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FROM FAR OR FROM NEAR? SOURCES OF KRAKÓW-CZĘSTOCHOWA BANDED AND CHOCOLATE SILICITE RAW MATERIAL USED DURING THE STONE AGE IN BIŚNIK CAVE (SOUTHERN POLAND)

ABSTRACT: Biśnik Cave is a multilayered archeological site situated on Kraków-Częstochowa Upland (southern Poland). Long sequence of cultural levels places the Biśnik Cave among the most important archeological sites of Middle European Paleolithic. Archeological levels contain numerous silicite artefacts. Preliminary analysis of silicite assemblages showed high diversity of raw material. The inventory is rich in local Jurassic silicite (so called "Cracowian silicite"), but also substantial occurrence of chocolate and banded silicites is significant. The provenance of raw material used by ancient people in Biśnik Cave to make artefacts was not clear and it had inspired the authors to search for the outcrops of silicite raw material in the area around the site. Authors conducted the field survey to prepare a map of natural silicite deposits in 10 km circle around the Biśnik Cave. As a result ten types of Jurassic silicites were discovered. Among them the occurrence of "Kraków-Częstochowa banded (=striped) silicite" and "Kraków-Częstochowa chocolate silicite" at this area was established, the varieties of banded and chocolate silicites known from the Holy Cross Mountains. Analysis of macro- and microscopic characteristics of artefacts made of banded and chocolate silicites from Biśnik Cave has showed that this raw material present the same features as respective silicites from natural deposits in the vicinity of Biśnik Cave. This discover changes the former interpretation of silicite import to Biśnik Cave from Holy Cross Mountains. New data on the usage of local chocolate and banded silicites in the consecutive cultural levels at Biśnik Cave prove that we have to be cautious while drawing conclusions about long-distance import of raw material during Stone Age.

KEY WORDS: Silicite – Chert – Deposit – Distribution – Kraków-Częstochowa Upland

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INTRODUCTION

Silicite raw materials in archeology

Thanks to its natural features, such as hardness, homogeneity or knapping properties, chert, flint and other silicites are the raw material relatively easy to process (Přichystal 1997, 2009). That is why artefacts made of silicites have accompanied humans since the oldest times. The range and the method of using silicite raw material as well as obtaining and processing it in different spheres of human activity was very important for the civilization progress of pre-historic communities (Blades, Adams 2009). It is also a significant source in reconstructing various social behaviors (Allard *et al.* 2006, Ryzhov *et al.* 2005, Schild, Sulgostowska 1997, Thorpe *et al.* 1984).

The studies of silicite raw material distribution are carried out at a number of levels, depending on the examined period and region. Apart from purely utilitarian aspects, connected e.g., with technology, accessibility and the quality of the raw material, there are also aspects referring to the ideological context, e.g., a tool style (Tomaszewski 1988). The study on raw material is also perceived as a method of reconstructing possible contacts between pre-historic communities (Dobosi 1997). Attempts to establish ancient contacts (their aim, range, intensity) are one of the least tangible issues in pre-historic research, especially in its oldest phases (Binford 1979, Service 1966, Sulgostowska 2005: 7). Therefore it is of utmost importance that a researcher of Stone Age tries to establish where the raw material was obtained from and to what destinations it was spread.

Silicite raw materials in Biśnik Cave

Biśnik Cave is a very special site, as regards raw material analysis, due to its interesting and varied silicite assemblage. It is a multilayer archeological site situated in central part of Kraków-Częstochowa Upland (southern Poland, *Figure 1*). The sequence of sediments

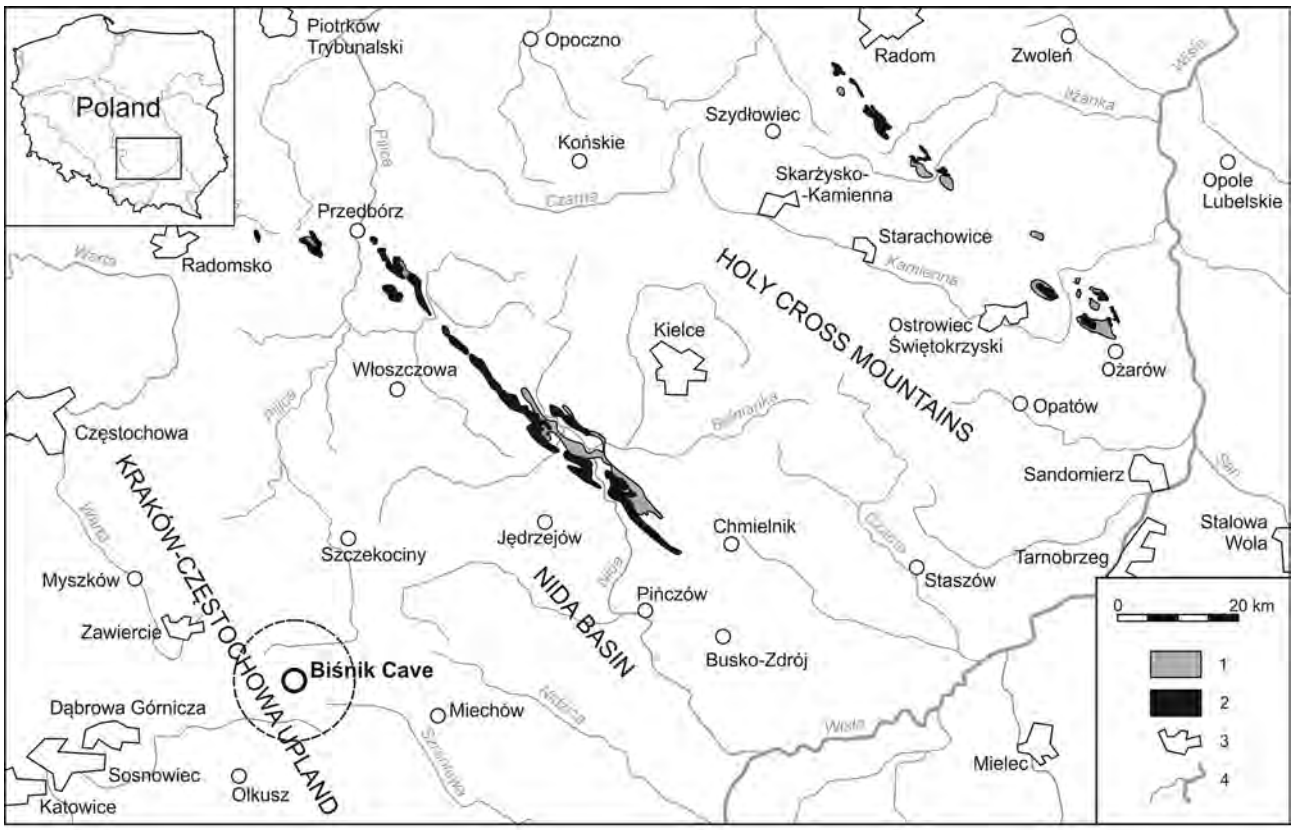

FIGURE 1. Localization of Biśnik Cave on the background of known outcrops of rocks bearing banded and chocolate silicites. 1, Upper Jurassic rocks with banded silicite; 2, Kimmeridgian rocks with chocolate silicite; 3, the biggest towns and cities; 4, the biggest rivers. Research area (circle of 10 km radius around the Biśnik Cave) is marked with dashed line.

