

# One ring to interpret. Bone ring-type adornment from the Epigravettian site Bratčice (Moravia, Czech Republic)

*Un anneau à interpréter. Un ornement en os de type anneau du site épigravettien de Bratčice (Moravie, République Tchèque)*

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**ABSTRACT** - The newly excavated site of Bratčice III (South Moravia, Czech Republic) represents a lesser-known Late Upper Palaeolithic site in Moravia. According to the stratigraphy, the overall character of the lithic assemblage and the <sup>14</sup>C date, the site is associated with the Epigravettian. A unique find – a personal adornment found probably in context of the Epigravettian finds – can be understood as the first evidence of this kind of mobile art during the Late Upper Palaeolithic. The detailed study of the finds from Bratčice III is presented here. The special focus is placed on the study of personal adornment to evaluate this find and place it in a wider geographic context.

**RÉSUMÉ** - Le site de Bratčice III (Moravie du Sud, République Tchèque), fouillé récemment, représente un campement moins connu du Paléolithique supérieur récent en Moravie. D'après la stratigraphie, le caractère général de l'assemblage lithique et la date au radiocarbone, le site peut être associé à l'Épigravettien. Un objet unique – une parure personnelle trouvée probablement dans le contexte des découvertes épigravettiennes – peut être considéré comme la première preuve de ce type de l'art mobilier du Paléolithique supérieur récent. L'article présente une analyse détaillée des trouvailles de Bratčice. Une attention spéciale est mise sur l'étude de la parure pour évaluer l'objet et le mettre dans un contexte géographique plus large.

**KEYWORDS** - Late Upper Palaeolithic, adornment, Epigravettian, Moravia (Czech Republic)  
*Paléolithique supérieur récent, parure, Epigravettien, Moravie (République Tchèque)*

## Introduction

Different types of ornaments are well-known from Pavlovian/Gravettian sites as well as from Magdalenian sites across to the whole area occupied by modern humans (Jelínek 1990; Kozłowski 1992; Valoch 1998; Sacchi 2003; White 2003). If we have a look at the region of Moravia, the Pavlovian/Gravettian as well the Magdalenian sites provided a significant number of portable art and ornaments made on different types of materials, including bones, ivory, teeth, ceramics, stones or shells. All these finds are well documented and published. The short period between the Willendorf-Kostenki type industries (24-25 ka calBP) and the Magdalenian (18 ka calBP in Moravia) was understood to be a gap in the occupation of Central

and Northern Europe, including Moravia. We recorded that people had left certain regions (e.g. the northern territory of Germany) and archaeological evidence for this period was for a long time sparse and incomplete. Recent archaeological excavations of new sites as well as re-analyses of existing information show that people persisted in refugia. Especially in Moravia, analyses of lithic assemblages indicate the co-existence of two groups of people in time and territory with different settlement strategies, technologies and subsistence strategies: the Epigravettian and the Epiaurignacian (Nerudová et al. in press). Moreover, <sup>14</sup>C dates indicate that both groups – and especially the Epigravettian – could have co-existed with the first Magdalenian hunters who appeared in Poland and Moravia around 18 000 BP (Wiśniewski et al. 2017).

The aim and scope of this contribution involve the presentation of the new Palaeolithic site of Bratčice III

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(Moravia, Czech Republic) that has yielded many animal remains and a few pieces of lithic industry in a very specific stratigraphic position, and the site of Bratčice (without a clear localization) with the finding of a handcraft probably of Palaeolithic age. The handcraft – a ring – is an unusual find. In association with the ring were found animal teeth, which provided a  $^{14}\text{C}$  date, indicating that these finds might belong to the Late Upper Palaeolithic (LUP). We analysed all archaeological finds with special focus on the ring to verify its Palaeolithic age.

### Bratčice III: geographical settings

Bratčice is a small village situated less than 20 km south-south-west of Brno, in the proximity of the eastern slopes of the Krumlovský les (Krumlov Forest) area (Fig. 1). Numerous Palaeolithic sites are known from the cadastre of Bratčice, especially sites from the Early Upper Palaeolithic (EUP) period – the Szeletian culture (Belcredi et al. 1989). One of these is located on the right bank of the small stream of Šatava, 1.5 km to the south-east of the village centre. The open-air site faces north-north-east at an elevation of 224 m a.s.l., 18 m above the valley floor.

### History of the research of the Bratčice sites

The site (with the address of the local finder) was mentioned for the first time by Karel Valoch in his own field notebook on 13<sup>th</sup> November 1969. Sometime before this date, a group of young schoolboys found mammoth molars and some blades in an unused sandpit near the village of Bratčice. Valoch visited the site a second time during the spring of the following year (20<sup>th</sup> May 1970). He wrote (in Czech): *"We visited the place where the schoolboys [the same group] found mammoth teeth again this spring. One bank of the sandpit is largely dug out. We [Karel Valoch, his son and Václav Gebauer] extended the pit..."* (Valoch 1967-1976).

They found two bone fragments and a splinter of a tusk. The stratigraphic situation was very simple: in the small depression, the black humic horizon was preserved under the topsoil. In the upper part of the humic horizon were atypical shards (of a post-Palaeolithic age); in the bottom part of the humic horizon and in the underlying layer of orange-brown loess-like sediment were some lamellas from mammoth molar. The maximum thickness of the humic horizon was approximately 40 cm; the underlying loess-like sediment was 15 cm thick. There was a clear border between the horizon with archaeological and osteological finds and the underlying sediment, the border between the humic horizon and loess-like sediment was gradual. Below the loess-like sediment was loess of 50 cm in thickness. A few metres away, Valoch observed an intensive red-brown soil with rests of ice wedges completed by dark humic sediment under the loess layer (Valoch 1974: 12). He also noted that the bottom part of the profile is not related to the upper part. The black humic horizon developed on the Upper Weichselian loess cover.

The information about this site was forgotten for a long time despite Valoch's statement that the site could be associated with a very young phase of the Upper Palaeolithic, unknown in this region. The main reason why the site was not excavated was that the actual location of the site was unclear due to significant geomorphological changes in the neighbourhood of the village of Bratčice.

In 1999, a very unique piece was donated to the Anthropos Institute: a broken ring together with fragments of mammoth molars. All the pieces had been found together by an amateur collector at the same place (according to the collector's details). Although we also obtained a description and a sketch of the place where the pieces were found, the exact location is no longer clear, nor are the date and identity of the collector, but it was in the loess 'somewhere' around the village of Bratčice.

In the light of the new results obtained at the Brno-Štýřice III site (Nerudová & Neruda 2014; Nerudová 2015), we have tried to find a new stratified Epigravettian site. Due to its similar stratigraphy and presence of bones and chipped stone artefacts, the Bratčice III site seemed to be a logical solution. For this reason, during short campaigns in 2017 and 2018, we tried to find the site to fix the true position using GPS, confirm the stratigraphic position and, last but not least, find Palaeolithic artefacts and bones in stratigraphic context.

