site.

INTRODUCTION

The sediments removed from caves during earlier excavations were often dumped close to the cave entrances, where they still survive. The potential of such deposits was documented, for example, at Vogelherd Cave (*Conard/Janas/Zeidi 2015*; *Dutkiewicz 2015*) and Feldhofer Cave (*Schmitz et al. 2002*) in Germany. The re-excavation of Vogelherd Cave yielded additional material (including portable art objects, ivory beads, lithic and bone artefacts, and faunal remains) missed during the original excavation by G. Riek's team who emptied almost the entire cave of its sediments in 1931 (in a similar scenario to Švédův stůl Cave, they were dumped outside the cave entrance). At Feldhofer Cave, the re-excavation of dumped sediments yielded additional Neanderthal skeletal remains suitable for aDNA analysis including three fragments that fit directly on the femur and cranium of Neanderthal 1 individual recovered during the original excavation in 1856 (*Schmitz et al. 2002*). Paleolithic artefacts and faunal remains that were missed during the 1856 mining operations were also recovered during the re-excavation.

In Moravia, a re-excavation attempt of the Pekárna Cave spoil heap in front of the cave had demonstrated the potential of high resolution re-excavations of cave deposits removed from the cave during earlier excavations (*Škrdla/Lázničková 1999*). Švédův stůl Cave (Fig. 1: 1), as in the case of the nearby Pekárna Cave, was completely excavated over several excavation campaigns during the last two centuries (for details see *Mlejnek et al. 2024*). All the sediments (including limestone fragments and soil/loess sediments from both Pleistocene and Holocene periods) from Švédův stůl were removed during Kříž's 1886–1887 and Klíma's 1953–1955 excavations from the cave interior as well as the entrance plateau and they are currently deposited in a conical spoil heap in the front of the cave. *B. Klíma* (*1962*, 22) had reported that the spoil heap consists of 450 m^3 of sediments. These sediments attracted amateur

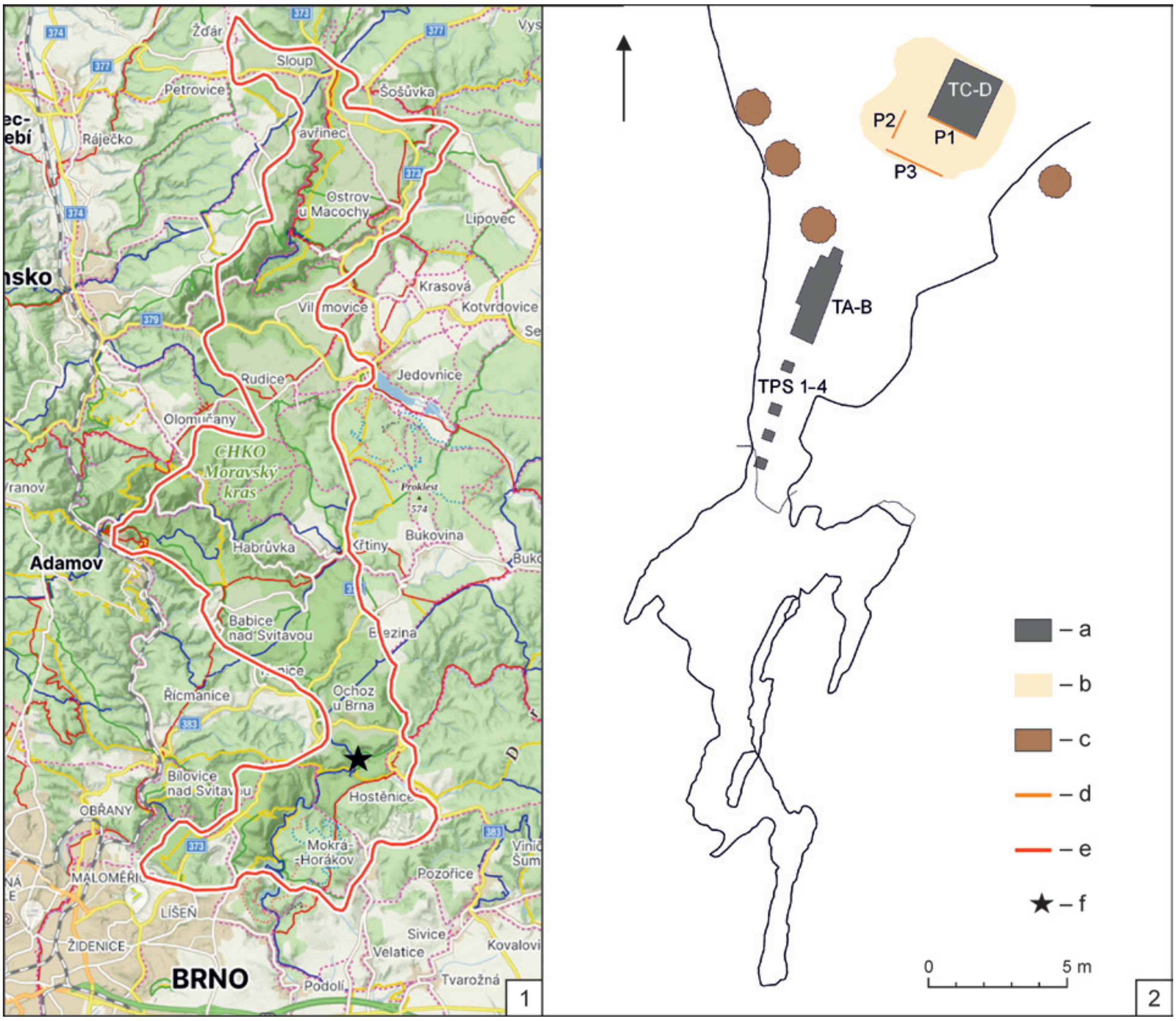


Fig. 1. 1 – location of Švédův stůl Cave in the Moravian Karst; 2 – location of trenches dug during 2019–2024. Legend: a – excavation 2019; b – excavation 2020 – 2024; c – trees; d – profiles; e – Moravian Karst; f – cave location. Author J. Bartík, map source: mapy.cz.

archaeologists who collected artefacts and faunal remains from the surface and they also re-excavated the uppermost part of spoil heap (to a maximum depth of ca. 80 cm; *Bartík et al. 2023*, 158, fig. 25; *Nejman et al. 2021*, 179, fig. 12). A small collection of Paleolithic artefacts was collected also by one of the authors during the 1990s – these artefacts are also included in the collection presented in this work. However, the most important finds were collected by *J. Vaňura* (*1965*) and his daughter, who discovered a Neanderthal tooth (for details see *Mlejnek et al. 2024*, 24). This find was one of the reasons that stimulated our research of the spoil heap. In order to evaluate the archaeological potential still hidden within the spoil heap we exploited and subsequently wet-sieved 16 m^3 (which corresponds to ~3.5% of the total spoil heap volume; Fig. 1: 2) of sediments in several campaigns over the years 2019–2024 (*Bartík et al. 2023*; *Nejman et al. 2020*).

METHODS

Archaeological fieldwork in the Moravian Karst is complicated by its status as a Nature Reserve (necessity of obtaining permits and working under restrictions) and logistical problems – absence of water (ephemeral creek only) and lack of suitable roads to transport sediments for off-site sieving (outside

Fig. 2. Excavation methodology. 1 – digging sediments from the surface; 2 – wet-sieving in nearby dry river bed; 3 – transporting sediment in bags; 4 – off-site wet-sieving; 5 – documenting profile in deep trench. Photo by P. Škrdla, J. Bartík.

of the protected karstic area). The site itself is currently off the designated tourist trail and approximately 100 m from the nearest track. A narrow path that is often blocked by fallen trees leads to the cave from the road. Our method of re-excavation was continually adapted and improved over time (Fig. 2). It consists of several steps: 1. excavation of the spoil heap sediments; 2. carrying sediments in buckets or bags to a vehicle parked on the track; 3. transporting sediment bags to the wet-sieving station using a pick-up vehicle or a car trailer; 4. wet-sieving; 5. screening washed sediments in a laboratory. 2 × 2 mm mesh size sieves were used for the wet sieving. In the last campaign we enhanced our methodology by adding an extra step (labelled as 1.5 – i.e. an extra step between the first and second steps). This consists of dry sieving of sediment using a 10 × 10 mm mesh and washing of separated material (over 10 mm) in vats on-site in a nearby dry stream bed. This method saved water and was less time consuming compared to wet-sieving of all sediments and allowed us to reduce the weight and the volume of the sediment (10 mm and smaller fractions) transported for off-site sieving. In addition, water brought to the site in barrels allowed cleaning of limestone boulder surfaces which made it possible to inspect them for potential anthropogenic marks. Off-site wet-sieving was realized using a combination of 3 mm and 2 mm mesh sizes and all sediment was carefully washed in order to remove all fine grained sediment (soil and loess). Two fractions > 3 mm and between 2–3 mm were sorted separately, dried and transported to laboratory for careful screening. The last step was the most time consuming operation.

