

Artefacts Made from Siliceous Rocks of Polish Origin on Prehistoric Sites in the Czech Republic

Antonín Přichystal^a

Compared with Poland, the territory of Bohemia and Moravia is not so rich in natural occurrences of high-quality siliceous rocks (silicites, 'flints'). This contribution follows distribution of the four most attractive Polish chipped raw materials (silicite of the Cracow-Częstochowa Jurassic, 'chocolate' silicite, banded Krzemionki [striped] silicite and spotted Świeciechów [grey white-spotted] silicite) in the Czech Republic. Since the middle phase of Upper Palaeolithic (Gravettian) the Jurassic-Cracow silicites had been transported to Moravia and since its late phase (Magdalenian) also to Bohemia. The first use of the 'chocolate' silicite has been ascertained at some Late Aurignacian (Epiaurignacian) sites of central Moravia similarly as an exceptional find attesting early use of Świeciechów spotted silicite (Late Szeletian?). No finds of the banded Krzemionki silicite have been registered in Pre-Neolithic flaked assemblages in the Czech Republic.

Evidence of systematic and mass transport of silicites from the Cracow-Częstochowa Jurassic to northern/central Moravia and to eastern/central Bohemia has been found in some periods of the Neolithic (especially connected with the Linear Pottery culture). For the period of the earlier Eneolithic (Funnel Beaker culture) we can identify a small but systematic presence of raw materials from the northern foreland of the Świętokrzyskie (Holy Cross) Mountains, this comprises objects of banded Krzemionki silicite and spotted Świeciechów silicite. About 24 Moravian non-stratified finds of axes made of the banded Krzemionki silicite and polished over the whole surface can be probably connected with the Globular Amphora culture. Silicites from the Cracow-Częstochowa Jurassic appeared again in the late Eneolithic, especially as arrowheads of the Bell Beaker culture in Moravia. Only two pieces made from the Jurassic Cracow-Częstochowa silicite appeared in a collection of 1463 artefacts connected with the Early Bronze Age in Moravia.

KEY-WORDS: Polish silicites ('flints'), Czech Republic, Palaeolithic, Neolithic, Eneolithic, Early Bronze Age

INTRODUCTION

There are a number of characteristic siliceous rocks (silicites) that originated in the area that is now Poland. In the local archaeological literature, the ones that also played

^a Institute of Geological Sciences, Masaryk University, Brno, Czech Republic; e-mail: prichy@sci.muni.cz; ORCID: 0000-0001-6653-0416

an important role also in the surrounding regions are usually termed Jurassic flint, banded (striped) flint, grey white-spotted (Świeciechów) flint and 'chocolate' flint. This contribution deals with the distribution of these flints in the Palaeolithic, Neolithic, Eneolithic and Early Bronze Age in the former lands of Czech Republic – Bohemia, Moravia and Czech Silesia. Until the First Petroarchaeological Seminar in Brno 1975, our older colleagues in former Czechoslovakia knew relatively little about Polish raw materials used for flaked tools and generally they considered almost all high quality siliceous raw materials at prehistoric sites in Czechoslovakia to be erratic flints from glacial deposits of Pleistocene continental ice sheets. On the other hand, already in 1937, Josef Skutil described six axes prepared from the banded Krzemionki flint and found in Moravia (Skutil 1937). Slavomil Vencl (1971: 74) drew our attention to occurrences of the Cracow flint in chipped collections connected with the Linear Pottery in eastern Bohemia and Moravia. Also flints of some Eneolithic axes or daggers were supposed to come from primary sources at the Baltic coast or in Scandinavia. Since 1975 the author has started cooperation with many archaeologists and geologists from Poland and in 1977 he sampled for the first time together with help of Krzysztof Sobczyk siliceous rocks from the Cracow-Częstochowa Jurassic. In recent time the Lithotheca of prehistoric raw materials at Masaryk University in Brno contains all common Polish flaked raw materials of Paleozoic, Mesozoic and Tertiary ages. In addition, the author published their basic characterisation in water immersion under the stereomicroscope and in petrographic thin sections using the polarising microscope (Přichystal 2009, 2013).

WHY THE AUTHOR PREFERS THE TERM SILICITE INSTEAD OF FLINT

The term flint and its local equivalents (in Polish it is 'krzemień', in Czech 'pazourek') originated very early and without clear definition. It appears in Polish written communications for the first time in Cracow in 1568 (Król and Migaszewski 2009), in the Czech language substantially later, in the first half of the 19th century in connection with the first German – Czech dictionary. Before this, in both countries they used only the word for 'stone making fire', i.e., Feuersteine (in Polish 'skałka' or 'krzesak', in Czech 'křesací kámen') and this term covered various rocks and minerals including flint. It is evident that both words 'krzemień' and 'pazourek' were originally also used in the same wide sense, i.e., stone for making fire.