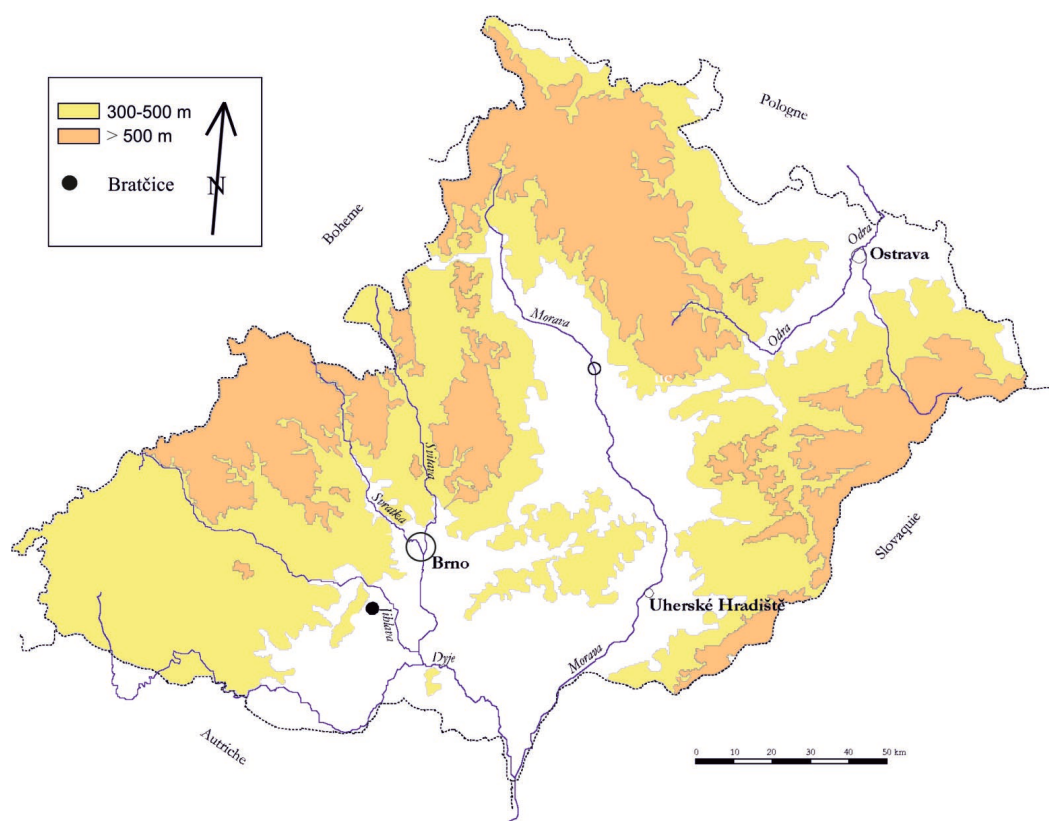
### Material and methods

The re-evaluation of finds from Bratčice III and the Bratčice sites included analyses of materials stored in the Anthropos Institute (AI) of the Moravian Museum in Brno, the archaeological prospection in the terrain and detailed analyse of the ring.

The materials from the Bratčice cadastre are divided into two groups: Bratčice III and Bratčice. The material from the Bratčice III site contains eight lithic artefacts, 14 bones and 23 fragments of mammoth molars. The site denominated as Bratčice is represented by a small ring made from hard animal tissue and by two fragments and approximately 14 splinters of mammoth molars.

### Faunal remains

Rudolf Musil performed the first determination of the osteological remains from Bratčice III, while the determination of the animal remains from Bratčice was performed by the palaeontologist Martina Roblíčková. Because all the osteological remains are still available in the AI, we were able to perform a comparison. With the palaeontologist, we compared the condition, abrasion and morphology of all the mammoth teeth found in both sites in Bratčice. Zdeňka Nerudová tried to conjoin the fragments of teeth between the sites to confirm/refute any chronological context between them.



**Fig. 1.** Moravia region (eastern part of the Czech Republic) with the location of the Epigravettian site Bratčice. Compilation by Z. Nerudová.

**Fig. 1.** La région de Moravie (l'est de la République Tchèque) avec l'emplacement du site épigravettien de Bratčice. Compilation de Z. Nerudová.

### Archaeological analyses

The collection of lithic pieces was studied according to the actual knowledge of the lithic technology, described for Moravian LUP collections. We can describe the Epigravettian technology as a reduction of unipolar blade cores using direct percussion by a soft-mineral hammer with blanks with punctiform butt and characteristic ventral or dorsal flat splinter negative (Nerudová & Moník 2019), while the Epiaurignacian technology is described as a production focused on carenoidal elements with specific types of microliths (Demidenko et al. 2018).

The radiocarbon date obtained from a mammoth molar was measured in the Oxford Laboratory (UK) in 2016. For the calibration of the date, we used the CalPal program in version 2018 and the calibration curve IntCal13 (Reimer et al. 2013).

### Ring analyses

The micro-CT scan was done with accelerating voltage 110 kV and target current 51  $\mu$ A, with 1 mm thick aluminum filter on the detector. Exposure time was set to 10 s per projection. The scan was performed using the Heliscan space-filling trajectory, with 5 928 projections. This trajectory is designed to produce a maximally uniform sampling throughout the entire scanned volume, thereby keeping the total number of projections required for a geometrically faithful tomographic image to a minimum (Kingston et al. 2018).

Different approaches have been used to identify and correctly classify the object, such as taphonomy, typology and morpho-technology. The ring has been analysed from the point of view of the taphonomic preservation, its fragmentation and the characteristics of the macroscopic traces that were identified on the surface. The identification of basic taphonomic alterations has been applied as a first step in the analysis of the ring. The aim of this analysis was to exclude possible non-human agents that can affect the modification of the ring surface during the different stages of the manipulation with the object, including the post-burial process (e.g. Fernández-Jalvo & Andrews 2016). The typo-technological analysis includes the general morphometric description and some technological observations, based on the identification of raw material, fabrication traces and their possible association to the debitage and shaping techniques. For microscope observation, a stereo microscope Nikon C-PS using 8 $\times$ –50 $\times$  magnification was used. The identification of traces is based on the appropriate description of their morphology and a comparative analysis of the surface alterations with published datasets (e.g. Poplin 1974; Barge-Mahieu 1991; Christensen 2004; Provenzano 2004a, 2004b; Märgärit et al. 2018). Very helpful in the object analysis is the reconstruction of the fragmentation process and the morphology of the breakages, particularly related to the possible fatigue breaks (e.g. Fischer 1995; Bradfield

2013). Due to the lack of necessary equipment (low magnification and absence of comparative collections), we could not exclude the occurrence/presence of wear traces. Therefore, the use-wear analysis will be one of the objectives for future research.

## Results

### Archaeological excavations

During the surface prospection in 2016, Zdeňka Nerudová found an old unused sandpit and in a nearby field one or two sporadic Palaeolithic artefacts near the village of Bratčice. The position of the sandpit more or less corresponded with Valoch's published text, and for this reason, the following year (2017) we (Petr Neruda, Zdeňka Nerudová and a student) focused on this area. We drilled a set of boreholes and performed surface prospection. Antonín Otta, a local resident, helped us significantly by finding the last member of the group of schoolboys. This witness personally showed us the actual location of the findings, so that we could focus on it more precisely.

Despite the morphological changes to the sandpit, which are evident by comparing old aerial maps from the 1950s (available at [kontaminace.cenia](http://kontaminace.cenia)) with current aerial maps, we found and confirmed the previously described stratigraphy, which fully corresponds to that of the Brno-Štýřice III site (Fig. 2). The archaeological layer should have corresponded to the orange-brown loess sediment, unfortunately the rest of the original archaeological horizon was not found. Sporadically, unpatinated chipped artefacts have been recorded in the surrounding area, but with no stratigraphic context. Therefore, we assume that the original place with the findings was destroyed in the 1970s.