While artefact raw materials were analyzed using a stereomicroscope with water as an immersion liquid, identification of the raw materials of heavy duty implements was realized only macroscopically.

Glass beads were surface-analyzed using X-Ray fluorescence (XRF) spectroscopy which allows rapid and non-destructive analysis of artefacts in terms of their elemental composition, ranging from sodium (Na) to uranium (U). A benchtop XRF spectrometer ElvaX Pro was used for the analysis under the following conditions: Ag anode, Fast SDD detector, Soils mode, Dual beam, acceleration voltage 8 and 35 kV, measuring time 120 + 120 seconds, focus spot 4 mm. Acquired results and accuracy of the analysis are primarily influenced by the surface nature of the analysis, as the weathered surface of archaeological glass finds often has a slightly different composition than the unweathered material. The surface layer is often depleted in sodium and typically exhibits partially altered coloration. Furthermore, the measurements were conducted without a helium flush, which affects the detection limits for lighter elements, particularly sodium and magnesium. For these reasons, the results should be considered as semi-quantitative at best. The interpretation of the obtained data is therefore limited to determining the basic characterization of bead raw material and potential additives acting as colorants. However, the results cannot be used to determine the provenance of the finds, or the precise characterization of the colorants and opacifiers.

RESULTS

Planighraphy and stratigraphy

Trench TC-D was located at the end of the cave entrance plateau where it slopes steeply into the river valley. The first trench was dug in 2019 and reached a depth of 2.2 m (*Wright et al. 2021*). At the conclusion of the excavation, the trench was back-filled for safety reasons and by agreement with the Nature Reserve management. A subsequent spoil heap excavation in 2020 proceeded from TC-D towards the cave entrance. During this excavation we removed the top part of the spoil heap and the trench was sloped in order to avoid deep holes when leaving the site. However, this part of the profile had been re-excavated by amateur archaeologists earlier, as documented by a homogenized layer in the profile, frequent presence of modern waste up to 80 cm in depth (*Bartík et al. 2023*, 158, fig. 25), and a smaller number of finds compared to the deeper (untouched) deposits. We therefore deepened the 2020 trench during the two campaigns that followed. In sum, we re-excavated an area of 17 m^2 reaching a depth of up to 2.2 m (Fig. 1: 2; 3).

High-resolution methodology using ED-XRF and Itrax was used during the first year for the TC-D trench sediments. This was an experimental attempt to separate individual depositional (secondary) horizons within a spoil heap (*Wright et al. 2021*). Considering the difficulties of applying this high-resolution method (a time consuming process), the additional mixing of the upper part of the spoil heap sediments by the actions of amateur archaeologists, and a low density of finds within the spoil heap sediments, we did not conduct geochemical analyses over the subsequent excavation campaigns. We can conclude that the upper ca. 80 cm portion of the spoil heap consists of sediments that have been further mixed by amateur archaeologists who re-excavated them during an earlier time (1970s–1990s) and who collected much of the archaeological material that had been present. Deeper part of the profile has a layered character where the layers of different thicknesses and colors (from yellow to black according to their geological age) alternate. While the above mentioned parts of the documented profile are composed of limestone scree consolidated by fine-grained sediments, the lowermost part of the documented profile is dominated by scree containing much smaller amounts of fine-grained sediments, and often with hollow cavities between individual rocks (Fig. 3: 3).

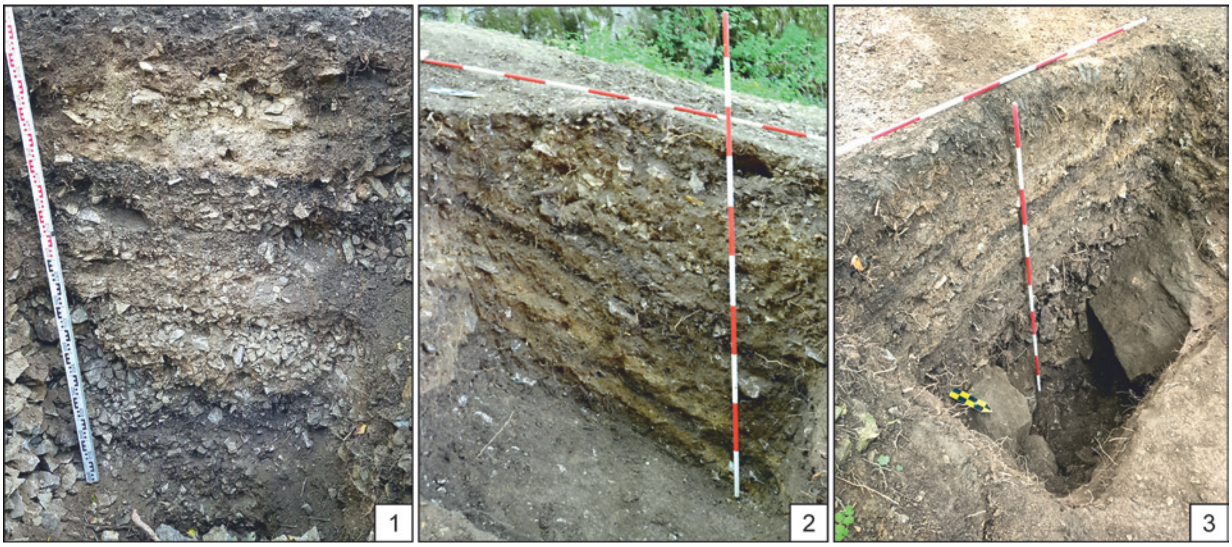


Fig. 3. Stratigraphic profiles in spoil heap sections (Profiles P1-P3, for location see Fig. 1: 2). Photo by J. Bartík, D. Wright.

Analysis of archaeological material

The stone artefacts (Fig. 4–6) from the Švédův stůl Cave spoil heap were divided into two basic categories: knapped artefacts made from siliceous rocks and heavy-duty implements made from coarse pebbles (including quartz) and manuports. Given the method used to recover this collection – from a secondary deposit that contains stratigraphically mixed sediments of late Pleistocene to Holocene ages – all of the recovered artefacts were analyzed as a whole without chrono-cultural subdivisions. The artefacts display a range of weathering surfaces, from unweathered to slightly patinated, to heavily patinated. In addition, only one unpatinated artefact can be reliably attributed to the Neolithic – Eneolithic period on the basis of its typology (trapeze – sickle blade, Fig. 4: 37) even though artefacts from both of these Holocene periods (mostly pottery) were documented during both earlier and recent excavations. On the other hand, some of the characteristically Magdalenian backed bladelets from the recent collection possess fresh-looking surfaces without any traces of patina. Similarly, as in the case of the knapped industry, the heavy duty implements and manuports made prevailingly from local gravels do not possess chronologically diagnostic characteristics – similar coarse forms were utilized in all prehistoric periods documented in this cave.

Knapped stone artefacts

Raw materials

Local and imported rocks were used to knap artefacts with the local sources used slightly more often. Imported raw materials include erratic flint (35.4%), radiolarite (6.5%), rare artefacts from Kraków-Czenstochova Jurassic and chocolate flints (one specimen of each). Other imported items are of more notable significance although again, only one of each has been found. These are rock crystal (light citrine) from the Bohemian-Moravian Highlands (Fig. 4: 26; 5), and spotted flint closely resembling a lithic raw material from Bavaria (Fig. 4: 27). The origin of this raw material is not entirely certain and it may have also originated in the Kraków-Czenstochova Jurassic formation. The most common local raw materials are Cretaceous spongolite chert from the Boskovice Furrow (27.1%) and Moravian Jurassic cherts (16.2%). Others include Moravian Jurassic cherts (not further specified), Krumlovský les-type chert (variety II – five items and variety III – one item) and a single specimen of (probably) Stránská skála-type chert. Five artefacts are made from Olomučany-type chert and several are made from quartzite collected in the local Kulmian gravels (Fig. 6: 3, 7), orthoquartzite from Drahany upland (sun boulder, Fig. 4: 25), schist from Devonian-Kulmian boundary (Fig. 6: 4), and a retouched limestone fragment (Fig. 4: 36).