reaches 10 m and consists of over 20 layers, including cultural horizons of the Middle Paleolithic, Upper Paleolithic, Neolithic, Bronze Age, Iron Age and Middle Ages (Cyrek 2002, Cyrek *et al.* 2010). Numerous horizons of the Middle Paleolithic, dated between final MOIS 8 and MOIS 3 (Krajcarz, Madeyska 2012), place the Biśnik Cave among the most important Middle Paleolithic sites in Central Europe. Paleolithic horizons contain numerous silicite artefacts, such as backed knives, scrapers and hand-axes (Cyrek 2002, 2006a, b, Cyrek, Sudoł 2008, 2009, Cyrek *et al.* 2010). However, the provenance of silicite raw material used by Neanderthal people to make artefacts was not clear.

Preliminary analysis of silicite assemblages has revealed a considerable diversity of raw material of each archeological level, what has been frequently emphasized in several publications (Cyrek 2002, 2009, Cyrek, Sudoł 2008, 2009, Cyrek *et al.* 2010). That is why Biśnik Cave has become the subject of a synthetic study of the use and distribution of stone raw material in the early phase of the Middle Paleolithic in Central Europe (Wiśniewski 2007). Silicite assemblages in Biśnik Cave are dominated by local Jurassic silicite, which occurs in outcrops located in the close vicinity of the cave (Cyrek, Sudoł 2009, Cyrek *et al.* 2010). However there is a considerable percentage of chocolate silicite, especially in the older Middle Paleolithic assemblages.

Many artefacts from Biśnik Cave were impossible to be examined in respect to type of raw material with the use of a macroscopic analysis, due to extensive chemical weathering or diagenesis. Some artefacts are covered with a characteristic white patina. Such specimens in small not-altered places show some features of the Upper Jurassic raw material from the north-eastern outskirts of the Holy Cross Mountains. A large frequency of the raw material in the youngest Middle Paleolithic levels, as well as in the Neolithic level, induced the authors of the current paper to search for the unidentified raw material in the close vicinity of the site.

Chocolate and banded silicites in Poland

Many types of silicites can be found in Poland. The most widespread silicite is Cretaceous erratic flint occurring on almost all territory of the country (Ginter, Kozłowski 1969: 14). However, Jurassic silicites of good quality occurring *in situ* in outcrops can only be found in southern Poland.

Till date the natural deposits of chocolate and banded (=striped) silicites have only been found in the Holy Cross Mountains. Initially their outcrops on the north-eastern margin of the Holy Cross Mts. underwent research (*Figure 1*, Balcer, Kowalski 1978, Budziszewski, Michniak 1984, Ginter, Kozłowski 1969, Krukowski 1923, Migaszewski, Olszewska 2002, Migaszewski *et al.* 2006, Samsonowicz 1923, 1934, Schild 1971) and over a long period of time that area was believed to be the only region where these silicites occur (Pieńkowski, Gutowski 2004). The occurrence of silicites on the south-western margin of the Holy Cross Mts. was occasionally mentioned (Kutek, 1962, Migaszewski, Olszewska 2002, Migaszewski *et al.* 2006), however these silicites were poorly described and not assigned to any type known from the north-eastern margin until the recent investigations of Krajcarz and Krajcarz (2009). These researchers have established the occurrence of banded and chocolate silicites in mentioned area. Their discovery suggests that chocolate and banded silicites may occur in a wider area than it was initially believed, i.e., in the whole area of Poland determined by occurrence of shelf-derived carbonate rocks of the uppermost Upper Oxfordian and lowermost Kimmeridgian.

The main aim of this study is to present the newest data on the occurrence of outcrops of banded and chocolate silicites on the Kraków-Częstochowa Upland, around the Biśnik Cave. An additional goal is to emphasize the problem of usage and distribution of local silicite raw material on Kraków-Częstochowa Upland during the Stone Age.

MATERIAL AND METHODS

Archeological assemblages from Biśnik Cave

Artefacts made of chocolate silicite are present in the most of Middle Paleolithic cultural levels of Biśnik Cave (Cyrek, Sudoł 2008). They were a subject of a separate study. It is worth emphasizing that they were classified as artefacts made of imported raw material, linked with the outcrops from the region of the Holy Cross Mts. It was a consequence of the research progress at that time, when other outcrops of chocolate silicite were not known.

It has to be noted that the occurrence of banded silicite at the cave has not been thoroughly analyzed. It was limited to few selected samples, whereas detailed research of the whole assemblage is now being carried out.

Methods of field research

The first stage of work was a preparation of a map, gathering the hypothetical distribution of silicite-bearing rock outcrops in the vicinity of the Biśnik Cave. The authors decided to map the Oxfordian and Kimmeridgian limestones and marls, potentially containing banded and

chocolate varieties of silicite. The map was constructed on the basis of Geological Map of Poland 1:200 000 and Detailed Geological Map of Poland 1:50 000 (Bednarek *et al.* 1978, 1985a, Bukowy 1968, Kaziuk, Lewandowski 1979, Kaziuk *et al.* 1978, Kotlicki 1968, Kurek, Preidl 1992) using the same method as Krajcarz and Krajcarz (2009). The next stage of work was verification of the achieved map. The authors have conducted geological field survey to visit all mapped areas with potential silicite occurrence. The field researches were conducted between 2007 and 2012. The chosen area was a circle of 10 km radius around the Biśnik Cave (*Figure 1*). All found outcrops were mapped and GPS localized. Samples of silicite material as well as the samples of carbonate rock and fossils were collected.

Whole nodules and their fragments of both banded and chocolate silicites are very abundant on the ground surface in outcrop areas. About 100 samples of each silicite type were collected, however many others were studied in field. To have representative samples and to provide the study with whole variability of the raw material, we were intent on collecting all kind of specimens (different coloristic and facies varieties, small and large nodules, fresh and weathered material, whole nodules as well as clasts and flakes), according to conventional procedure (Mester, Faragó 2013).