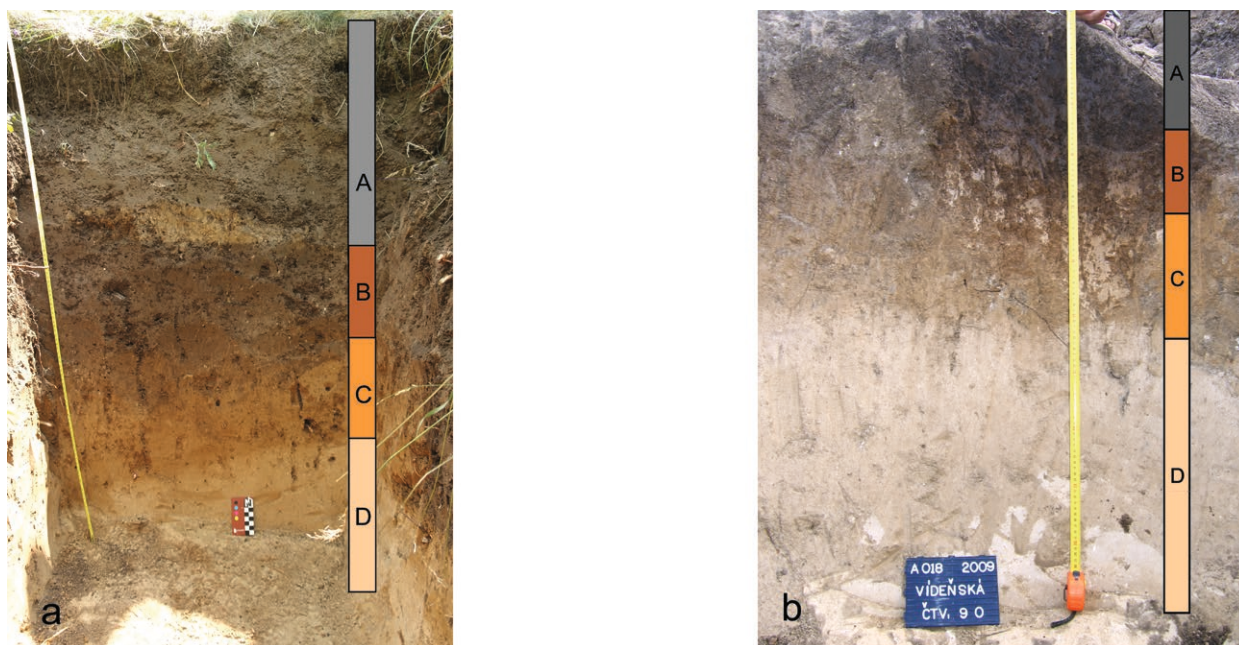
### Lithic material

The lithic industry contains eight pieces made from different types of raw materials: chert of the Krumlovský les type, erratic flint and spongolite. All the pieces are undiagnostic and covered with a light white patina (Fig. 3). We can distinguish some blades (Fig. 3: 1, 2 & 5-7) and three flakes (Fig. 3: 3, 4 & 8). The preserved butts were knapped with a mineral hammer (Fig. 4).

### Animal remains and dating

The group of animal remains from the Bratčice III site (Fig. 5) contains bones and molars. According to H. R. Musil, the bone fragments are from the pelvis, vertebrae and intermaxilla. The molars, frequently in fragments, come from numerous individuals (from young animals as well as from adults) and are looked upon as a form of diminutive/nanism individuals. In addition to the mammoth bones, a fragment of reindeer antler was found (Valoch 1974).

Concerning the animal remains from the second group (Bratčice; Fig. 6), M. Roblíčková (personal



**Fig. 2.** Reconstructed stratigraphy at Bratčice III (a) and its comparison with that of Brno-Štýřice III (b). Photos by P. Neruda, digitisation by Z. Nerudová.

*Fig. 2. La stratigraphie reconstituée de Bratčice III (a) et sa comparaison avec celle de Brno-Štýřice III (b). Photos de P. Neruda, digitalisation de Z. Nerudová.*

communication 2019) concluded that the mammoth molars found together with the ring came from at least two individuals (fragment of the 3<sup>th</sup> or 4<sup>th</sup> molar of a sub-adult/adult and fragment of the 5<sup>th</sup> or 6<sup>th</sup> molar of an adult). In 2015, we took a sample for dating from one fragment of a mammoth tooth (Fig. 6: a). The result of <sup>14</sup>C dating from Bratčice was unexpected, because the date is much younger than the general EUP occupation in the region. In 2016, we obtained the following date (OxA-33454): 14 395 ± 70 uncalBP, after calibration a date range between 17 750-17 350 calBP (Fig. 7). Two new samples for dating have been taken from a fragment of reindeer antler (Fig. 5) and a fragment of mammoth molar in 2019. Unfortunately, both samples cannot be dated. A first sample (reindeer antler) failed due to low yield, the second sample failed due to no yield.

### The ring from Bratčice

In the collection of hard animal tissues a small artificial ring was preserved. Currently, it is broken into two fragments and a splinter has broken off one fragment (Fig. 8: a). The external diameter is 2.1 cm, the internal diameter is 1.65 cm, the D-shaped cross-section has dimensions of 0.15 × 0.35 cm. The ring has not been published yet.

### Choice of the raw material

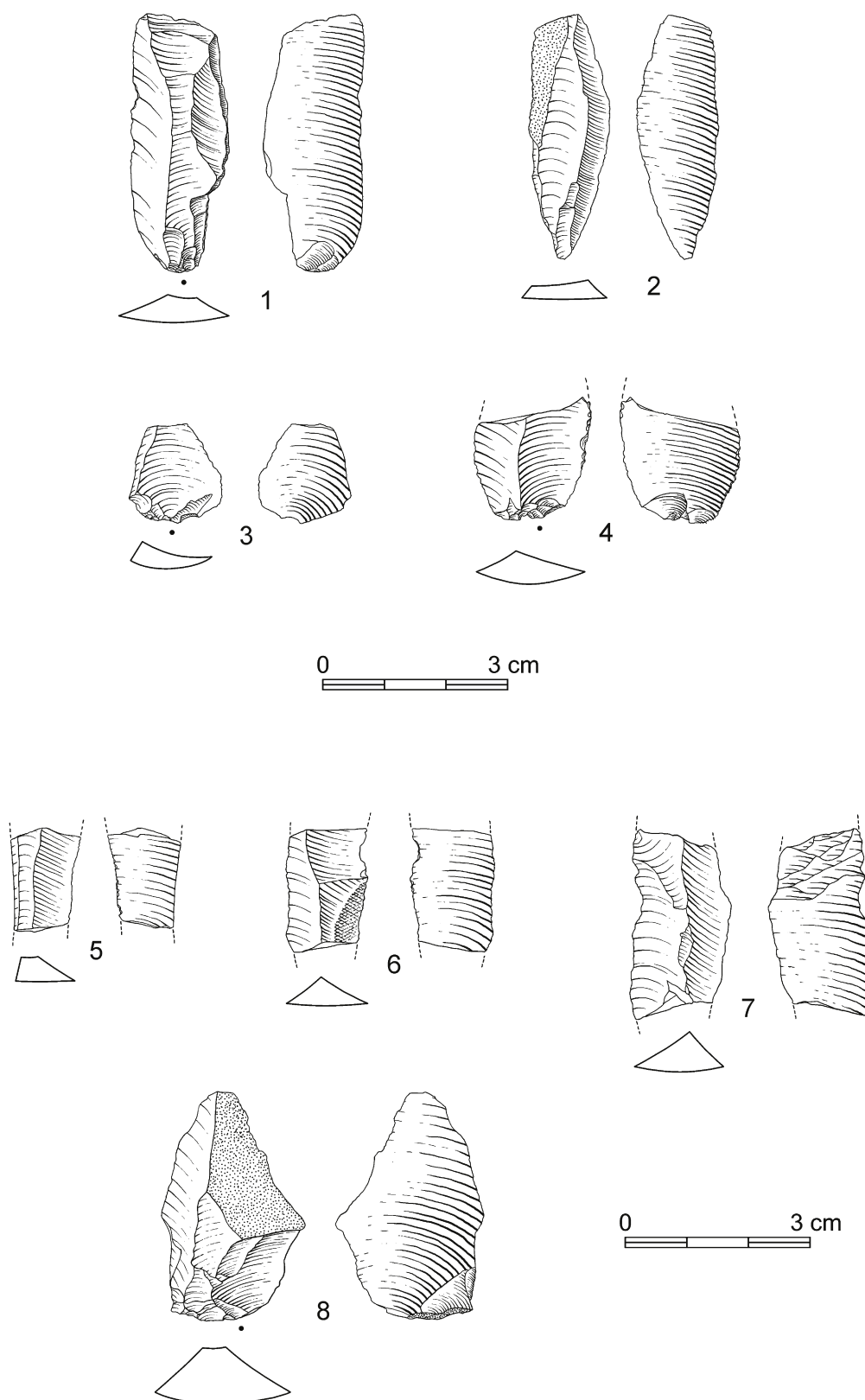
Primary observations kindly provided by Marylène Patou-Mathis suggest that the ring was made from a bone (M. Patou-Mathis, undated). The CT-scan clearly confirmed bone as the material used for the ring. On the basis of the CT-scan we can observe the plexiform