The recent Polish petrographic definition of flint and chert ('krzemień' and 'rogowiec') is based on the siliceous rock shape: nodular siliceous rock is termed flint and the term used for layered varieties is chert (for example Žaba 2006: 231, 373). Since the end of the 19th century (Dana 1895: 281), the English and American geological dictionaries usually define flint as a variety of chert that occurs commonly as nodules

and bands in (Cretaceous) chalk (e.g., Bates and Jackson eds 1987; Allaby and Allaby eds 2003) whereas chert (older synonym hornstone, now not recommended) forms 'nodules sometimes becoming continuous layers in other limestones'. Czech and Slovak petrologists have used similar definitions based on the age and origin of the siliceous rock. Michael Brandl (2010) published the same opinion as the Austrian view on the classification of these raw materials. A typical entry in a recent sedimentological dictionary might be: 'Chert occurs in nodules and in strata (bedded or ribbon cherts). Common synonyms for cherts include flint' or 'Flint is the other common name for chert. It occurs in both nodular and bedded forms' (e.g., Garrison 2010: 175). It is evident the classification of flint and chert cannot be based on the shape of siliceous rocks.

As a consequence of different opinions current in various countries, the author prefers to use the comprehensive and geologically well-defined term silicite with more detailed specification using the name of source locality, i.e., banded Krzemionki silicite (because there is also the banded Stránská skála chert in Brno, banded Pęgów flint in Poland, banded flint from glacial deposits from various places in central Europe) or the spotted Świeciechów silicite (because we know of various spotted Jurassic cherts also in Moravia or in Bavaria). As a matter of fact, in the Polish archaeological literature the term 'krzemień' (or its English equivalent flint) is used in a very broad sense corresponding to the geological chert or silicite.

The term silicite started to be used by Russian specialists in sedimentary petrography in the first half of the 20th century. It was introduced to English speaking scientists by Sergei Ivanovich Tomkeieff (1983) in his *Dictionary of Petrology*. The term covers all varieties of chert, including flint. The term chert is recommended only for marine silicite (Přichystal 2010). Because of the long tradition of differentiation between northern flint and local cherts in Central Europe, the author has proposed defining flint as a variety of chert (silicite) originating in the Upper Cretaceous (Maastrichtian) chalk or Lowermost Tertiary (Danian) Bryozoan limestone (we are not able very often to differ between Maastrichtian and Danian flints in Pleistocene deposits of extensive glaciated areas of Poland, Germany and the Czech Republic). Besides marine cherts, it is necessary to distinguish limnosilicites of freshwater origin. In cases of different terminology or if we are not sure of siliceous rock determination, the best resolution seems to be the use of the neutral term silicite.

SILICITES OF THE CRACOW-CZEŚTOCHOWA JURASSIC (SKCJ), ESPECIALLY VARIETY A ('KRZEMIEŃ JURAJSKI PODKRAKOWSKI') AND VARIETY G

There is no reliable evidence for the occurrence of this material on Middle Palaeolithic and early Upper Palaeolithic (Bohunician) sites in the Czech Republic. A Middle Pal-

aeolithic side scraper made of the SKCJ (Fig. 1) was found, it is true, at an Eneolithic hillfort Starý Zámek near Jevišovice (western Moravia) but is believed to have been brought there and reutilised a community of the Funnel Beaker culture (Šebela *et al.*, 2017). Two tools (an end scraper and a side scraper) come from the Szeletian locality Dryšice I – Kluče and four cores made of the SKCJ have been described from a Late Szeletian(?) site Rozdrojovice near Brno (Oliva 2001: 84), the cultural classification of the last locality is a matter of question because Zdeňka Nerudová (2016) considers it to be an Epigravettian site. As far as Aurignacian and Epiaurignacian sites in central Moravia are concerned, because of the strong patina it is very difficult to distinguish possible occasional occurrences of the SKCJ among the erratic flints that dominate these assemblages. Martin Oliva (2001: 85) mentioned rare flaked tools made of the SKCJ: one combined tool from Bělov I (Kroměříž district), one borer from Míškovice (Kroměříž district) and one end scraper found at Dubicko (Šumperk district).

Without doubt, items of SKCJ are regularly present on some south- and east-Moravian Gravettian localities as has already been mentioned by Janusz K. Kozłowski (1958). Their presence has been described from Pavlov II, Dolní Věstonice I, Jarošov II, Spytihněv I with the estimated quantity for example at Pavlov II of up to 27%, possibly 38% when the collection is evaluated without waste (Oliva 2007: 49). Surprisingly, there is almost no occurrence of SKCJ (only two pieces) at the famous Gravettian

