

CHOCOLATE FLINT OUTCROPS IN THE KRAKÓW-CZĘSTOCHOWA UPLAND

State of knowledge on mining, use and distribution of the raw material and further research perspectives

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Abstract: New data obtained from the central part of the Kraków-Częstochowa Upland cast an interesting light on the issues of the origin of chocolate flint and the ways it was used by prehistoric communities inhabiting the region. Earlier interpretations indicated that the chocolate flint found at prehistoric sites in the Kraków-Częstochowa Upland was imported from the outcrops in the north-eastern part of the Holy Cross Mountains. Identifying the sites of siliceous rocks outcrops, extraction and distribution are extremely important at not only the local but also trans-regional level.

INTRODUCTION

Many varieties of siliceous raw materials can be found in the territory of Poland. Known exclusively from *in situ* outcrops in the Holy Cross Mountains area until recently, chocolate flint is distinctive in terms of its technical and visual features.

The north-eastern margin of the Holy Cross Mountains is the best known and researched area of the occurrence of chocolate flint (e.g. *Krukowski 1923; Migaszewski et al. 2006; Samsonowicz 1923; Schild 1971*). For many years, it has been considered to be the only region where this raw material can be found (*Pieńkowski/Gutowski 2004*). The issues of the extraction and processing of chocolate flint in the north-eastern part of the Holy Cross Mountains are still relevant and studies within the framework of research projects, an excellent example of which are the verifications conducted in chocolate flint mines in Orońsko (Fig. 1: A) since 2016 (*Kerneder-Gubała 2016; Kerneder-Gubała et al. 2017*). Recently, attempts have been made at obtaining a set of diagnostic data on various “chocolate” flint in central Poland based on geochemical methods of siliceous rock identification (*Brandl et al. 2016*).

It was concluded that – besides the north-western range – chocolate flint outcrops could be found in the south-western part of the Holy Cross Mountains. Initially, it was rarely mentioned in the literature (*Kutek 1962; Migaszewski/Olszewska 2002; Migaszewski et al. 2006*) and the existence of chocolate flint in this area was confirmed and described only in the last decade (*Krajcarz/Krajcarz 2009*). These findings provided the ground for further research into the existence of chocolate flint at a larger area than initially assumed, that is on the entire surface of the outcrops of Upper Oxfordian and Lower Kimmeridgian, including in the Kraków-Częstochowa Upland (*Krajcarz et al. 2012a; 2012b*).

Accurate identification of chocolate flint from the Kraków-Częstochowa Upland, which is macroscopically similar to that known from the Holy Cross Mountains, will allow the verification of the current state of knowledge on the subject of the distribution of this raw material. This will allow assessment of the importance of this area as an important flint production centre exploited in the Palaeolithic, Mesolithic and Neolithic. The results will be important for future research, not only on the Upland itself, but also on other regions located both in Poland and in neighbouring countries, especially for the Moravia (e.g. *Přichystal 2018; Valoch 2001*), Bohemia (e.g. *Burgert 2018; Matejciucová 2008*) and Slovakia (e.g. *Kaczanowska 1985; Kozłowski 2013; Nemergut 2020; Soják 2002*).