bone structure (Fig. 9: B & C). This type of bone structure is generally associated with domestic type of animals (like pig, cow, goat, sheep, horse), nevertheless, it is also typical for Pleistocene mammal species, especial for quickly growing and larger species (for example *Megaloceros* or horse; see Sawada et al. 2014 with a wider overview).

Very well visible is the inner structure of the compact bone. The cells (osteons) have omnidirectional orientation, which indicates that it comes from a long bone (like humerus or tibia (Fig. 9: B). The compact bone is very thick. If the ring is of an Epigravettian age, it must be worked from the middle part of horse's tibia or middle part of horse's radius. Both types of bones have a sufficiently large surface to prepare a ring of such dimensions.

### Distinguishing the taphonomical alterations from the technological traces

The object is light pale-yellowish and disintegrated into three pieces. The object is broken transversally in to two parts. Despite the strong gloss, we can observe different taphonomical alterations, evenly distributed on the surface (Fig. 10). Major taphonomical damage is related to the bone weathering and very slight corrosion in the certain spots of the external surface. The surface of the object shows signs of flaking and some patches of tiny cracks that are still not going deep to the tissue (after Behrensmyer 1978). In two spots the object is broken transversally. Crack edges are angular, going along the fibrous texture of the bone and their surface is of different colour than the rest of the object – usually cream-white to white.



**Fig. 3.** Lithic industry found in the 1970s in Bratčice: (1), (3) & (4) erratic flint, (2) & (6-8) spongolite (Cretaceous chert) and (5) chert of Krumlovský les type. Drawing by T. Janků.

**Fig. 3.** Industrie lithique trouvée dans les années 1970 à Bratčice: (1), (3) & (4) silex erratique, (2) & (6-8) spongolite (silex du Crétacé) et (5) silex de type Krumlovský les. Dessin de T. Janků.

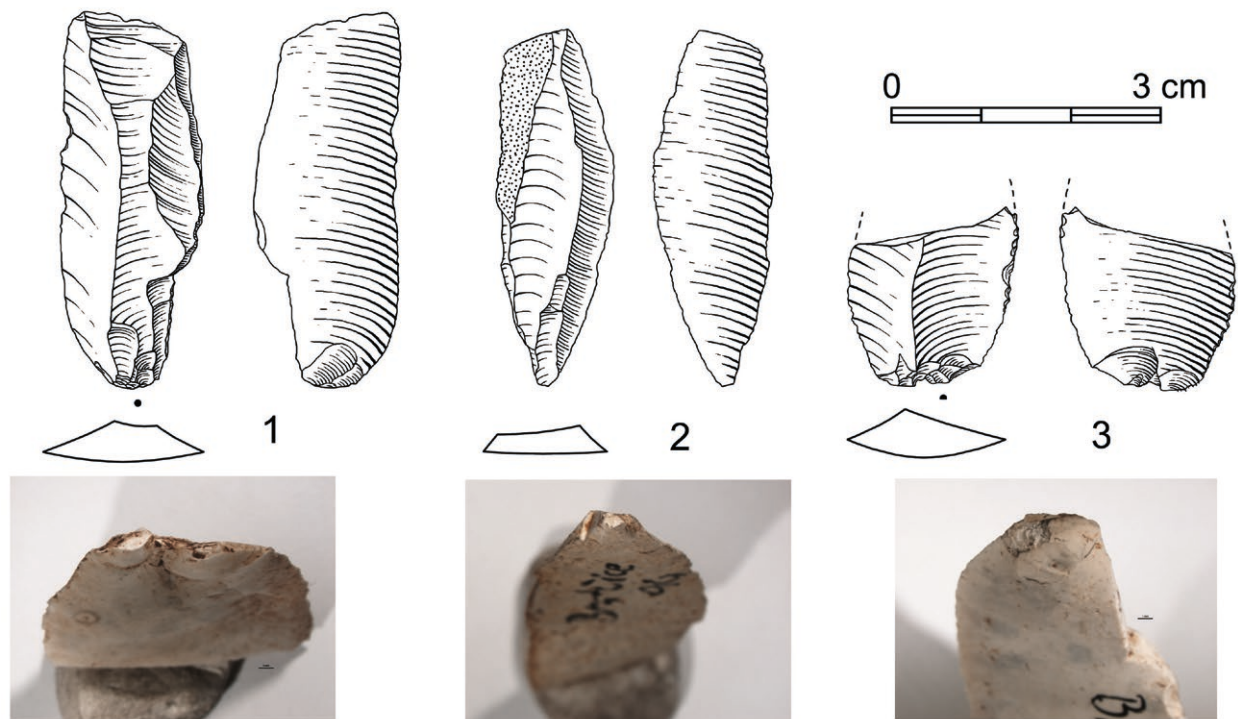


Fig. 4. The details of punctiform butts knapped by soft mineral hammer. Drawing by T. Janků, microphoto by M. Kmošek.

Fig. 4. Les détails des talons punctiformes, taillés par percuteur de pierre tendre. Dessin de T. Janků, microphoto de M. Kmošek.

Those cracks are more likely related to post-depositional processes, when the bone material has been disintegrated in the weakest part.

A tiny piece of the material is missing at one edge of the bone, leaving the negative of the removal. This negative is visible on the object and differs by colour (little bit lighter-coloured) from the rest of surface. Thus, we suppose that this damage appeared almost certainly later. The negative surface is covered by numerous parallel linear traces, almost perpendicularly oriented to the edge of ring and it ends by tiny step fracture. The striation on the negative surface is shallow with V-section and represents the typical bounces that appear due to the movement of a very sharp tool under a small angle (Fig. 10: A & B). It is very likely that the piece of the bone has been cut off by a knife recently, perhaps as the result of peeling off sediment from the surface.

#### **Morphology and fabrication**

The cross-section of the ring is plano-convex up to double-convex in some parts, with visible thickening in the mesial axis. The general morphology of the ring and the morphology of the cross-section suggests a biconvex modification of the object, perhaps by biconvex perforation. The external ring surface is partially covered by clusters of little striations that apparently were caused by surface abrasion. No other technical traces have been identified on the ring. The rest of the surface is strongly modified and glossy.

Despite the lack of the traces related to the fabrication of the object, the cortical bone microstructure and the results of the histological analysis give us some clue how the blank for the ring has been oriented in the bone. Surprisingly, the inner structure shows that the ring was made (or the blank for ring was obtained) not from the cross-section of a bone, but from the surface. Very likely, the flattened preform has been obtained from the surface of a long bone diaphysis. For the ring production, solely cortical bone has been used, which has the appropriate properties such as strength, stiffness or good viscoelasticity (obviously depending from the many biological and taphonomical factors, see Evans 1973; Reilly & Burstein 1974; Fernández-Jalvo & Andrews 2016). The following procedure remains unclear, but it includes the perforation (perhaps biconical or scraping with rotative movement) and modification of the perforation by unclear shaping technique. The final shaping of the surface has been done by abrasion. Possible traces of the polishing or other fine technique are not visible on the surface. Final gloss belongs, very likely, to the use-wear and has to be analysed under the microscope with higher resolution or SEM.