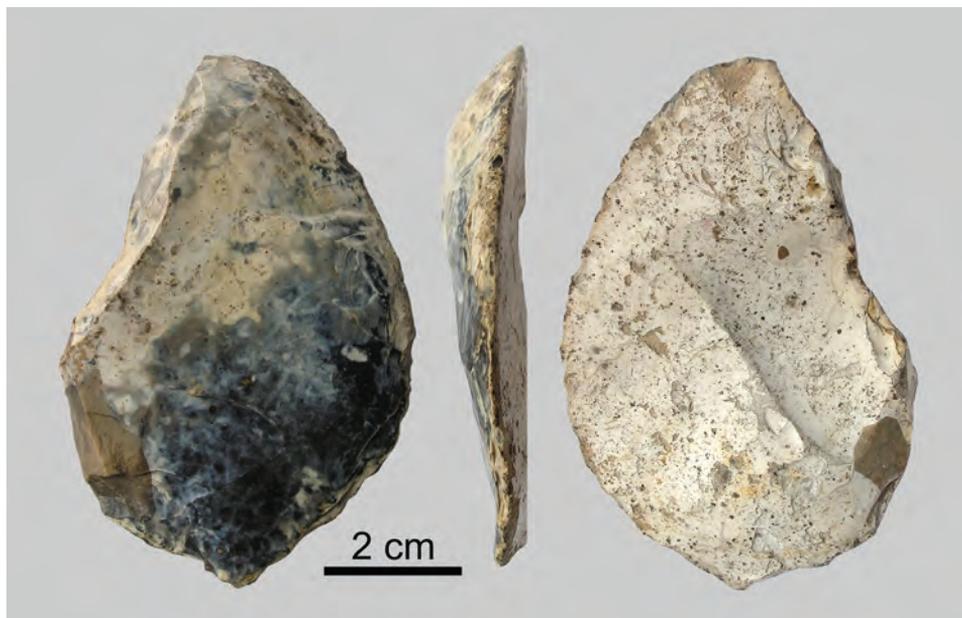


Fig. 1. Middle Palaeolithic side scraper, silicite of the Cracow-Częstochowa Jurassic. Jevišovice-Starý Zámek, Znojmo distr., south-western Moravia. Photo: L. Plchová.

site of Přerov-Předmostí. There were no occurrences at the three localities in Brno, generally accepted as the Epigravettian, i.e., Brno-Stránská skála IV, Brno-Jundrov and Brno-Štýřice. The SKCJ appeared occasionally among the raw materials used by the Magdalenian hunters in caves of the Moravian Karst: Pekárna cave – 2% from studied 592 cores (Voláková 2001: 109); Ochozská cave – under 0.5%. A very small amount of the SKCJ has been found at some Late Palaeolithic and Mesolithic sites (Smolín, Přibice, Dolní Věstonice) in Moravia.

In Bohemia, there is no evidence of the presence of Polish siliceous raw materials in the Early Upper Palaeolithic (Bohunician?, Leaf Point complexes, Aurignacian) and in the middle phase of the Upper Palaeolithic (Gravettian). The first small occurrence of the silicites of Polish origin has been noted only in the Magdalenian collections from Tmaň – Děravá jeskyně and Putim (Vencl and Fridrich eds 2007: 101).

A real mass transport of Jurassic silicites from south Poland to Moravia, Silesia and Bohemia started at the beginning of the Neolithic when in some phases of the Linear Pottery culture (LBK) they even represented the prevalent raw material: Bylany in central Bohemia (LBK II–III, 46% of SKCJ; Ivan Pavlů and Antonín Přichystal in Přichystal 1985), Bravantice near Studénka (LBK IIB); Žopy I, Kladníky, Šišma, Mohelnice (LBK I; Mateiciucová 2000: 232, 2008: 126). In spite of its position within a glaciated area with natural occurrences of erratic flints, the Linear Pottery culture micro-region around Studénka very probably played an important mediation role in the distribution of the SKCJ further to the south (Janák *et al.*, 2016), where around Přerov, i.e., in the southern part of the Bečva Gateway, we know again of settlements with flaked industries rich in SKCJ silicite (Mateiciucová 2000, 2008; Schenk 2007): Kladníky I, LBK Ia, 65% of SKCJ; Přerov-Dluhonice II, LBK IIB, 95% of SKCJ or Šišma. LBK settlements with prevalent SKCJ raw material occur around the southern entrance of the Moravian Gateway through the Carpathian mountains: at Příkladovice (Olomouc district) 73% of SKCJ; Žopy (Kroměříž district) 63% of SKCJ (Mateiciucová 2008) and probably other sites (Fig. 2).

This distribution on a mass scale is connected with extensive raw material mining in the source area (Dzieduszycka-Machnikowa and Lech 1976; Lech 1980). After the period of Linear Pottery culture, the raw material occurred in substantially smaller quantities on several sites of the succeeding Stroked Pottery and Lengyel cultures. Janák and Přichystal (2007) published a detailed analysis of the distribution of SKCJ in Moravia during the Neolithic and the beginning of the Eneolithic. In central Moravia, the distribution of this raw material culminated probably already in the LBK Ia phase, in surrounding areas mostly from phase Ib or II. At the end of the Stroked Pottery culture (SBK IV) and the beginning of Lengyel culture (Lg I) and especially in the transitional period LgI/LgII it is possible to note again a rather higher supply of the SKCJ to Moravia. Małgorzata Kaczanowska and Janusz K. Kozłowski (1976: 213) found the Jurassic Cracow silicite at a Lengyel settlement near Těšetice-Kyjovice, Znojmo