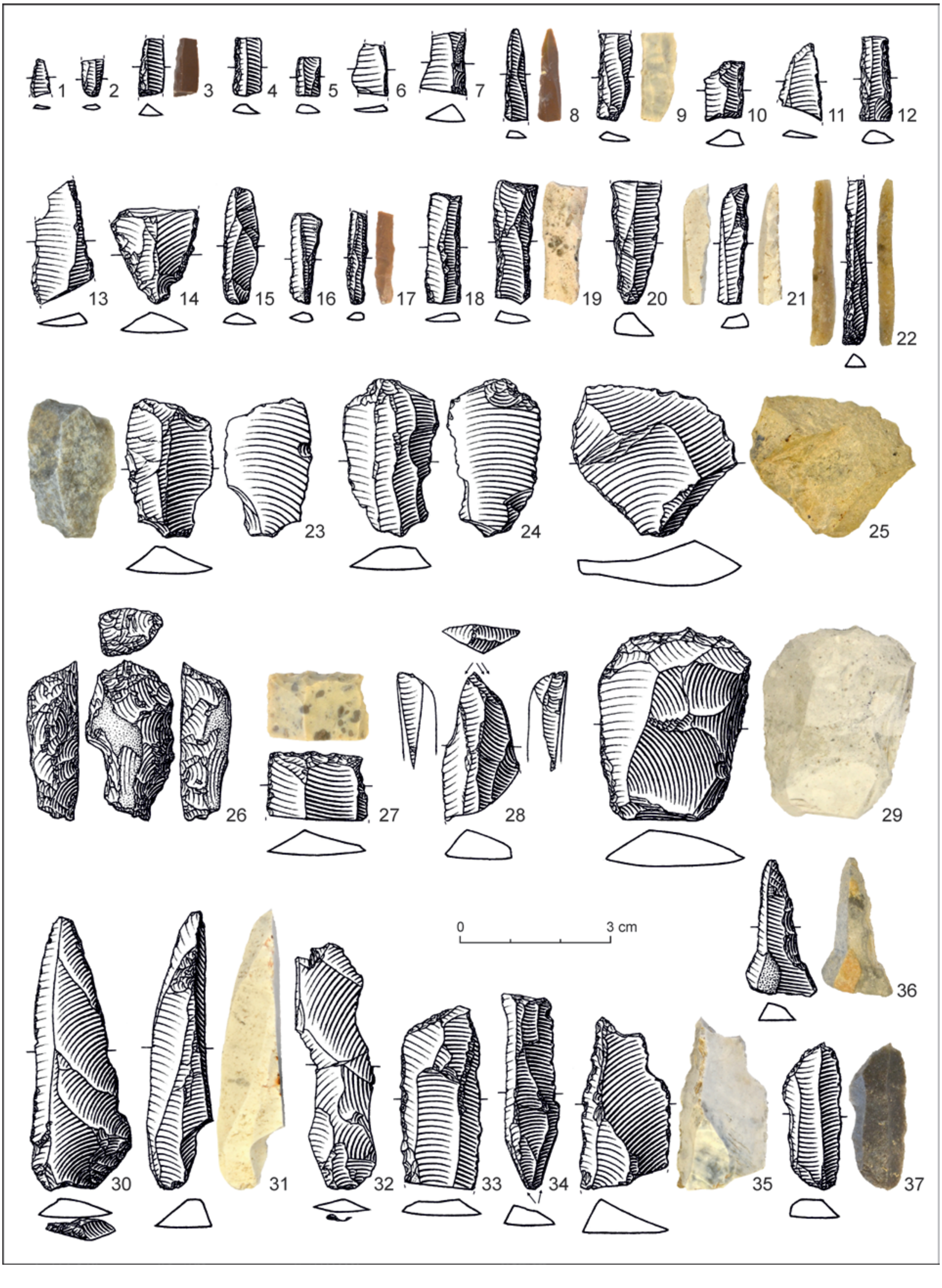


Fig. 4. Selected knapped artefacts. 1, 5, 20, 22, 32 – Cretaceous spongolite chert; 2, 10 – burnt; 3, 8, 17, 19 – radiolarite; 4, 11, 14, 16, 21, 24, 29–35 – erratic flint; 6, 7, 9, 12, 13, 15, 18, 23, 28 – Moravian Jurassic cherts; 25 – sun boulder; 26 – rock crystal/citrine; 27 – Bavarian spotted flint; 36 – limestone; 37 – Olomučany-type chert. Drawing by J. Brenner, photo by J. Bartík.

Technology

The collection of the recently obtained artefacts more than double the original Klíma's 1950s collection (229 versus 193 items), however, the artefacts differ in their modal size distribution – the new collection contains many smaller items compared to Klíma's collection. The most common technological category is small shatter including microchips, microfragments, and broken artefacts smaller than 1.5 cm (45%). The rest of collection consists of flakes (14%), an isolated core (Fig. 6: 4), blades (3.5%) and blade fragments (2.6%), bladelets (2.2%) and bladelet fragments (7.9%). One blade fragment and one bladelet fragment are partially retouched. Burin spalls compose 6.5% of assemblage (15 items). Three fragments of siliceous rocks complete the technological spectrum. There are 36 tools (15.7%) present in the collection. Eleven artefacts were burnt. A characteristic Magdalenian *en eperon* butt was documented in one instance (Fig. 4: 14).

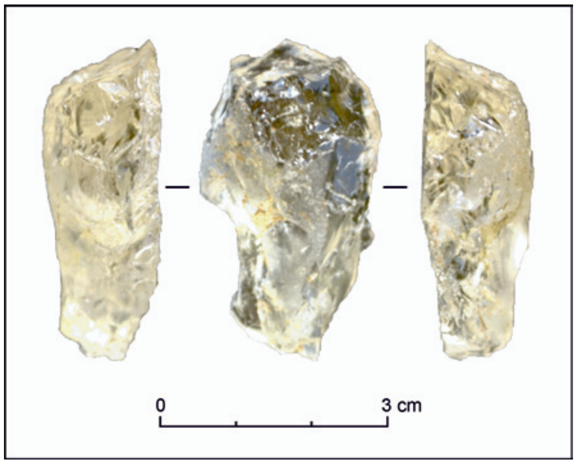


Fig. 5. Rock crystal/citrine endscraper. Photo by J. Bartík.

Typology

Small microlithic tools account for over half of the tools. Twelve items are simple backed bladelets (Fig. 4: 4–7, 10, 11, 16, 21, 22), two other backed bladelets have additional retouch on the opposed lateral edge (Fig. 4: 3, 12, 17), another two backed bladelets are truncated on one end (Fig. 4: 18, 19), one backed bladelet is pointed (Fig. 4: 1), and another pointed bladelet has partial retouch (Fig. 4: 8). Endscrapers include a simple endscraper (Fig. 4: 29), a double endscraper (Fig. 4: 23), and a steep endscraper with additional bilateral retouch (Fig. 4: 26). There are two dihedral burins (Fig. 4: 28, 34), one of them with scraper-like retouch on its tip (Fig. 4: 34). Four bladelets are retouched (Fig. 4: 2, 15). A retouched blade and two retouched blade fragments have a straight truncation (Fig. 4: 27), and a proximal blade fragment has bilateral retouch (Fig. 4: 14). Other tools are represented by a single item each – a borer (Fig. 4: 35), a splintered piece (Fig. 4: 24), and a retouched fragment (Fig. 4: 36). There is one post-Paleolithic specimen – a backed trapeze made from Olomučany chert (Fig. 4: 37).

Pottery

The prehistoric (post-Paleolithic) finds of pottery from our spoil heap excavation are of similar character to the pottery reported from the excavations of the intact sediments (cf. *Klíma 1962*). Most recovered pieces are small undecorated fragments. During the spoil heap excavation, we recovered 141 fragments of ceramic vessels with a total weight of 355 g. The pieces are highly fragmented and almost half of the shards fall into the category of small ground fragments not exceeding 3 cm^2. Only seven larger fragments between 5 and 7 cm^2 were found. There is one distinct difference between our finds and Klíma's collection – the smallest fraction of sherds is absent in Klíma's collection as his team did not utilize wet sieving. Given the origin of the material from relocated secondary and tertiary contexts, the absence of conjoinable specimens is not surprising. A similar situation has been found in the excavation of intact sediments, where only one almost completely reconstructed Linear Pottery culture globular vessel was recovered (*Bartík 2020*, 79; *Klíma 1962*, 86; *Ondroušková 2011*, 80).

A large proportion of the ceramic pieces (127 pieces, 90%) can be dated to the agricultural prehistoric period based on the nature of the ceramic mass, profiling, or decoration from a chronological point of view. The remaining 10% can be attributed to the High Medieval (gray thin-walled pottery), modern (beige to brick-orange pottery with yellow-green glaze) and sub-recent periods (porcelain, stoneware with brown glossy glaze). A small clay ball complements the ceramic finds from the modern period. The vast majority of the prehistoric pottery, which moreover consists mainly of undecorated ware, can only be dated tentatively without further chronological refinement. Only 16.5% of the prehistoric pottery show diagnostic features where cultural classification is possible. Thirteen pieces can be dated to the younger stage of the Linear Pottery culture and are characterized by finely floated matrix with