#### **Function?**

According to the preliminary observations we can assume that this ring-shaped object does not display any traces related to the unidirectional surface alteration which could be related to the use of the ring as a pendant, hanging ornament or costume decoration.



**Fig. 5.** Faunal remains from Bratčice III (first finding group). The reindeer bone is marked with a cross. Photo by Z. Nerudová.

**Fig. 5.** Vestiges fauniques de Bratčice III (premier groupe de trouvailles). L'os du renne est marqué par croix. Photo de Z. Nerudová.





Fig. 6. Faunal remains from Bratčice (second finding group): (a) fragment of molar used for <sup>14</sup>C dating and (b) mammoth molar. Photo by Z. Nerudová.

Fig. 6. Vestiges fauniques de Bratčice (second groupe de trouvailles): (a) fragment de molaire utilisé pour la datation au <sup>14</sup>C et (b) molaire de mammoth. Photo de Z. Nerudová.

Traces and gloss are relatively evenly represented on the whole length of the surfaces. The internal part is much more glossy than the external, which is partly damaged with a series of different traces and little damages, including microscopic depressions on the edge. Very likely this piece represents a proper ring, which has been worn for a while.

**Comparison of mammoth remains**

Due to the <sup>14</sup>C date from the Bratčice site, which is in direct correlation with the stratigraphy in Bratčice III, we can assume, due to the proximity of both sites that the finds from Bratčice originate from Bratčice III. To confirm or refute this idea, we worked with M. Roblíčková to compare the animal teeth from both sites, i.e. from Bratčice III and Bratčice. The result is that all the mammoth teeth have the same intensive occlusal abrasions, a diminutive form and the same state of (bad) preservation.

Lab. Number	<sup>14</sup> C-Age	STD	CalAge p (95 %)	CalAge p (95 %)
	[BP]	[BP]	[calBC/AD]	[calBP(0=AD1950)]
Lab Code 1	14.395	± 70	15 800-15 400	17 750-17 350

Fig. 7. The calibrated date from Bratčice using CalPal program version 2018 and calibration curve IntCal13 (Reimer et al. 2013).

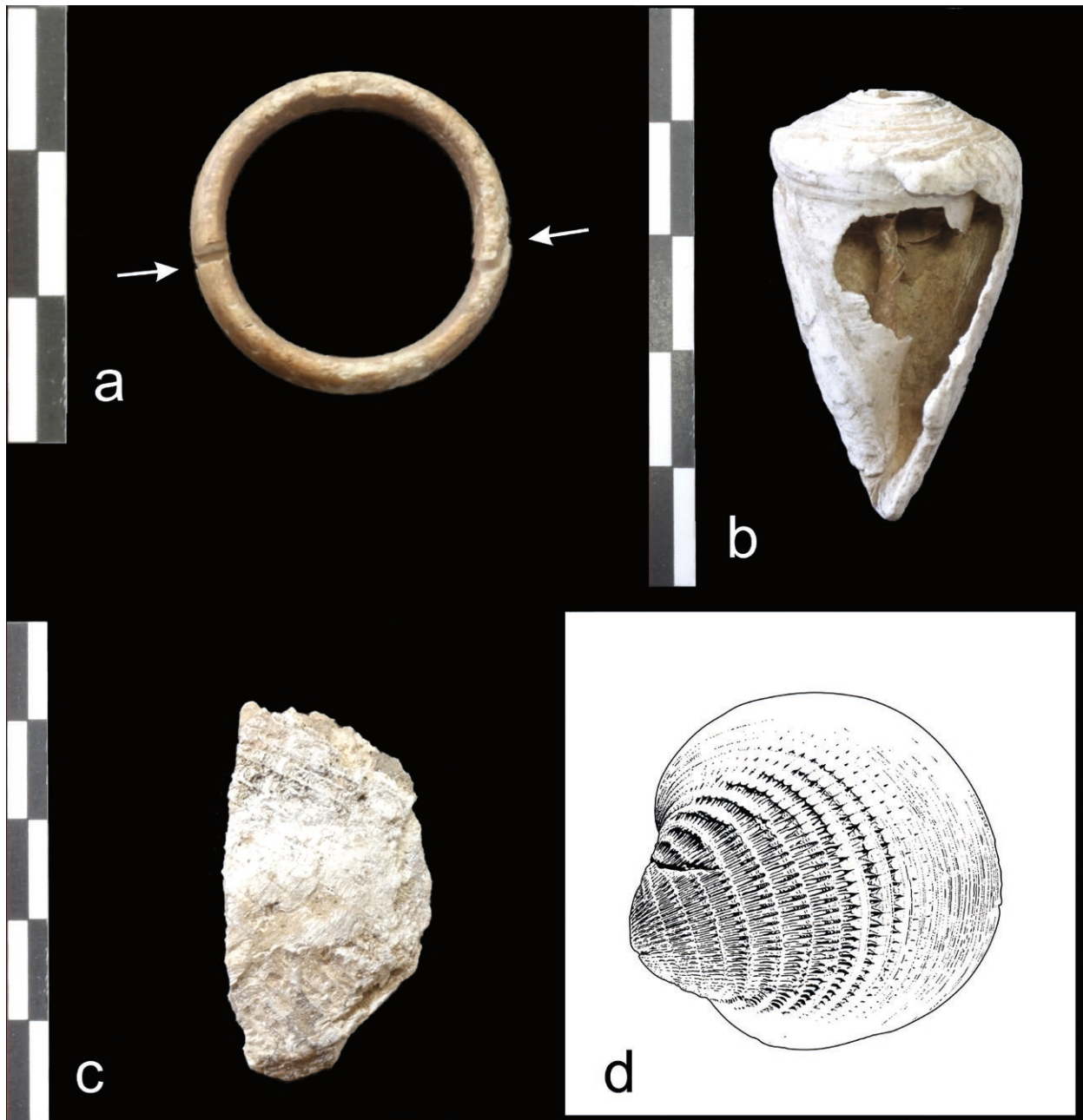
Fig. 7. La date calibrée de Bratčice obtenue en utilisant le programme CalPal version 2018 et la courbe de calibration IntCal13 (Reimer et al. 2013).

**Interpretation of both sites**

On the basis of the osteological material character we can probably conjoin all the finds and in this light we can declare with very high probability that the bones, the lithics as well as ring originated from one site: Bratčice III. We can associate the <sup>14</sup>C date obtained on the basis of the described situation with the age of the ring and the age of the findings. At the same time the date fit well with the LUP occupation in Moravia. The relative and absolute chronology of this site is interesting, the region near Bratčice is typical for EUP occupation, not for Middle Upper Palaeolithic (Gravettian) or LUP (Epigravettian, Epiaurignacian) (Nerudová 2013). The association of the ring with the Szeletian site of Bratčice I published by Martin Oliva (2016) cannot be correct.

**Discussion**

Generally, despite the presence of larger ring-shaped pieces in the Palaeolithic assemblages, there are just very few pieces we can compare to the object from Bratčice. The ring from Bratčice is rather unique by its shape and material used for its production. In Palaeolithic, bone tissue seems to be rare raw material for the production of this type of adornment. Bone rings occur in the collections sporadically from the Holocene period, particularly from the Neolithic (see Barge-Mahieu 1991). However, they never have been widely represented in the bone assemblages throughout the whole Prehistory.