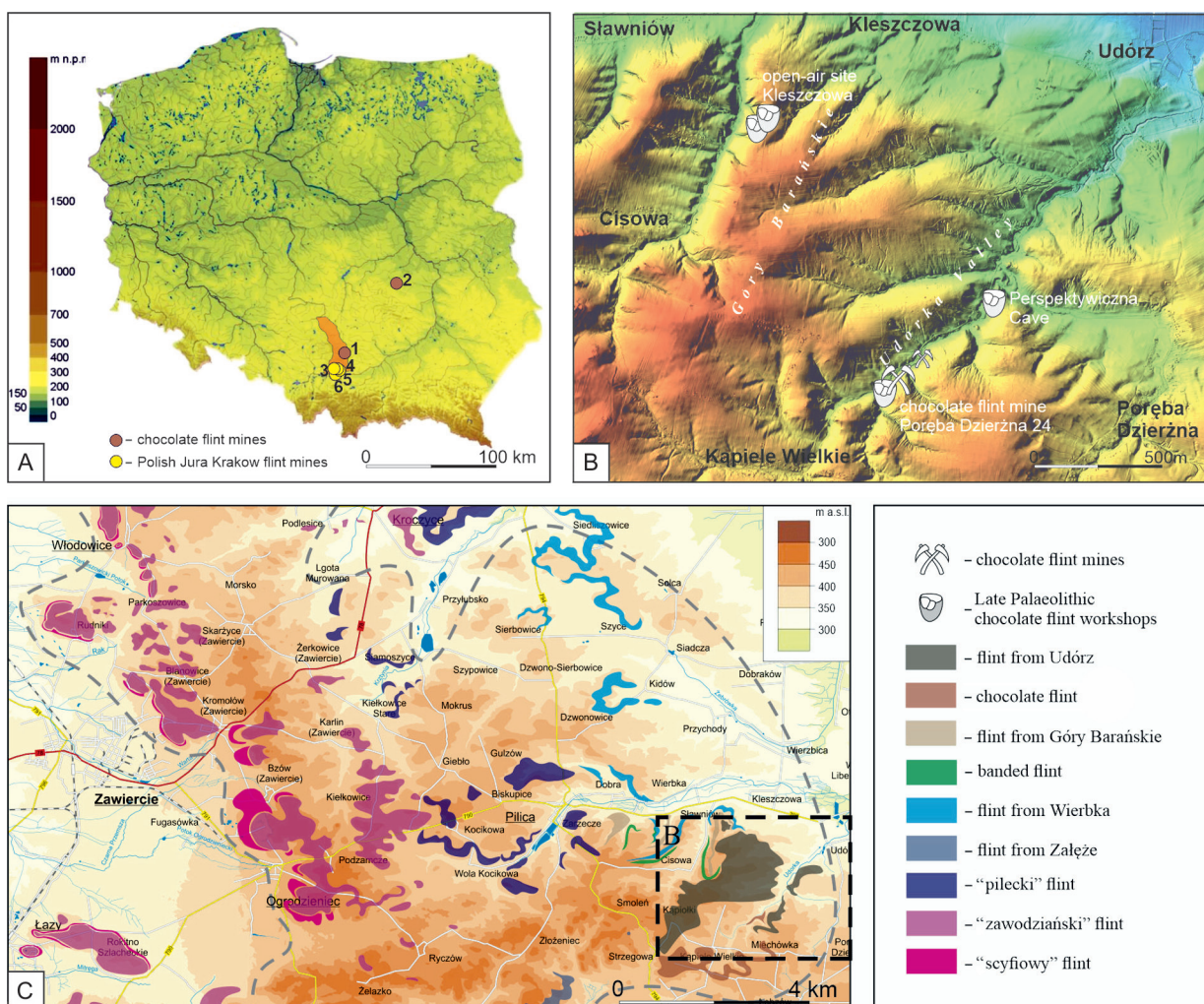


Fig. 1. Location of regions and sites included in the project. A – map of Poland with the selected area Kraków-Częstochowa Upland and sites described in the text (1 – Poręba Dzierżna 24; 2 – Orońsko; 3 – Sasów; 4 – Bębło; 5 – Zelków; 6 – Mników); B – Udorka Valley region with the location of sites related to exploitation and further processing of chocolate flint (after Sudoł-Procyk/Krajcarz 2021, with author changes); C – map of raw materials on the Ryczów Upland (after Sudoł-Procyk/Cyrek, in press, with author changes).