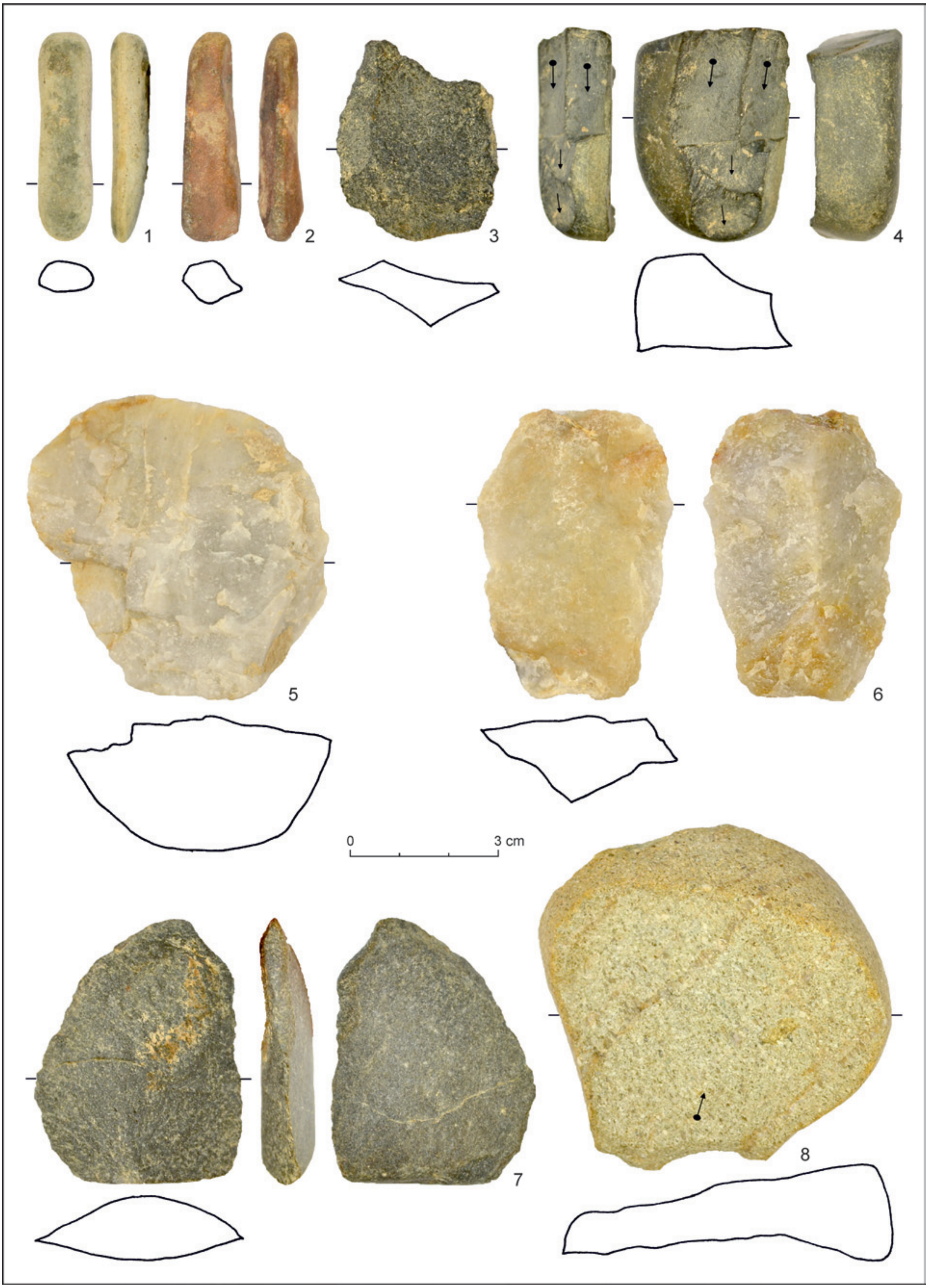


Fig. 6. Selected other stone artefacts. 1, 2 – Kulmian schist; 3, 7 – quartzite from Kulmian gravels; 4 – schist from Devonian-Kulmian boundary; 5, 6 – quartz; 8 – arkose sandstone. Drawing and photo by J. Bartík.

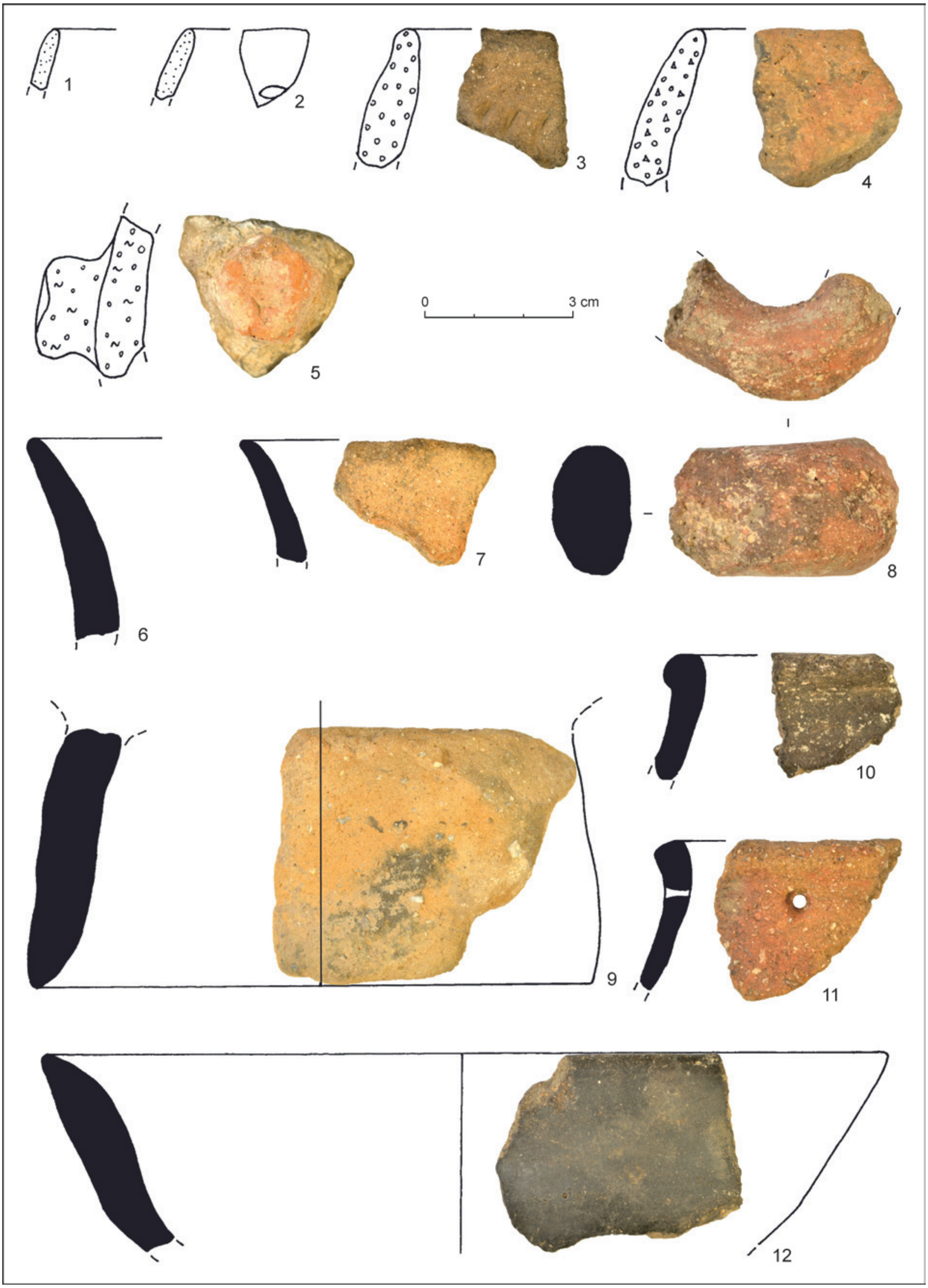


Fig. 7. Selected pottery finds. Drawing and photo by J. Bartík.

sandy or organic admixture. Very small proportion of fragments were identified morphologically. Two fragments were identified as base of a vessel. Four pieces were rim fragments of smaller globular vessels (Fig. 7: 1–4), one of which is decorated with a slightly oblique line of nail-like indentations at the transition to the body (Fig. 7: 3). A fragment of a spout of a medium-sized vessel with a plug-like protrusion (Fig. 7: 5) was identified in detail. Furthermore, five shards attributable to the Lengyel culture were obtained from the spoil heap excavation. These include a fragment depicting the greater part of the profile of a bowl with faint, slightly outwardly curved shoulders and a rounded rim (Fig. 7: 12), a fragment from a pedestal bowl (Fig. 7: 9), a fragment of a rounded handle with an oval cross-section (Fig. 7: 8) and two more rim shards from indeterminate vessel types (probably pots or beakers; Fig. 7: 6, 7).

Based on the character of the rim and a polished surface remnant, several remaining fragments can be dated to the younger agricultural prehistory, which was also identified during Klíma's research (cf. *Klíma 1962*). Within layer No. 3 human activities from the Early Bronze Age (Únětice culture; *Ondroušková 2011*, 81; *Peška 2020*, 116; *Stuchlík 1981*, 15, 16) and from the Early Iron Age (Horákov culture, *Klíma 1962*, 49; *Ondroušková 2011*, 81) were documented. The shard from the rim of a small vessel, which has a (repair?) hole (Fig. 7: 11), can also be dated probably to the younger prehistoric period.