Analysis of silicite material

Collected samples were analyzed in the same way as silicite artefacts from Biśnik Cave. Micro- and macroscopic features were described according to the criteria used in petroarcheological literature (Budziszewski, Michniak 1984, Ginter, Kozłowski 1969, Kaczanowska *et al.* 1979, Krajcarz, Krajcarz 2009, Přichystal 2009, Schild 1971). Following features were noted:

- lithostratigraphical unit containing the silicate;
- size and shape of nodules;
- facture, thickness and color of cortex;
- boundary between cortex and silicite substance;
- crystallinity, transparency, luster, homogeneity and color of silicite substance;
- presence and distribution of intercalations, insertions, fossils, intra- and extraclasts;
- fracture and flint-knapping properties.

RESULTS

Outcrops of Jurassic silicites around the Biśnik Cave

During field survey ten types of Jurassic silicites were discovered in 10 km circle around the Biśnik Cave. Five

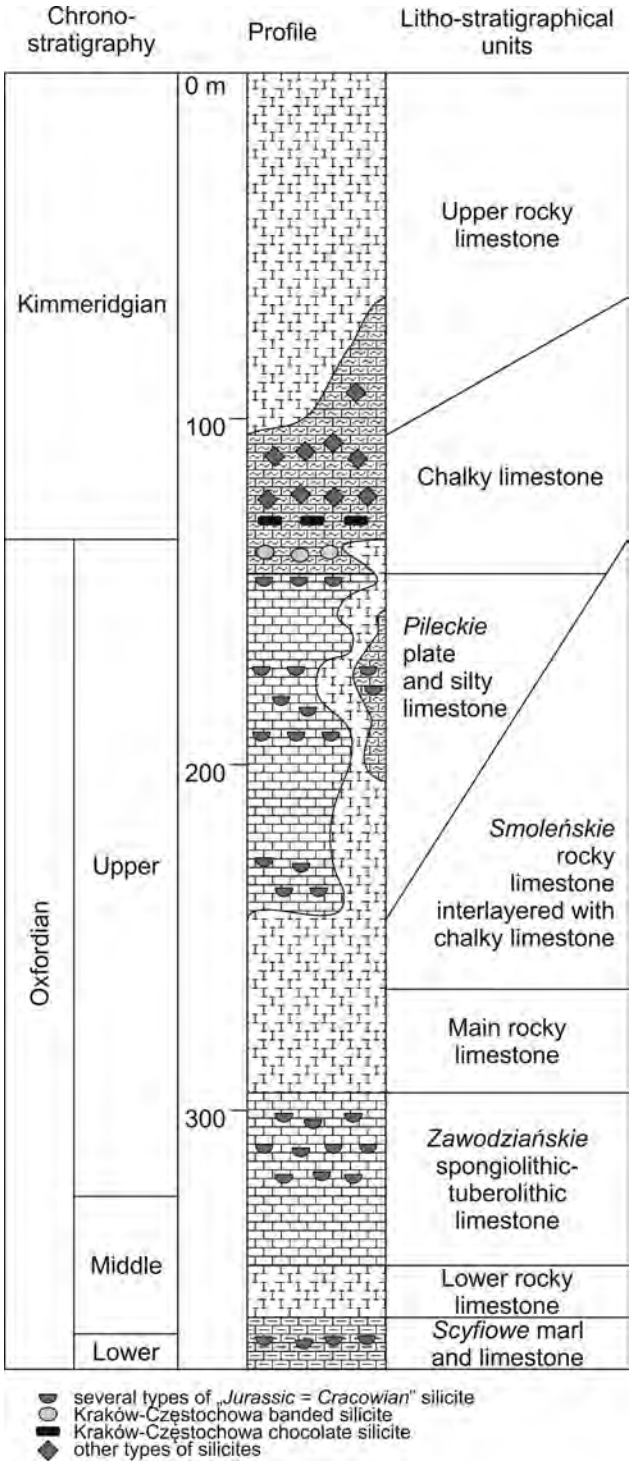

FIGURE 2. Simplified lithological and stratigraphical profile of Oxfordian and Kimmeridgian in the vicinity of Biśnik Cave (after Bednarek *et al.* 1978, 1985a, b, Kaziuk *et al.* 1978) with marked position of silicites.

of them occur in Lower, Middle and lower Upper Oxfordian rocks and represent different types of the so called "Jurassic silicite" (="Cracowian silicite", in Polish: *krzemień jurajski podkrakowski*, see Ginter, Kozłowski 1969, Kaczanowska *et al.* 1979). Discovered silicites were named after lithostratigraphical units of rocks which contain these silicites or after the nearest village: *scyfiowe silicite*, *zawodziańskie silicite*, *pileckie silicite*, *silicite from Załęże* and *silicite from Udórz* (*Figure 2*). In uppermost Upper Oxfordian and Kimmeridgian several types of not-"Cracowian" silicites have been discovered: *banded silicite*, *striped silicite from Cisowa*, *silicite from Góry Barańskie*, *chocolate silicite* and *silicite from Wierbka* (*Figure 2*, see also *Figures 3, 4 and 5* with photos of exemplary specimens). Only chocolate silicite and banded silicite are the subject of this study. The other types are under research and will be presented in future papers.

FIGURE 3. A–E, exemplary specimens of Kraków-Częstochowa banded silicite from the vicinity of Biśnik Cave. Arrows indicate typical weathered surfaces. Characteristic inner core is visible on the specimen A. Specimens A and C reveal striping like banded silicite from Holy Cross Mts., but others do not. F–I, exemplary artefacts from Biśnik Cave made of banded silicite (F, inv. no W-2396, layer 1; G, inv. no W-887, layer 13; H, inv. no W-1937, layer 15; I, inv. no W-5194, layer 13). A characteristic inner core is visible on the right part of specimen F. Specimens G and I are strongly altered by weathering/diagenesis.

Banded silicite around Biśnik Cave

Banded silicite occurs in chalky limestone of uppermost Upper Oxfordian, in the area of Cisowa village and Góry Barańskie hills, about 5 to 5.5 km to NE from Biśnik Cave (*Figure 6*). Nodules can be found in soil and in weathering mantle on slopes and on the bottom of now-dry valley in Cisowa. There are no natural outcrops of non-weathered rocks with nodules, however there are several artificial outcrops. Nodules (*Figure 3*) are rounded, spherical, sometimes branched, and have diverse size – from several centimeters to several dozen centimeters. Cortex is thin (1–5 mm, average 2 mm) and smooth, white, clearly separated from inner silica substance and from the outside rock. Silica substance is dark in color, from gray to black, slightly transparent to nontransparent, dull or with slight