CHOCOLATE FLINT OUTCROPS ON THE CENTRAL PART KRAKÓW-CZĘSTOCHOWA UPLAND

In the last decade, in the central part of the Kraków-Częstochowa Upland, the team headed by geologist M. Krajcarz conducted intensive research into finding and documenting siliceous raw materials outcrops there. The studies revealed significant diversification of siliceous raw materials and the existence of new outcrops, particularly the Ryczów Upland. The outcrops of high-quality chocolate flint situated in the Udorka Valley are particularly distinctive (Fig. 1: B, C; Sudoł-Procyk et al. 2018).

The Udorka Valley region is densely forested and divided by deep gorges, which makes it difficult to conduct prospective surface surveys. It was only in 2013 that the flint deposits could be precisely localised, whereas anthropogenic pits were discovered in the outcrop area two years later. Flint semi-raw material in the form of flakes and numerous concretions, including initially processed ones that are the remnants of mine workshops dealing in the initial processing of raw materials, were documented in their vicinity, particularly in at the edge of the slope. Conducted in 2018 and 2019, survey studies confirmed that the pits were mines (Krajcarz/Sudoł-Procyk 2019b; Sudoł-Procyk/Krajcarz/Krajcarz 2018).

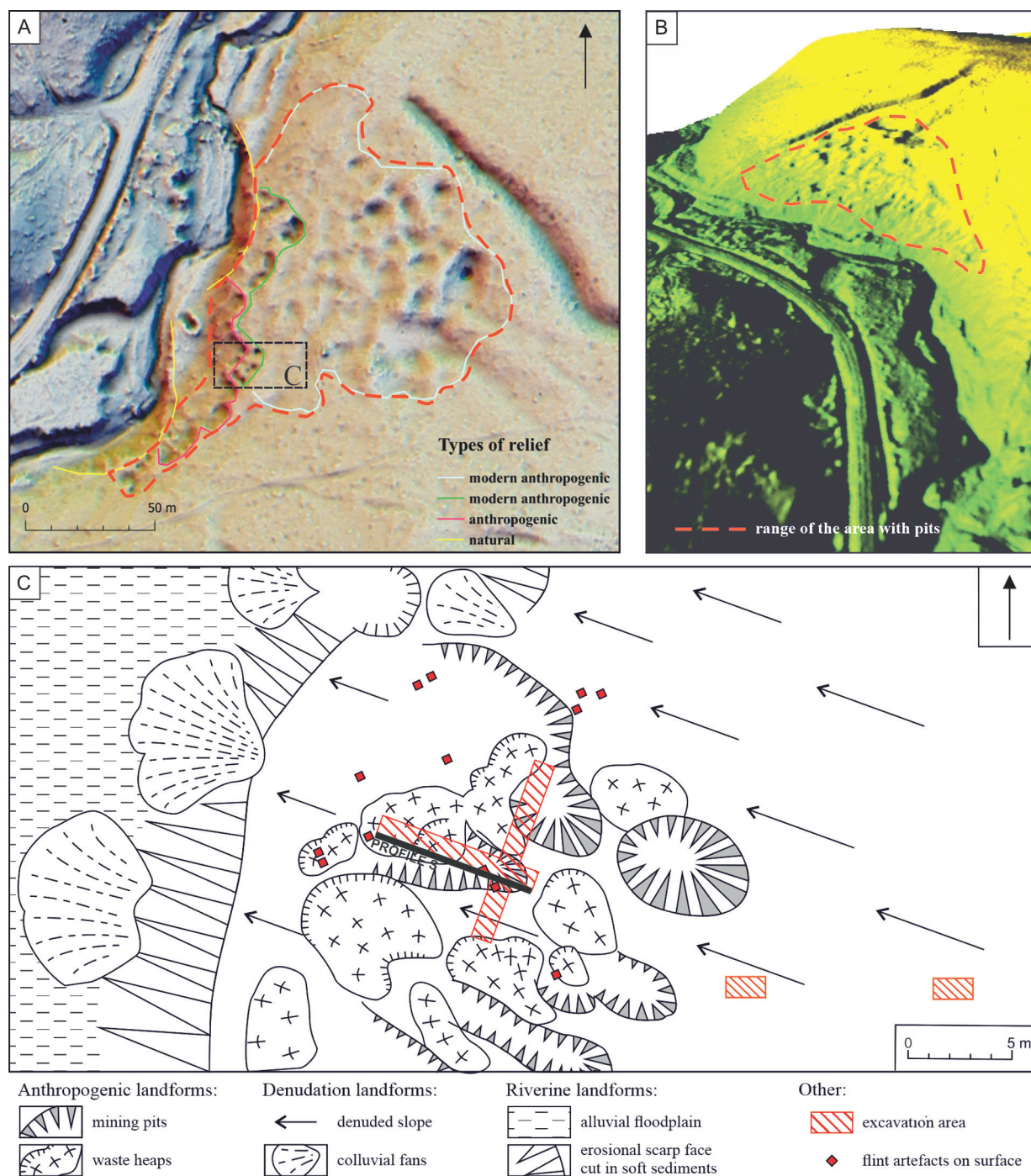
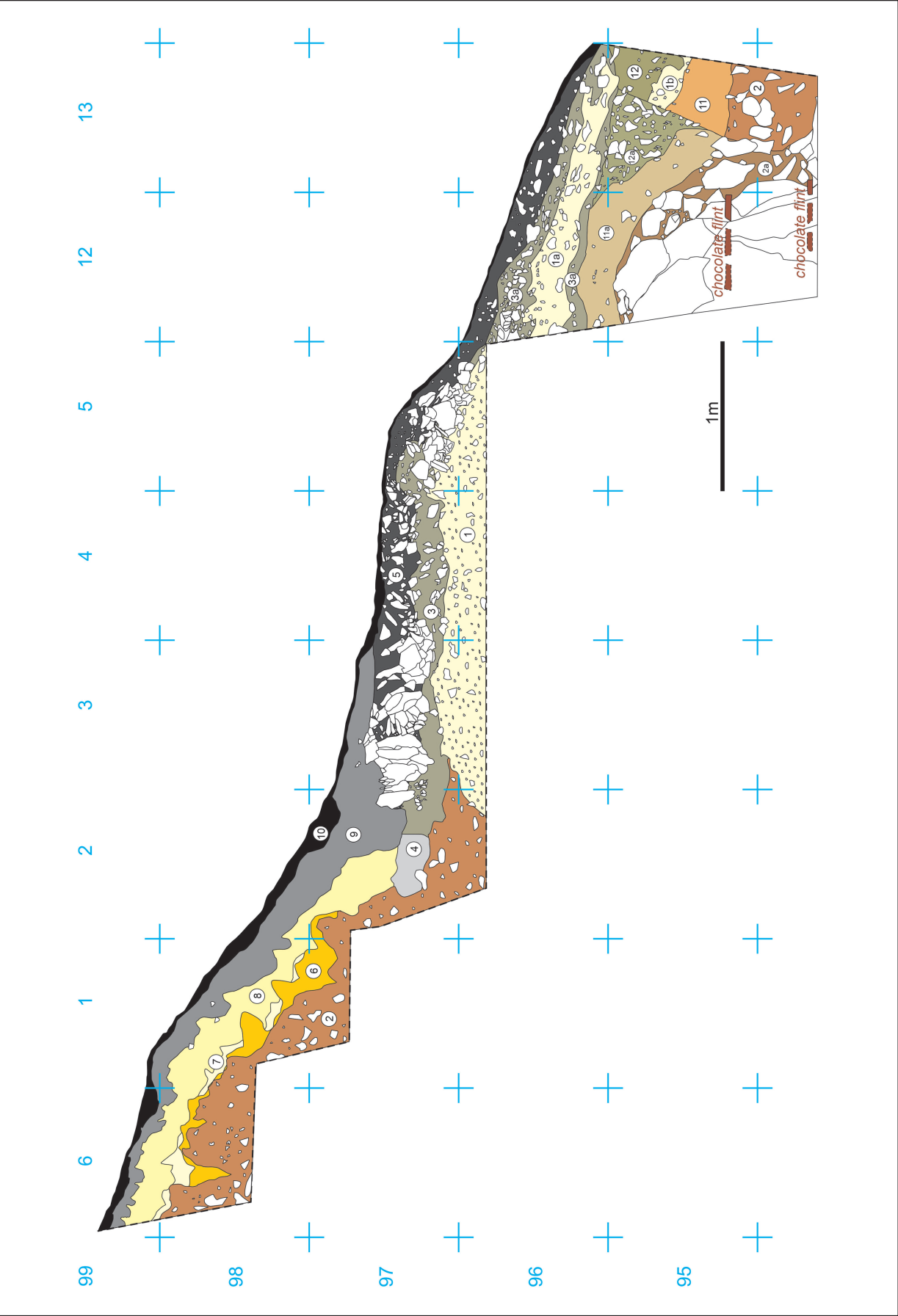