Glass beads

As all of the excavated sediments were wet-sieved, small objects such as three glass beads were also discovered. The first two specimens can be described as small flat beads. One is dark blue (Fig. 8: 1; GB-1) and the other green in color (Fig. 8: 2; GB-2). Based on their potassium and magnesium contents, they can be characterized as mixed-alkali glasses with a low-magnesium content (LMHK type; Tab. 1). This type of glass appears in beads from the Middle Bronze Age, and probably earlier, with continuation into the Late Bronze Age (*Henderson 2013*, 90, 91). Copper, which is present in elevated amounts in both beads, serves as the primary colorant for green and less commonly, for dark blue glass (*Purowski 2022*). The green coloration in bead GB-2 was evidently achieved through an increased iron content. This bead also contains higher levels of lead and titanium. The last and largest of the beads (only one half remains) is made of light green faience, it is barrel-shaped and the surface is decorated with oblique grooves (Fig. 8: 3; GB-3). Glass bead GB-3, based on its composition, corresponds to natron glass, characterized by low magnesium and potassium contents (Tab. 1). Compared to GB-1 and GB-2, it has a higher content of silicon, tin, and barium. The peak production of natron glass occurred approximately between 800 BCE and 800 CE in Europe and the Near East (*Henderson 2013*, 92–97). In general, the identified beads correspond to the hitherto known findings of glass production (from graves and hoards) of the Bronze Age and Hallstatt period from Moravia (*Čižmář/Čižmářová 2014*; *Golec et al. 2023*; *Kršová 2013*; *2017*).

Heavy-duty implements

The coarse tools and manuports are made from pebbles other than limestone and they are often fragmented. Some of them have pounding marks on their surfaces indicating their use as hammerstones utilized for knapping hard material, or traces of polishing indicating their use for powdering softer material. It was possible to find all these pebbles in primary and secondary geological deposits in close vicinity of the cave. As the similar artefacts were utilized during all periods identified in the cave, i.e. from the Paleolithic to the Early Medieval, a more refined chrono-cultural classification is not possible.

Other finds

The most important find in this category is an engraved limestone fragment. The limestone is similar to the limestone in the local environment, with the surface consisting of a smoothed part with engravings interpreted as horses and a broken surface without any engravings (*Langley et al., submitted*). The artefact is interpreted as a fragment of a bigger block or cave wall. Similar artefacts, fragments of limestone that probably spalled from cave walls, were reported from deposits of Hohle Fels Cave in Swabian Jura, Germany (*Wolf et al. 2018*). In the case of Hohle Fels Cave, the limestone fragments were painted with a red colorant.

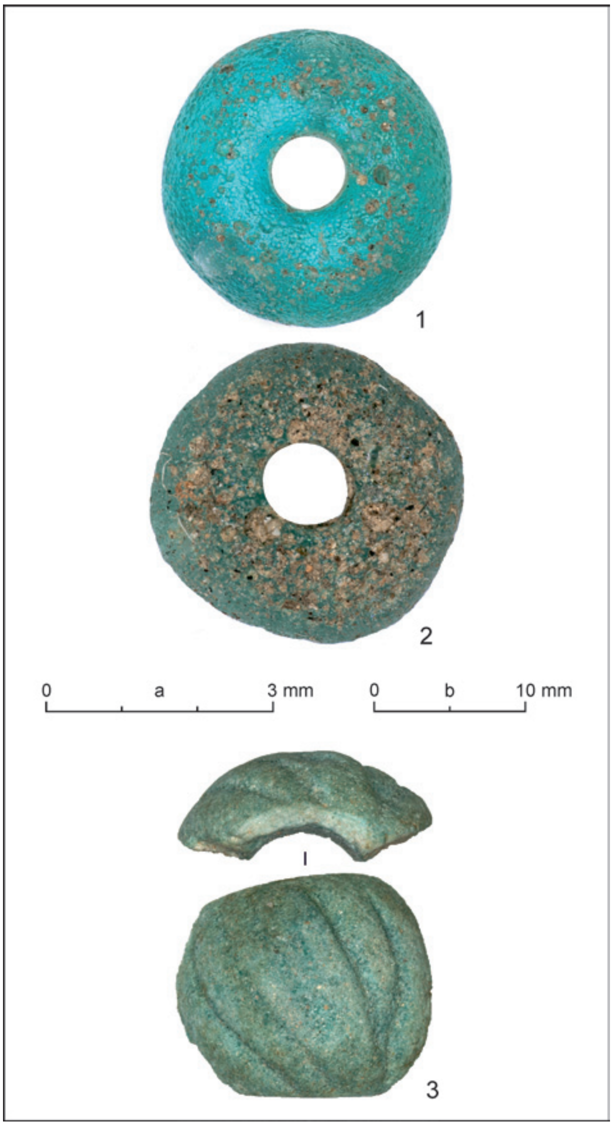


Fig. 8. Glass beads. Scale: a – 1, 2; b – 3. Photo by K. Augustinová and M. Kmošek.

Tab. 1. Elemental composition of glass beads according to XRF analysis. (wt %; LE = Light Elements below Na).

Sample	GB-1	GB-2	GB-3
LE	45.1	45.05	56.44
Na	< 0.9	< 0.9	< 0.6
Mg	0.3	0.3	0.3
Si	13.2	10.4	22.8
P	0.4	0.8	0.1
S	0.1	0.2	0.1
Cl	13.9	12.2	5.5
K	7.4	6.0	< 0.03
Ca	16.0	20.3	11.9
Fe	2.1	3.1	1.3
Cu	2.9	2.8	0.9
Ti	0.2	0.5	0.1
Mn	0.1	0.1	0.0
Sn	< 0.01	0.01	0.22
Pb	0.08	0.29	0.01
As	0.03	0.04	0.00
Sr	0.19	0.23	0.02
Ba	< 0.15	0.6	1.5
Co	0.05	0.11	0.02
Ni	0.01	0.01	< 0.001
Zn	0.02	0.03	0.01
Cd	0.08	0.09	< 0.01
Sb	0.05	0.04	< 0.02
Bi	0.011	0.003	< 0.0006

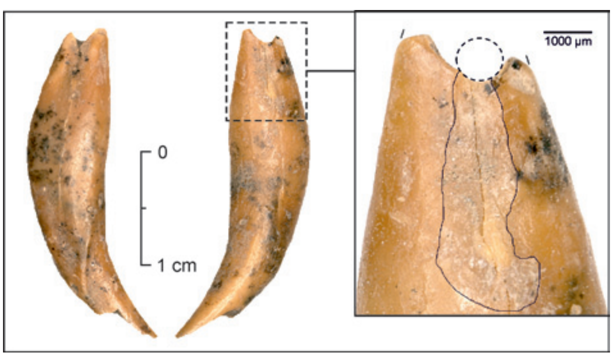


Fig. 9. Perforated fox tooth. Photo by Č. Fouček and J. Bartík.

An isolated fox tooth – a canine – shows traces of bifacial thinning in the root-end. There are visible cut marks in the direction of the long axis, however, the tooth is broken in the area of an expected hole (Fig. 9). As similar personal ornaments are known to have been used during various periods ranging from the Initial Upper Paleolithic to post-Paleolithic, the artefact was sampled for radiocarbon dating.

Two elongated, flat pebbles of Kulmian schist without cut marks, decoration, or other traces of utilization also represent important finds (Fig. 6: 1, 2). One of them has a reddish surface, but no red ochre was conclusively identified (Fig. 6: 2). These pebbles were brought to the cave from elsewhere, but their function remains unclear. Similar items were also described by *B. Klíma* (*1974*, fig. 27) in nearby Pekárna Cave.

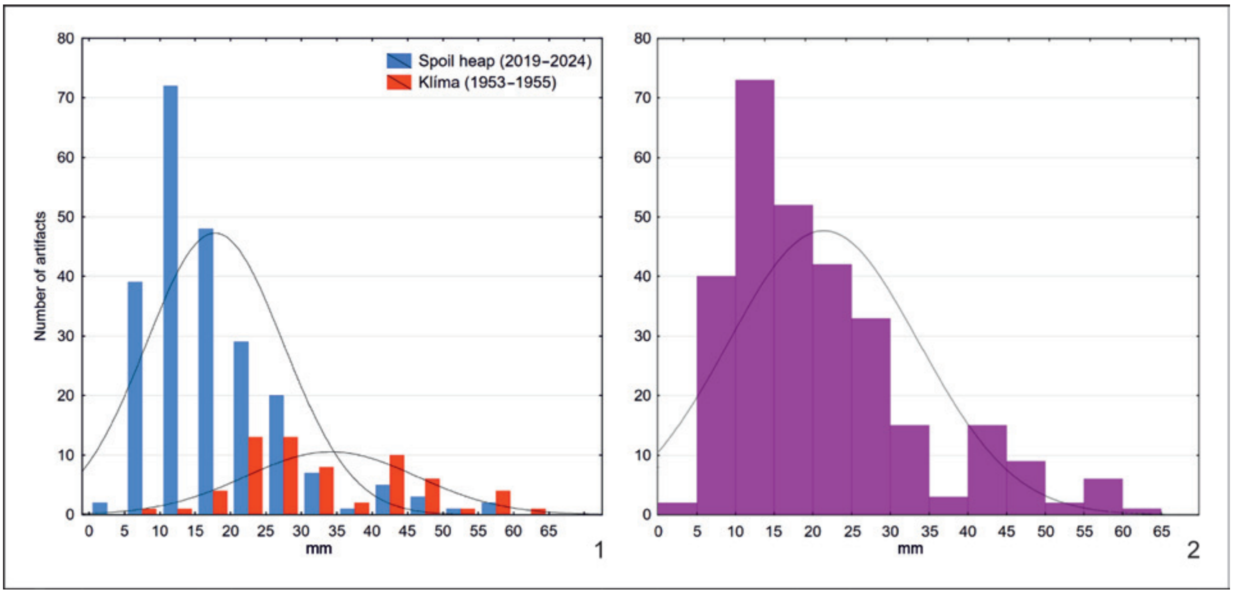


Fig. 10. Histograms comparing artefact maximum dimensions of B. Klíma's data and recent collections (1; provided by Z. Nerudová, Moravian Museum). Sum of both Klíma's and recent collections (2). Fits represent a normal distribution. Note that while B. Klíma excavated the entire cave, only 3.6% of the discarded sediments were re-excavated recently, i.e. a small fraction, prevailing in recent re-excavation, is significantly underestimated.