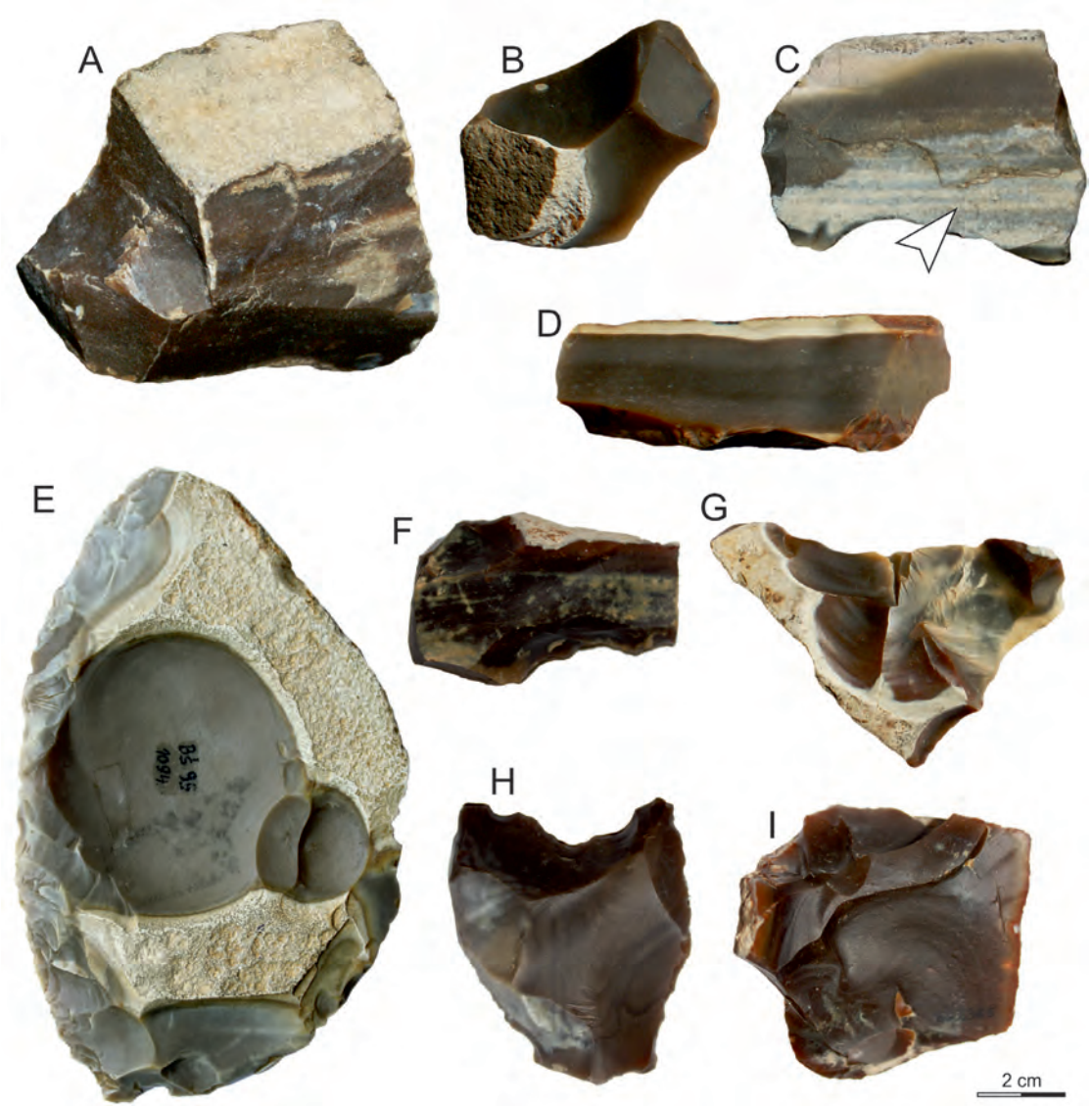

FIGURE 4. A–D, exemplary specimens of Kraków-Częstochowa chocolate silicite from the vicinity of Biśnik Cave. Arrow indicates typical weathered surface. Characteristic inner lamination is visible on specimens A, C and D. E–I, exemplary artefacts from Biśnik Cave made of chocolate silicite (E, inv. no W-1094, layer 5; F, inv. no W-2081, layer 14; G, inv. no W-2057, layer 14; H, inv. no W-1995, layer 15; I, inv. no W-2365, layer 19). Specimen E is strongly weathered with color turned to gray, specimens F, G and H are slightly altered, with yellowish and grayish spots of patina.

glassy luster, fine-crystalline. Two subtypes may be distinguished: specimens with homogenous dark color and specimens which are striped with darker and lighter bands. Inside silica substance there usually is an ellipsoidal core built of nontransparent light gray, dull and coarse-crystalline silica. However such cores do not occur in each specimen.

When knapped this silicite gives subconchoidal fracture. Knapping properties are very good and seem to be better than the properties of banded silicite from the Holy Cross Mts. It is probably due to less marked striping and greater homogeneity.

Weathered cortex is yellowish white to orange, sometimes with brown patches. Weathered silica