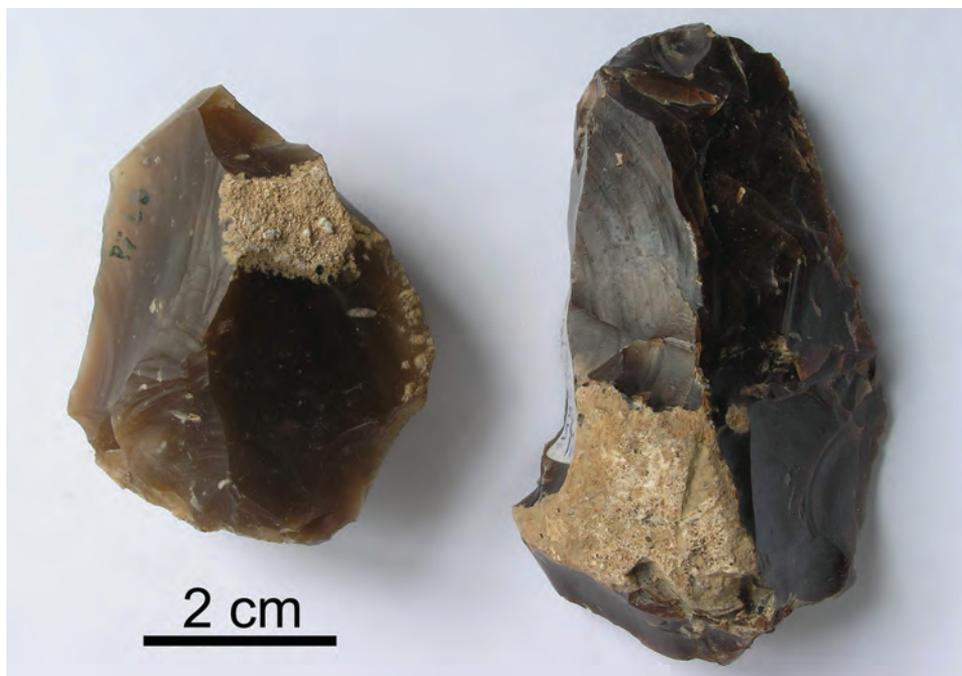


Fig. 2. Neolithic (probably Linear Pottery culture) chips, silicite of the Cracow-Częstochowa Jurassic. Slatinice, Olomouc distr., central Moravia. Photo: A. Přichystal.

district, but according to our recent knowledge, its presence is not so high (only about 1%). Going to the west in Bohemia, the occurrence of SKCJ material declines considerably, for example in a small collection of 45 pieces from the LBK settlement at Kosoř (Praha-west district) it was used for only 2 artefacts (Nerudová and Přichystal 2011: 83).

In eastern/central Bohemia, SKCJ are also present in flaked assemblages of the Stroked Pottery culture but substantially less in comparison with older LBK assemblages, for example at Bylany, about 12% (Pavlů and Přichystal in Přichystal 1985), at Mšeno, district Mělník (a collection of 3128 artefacts, excavations of M. Lička) there were found only 4 pieces, i.e., under 0.1%, because of the near total dominance of silicites from glacial sediments (Přichystal 1987). On the other hand, SKCJ have been described more far to the west from Chrástany near Rakovník (Lech 1993).

Raw materials of the SKCJ group occurred in the early Eneolithic is concerned, for example at the famous hillfort Hlinsko (Funnel Beaker culture) near the Moravian Gateway (only 7 pieces, i.e., around 0.2%), and also at other hillforts of the same period lying more to the south (the Prostějov area). So far, not a single piece of SKCJ material has been noted at the hillfort of Staré Zámky in Brno-Líšeň, where we know one piece of spotted Świeciechów silicite and two axes made of the banded Krzemionki silicite. In deposits of the young Eneolithic cultures in Moravia (the Jevišovice, Bošáca

and Globular Amphorae cultures; the Eneolithic in Moravia has been subdivided into several stages, usually five or six, including young, late and final; e.g., Kopacz *et al.*, 2014: 4), the presence of SKCJ among flaked artefacts seems to be very rare and accidental. Occurrences of siliceous axes made of the SKCJ, variety G, are connected with the late Eneolithic Corded Ware culture in central Moravia. Surprisingly, the SKCJ, variety A, was used as an important raw material especially for arrowheads in the period of the Moravian Bell Beaker culture: 75 pieces altogether, it is 11% of the whole Moravian collection (Kopacz *et al.*, 2009). Probably from the Eneolithic period comes also a small deposit of three long blades (12–14 cm, SKCJ, variety G) from Bernartice nad Odrou, northern Moravia (Janák *et al.*, 2004).

The utilisation of SKCJ during the Early Bronze Age in Moravia (the Únětice culture and the Věteřov group) was very low. The material (1463 artefacts) from 86 Moravian localities was studied (for more details see Kopacz and Šebela 2006) and among them, only two items were of this raw material (Přichystal 2006).

‘CHOCOLATE’ SILICITE (CHoS, ‘KRZEMIEŃ CZEKOLADOWY’)

The ‘chocolate’ silicite appeared for the first time at Late Aurignacian (Epiaurignacian) sites Slatinice near Olomouc and Lhotka near Kroměříž. Oliva (2001: 85) has discussed one piece from the Aurignacian site of Bělov I. The raw material is present (0,3% from 592 cores; Voláková 2001) in the Magdalenian settlement in the Pekárna Cave (Moravian Karst). In Bohemia, the ‘chocolate’ silicite was ascertained very rarely at Late Palaeolithic sites Voletiny near Trutnov or Světlá nad Sázavou (eastern Bohemia). It was found at more Mesolithic sites in southern Moravia (Smolín, Přibice, Dolní Věstonice). The Mesolithic collection from Hořín near Mělník (central Bohemia) contains probably 1 piece.

At the Neolithic localities with Linear Pottery the ‘chocolate’ silicite occurs only as individual pieces – at Bylany, Kolín (central Bohemia), Mohelnice (?) in northern Moravia. Pavel Burgert in this volume has evaluated the role of ‘chocolate’ silicite in the Neolithic of Bohemia (Burgert 2018). He mentions its occurrences on settlements of the Stroked Pottery culture especially during the later phase IV. The find spots are spread in eastern Bohemia, prevalently in the area of the Elbe right bank between Jaroměř and Hradec Králové (ChoS up to 2% of the assemblage) where he has described even a workshop at Plotiště nad Labem (almost 9% of the ChoS in the assemblage).