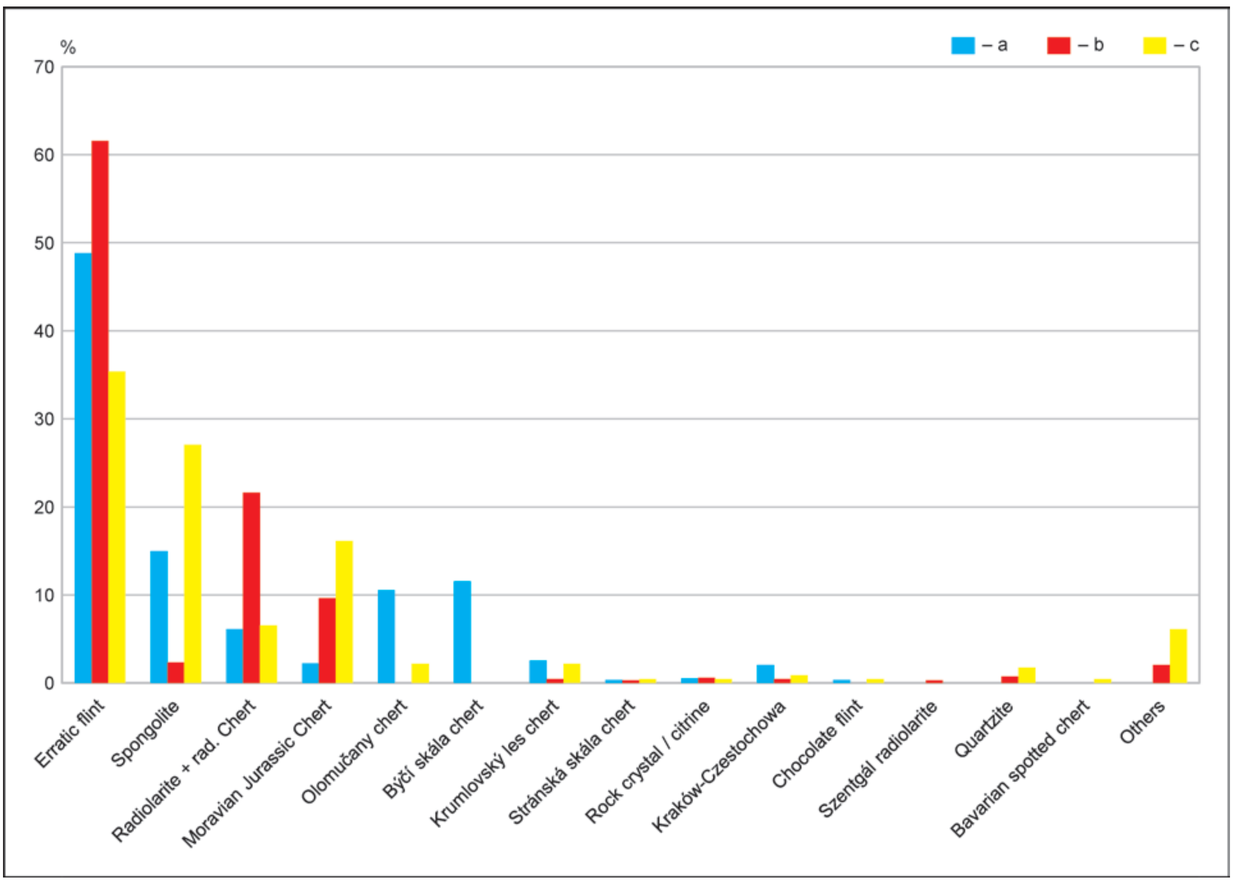


Fig. 11. Comparison of the raw material spectra within Magdalenian collections in the southern part of the Moravian Karst. Legend: a – Pekárna Cave (*Voláková 2001*); b – Ochozská Cave (*Přichystal 2002*); c – Švédův stůl Cave (new).

Variously shaped small lumps of yellow to brown ferric oxides with natural surfaces lacking any traces of their utilization are also present. This material may have been collected in the vicinity of the cave for ochre preparation, but we cannot exclude its origin within cave sediments (as weathering crust).

In addition, over 30 kg of faunal osteological material (mostly undiagnostic fragments belonging to both Pleistocene and Holocene periods) was collected and will be subject to detailed analysis in the future.

DISCUSSION

Recent re-excavation of cave sediments removed during Klíma's excavation of the cave permit a comparison of both excavation campaigns, that are separated by a period of almost 70 years. There were significant differences in excavation techniques – while the intact cave sediments were dug using heavy tools and were not sieved during Klíma's excavation, the sediments from Klíma's spoil heap were completely wet-sieved and screened during the recent re-excavation. The use of a 2 mm mesh and water for washing all screened material provided an opportunity to recover artefacts that were missed during the earlier excavation. The spoil heap artefacts are generally smaller compared to the earlier finds (knapped stone artefacts – cf. Fig. 10, pottery shards, beads), but the collection of new finds also consists of larger items including heavy-duty industry and an engraved limestone fragment (Fig. 10).

Most of the lithic artefacts can be classified as Magdalenian. Only several flakes from coarse raw materials (sun boulder – Fig. 4: 25, Kulmian-Devonian schist – Fig. 6: 3, 7) and quartz fragments (Fig. 6: 5, 6) suggest a Middle Paleolithic antiquity, however, it cannot be completely excluded that they belong to the Magdalenian period. Only single artefacts (including a rectangle made from Olomučany-type chert) can be linked to post-Paleolithic knapped industry. The raw material spectrum of the Švédův stůl knapped artefact collection slightly differs from previously analyzed collections from two (the only two analyzed by A. Přichystal in detail) neighboring sites – Pekárna Cave and Ochozská Cave plateau (Fig. 11). It is characterized by decreasing proportion of erratic flint and increased proportion of local materials including Cretaceous spongolite chert and Moravian Jurassic cherts. Surprisingly, other local materials including Olomučany-type chert and Býčí skála-type chert decrease in comparison to Pekárna Cave assemblage. Radiolarite is present in a similar proportion to Pekárna Cave but 3× lower than in Ochozská Cave plateau. The 18 backed bladelets (including truncated, laterally retouched, and pointed items) are the most typical of Magdalenian tools. Five of the bladelets are made from Moravian Jurassic cherts, four from spongolite, four from radiolarite, four from erratic flint and one specimen is burnt. A steeply retouched endscraper made from citrine has no analogy in other analyzed collections from the southern part of the Moravian Karst and neighboring areas (e.g. Brno Basin) with only one exception – a similar citrine artefact was reported from the Epigravettian site Stránská skála IV where other steeply retouched and carinated endscrapers (on other raw materials) were also described (*Škrdla/Plch 1993*). Possible Bavarian spotted flint, although only represented by one specimen, is an important raw material connecting the Moravian Karst with the Danube Route.

The Neolithic ceramic material presented here is consistent with the stratified finds from layer No. 4 and provides evidence of unspecified human activity during the Early/Middle and Late Neolithic periods (*Klíma 1962*, 26, 48). Švédův stůl Cave should not be considered a large residential cave like, for example, Pekárna Cave. Human activities had a rather short-term or seasonal character in the Neolithic. Of course, sacral and ritual use of caves is also predicted for this period (*Bartík 2020*; *Peša 2014*; *Zajíček/Golec/Světlík 2019*) and we can assume the same site function in the Bronze and Iron Ages.

CONCLUSION

The recent re-excavation, lasting for six years (2019–2024 – with interruptions caused by pandemic restrictions) was aimed at uncovering more details about human utilization of Švédův stůl Cave during prehistoric times. We have not identified any occupation phase previously not reported from this cave, however we have discovered categories of artefacts that have not been previously described from the earlier excavations. Citrine and Bavarian spotted flint increase the spectrum of lithic raw materials. A pierced tooth represents the presence of a personal ornament and an engraved stone represents non-utilitarian activity most probably from the Magdalenian period. Glass beads provide evidence of human activities during the Bronze and Iron Ages.