**Fig. 8.** (a) Bratčice: the ring is made from bone. The arrows show the position of the fracture; (b) Brno-Jundrov: shell found at the site. The lithic industry was previously associated with the Epiaurignacian, but the presence of carinated elements is low; (c) Brno-Štýřice III: fragment of a Tertiary *Glycymeris* sp. shell. The shell is burnt intensively; (d) Reconstruction of *Glycymeris* sp. shell. Photo by Z. Nerudová, drawing by T. Janků.

**Fig. 8.** (a) Bratčice: l'anneau est fait de l'os. Les flèches montrent la position de la fracture; (b) Brno-Jundrov: coquille trouvée sur le site. L'industrie lithique a précédemment été associée avec l'Épiaurignacien mais la présence des éléments carénés est rare; (c) Brno-Štýřice III: fragment d'une coquille de *Glycymeris* sp. d'âge du Tertiaire. La coquille est brûlée intensivement; (d) Reconstitution de la coquille de *Glycymeris* sp. Photo de Z. Nerudová, dessin de T. Janků.

Currently, the oldest ring made of hard organic material is the ivory ring from layer 11 from the southern chamber of Denisova Cave, Russia (EUP, e.g. Shunkov et al. 2018). Other small-sized ring-shaped pieces come solely from the Gravettian period.

Similar rings are known from the Pavlovian/ Gravettian site of Pavlov (Klíma 1994, 1997). Five undecorated rings reminiscent of modern rings were made from mammoth ivory; they have a diameter of approximately 2 cm and they have a small protrusion on its external part. Despite the typical ring-shaped

form of the pieces, B. Klíma concluded that those rings have been worn as a necklace ("eine Einheit im Sinne einer Halskette") and not separately from each other (Klíma 1994: 98). Nowadays, we still lack detailed technological and functional analysis of those pieces. Thus, it remains open whether the Pavlov I rings can be seen as possible analogies to the Bratčice ring.

Except the above mentioned Pavlov ivory adornments, another ring-shaped piece from ivory is known from the Gravettian layers of the site Grotte du Pape in Brassempouy, France (coll. É. Piette). Nevertheless we

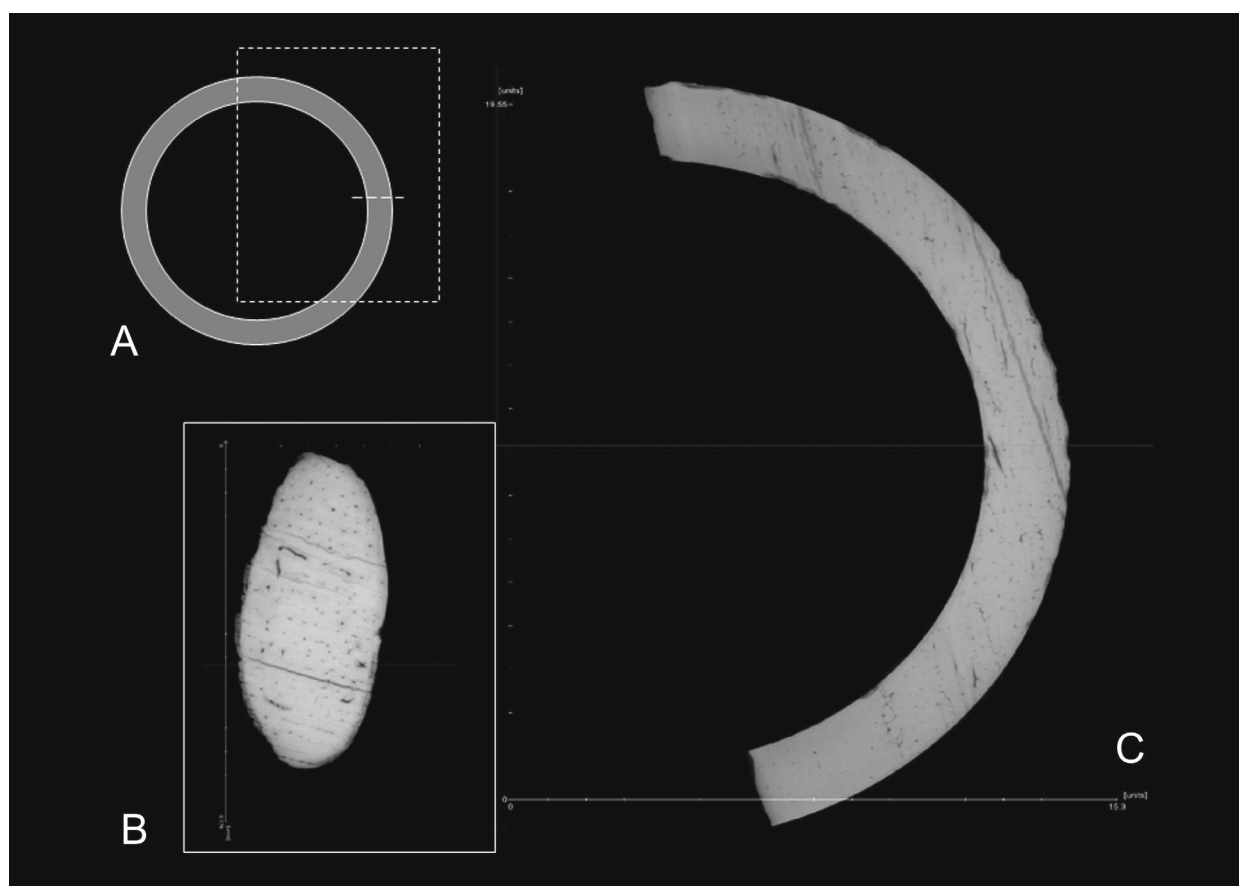


Fig. 9. Orthoslice from micro-CT scan (B, C) of the ring (A). Recording by F. Zelenka, image analyses by P. Neruda.

Fig. 9. Coupes transversales par micro-CT scan (B, C) de l'anneau (A). Enregistrement de F. Zelenka, analyse d'image de P. Neruda.

lack technological details about this piece (e.g. Piette 1895; Goutas & Simonet 2009; Simonet 2012).