Fig. 2. Poręba Dzierżna 24, com. Wolbrom, małopolskie voiv. A, B – LiDAR photograph displaying an image of outcrops chocolate flint in Udorka Valley and anthropogenic holes around them (after *Sudoł-Procyk et al. 2018* with author changes); C – geomorphology and the progress of archaeological works (after *Krajcarz/Sudoł-Procyk 2019b*, with author changes).

CHOCOLATE FLINT MINE IN THE UDORKA VALLEY

The area of chocolate flint outcrops in the south-eastern part of the Ryczów Upland and newly discovered traces of anthropomorphic pits, which are the remains of prehistoric miners (open-air site Poręba Dzierżna 24; Fig. 1: A), is situated in the Udorka Valley (the region of Poręba Dzierżna village, com. Wolbrom, małopolskie voivodeship; Fig. 1: B).



An important piece of information is that there are several prehistoric flint mines in the Kraków-Częstochowa Upland, but they are related to another type of raw material – Polish Jura Kraków flint (Polish: krzemień jurajski according to *Ginter/Kozłowski 1969*). These sites are concentrated in the southern part of the area of Jurassic deposits, near the Ojców National Park (Fig. 1: A). They are related to the activities of early Neolithic communities, e.g. Sąspów or Bębło, Kraków district (e.g. *Dzieduszycka-Machnikowa/Lech 1976*), but also with the manufacture of modern gunflints, for example at Żelków or Mników (e.g. *Ginter/Kowalski 1964; Werra et al. 2019*).

Before starting excavations, the terrain was subject to investigations carried out by a research team headed by Ph.D. J. Budziszewski, using a method of the Airborne Laser Scanning (ALS; *Sudoł-Procyk et al. 2018; Sudoł-Procyk/Krajcarz 2021*).

The LiDAR analysis confirmed a preliminary evaluation of the ground relief around the chocolate flint outcrops (Fig. 2: A, B). At higher elevation, there is a vast area where pits of varied shape and depth occur. This zone ranges up to 100 m away from the valley bottom and covers an area of ca. 0.7 hectares. The higher on the slope, the bigger and deeper are the pits. The features situated below usually have diameters of few meters only. Their relief is so blurred that it is impossible to determine the number of outcrops unambiguously. To the south-west from them, at the edge of the valley, vast niches were recorded, extending over a distance of nearly 100 m. Within them, there are many small pits with diameters of a few meters, which can be described as niches opened towards the valley. This indicates that these forms were shaped through exploitation activities repeated multiple times, though always performed on a small scale. At the lowest altitude, at the very edge of the valley, there were captured two vast erosional niches being a result of bank erosion transforming the channel of the Udorka stream (*Sudoł-Procyk et al. 2018*).

In 2018 and 2019, an exploratory survey was carried out (Fig. 2: C). To obtain the most accurate information about the nature of the pits and their stratigraphic relationships with the flint deposit, two trenches along and across the slope were created, with a width of 1 m, perpendicular to each other. Besides, in the higher but flatter area, two small trenches were established (*Krajcarz/Sudoł-Procyk 2019b*).