We can conclude that the relicts of intact sediments (lowermost part of the spoil heap profile) have been preserved within parts of the cave plateau (*Nejman et al. 2020*; *Wright et al. 2021*). The sediments deposited on the spoil heap that is located at the end of the cave plateau contain a substantial proportion of finds (artefacts and osteological material) that has produced more information pertaining to the utilization of the cave during prehistoric periods and it is desirable to continue these re-excavations. The re-excavation method developed for this cave can be used (especially in its improved form) for future works at this site. The spoil heap contains archaeological material representing a secondary archaeological site and therefore needs to be protected.

Acknowledgments

Excavation, wet sieving, laboratory screening, analysis of finds, and preparation of this publication was undertaken with the institutional support RVO: 68081758 – Czech Academy of Sciences, Institute of Archaeology, Brno. Special thanks to all participating volunteers for their hard work in the field and at the wet-sieving station, as well as for their time consuming and precise work in laboratory.
Zdeňka Nerudová kindly provided metrical data from B. Klíma's collection currently deposited in the Moravian Museum in Brno.

REFERENCES

Bartík 2020 — J. Bartík: Příchod zemědělců. In: M. Novák (ed.): *Blanensko a Moravský kras v pravěku*. Blansko 2020, 56–89.

Bartík et al. 2023 — J. Bartík/P. Škrdla/O. Mlejnek/L. Nejman/D. Chlachula/K. Augustinová/E. Urban/M. Králík/M. Macků: Ochoz u Brna (k. ú. Ochoz u Brna, okr. Brno-venkov). *Přehled výzkumů* 64, 2023, 158–159.

Conard/Janas/Zeidi 2015 — N. J. Conard/A. Janas/M. Zeidi: Neues aus dem Lonetal: Ergebnisse von Ausgrabungen an der Fetzershaldenhöhle und dem Vogelherd. *Archäologische Ausgrabungen Baden-Württemberg 2014*, 2015, 59–64.

Čižmář/Čižmářová 2014 — M. Čižmář/J. Čižmářová: Pozdně halštatský nález z Pavlovic (okr. Vyškov) a několik dalších halštatských depotů z Moravy. In: J. Čižmářová/N. Venclová/G. Březinová (eds.): *Moravské křižovatky. Střední Podunají mezi pravěkem a historií*. Moravské zemské muzeum. Brno 2014, 35–56.

Dutkiewicz 2015 — E. Dutkiewicz: *The Vogelherd Cave and the discovery of the earliest art – history, critics and new questions*. Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Universität Tübingen. Tübingen 2015.

Golec et al. 2023 — M. Golec/J. Bartík/Z. Golec Mírová/L. Kučera/T. Ingr/T. Chrástek/J. Kapusta/K. Samajová: Trade, use, offer. The hoard of Bánov – „Skalky" (CZ). *Journal of Archaeological Sience Reports* 50, 2023, 104097.
DOI: https://doi.org/10.1016/j.jasrep.2023.104097

Henderson 2013 — J. Henderson: *Ancient Glass. An Interdisciplinary Exploration*. Cambridge 2013.

Klíma 1962 — B. Klíma: Die archäologische Erforschung der Höhle Švédův Stůl in Mähren. In: R. Musil (red.): *Die archäologische Erforschung der Höhle Švédův Stůl 1953–1955*. Anthropos 13. N. S. 5. Brno 1962, 7–96.

Klíma 1974 — B. Klíma: *Archeologický výzkum plošiny před jeskyní Pekárnou*. Studie AÚ *ČSAV* Brno 2/I. Praha 2017.

Kršová 2013 — M. Kršová: *Skleněné korálky doby bronzové a halštaské na Moravě*. Bachelor's thesis stored at ÚAM FF MU. Brno 2013. Unpublished.

Kršová 2017 — M. Kršová: *Skleněné korálky z pohřebišť doby halštatské na Moravě*. Master thesis stored at ÚAM FF MU. Brno 2017. Unpublished.

Langley et al., submitted — M. C. Langley/P. Škrdla/M. Kmošek/L. Nejman/D. Wright/O. Mlejnek/A. M. Way/N. Skopal/M. Králík, forthcoming: *Engraved limestone from Švédův Stůl Cave, Czech Republic*. Submitted.

Mlejnek et al. 2024 — O. Mlejnek/M. Oliva/M. Nývltová Fišáková/L. Lisá/A. Bajer: History of research at Švédův stůl Cave in the Moravian Karst. *Přehled výzkumů* 65, 2024, 11–37.

Nejman et al. 2020 — L. Nejman/P. Hughes/M. Sullivan/D. Wright/A. M. Way/N. Skopal/O. Mlejnek/P. Škrdla/L. Lisá/M. Kmošek/M. Nývltová Fišáková/M. Králík/P. Neruda/Z. Nerudová/A. Přichystal: Preliminary report of the 2019 excavation at Švédův Stůl Cave in the Moravian Karst. *Přehled výzkumů* 61, 2020, 11–19.

Nejman et al. 2021 — L. Nejman/R. Bortel/R. Johančík/M. Králík/M. Lengyel/O. Mlejnek/L. Nedomová/P. Škrdla/S. Vohryzek/V. Záhorák: Ochoz u Brna (okr. Brno-venkov). *Přehled výzkumů* 62, 2021, 179.
DOI: https://www.arub.cz/wp-content/uploads/61_1_01.pdf

Ondroušková 2011 S. Ondroušková: *Pravěk Moravského krasu (neolit–doba stěhování národů)*. Master thesis stored at ÚAM FF MU. Brno 2011. Unpublished.

Peša 2014 V. Peša: Jeskyně v neolitu a časném eneolitu mezi předním východem a střední Evropou – chronologie, funkce a symbolika. *Acta Musei Moraviae, Scientiae sociales* IXC/2, 2014, 169–210.

Peška 2020 J. Peška: Starší doba bronzová. In: M. Novák (ed.): *Blanensko a Moravský kras v pravěku*. Blansko 2020, 115–119.

Přichystal 2002 A. Přichystal: Výzkum surovin štípaných artefaktů magdalénienského osídlení z Ochozské jeskyně. In: J. Svoboda (ed.): *Prehistorické jeskyně*. Dolnověstonické studie svazek 7. Brno 2022, 226–228.

Purowski 2022 T. Purowski: Identifying Bronze Age glass production centres through bead-making techniques. *Archeologia Polski* 67, 2022, 61–80.

Stuchlík 1981 S. Stuchlík: *Osídlení jeskyň ve starší a střední době bronzové na Moravě*. Studie Archeologického ústavu Československé akademie věd v Brně 2. Brno 1981.

Škrdla/Lázničková 1999 P. Škrdla/M. Lázničková: Mokrá-Horákov (kat. úz. Mokrá, okr. Brno-venkov). *Přehled výzkumů* 40, 1999, 158–159.

Škrdla/Plch 1993 P. Škrdla/M. Plch: Osídlení epigravettienu v okolí Stránské skály (okr. Brno-město). *Archeologické rozhledy* 45, 1993, 429–435.

Schmitz et al. 2002 R. W. Schmitz/D. Serre/G. Bonani/S. Feine/F. Hillgruber/H. Krainitzki/S. Pääbo/F. H. Smith: The Neandertal type site revisited: Interdisciplinary investigations of skeletal remains from the Neander Valley, Germany. *PNAS* 99, 2002, 13342–13347. DOI: https://www.pnas.org/doi/full/10.1073/pnas.192464099

Vaňura 1965 J. Vaňura: Nález moláru neandrtálského člověka na haldě před jeskyní Švédův Stůl Moravském krasu. *Časopis pro mineralogii a geologii* 10/3, 1965, 337–341.

Voláková 2001 S. Voláková: K technologii štípané industrie magdalénienu: analýza jader z jeskyně Pekárny. *Acta Musei Moraviae – scientiae socialis* 86, 2001, 101–116.

Wolf et al. 2018 S. Wolf/R. Dapschauskas/E. Velliky/A.W. Kandel/H. Floss/N. J. Conard: The Use of Ochre and Painting during the Upper Paleolithic of the Swabian Jura in the Context of the Development of Ochre Use in Africa and Europe. *Open Archaeology* 4, 2018, 185–205. DOI: https://doi.org/10.1515/opar-2018-0012

Wright et al. 2021 D. Wright/P. Hughes/N. Skopal/M. Kmošek/A. M. Way/M. Sullivan/L. Lisá/P. Ricardi/P. Škrdla/L. Nejman/P. Gadd/M. Nývltová Fišáková/O. Mlejnek/M. Králík: The archaeology of overburden: Method within the madness at Švédův Stůl, Czech Republic. *Journal of Archaeological Science* 132, 2021, 105429. DOI: https://doi.org/10.1016/j.jas.2021.105429

Zajíček/Golec/Světlík 2019 P. Zajíček/M. Golec/I. Světlík: Pravěké čáry. Epigrafický výzkum v Moravském krasu odhalil nejstarší jeskynní kresby na území České republiky. *Vesmír* 98, 2019, 588–591.