This raw material occurs in small quantities in Moravian Painted Ware assemblages in southern Moravia. Two pieces were ascertained at the Funnel Beaker hillfort at Čechovsko near Prostějov. Only three Eneolithic axes made of ‘chocolate’ silicite have been found in Moravia, but none in Bohemia or in Czech Silesia (Šebela *et al.*, in preparation). One Late Eneolithic dagger made of ‘chocolate’ silicite (Fig. 3) was found



Fig. 3. Late Eneolithic dagger, 'chocolate' silicite. Osice, Hradec Králové distr., eastern Bohemia.
Photo: L. Plchová.

at Osice, eastern Bohemia (Přichystal and Šebela 2015), probably of the Early Bronze Age. Three flaked artefacts including two arrowheads made of the ChoS have been described from a grave of the Bell Beaker culture in Praha – Velká Chuchle (Přichystal and Šebela 2009).

SPOTTED ŚWIECIECHÓW SILICITE (SwS, 'KRZEMIENÍ NAKRAPIANY ŚWIECIECHOWSKI' OR 'GREY WHITE-SPOTTED')

The raw material was used for a leaf-shaped point found at an Upper Palaeolithic site Míškovice-Křemenná near Holešov (Kozłowski 1972–73: 13), in recent time classified as the Aurignacian influenced by the Szeletian (Svoboda *et al.*, 2009: 163). One artefact was probably also found at the Szeletian site of Drystice I, central Moravia (Přichystal 2001). Only individual pieces were found in the Magdalenian collections from the Kůlna and Pekárna caves in the Moravian Karst (Valoch 1987). No finds have been described from the Moravian or Bohemian Mesolithic. In the Neolithic period, four pieces have been found connected with the Linear Pottery settlement at Bylany (Bohemia) and Mohelnice (Moravia). One piece was also announced from the Stroked Pottery culture site at Lobeč, NE of Mělník in Bohemia, (Spurný 1951: 134).

Perfectly flaked tools (scrapers, retouched blades) occur almost always as a few pieces at hillforts of the Funnel Beaker culture in central Moravia: Hlinsko near Lipník (32 pieces, i.e., about 1%), Čechovsko (7 pieces, i.e., 1%) and Ohrozim (1 piece) near Prostějov (Šmíd and Přichystal 2015: 93, 148). The southernmost find (1 piece) was ascertained at Staré Zámky near Brno-Líšeň (Fig. 4). Six axes made of the spotted



Fig. 4. Eneolithic (Funnel Beaker culture) end scraper, spotted Świeciechów silicite. Brno-Líšeň, Staré Zámky, Brno-město distr., southern Moravia. Photo: L. Plchová.

Świeciechów silicite (Lhotka, Nezamyslice, Velehrad, Veselíčko, Bezměrov, Želešice) are connected with the Corded Ware culture in Moravia (Šebela *et al.*, in preparation).

In Bohemia, finds of the spotted Świeciechów silicite connected with the Funnel Beaker culture are absolutely exceptional – a blade from Mradice (Neustupný *et al.*, 2008). No Late Eneolithic axes manufactured from the spotted Świeciechów silicite have been described from Bohemia (Šebela *et al.*, in preparation).

BANDED KRZEMIONKI SILICITE (KrS, 'KRZEMIEŃ PASIASTY')

There are no reliable data about the presence of this material on Palaeolithic or Mesolithic sites in the Czech Republic. Žebera (1958: 143) mentioned the presence of Krzemionki banded flint at a Mesolithic (in his text Tardenosian) locality Liblín (correctly Libín) near Hořice, district Jičín, NE Bohemia, but this seems to be very unlikely and, according to personal communication from Slavomil Vencl, the raw material is probably a variety of erratic flint.

Does this characteristic Polish silicite appear for the first time as occasional individual chips at some Neolithic sites around the Moravian Gateway? Inna Mateiciucová (2008) has not mentioned it at all among Neolithic raw materials in Moravia. Petr Gadas found a chip of the Krzemionki banded silicite at Šišma III – Amerika, district Přerov (Fig. 5), the locality is usually classified to the Linear Pottery culture but according to polished tools made of Culmian siltstone at the same place, the Funnel Beaker culture occurrence is also almost sure and the chip should be more probably connected with this culture.

Archaeological excavations at a hillfort of the Funnel Beaker culture at Hlinsko near Lipník nad Bečvou revealed 5 flaked artefacts and one polished axe. Other reliably documented occurrences of the Krzemionki silicite in Moravia are represented by 24 silicite axes of the Eneolithic age, according to their shape connected with the Globular Amphorae culture (Šebela *et al.*, in preparation). Two axes from the Eneolithic hillfort Staré Zámky in Brno-Líšeň represent the southernmost finds on the Bohemian Massif in Moravia (Fig. 6).

Three axes made of the banded Krzemionki silicite have been found also in eastern/central Bohemia: Denemark near Kutná Hora – Řivnáč culture (Zápotocký 2012: 132); Slatiny, south of Jičín – of the Bell Beaker culture and Mladotice (Chrudim district) – probably Krzemionki banded silicite, an accidental find (Šebela *et al.*, in preparation).