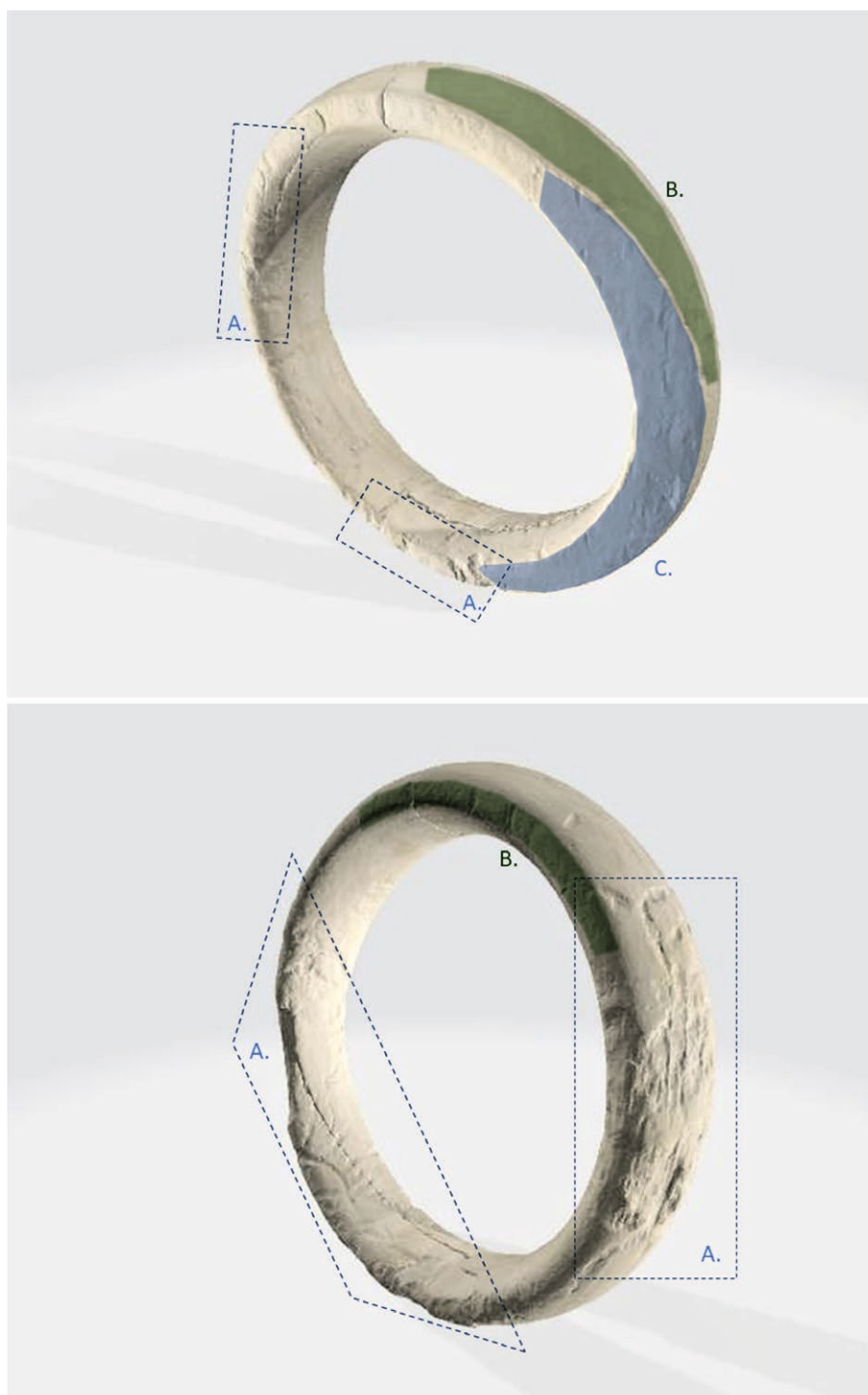
Regional Epigravettian material is poor for the analogies, the art is represented not very widely – mostly by unique and individual pieces. From the period of the LUP in Moravia region a shell found at the Brno-Jundrov site is documented (Fig. 8: b). The lithic industry was previously associated with the Epiaurignacian, but the presence of carinated elements is low. The exact position of this site is unknown today due to the existing urban area, but surface prospection in the neighbourhood revealed the existence of loess. From Brno-Štýřice III a fragment of intensively burnt Tertiary shell of *Glycymeris* sp. was published (Fig. 8: c). Due to the poor preservation of the shell there is no evidence for any anthropic impact but the presence of this type of shell at the site is evidence of manuport (Nerudová 2016). The last evidence come from Epigravettian site Opava – Předměstí III "výtopna", where an iron meteorite is documented.

Epigravettian assemblages from Slovakia are very low-represented and include only unique examples of pieces of art or worked bone objects, among which we completely miss adornments. Nowadays, the largest „series“ of worked bone pieces are known from the possible Epigravettian assemblage from Moravany-Žakovská. The very small collection of hard animal raw

material pieces includes perforated tertiary and pleistocene shells (coll. Zotz) (Bárta 1970: 209) and a conical-shaped bone (?) bead (coll. Hromada/Sobczyk). Also, four objects from burned clay have been discovered in the upper layer in Kašov I (Kaminská 2014: 282).

Another close Epigravettian site near Kammern-Grubgraben in Austria does not include any bone or ivory adornments and only a few pieces of bone industry, perforated animal teeth and molluscs (Händel et al. in press). No piece of Epigravettian art is known from Poland. Sporadic finds of ceramic objects (Kašov, Vela Spila) are out of focus of this article.

The attribution of "out-of-context" objects requires a very sensitive approach to the informative value of the piece. Although our chosen approach is based on the assumption that the ring is of Palaeolithic origin, we have checked other Prehistoric materials from the sites in the vicinity. In the vicinity of the Palaeolithic site are Neolithic occupations of the LBK culture/Moravian painted ware/Stroke pottery culture as well as Eneolithic settlements of the Bell Beaker culture/Corded ware culture and of Early Bronze Age, particularly of the Únětice culture (Belcredi et al. 1989). None of those assemblages known from the territory of Moravia, Western Slovakia or broader neighbourhood area includes pieces similar to the bone ring.



**Fig. 10.** The ring (avers and revers) segmented from micro-CT image. Segmentation by P. Neruda in cooperation with F. Zelenka: (A) taphonomic alterations, (B) clusters of little striations of different origin, (C) negative of the removal, perhaps cutted off from the surface in the recent period. Graphics by B. Hromadová.

**Fig. 10.** L'anneau (avers et revers) segmentée à partir de l'image de micro-CT. Segmentation de P. Neruda en coopération avec F. Zelenka: (A) altérations taphonomiques, (B) groupes de petites striations d'origine différente, (C) négative d'enlèvement, coupé de la surface peut-être dans une période récente. Graphique de B. Hromadová.

## Conclusion

Nowadays, based on the typo-technology it is not possible to classify this object from the chrono-cultural point of view, neither to give a certain answer about its

age. Those types of rings are extremely difficult to date, thus the question about the origin and dating of the Bratčice ring remains open. Further available analysis, such as <sup>14</sup>C dating, would destroy a significant part of the piece. Therefore, the ring is too fragile to be

dated, and for this reason absolute dating is currently not applicable. We can assume that the bone ring is a unique object in the Palaeolithic assemblages, as well as a rare object in other periods. The given information about the find context, the character of the alterations, the general taphonomical condition and the fact that other related pieces are either limited or not directly comparable make it difficult to unambiguously attribute this ring as a Palaeolithic piece.