Revizní výzkum sedimentů vyvezených z jeskyně Švédův stůl (Moravský kras, ČR) a jejich archeologický potenciál

Petr Škrdla – Jaroslav Bartík – Ladislav Nejman – Antonín Přichystal – Ondřej Mlejnek – Miroslav Králík – Matěj Kmošek

Souhrn

V letech 2019–2024 byl proveden revizní výzkum sedimentů z haldy, kterou B. Klíma deponoval před jeskyní Švédův stůl během jeho výzkumů v 50. letech minulého století. Zatímco B. Klíma podle jeho odhadu prokopal a vyvezl 450 m^3 sedimentů, nově bylo prozkoumáno pouze 16 m^3 těchto sedimentů, což představuje přibližně 3,6 % objemu Klímovy haldy (obr. 1; 3). Na rozdíl od původní výzkumné metodiky byly při revizním výzkumu veškeré sedimenty plaveny na sítech o rozměru oka 2 mm, což umožnilo získání i těch nejdrobnějších artefaktů (obr. 2).

Nově bylo získáno 229 artefaktů (oproti 193 artefaktům z výzkumu B. Klímy). Převážnou část nově získaných artefaktů štípané kamenné industrie lze klasifikovat jako magdalénien (obr. 4), pouze u několika úštěpů z hrubozrnných surovin (sluňák – obr. 4: 25, břidlice devon-kulm – obr. 6: 3, 7 a zlomky křemene – obr. 6: 5, 6) lze uvažovat i o středopaleolitické klasifikaci, ale nelze vyloučit, že patří taktéž k magdalénienu. Ojedinělé artefakty umožňují i postpaleolitickou klasifikaci (srpová čepel z rohovce typu Olomučany – obr. 4: 37). Spektrum surovin nově získané kolekce se odlišuje od dříve zdokumentovaných spekter z Pekárny a z plošiny před Ochozskou jeskyní (obr. 11). Oproti zmíněným kolekcím zejména klesá podíl eratického silicitu a naopak narůstá podíl křídového spongiového rohovce a moravských jurských rohovců. Za pozornost stojí i přítomnost ojedinělých artefaktů z křišťálu/citrínu (obr. 5) a kropenatého bavorského rohovce. Technologické spektrum je téměř z poloviny (45 %) tvořeno drobnými artefakty do velikosti 1,5 cm. Skupina nástrojů představuje 15,7 % souboru a z poloviny je tvořena mikrolitickými nástroji (obr. 4: 1–12, 15–22), které doplňují škrabadla (obr. 4: 23, 26, 29), rydla (obr. 4: 28, 34), retušované čepele a jejich zlomky (obr. 4: 2, 14, 15, 27), vrták (obr. 4: 35), odštěpovač (obr. 4: 24) a retušovaný zlomek (obr. 4: 36).

Nálezy keramických fragmentů odpovídají kulturním okruhům doloženým již výzkumem B. Klímy (obr. 7). Nově ale byly získány dva malé a zlomek jednoho většího skleněného korálku, které lze na základě prvkové analýzy datovat do doby bronzové a do doby železné (obr. 8).

Z dalších zajímavých předmětů pravděpodobně paleolitického stáří, které byly nově získány, lze zmínit zlomek vápence se stopami rytí, snad opad ze stěny jeskyně, který bude předmětem specializované studie (*Langley et al., submitted*), dva protáhlé valounky kulmské břidlice beze stop rytí (obr. 6: 1, 2; analogické artefakty pocházejí také z Pekárny, *Klíma 1974*, obr. 27), špičák lišky s poškozeným otvorem na zavěšení (obr. 9) a hrudky oxidů železa. Výše popsané nálezy doplňuje více než 30 kg fragmentů osteologického materiálu, které budou předmětem budoucího výzkumu.

Závěrem je možno konstatovat, že výzkum již jednou překopaných sedimentů má potenciál přinášet další poznatky o využívání jeskyně v různých obdobích pravěku a z tohoto důvodu máme v plánu v něm pokračovat. Současně je třeba konstatovat, že výsypka před jeskyní z našeho pohledu představuje sekundární archeologickou lokalitu a jako takovou je ji třeba chránit.

Obr. 1. 1 – lokalizace jeskyně Švédův stůl v Moravském krasu; 2 – lokalizace sond vykopaných v letech 2019–2024. Legenda: a – výzkum 2019; b – výzkum 2020–2024; c – stromy; d – profily; e – Moravský kras; f – poloha jeskyně. Autor J. Bartík, zdroj mapy: mapy.cz.

Obr. 2. Metodika výzkumu. 1 – kopání sedimentů na povrchu haldy; 2 – plavení v suchém korytu řeky; 3 – transport sedimentu v pytlech; 4 – plavení mimo lokalitu; 5 – dokumentace profilu v hloubkové sondě. Foto P. Škrdla, J. Bartík.

Obr. 3. Stratigrafie profilů v haldě (profily P1–P3, jejich lokalizace viz obr. 1: 2). Foto J. Bartík, D. Wright.

Obr. 4. Vybrané štípané artefakty. 1, 5, 20, 22, 32 – křídový spongiový rohovec; 2, 10 – přepáleno; 3, 8, 17, 19 – radiolarit; 4, 11, 14, 16, 21, 24, 29–35 – eratický silicit; 6, 7, 9, 12, 13, 15, 18, 23, 28 – moravské jurské rohovce; 25 – sluňák; 26 – křišťál/citrín; 27 – bavorský tečkovaný rohovec; 36 – vápenec; 37 – rohovec typu Olomučany. Kresba J. Brenner, foto J. Bartík.

Obr. 5. Škrabadlo z křišťálu/citrínu. Foto J. Bartík.

Obr. 6. Vybrané artefakty z ostatních surovin. 1, 2 – kulmská břidlice; 3, 7 – kvarcit z kulmských štěrků; 4 – břidlice z rozhraní devon, kulm; 5, 6 – křemen; 8 – arkózový pískovec. Kresba a foto J. Bartík.

Obr. 7. Vybrané keramické nálezy. Kresba a foto J. Bartík.

Obr. 8. Skleněné korálky. Měřítko: a – 1, 2; b – 3. Foto K. Augustinová a M. Kmošek.

Obr. 9. Zub lišky s otvorem. Foto Č. Fouček a J. Bartík.

Obr. 10. Histogramy porovnávající maximální rozměry artefaktů z výzkumu B. Klímy a z nové kolekce (1; data poskytla Z. Nerudová, Moravské zemské muzeum). Klímova a nová kolekce dohromady (2). Křivky představují normální rozdělení. Pozn.: Zatímco B. Klíma prozkoumal celou jeskyni, pouze 3,6 % jeho haldy bylo nově proplaveno, tzn. že malá frakce, která v novém souboru převažuje, je výrazně podhodnocena.

Obr. 11. Porovnání surovinových spekter magdalénských souborů z jižní části Moravského krasu. Legenda: a – jeskyně Pekárna (*Voláková 2001*); b – Ochozská jeskyně (*Přichystal 2002*); c – jeskyně Švédův stůl (nové).

Tabela. 1. Prvkové složení skleněných korálků na základě XRF analýzy.

Translated by authors

Ing. Petr Škrdla, Ph.D., DSc.
Archeologický ústav AV ČR, Brno, v. v. i.
Čechyňská 19
CZ – 602 00 Brno
skrdla@arub.cz
http://orcid.org/0000-0002-4364-2594

Mgr. Jaroslav Bartík, Ph.D.
Archeologický ústav AV ČR, Brno, v. v. i.
Čechyňská 19
CZ – 602 00 Brno
bartik@arub.cz
http://orcid.org/0000-0003-1078-5799

Ladislav Nejman, Ph.D.
School of Archaeology and Anthropology
Banks Building
The Australian National University
44 Linnaeus Way
AU – 0200 Canberra

&

Archeologický ústav AV ČR, Brno, v. v. i.
Čechyňská 19
CZ – 602 00 Brno
lnejman81@gmail.com
http://orcid.org/0009-0009-1748-7883

prof. RNDr. Antonín Přichystal, DSc.
Ústav geologický věd
Přírodovědecká fakulta Masarykovy univerzity
Kotlářská 2
CZ – 611 37 Brno
prichy@sci.muni.cz
http://orcid.org/0000-0001-6653-0416

Mgr. Ondřej Mlejnek, Ph.D.
Univerzita Hradec Kralové
Filozofická fakulta
Katedra archeologie
Rokitanskeho 62
CZ – 500 03 Hradec Králové
mlejnek@erca.cz
http://orcid.org/0000-0003-2806-6776

doc. RNDr. Miroslav Králík, Ph.D.
Masarykova univerzita
Přírodovědecká fakulta
Ústav antropologie
Kotlářská 267/2
CZ – 611 37 Brno
kralik@sci.muni.cz
http://orcid.org/0000-0002-2077-4068

Mgr. Matěj Kmošek, DiS.
Archeologický ústav AV ČR, Brno, v. v. i.
Čechyňská 19
CZ – 602 00 Brno
kmosek@arub.cz
http://orcid.org/0000-0002-5471-2201