CONCLUSION

Without doubt, the four most spectacular Polish silicites ('flints') were also used as raw materials in prehistoric times in Moravia, Czech Silesia and eastern/central Bohemia. Regular occurrences of silicites from the Cracow-Częstochowa Jurassic (evidently from its southern part around Cracow) appeared besides the prevalent erratic flints from northern Moravia or Silesia at some south and east Moravian Gravettian sites. The author believes the most probable explanation of their substantial presence at these localities can be connected with seasonal migrations of the Gravettian hunters through depressions between the Bohemian Massif and the West Carpathians and subsequently along the Carpathian bend up to the Cracow area. In Bohemia, SKCJ have been found in only two Magdalenian collections. Their utilisation during the Moravian Epigravettian, Late Palaeolithic and Mesolithic seems to be only accidental, probably with the exception in the Magdalenian with small but systematic occurrence in caves of the Moravian Karst. Transport of SKCJ to northern /central Moravia and eastern/central Bohemia on a really mass scale started with the Linear Pottery culture. The material is present in smaller quantities in lithic collections of succeeding Neolithic and Eneolithic cultures. Surprisingly, SKCJ is present in substantial quantities in the

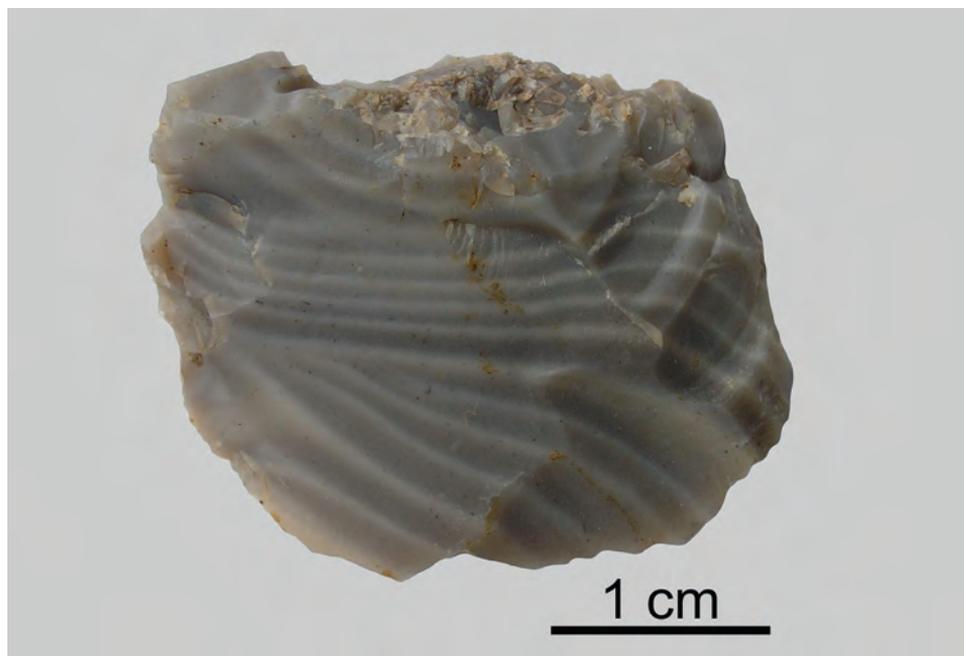


Fig. 5. Eneolithic (probably Funnel Beaker culture) chip, banded Krzemionki silicite. Šišma, Přerov distr., central Moravia. Photo: L. Plchová.



Fig. 6. Eneolithic silicite axe, banded Krzemionki silicite. Brno-Líšeň, Staré Zámky, Brno-město distr., southern Moravia. Photo: L. Plchová.

arrowheads of the Bell Beaker culture in Moravia. Their occurrence in Early Bronze Age findspots in Moravia is very rare (only 2 pieces in the collection of 1463 artefacts).

Only small amounts of ‘chocolate’ silicite appeared in central Moravia maybe even earlier than the SKCJ at some south- and east-Moravian Gravettian sites, but it is connected with the Late Szeletian or Epiaurignacian cultures. It is undoubtedly present among the raw materials of the Magdalenian settlement in the Moravian Karst (about 1% at Pekárna Cave) and as accidental finds at Late Palaeolithic and Mesolithic localities in Moravia and Bohemia. Only sometimes do the Neolithic and Eneolithic flaked collections in both regions have a few pieces of the ‘chocolate’ silicite. According to our current knowledge, an exception is represented by the settlements of the Stroked Pottery culture in eastern Bohemia, especially along the Elbe between Jaroměř and Hradec Králové, these are relatively rich in the ChoS. Individual pieces were found rarely in collections connected with the Funnel Beaker culture (Prostějov-Čechovsko, central Moravia).

Spotted Świeciechów silicite appeared for first time at two Upper Palaeolithic sites in central Moravia, classified as the Szeletian or the Aurignacian influenced by the Szeletian. Only individual pieces were found in the Magdalenian assemblage from the Kůlna and Pekárna caves in the Moravian Karst. No finds have been ascertained in the Moravian and Bohemian Mesolithic. SwS occurs in small quantities at some important Neolithic sites in Bohemia and Moravia as accidental pieces. A regular presence in small quantities is typical for the Funnel Beaker culture in Moravia. Four silicite axes in Moravia (none in Bohemia) are considered likely to be from the Corded Ware culture period.