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## Literature cited

- Barge-Mahieu, H. (1991).** Fiches anneaux (fiche 7). In: H. Camps-Fabrer (Ed.). *Fiche typologique de l'industrie osseuse. Cahier IV: Objets de parure*. Publications de l'Université de Provence, Aix-en-Provence.
- Bárta, J. (1970).** Zur Problematik der gravettezeitlichen Besiedlung der Slowakei. *Slovenská archeológia* 18: 207-215.
- Behrensmeyer, A. K. (1978).** Taphonomic and Ecologic Information from Bone Weathering. *Paleobiology* 4 (2): 150-162.
- Belcredi, L., Čizmář, M., Košťurík, P., Oliva, M. & Salaš, M. (1989).** *Archeologické lokality a nálezy okresu Brno-venkov*. Okresní muzeum, Brno-venkov.
- Bradfield, J. (2013).** Investigating the potential of micro-focus computed tomography in the study of ancient bone tool function: results from actualistic experiments. *Journal of Archaeological Science* 40 (6): 2606-2613.
- Christensen, M. (2004).** Fiche caractères morphologiques, histologiques et mécaniques des matières dures d'origine animale. In: D. Ramseyer (Ed.). *Fiches typologiques de l'industrie osseuse préhistorique. Cahier XI: Matières et techniques*. Éditions Société Préhistorique Française, Paris, 17-28.
- Demidenko, Y. E., Škrdla, P. & Rios-Garaizar, J. (2018).** European perspectives of the East European LGM Epi-Aurignacian with Sagaidak-Muralovka-type microliths. In: P. Valde-Nowak, K. Sobczyk, M. Nowak & J. Žračka (Eds.). *Multas per gentes et multa per saecula: Amici magistro et collegae suo Ioanni Christopho Kozłowski dedicant*. Jagiellonian University–Alter, Kraków, 85-92.
- Evans, F. G. (1973).** *Mechanical Properties of Bone*. Thomas, Springfield, Illinois.
- Fernández-Jalvo, Y. & Andrews, P. (2016).** *Atlas of Taphonomic Identifications*. Vertebrate Paleobiology and Paleoanthropology Series, Springer, Dordrecht–Heidelberg–New York–London.
- Fisher, J. W. (1995).** Bone surface modification in zooarchaeology. *Journal of Archaeological Method and Theory* 1: 7-65.
- Goutas, N. & Simonet, A. (2009).** Le secteur GG2 de la grotte du Pape à Brassempouy (Landes): un dépôt intentionnel d'armes gravettiennes? *Bulletin de la Société Préhistorique Française* 106 (2): 257-291.
- Händel, M., Simon, U., Maier, A., Brandl M., Groza-Săcaci, S.M., Timar-Gabor, A., & Einwögerer T. (in press).** Kammern-Grubgraben revisited - First results from renewed investigations at a wellknown LGM site in east Austria. *Quaternary International*.
- Jelínek, J. (1990).** *Umění v zrcadle věků. Počátky umělecké tvorby*. Moravské zemské muzeum, Brno.
- Kamrášková, L. (2014).** *Staré Slovensko 2. Paleolit a mezolit*. Archaeologica Slovaca Monographiae. Archeologický ústav Slovenskej akadémie vied, Nitra.
- Kingston, A. M., Myers, G. R., Latham, S. J., Recur, B., Li, H. & Sheppard, A. P. (2018).** Space-Filling X-Ray Source Trajectories for Efficient Scanning in Large-Angle Cone-Beam Computed Tomography. *IEEE Transactions on Computational Imaging* 4: 447-458.
- Klíma, B. (1994).** Die Knochenindustrie, Zier- und Kunstgegenstände. In: J. Svoboda (Ed.). *Pavlov I, Excavations 1952-53*. E.R.A.U.L. 66, Dolní Věstonice Studies 2, Université de Liège, Liège, 87-150.
- Klíma, B. (1997).** Die Knochenindustrie, Zier- und Kunstgegenstände. In: J. Svoboda (Ed.). *The Pavlov I - Northwest*. Dolnověstonické studie 4, Archeologický ústav Akademie věd České republiky, Brno, 227-286.
- Kozłowski, J. K. (1992).** *L'art de la Préhistoire en Europe orientale*. Jaca Book, Milano.
- Mărgărit, M., Mirea, P. & Bălăşescu, A. (2018).** Manufacturing technique and social identity: three cases of 'manufacture-by-wear' technique. *Archaeofauna* 27: 253-274.
- Nerudová, Z. (2013).** Palaeolithic settlement strategies in the Krumlov Forest area (South Moravia, Czech Republic) during MIS 3. *Quaternary International* 294: 61-70.
- Nerudová, Z. (2015).** On site settlement activities: the example of the Epigravettian site of Brno-Štýřice III (Czech Republic). *Anthropologie* 53 (1/2): 245-256.
- Nerudová, Z. (2016).** *Lovci posledních mamutů na Moravě*. Moravské zemské muzeum, Brno.
- Nerudová, Z. & Moník, M. (2019).** The Epigravettian of Kůlna Cave, a revision of artefacts. *Archeologické rozhledy* 71 (4): 567-586.
- Nerudová, Z. & Neruda, P. (2014).** Štýřice III (Koněvova St. or Vídeňská St.) – an Epigravettian Site in Brno (Czech Republic). *Interdisciplinaria Archaeologica Natural Sciences In Archaeology* 5 (1): 7-18.
- Nerudová, Z., Neruda, P. & Hamrozi, P. (in press).** Statistical and geographical modelling of Moravian (Czech Republic) Late Upper Palaeolithic occupation. *Quaternary International*.
- Oliva, M. (2016).** *Encyklopedie paleolitu a mezolitu českých zemí*. Moravské zemské muzeum, Brno.
- Piette, É. (1895).** La station de Brassempouy et les statuettes humaines de la période glyptique. *L'Anthropologie* 6 (2): 129-151.
- Poplin, F. (1974).** Deux cas particulier de débitage par usure. In: H. Camps-Fabrer (Ed.). *Premier Colloque International sur l'industrie de l'os dans la Préhistoire, Abbaye de Sénanque, les 18-20 avril 1974*. Éditions de l'Université de Provence, Aix-en-Provence, 85-92.
- Provenzano, N. (2004a).** Fiche terminologique du travail des matières osseuses du Paléolithique aux âges des métaux. In: D. Ramseyer (Ed.). *Fiches typologiques de l'industrie osseuse préhistorique. Cahier XI. Matières et techniques*. Éditions Société Préhistorique Française, Paris, 29-37.
- Provenzano, N. (2004b).** Fiche transformation des matières dures d'origine animale à l'Âge du Bronze en Italie du Nord. In: D. Ramseyer (Ed.). *Fiches typologiques de l'industrie osseuse préhistorique. Cahier XI. Matières et techniques*. Éditions Société Préhistorique Française, Paris, 205-218.
- Reilly, D. T. & Burstein, A. H. (1974).** The mechanical properties of cortical bone. *The Journal of Bone & Joint Surgery* 56 (5): 1001-1022.

- Reimer, P. J., Bard, E., Bayliss, A., Beck, J. W., Blackwell, P. G., Bronk Ramsey, C., Buck, C. E., Cheng, H., Edwards, R. L., Friedrich, M., Grootes, P. M., Guilderson, T. P., Haflidason, H., Hajdas, I., Hatté, C., Heaton, T. J., Hoffmann, D. L., Hogg, A. G., Hughen, K. A., Kaiser, K. F., Kromer, B., Manning, S. W., Niu, M., Reimer, R. W., Richards, D. A., Scott, E. M., Southon, J. R., Staff, R. A., Turney, C. S. M. & van der Plicht, J. (2013). IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0-50,000 Years cal BP. *Radiocarbon* 55(4): 1869-1887.
- Sacchi, D. (2003). *Le Magdalénien. Apogé de l'art quaternaire*. La Maison des roches, Paris.
- Sawada, J., Nara, T., Fukui J., Dodo Y. & Hirata, K. (2014). Histomorphological species identification of tiny bone fragments from a Paleolithic site in the Northern Japanese Archipelago. *Journal of Archaeological Science* 46: 270-280.
- Shunkov, M. V., Fedorchenko, A. Yu. & Kozlikin, M. B. (2018). The Early Upper Palaeolithic Personal Ornaments from the Southern Chamber of Denisova Cave. *Problems of Archaeology, Ethnography, Anthropology of Siberia and Neighboring Territories* 24: 198-202 (in Russian).
- Simonet, A. (2012). *Brassempouy (Landes, France) ou la matrice gravettienne de l'Europe*. ERAUL 133, Université de Liège, Liège.
- Valoch, K. (1967-1976). *The unpublished personal K. Valoch's diary*. Archives of the Anthropos Institute.
- Valoch, K. (1974). Nové kolekce ve sbírkách Ústavu Anthropos Moravského muzea. *Přehled výzkumů* 1973: 9-14.
- Valoch, K. (1998). L'art magdalénien en Moravie (Rép. Tchèque). *Rivista di Scienze Preistoriche* 49: 65-81.
- Wiśniewski, A., Połtowicz-Bobak, M., Bobak, D., Jary, Z. & Moska, P. (2017). The Epigravettian and the Magdalenian in Poland: New Chronological Data and an Old Problem. *Geochronometria* 44: 16-29.
- White, R. (2003). *Prehistoric Art. The symbolic journey of humankind*. Abrams, New York.