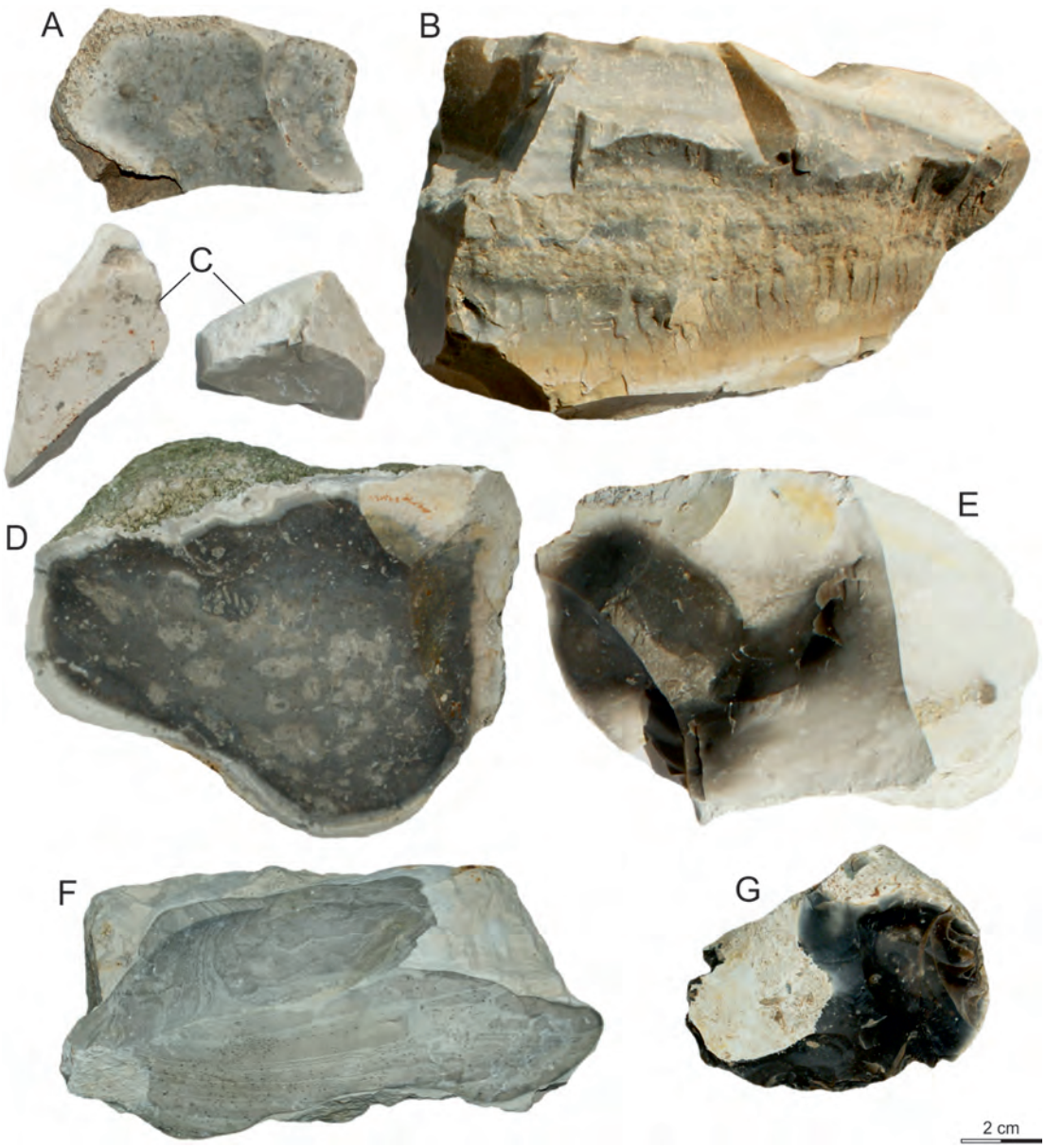

FIGURE 5. Exemplary specimens of different types of silicites from the vicinity of Biśnik Cave. A, *zawodziańskie* silicite; B, silicite from Załęże; C, *pileckie* silicite; D, silicite from Udórz; E, silicite from Wierbka; F, striped silicite from Cisowa; G, silicite from Góry Barańskie.

substance is dull, nontransparent, milky white or grayish white, sometimes with grayish or bluish spots and lines.

We propose to name this type of silicite the *Kraków-Częstochowa banded silicite* to separate it from the classical banded silicite from Holy Cross Mountains. These two types of silicites are not identical and may be differentiated on the basis of macroscopic features, and possibly also microscopic features (A. Přichystal – pers. comm.), what needs further researches.

Chocolate silicite around Biśnik Cave

Chocolate silicite occurs in lowermost Kimmeridgian chalky limestone, in the area of Góry Barańskie hills and valley of Udorka stream, about 6 km to NE from Biśnik Cave (*Figure 6*). Neither natural nor artificial outcrops of non-weathered rocks with nodules of this silicite occur there. On the surface this silicite can be found in the soil and in weathering mantle on tops of hills. It also occurs in the alluvial gravels of Udorka stream. Nodules (see *Figure 4*) are flat with parallel upper and lower surfaces. The thickness of nodules is 2–10 cm and diameter from several to over a dozen centimeters. Cortex is thin (about 0.5–5 mm, average 1–2 mm), white, smooth but with numerous fossils and grains on the surface, clearly separated from an outside rock. Below the cortex a white dull nontransparent zone occurs, several millimeter thick, distinctly separated from inner silica substance. Silica substance is dark, from dark brown to yellowish brown and grayish brown. It is fine-crystalline, dull, slightly transparent, with fatty or pearl luster. In some specimens inside the substance occur horizontal bands of coarse-crystalline silica. Knapping properties are very good. When knapped this silicite shows subconchoidal fracture. Weathered cortex is orange. Weathered silica