There are no reliable records of the occurrence of the banded Krzemionki silicite in the Palaeolithic and Mesolithic of Moravia, Bohemia and Czech Silesia. Very scarce chips of the Krzemionki silicite are related to the Early-Middle Eneolithic (prevalently Funnel Beaker culture), and found in the southern part of the Moravian Gateway. But Moravia is relatively rich in surface finds of silicite axes made of the banded Krzemionki silicite (about 24 pieces). In northern and central Moravia they are linked with the Globular Amphora culture, in southern Moravia they are classified as imports into the milieu of the Jevišovice culture.

REFERENCES

- Allaby, A. and Allaby, M. (eds) 2003. *A Dictionary of Earth Sciences (2nd edition)*. Oxford.
- Bates, R. L. and Jackson, J. A. (eds) 1987. *Glossary of Geology (3rd edition)*. Alexandria.
- Brandl, M. 2010. Classification of rocks within the chert group: Austrian practice. *Archeometriai Műhely* 2010 (3): 183–190.
- Burgert, P. 2018. The Status and the Role of ‘Chocolate’ Silicite in Bohemian Neolithic. *Archeologia Polona* 56: 49–64.

- Dana, E. S. 1895. *Minerals and how to study them. A book for beginners in mineralogy*. New Haven.
- Dzieduszycka-Machnikowa, A. and Lech, J. 1976. *Neolityczne zespoły pracowniane z kopalni krzemienia w Sączowie*. Wrocław-Warszawa-Kraków-Gdańsk, Ossolineum.
- Garrison, E. G. 2010. *Techniques in Archaeological Geology*. Berlin, Springer. Natural Science in Archaeology.
- Janák, V., Oliva, M., Přichystal, A., and Grepl, E. 2004. Hromadný nález silicitových čepelí z Bernartic nad Odrou, okr. Nový Jičín. In E. Kazdová, Z. Měřínský and K. Šabatová (eds), *K poctě Vladimíru Podborskému*, 167–175. Brno.
- Janák, V., Papáková, K., Přichystal, A., Kováčik, P., Rataj, P. and Hořínková, A. 2016. Neolitické osídlení v okolí Studénky a úloha zdejšího mikroregionu kultury s lineární keramikou v distribuci silicitů krakovsko-čenstochovské jury. *Slovenská archeológia* 64 (1): 1–63.
- Janák, V. and Přichystal, A. 2007. Distribuce silicitů krakovsko-čenstochovské jury na Moravě a v Horním Slezsku v neolitu a na počátku eneolitu. *Památky archeologické* 98: 5–30.
- Kaczanowska, M. and Kozłowski, J. K. 1976. Studia nad surowcami krzemienymi południowej części Wyżyny Krakowsko-Częstochowskiej. *Acta Archaeologica Carpathica* 16: 201–2016.
- Kopacz, J. and Šebela, L. 2006. *Kultura unietycka i grupa wietierzowska na Morawach na podstawie materiałów krzemieniarskich*. Kraków.
- Kopacz, J., Přichystal, A. and Šebela, L. 2009. *Lithic chipped industry of the Bell Beaker culture in Moravia and its East-Central European context*. Kraków–Brno.
- Kopacz, J., Přichystal, A. and Šebela, L. 2014. *Lithic Chipped Industry of the young Eneolithic in Moravia and Czech Silesia*. Brno. Spisy Archeologického ústavu AV ČR 46.
- Kozłowski, J. K. 1958. Przyczynek do znajomości surowców krzemienych występujących w paleolicie i neolicie ČSR. *Wiadomości Archeologiczne* 25: 355–360.
- Kozłowski, J. K. 1972–73. The origin of lithic raw materials used in the Palaeolithic of the Carpathian countries. *Acta Archaeologica Carpathica* 13: 5–19.
- Król, P. and Migaszewski, Z. M. 2009. Rodzaje, występowanie i geneza krzemieni. Zarys problematyki. In P. Król (ed.), *Historia krzemienia*, 12–45. Kielce.
- Lech, J. 1980. Flint Mining among the Early Farming Communities of Central Europe. *Przeгляд Archeologiczny* 28: 5–55.
- Lech, J. 1993. Analyse der Spaltindustrie aus der Grube 2. In M. Zápotocká, Chrástany, Bez. Rakovník. *Ein Beitrag zum chronologischen Verhältnis der Stichtbandkeramik zur Grossgartacher und Oberlauterbacher Keramik*. *Archeologické rozhledy* 45/3: 436–459.
- Mateiciucová, I. 2000. Časně neolitická štípaná industrie z osady Kladníky a Ivanovice na Moravě. In *Památky archeologické – supplementum* 13: 218–237.
- Mateiciucová, I. 2008. *Talking Stones: The chipped Industry in Lower Austria and Moravia and the Beginnings of the Neolithic in Central Europe (LBK), 5700–4900 BC*. Brno – Praha, Dissertationes archaeologicae Brunenses/Pragensesque 4.
- Nerudová, Z. 2016. *Lovci posledních mamutů na Moravě*. Brno, Moravské zemské muzeum, Studie Centra kulturní antropologie 2.
- Nerudová, Z. and Přichystal, A. 2011. Kamenná štípaná industrie. In M. Lička, *Osídlení kultury s lineární keramikou v Kosoři, okr. Praha-západ*. Praha, Fontes Archaeologici Pragenses 37: 78–86.
- Neustupný, E., Dobeš, M., Turek, J. and Zápotocký, M. 2008. *Archeologie pravěkých Čech / 4. Eneolit*. Praha.
- Oliva, M. 2001. Gravettienická sídliště u Pavlova. K otázce využívání silicitů krakovské jury. *Acta Musei Moraviae, Scientiae sociales* 86: 45–99.
- Oliva, M. 2007. *Gravettien na Moravě*. Brno – Praha, Dissertationes archaeologicae Brunenses / Pragensesque 1.