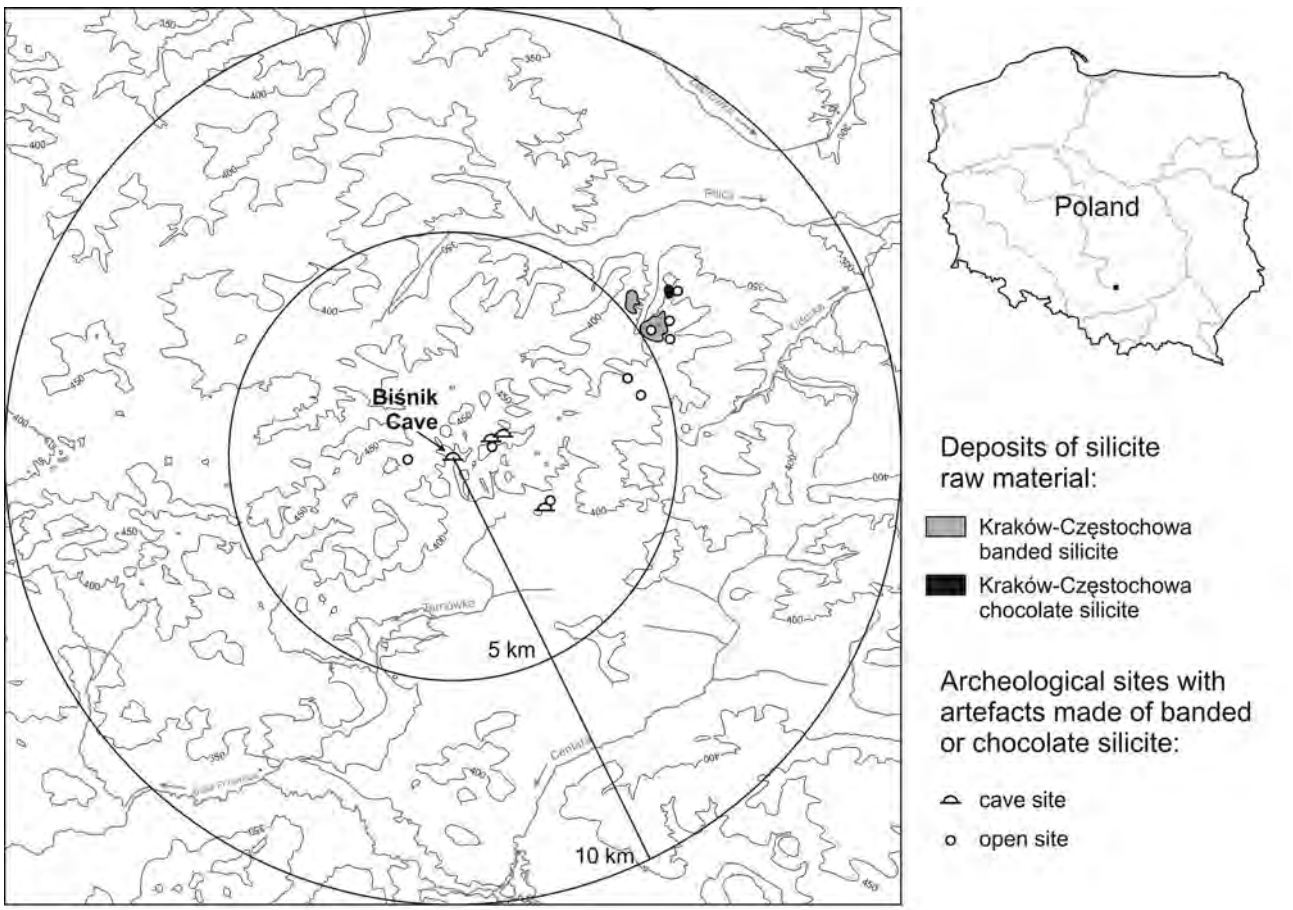

FIGURE 6. Research area with localization of surface or subsurface natural deposits of banded silicite and chocolate silicite in the Jurassic of Kraków-Częstochowa Upland. Archeological sites with use of this raw material confirmed during field survey or published (Cyrek 2006a, Cyrek, Sudoł 2008) are also shown.

substance is dull, nontransparent, gray to yellowish gray or bluish gray, in some specimens striped.

We propose to name this type of silicite the *Kraków-Częstochowa chocolate silicite* to separate it from the classical chocolate silicite from Holy Cross Mountains. These two types of silicites are not identical and may be differentiated on the basis of macroscopic features, and possibly also microscopic features, what needs further researches.

Chocolate and banded silicites in archeological assemblages from Biśnik Cave

Chocolate silicite appears early on the site (*Figure 7*). A considerable number of artefacts made of this raw material occurred in the Middle Paleolithic cultural levels from layers 19 and 18, dated to 200–250 thousand years BP (Krajcarz, Madeyska 2012). These artefacts are small tools with denticulate and niche retouch, as well as chips formed as a result of processing and retouching tools. Larger specimens were also found, such as retouched Levallois point and two cores (*Figure 4:I*). Also in the younger Middle Paleolithic levels (layers 15–12) single tools from that raw material have been observed, some of which stand out the assemblage, e.g., a niche tool from a massive Levallois flake made of brown silicite mass characterized by "striping" (*Figure 4:H*) and an initial backed knife (*Figure 4:F*) and core (*Figure 4:G*) (for more details see Cyrek 2007, Cyrek, Sudoł 2008). Till date no artefacts made of chocolate silicite have been observed in the early Vistulian cultural levels (layers 11–9). This raw material appears again in Micoquian assemblages from the Middle Plenivistulian in layers 7–5, in a form of single-backed knives and Levallois cores (*Figure 4:E*) (see also Cyrek 2006, Cyrek, Sudoł 2008).

Similarly, banded silicite is present in almost all layers (*Figure 7*). However in this case there is a larger quantitative and typological diversity of tools made of this raw material in the consecutive phases of the cave inhabitation. In the oldest levels (layers 19c–19) artefacts made of banded silicite are scarce. They are mainly relatively large semi-products, frequently covered with an extensive patina, white or light gray in color. Less frequently are tools and processed core forms (Cyrek 2007). In the case of Plenivistulian (layers 7–5) the situation is different, since a considerable number of artefacts was made of that raw material. In the layers mentioned above two abundant silicite assemblages have been documented (over 5 000 artefacts in total). They consist of semi-products (chips, flakes and blades), the effect of processing and retouching tools, in this case

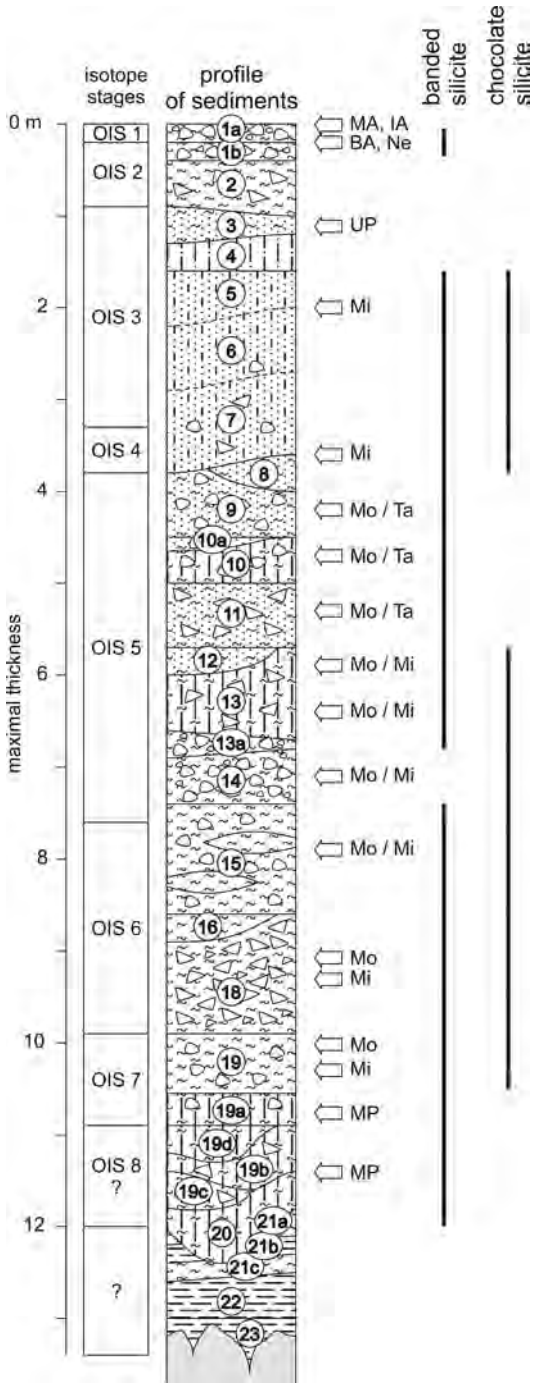

FIGURE 7. Occurrence of the Kraków-Częstochowa banded and chocolate silicites in archeological assemblages of Biśnik Cave. MP, Middle Paleolithic; UP, Upper Paleolithic; Mi, Micoquian; Mo, Mousterian; Ta, Taubachian; Ne, Neolithic; BA, Bronze Age; IA, Iron Age; MA, Middle Ages. Profile and stratigraphy after Krajcarz and Madeyska (2012), cultural attribution of levels after Cyrek (2002), Cyrek *et al.* (2010).

three-conical backed knives (Cyrek 2007). A rich cultural level found in the Holocene layer is also of analogous character. It is connected with the production of bi-conical and four-conical axes (*Figure 3:F*) (Cyrek 2002). This proves that banded silicite used at Biśnik Cave is a raw material of good quality, used for the production of technologically complicated core tools, such as knives and axes. It was appreciated by Neanderthal groups in the Middle Paleolithic, as well as later Neolithic and early Bronze Age communities of modern human.

DISCUSSION

New picture of the occurrence of banded and chocolate silicites in Poland

Conducted field survey confirmed that the occurrence of banded and chocolate silicites around the Biśnik Cave is correlated with the occurrence of uppermost Upper Oxfordian and lowermost Kimmeridgian rocks. In accordance to geological maps the outcrops of banded and chocolate silicites are not restricted to Holy Cross Mts. only, what was initially mentioned (Balcer, Kowalski 1978, Budziszewski, Michniak 1984, Ginter, Kozłowski 1969, Krajcarz, Krajcarz 2009, Krukowski 1923, Migaszewski *et al.* 2006, Pieńkowski, Gutowski 2004, Samsonowicz 1923, 1934, Schild 1971). Our data show that these types of silicite occur also in Kraków-Częstochowa Upland, in areas where appropriate limestone rocks are uncovered on the surface, or covered by soil or weathering mantle. Recognized area is limited to middle part of Kraków-Częstochowa Upland (microregion called Ryczów Upland according to Kondracki 1998). However authors believe that similar situation may be found in other parts of Kraków-Częstochowa Upland, wherever appropriate rocks of uppermost Upper Oxfordian and lowermost Kimmeridgian occur.

Facies appearance of silicite-bearing limestones on Ryczów Upland is slightly other than in Holy Cross Mts. The uppermost Upper Oxfordian and lowermost Kimmeridgian are formed here as soft, smearing, porous, not laminated spongiolithic-tuberolithic limestone, called *chalky limestone* due to its similarity to facies of chalk (Bednarek *et al.* 1978, 1985b). This lithostratigraphic unit is highly diversified, with numerous displacings by massive rocky limestone or silty limestone. Ooid grains were recognized during microscopic investigation (Bednarek *et al.* 1985b: 24), but presence of distinct oolithic layers, characteristic for the silicite-bearing rocks in Holy Cross Mts. (Borkowski, Michniak 1992, Kutek 1962, Pieńkowski, Gutowski 2004) was not recognized here. However it must be noticed that quarries or other well-exposed outcrops where limestone is available for detail sedimentological study do not exist in the region.

Presence of silicite deposits in the same area where authors have discovered the deposits of banded and chocolate silicites where noticed by Pelisiak (2003, 2006). However he assigned the flint to *Jurassic = Cracowian* silicite type, subtype G according to the typology of Kaczanowska *et al.* (1979). Our investigation showed that Pelisiak was partially right, as similar type occur also at the same area, in addition to banded and chocolate silicites (see *Figure 5:G*).

The presented data importantly change the map of banded and chocolate silicites deposits. Ryczów Upland, where these silicites are newly discovered, is situated about 60 km to the SW of the deposits at south-western margin of Holy Cross Mts. described by Krajcarz and Krajcarz (2009) and about 140 km to the SW from the most known silicite mines at north-eastern margin of Holy Cross Mts. (Balcer, Kowalski 1978, Ginter, Kozłowski 1969, Schild 1971 and others). It indicates that *Kraków-Częstochowa banded* and *chocolate silicites* from Ryczów Upland were more closely situated for the flint-diggers from Kraków-Częstochowa Upland (*Figure 1*) and from other regions situated to the NW, W, SW and S of the Upland (for example: Greater Poland, Silesia, Lusatia, Bohemia or Moravia, see *Figure 8*).

From far or from near?

Analysis of macro- and microscopic characteristic of artefacts made of banded and chocolate silicites from the Biśnik Cave has showed that silicite presents the same features as respective silicite from natural deposits in the vicinity of Biśnik Cave.

In the light of the current research we can pose a question about the accessibility of the presented raw material during the Pleistocene and the early Holocene, in the areas where natural silicite deposits are still present, as well as the intensity of usage of these silicites for tool production at Biśnik Cave. A macroscopic analysis, as well as the comparative analysis with the collected raw material samples seems to confirm the use of local variants of banded and chocolate silicites (literally *Kraków-Częstochowa banded flint* and *Kraków-Częstochowa chocolate flint*). A large number of chunks and natural nodules of banded silicite in the cave indicates a close vicinity of the outcrops. This is also proved by the analogous character of silicate substance and cortex. In the case of chocolate silicite,

which almost exclusively occurs in form of characteristic plates, the usage of local sources is confirmed by analogous plate forms on the site, regarded as tools, as well as their semi-products with well-preserved cortex surfaces. The character and thickness of the cortex and features of silicite substance of both artefacts and specimens from local deposits are also similar in macroscopic analyses.

Detail geochemical analyses are needed in future to proof that banded and chocolate silicites used in the Biśnik Cave were gathered by ancient human from the local deposits. However on the basis of macro- and microscopic observations this model of banded and chocolate silicites acquisition is very probable.

Archeological importance

The percentage of artefacts made of local *Kraków-Częstochowa chocolate* and *banded silicites* indicates that even in the earliest phases of the cave inhabitation their dwellers appreciated good utility features of the raw material. The silicite type revealing good knapping properties was searched for, despite easy access to other Jurassic raw material from nearer outcrops (for example *silicite from Załęże*). In addition other raw material of lower quality (*silicite from Udórz*) was accessible in the nearest vicinity of banded and chocolate silicites outcrops, but its presence has not been observed in the cultural assemblages in Biśnik Cave.

The above findings are extremely relevant for studies on obtaining and distribution of silicite raw material during the Middle and Upper Pleistocene as well as the Holocene. New data do not only supplement the state of research, but also considerably change it.