- Přichystal, A. 1985. Štípaná industrie z neolitického sídliště v Bylanech (okr. Kutná Hora) z hlediska použitých surovin a jejich provenience. *Archeologické rozhledy* 37: 481–488.
- Přichystal, A. 1987. *Petrografický výzkum štípané industrie ze Mšena (okr. Mělník)*. Praha, Manuscript of report. Národní muzeum v Praze.
- Přichystal, A. 2001. Zastoupení kamenných surovin na szeletských stanicích Drysice I a Ondratice IV (okres Prostějov, Vyškov). *Pravěk NŘ* 2000 (10): 35–39.
- Přichystal, A. 2006. Surowce kamienne morawskich inwentarzy krzemieniarskich z wczesnego okresu epoki brązu. In Kopacz, J. and Šebela, L., *Kultura unietycka i grupa wietrzowska na Morawach na podstawie materiałów krzemieniarskich*, 37–45. Kraków.
- Přichystal, A. 2009. *Kamenné suroviny v pravěku východní části střední Evropy*. Brno.
- Přichystal, A. 2010. Classification of lithic raw materials used for prehistoric chipped artefacts in general and siliceous sediments (silicites) in particular: the Czech proposal. *Archeometriai Műhely* (3): 177–182.
- Přichystal, A. 2013. *Lithic raw materials in prehistoric times of eastern Central Europe*. Brno.
- Přichystal, A. and Šebela, L. 2009. Příspěvek k poznání kamenné štípané industrie z pohřebiště kultury zvoncovitých pohárů v Praze-Velké Chuchli. *Archeologie ve středních Čechách* 13: 683–686.
- Přichystal, A. and Šebela, L. 2015. Silicite daggers from the territories of the Czech Republic and Slovakia (a preliminary study). In C. J. Frieman and B. V. Eriksen (eds), *Flint daggers in prehistoric Europe*, 133–148. Oxford–Philadelphia.
- Schenk, Z. 2007. Jihozápadní část Moravské brány v době kultury s lineární keramikou. *Archeologické studie Univerzity Hradec Králové* 1: 211–244.
- Skutil, J. 1937. O naleziškach siekierok z tzw. pasiastego krzemienia na Morawach. *Przegląd Archeologiczny* 6: 105–106.
- Spurný, V. 1951. Neolitické sídliště v Lobči. *Archeologické rozhledy* 3: 130–135.
- Svoboda, J., Havlíček, P., Ložek, V., Macoun, J., Musil, R., Přichystal, A., Svobodová, H. and Vlček, E. 2009. *Paleolit Moravy a Slezska* (3. aktualizované vydání). Brno, Dolnověstonické studie 16.
- Šebela, L., Přichystal, A., Král, L. and Král, P., in preparation. *Silicite axes from the lands Moravia, Bohemia and Czech Silesia*. Brno, Spisy AÚ AV ČR v Brně.
- Šebela, L., Přichystal, A., Škrdla, P. and Humpolová, A. 2017. Unusual Middle Paleolithic Stone Tool from Southern Moravia with Possible Relations to Southern Poland. *Acta Archaeologica Carpathica* 52: 3–10.
- Šmíd, M. and Přichystal, A. 2015. *Eneolitická hradiska na Prostějovsku. Obrozim – Čubernice a Prostějov – Čechovice-Čechovsko*. Brno, Pravěk – Supplementum 29. ÚAPP Brno.
- Tomkeieff, S. I. 1983. *Dictionary of Petrology*. Chichester.
- Valoch, K. 1987. Raw materials used in the Moravian Middle and Upper Palaeolithic. In K. T. Biró (ed.), *International conference on prehistoric flint mining and lithic raw material identification in the Carpathian Basin*, 263–268. Budapest–Sümege.
- Vencl, S. 1971. Současný stav poznání postmesolitických štípaných industrií v Československu. In *Z badań nad krzemieniarstwem neolitycznym i eneolitycznym*, 74–99. Kraków–Nowa Huta.
- Vencl, S. and Fridrich, J. (eds) 2007. *Archeologie pravěkých Čech / 2. Paleolit a mezolit*. Praha.
- Voláková, S. 2001. K technologii štípané industrie magdaléninu: analýza jader z jeskyně Pekárny. *Acta Musei Moraviae* 86: 101–116.
- Zápotocký, M. 2012. Silicitové sekery v eneolitu a starší době bronzové Čech. *Archeologie západních Čech* 4: 126–159.
- Žaba, J. 2006. *Ilustrowana encyklopedia skał i minerałów*. Katowice.
- Žebera, K. 1958. *Československo ve starší době kamenné*. Praha.