Neanderthal groups in the central part of the Kraków-Częstochowa Upland, whose inhabitation traces are present at Biśnik Cave, used exclusively local raw material (*Kraków-Częstochowa chocolate* and *banded silicites* including). It is a significant conclusion for the reconstruction of the process of obtaining raw material by Middle Paleolithic communities. New findings at Biśnik Cave are in agreement with the situation observed on other Middle Paleolithic sites in Poland, where Neanderthals used the raw material coming from the close vicinity of the sites, rarely further than 20 km away. For example the tools from Middle Paleolithic sites at Kraków Region are made of the local Jurassic silicite. Literally it can be seen in assemblages from Wylotne Shelter (Chmielewski 1975, 1988, Kozłowski 2006), Ciemna Cave (Kowalski 1976, Krukowski 1939–1948, Sobczyk, Valde-Nowak 2013) or a complex of Paleolithic sites at Piekary (Sachse-Kozłowska, Kozłowski 2004, Sitlivy *et al.* 2008), consisting of

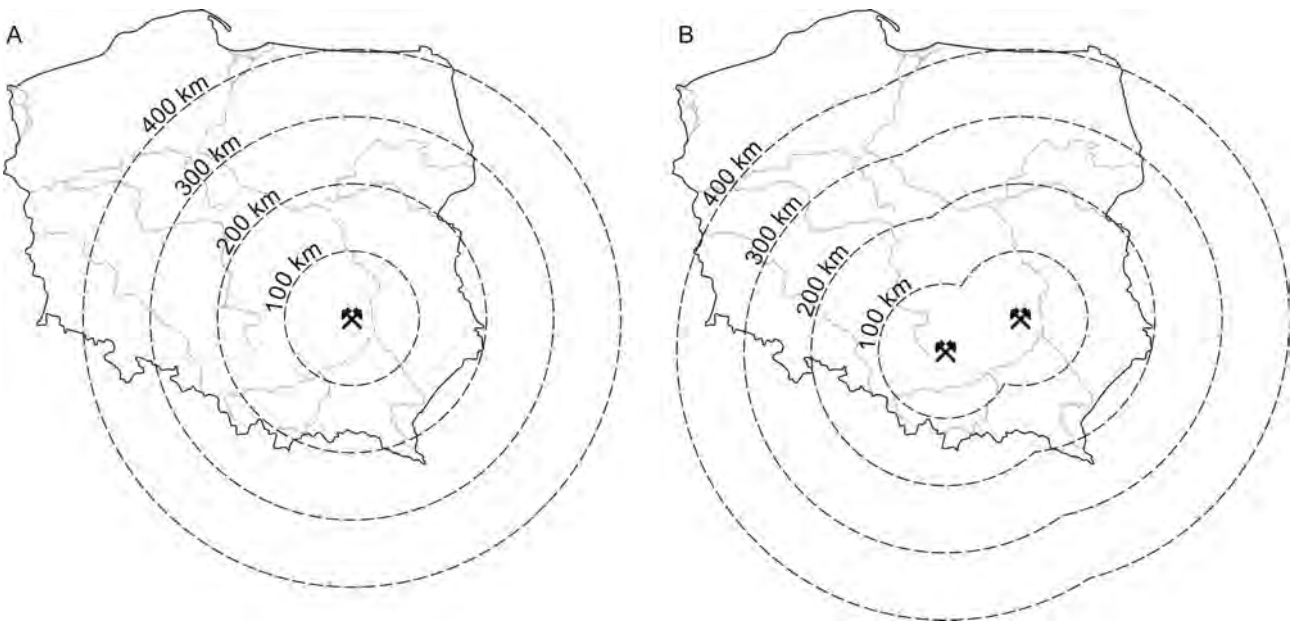

FIGURE 8. Circles of distribution of banded and chocolate silicites on the territory of Poland and neighbor countries. A, spreading from Holy Cross Mts. only (adapted from Balcer, Kowalski 1978, Sałaciński, Zalewski 1987, Schild 1971). B, spreading from both Holy Cross Mts. and the vicinity of Biśnik Cave (Ryczów Upland), according to new data.

several thousand artefacts each, the most of them made of local *Jurassic* (=*Cracowian*) *silicite*. Similarly, on Middle Paleolithic sites from the area of Silesian Lowland the artefacts were made of local Cretaceous erratic flint (Wiśniewski 2006, 2012, Wiśniewski, Kufel 2002) and in the area of southern Mazovia at the site Zwoleń the artefacts were made of local *chocolate silicite* from Holy Cross Mts. (Królik 2005, Schild *et al.* 2000). In the area of Sandomierz Basin the survey has yielded finds of Middle Paleolithic tools made of local *Świeciechów silicite* (Libera *et al.* 1994), whereas at Lublin Polesia – made of *Rejowiec silicite* (Libera 2003). Similarly, in many areas of Europe (e.g., Becov, layers 5, 7–8; I, Hôrka Ondrej B, layer 2; Hôrka Ondrej D, layer 3; Kůlna Cave, layer 14; Markkleberg Fdk. 1, Fdk. 2; Moravany; Trenčianske Teplice; Beharovce; Gánovce; Baume-Vallée, unit 1; Sainte-Anne I, unit J1; Payre, unit Gb) we can reconstruct the usage of local raw material coming from outcrops located at a distance 5–40 km (Fernandes *et al.* 2008: 2361–2368, Kaczanowska *et al*. 2013: 112–113, Kaminská 2013: 101, Wiśniewski 2007: 216).

Identifying banded silicite as the main raw material used for axe production is extremely relevant not only for the description of the Neolithic/Early Bronze Age cultural level at Biśnik Cave, but also for the whole microregion. Numerous workshop sites from the late Neolithic/Early Bronze Age are known from the vicinity of Biśnik Cave, where by-product of axe production, mainly in the form of flakes, was abundant. The most important of those sites are: a complex of sites in the region of Zegarowe Rocks (Stefaniak *et al*. 2009, Krajcarz *et al.* 2012), Jasna Strzegowska Cave (Mirosław-Grabowska, Cyrek 2009, Pelisiak 2003, Rybicka, Cyrek 1996,) and a complex of sites at Góry Barańskie hills (Pelisiak 2006). The same raw material was recorded on the sites, initially described as Jurassic silicite of subtype G (Pelisiak 2003, 2006). The misidentification of the raw material undoubtedly resulted from a slightly different character of *Kraków-Częstochowa banded silicite* from Ryczów Upland in comparison with the more familiar banded silicite from the Holy Cross Mts. The difference was connected with fainter stripes and extensive white patina, making it more difficult to recognize.

New findings are a premise for discussion on the mobility of Neanderthal groups in the Middle Paleolithic and the distribution of raw material in the Holocene, on the basis of silicite sources.

CONCLUSIONS

The natural deposits of banded silicite and chocolate silicite are not restricted to Holy Cross Mts. only. They also occur on Kraków-Częstochowa Upland, at least in its middle part, the Ryczów Upland, as the authors have demonstrated in this paper. This region is situated about 60 km away from the formerly known deposits at south-western margin of Holy Cross Mts. and about 140 km from the most known flint mines at north-eastern margin of Holy Cross Mts.

New data on the usage of local *Kraków-Częstochowa chocolate* and *banded silicites* in the consecutive cultural levels at Biśnik Cave prove that we have to be cautious while drawing conclusions about long-distance import of raw material in the Middle Paleolithic. Misinterpretation may happen when the raw material analysis of archeological assemblages does not take into consideration the results of detailed study on the local raw material situation.

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