Fig. 4. Poręba Dzierżna 24, com. Wolbrom, małopolskie voiv. Two levels of chocolate flint in the rock (photo by M. Sudoł-Procyk).

Fig. 3. Poręba Dzierżna 24, com. Wolbrom, małopolskie voiv. Cross-section (profile S) along the slope in the area of chocolate flint mine in Udorka Valley (after *Krajcarz/Sudoł-Procyk 2019b*). Description of layers: 1 – light gray loam with large amount of weathered fine limestone debris; 1a, 1b – light gray loam with large amount of weathered fine limestone debris (re-deposited material of layer 1?); 2 – orange clay loam with a natural weathered flint concretions; 2a – orange evacuated clay (re-deposited material of layer 2, possibly mixed with material of layer 11a); 3 – dark grayish brown loess with fine limestone debris; 4 – gray loess; 5 – black humiferous sediment with large amount of limestone stabs and limestone debris; 6 – orange loess – Bt horizon of a paleosol with single flint artefacts; 7 – light gray loess – Et horizon of a paleosol, without flint artefacts; 8 – re-deposited yellowish loess – BC horizon of a modern luvisol – a layer with flint artefacts; 8a – yellowish loess similar to layer 8, darker; 9 – black humiferous silt – AE horizon of a modern luvisol, possibly partially re-deposited by colluvial processes; 10 – contemporary litter – O horizon of a modern luvisol; 11 – orange-brown silt with fine limestone debris – a layer with flint artefacts; 11a – orange-brown silt with fine and coarse limestone debris (re-deposited material of layer 11, a backfill of the pit) – single flint products; 12 – gray-brown silty sand with large amount of limestone debris; 12a – gray-brown silty sand strongly with numerous intercalations of light gray silt (similar to layer 1) with large amount of limestone debris, possibly composed of mixed material of layers 12, 3a and 1a (re-deposited layer 12?, a backfill of the pit).



Fig. 5. Poręba Dzierżna 24, com. Wolbrom, małopolskie voiv. Condition of chocolate flint products. A – from the surface; B – from the loess deposits (photo by M. Sudoł-Procyk).

In the zone of the lowest position in relation to the valley bottom, the exploration of sediments was carried out until the limestone bedrock was reached, namely to the depth of ca. 2 m beneath the ground surface (Fig. 3). The profile established at this spot appeared to be extremely interesting since it allowed to capture the very edge of a pit, a mining shaft maybe, which cuts the sediments accumulated on the slope. These sediments were residues of mining heaps and colluvial loess deposits, the latter contained flint artefacts. This indicates a certain chronological relationship: the mining-related features were younger than colluvial processes that had disturbed the loess site with flint assemblage. In the lower part of the trench, two levels of chocolate flint within a solid rock were encountered. Based on the data obtained from this spot, it could be stated that apart from the chocolate flint level within the residual clay, nearby the outcrops, there were at least two other chocolate flint layers within the limestone, spaced at an interval of ca. 0.5 m (Fig. 3; 4; *Krajcarz/Sudoł-Procyk 2019b*).

A great majority of flint artefacts occurred within the redeposited loess sediments in the higher part of the slope (Fig. 3). A cross-section through these sediments obtained in the transverse trench (across the slope) revealed activity of erosion processes and an occurrence of erosional structures, filled up with colluvial loess containing flint material. The material had likely been primarily deposited at the more elevated, flatter region above the pits, and was secondarily relocated downward the slope. What is

of particular importance, the loess sediments were cut by small ice wedge pseudomorphs down to the depth of 0.5 m (Fig. 3). Forms of this type are exclusively associated with cool periglacial climate, which is believed to occur in Poland for the last time during the Younger Dryas. This constitutes a terminus ante quem for flint artefacts lying within those sediments and indicates their Pleistocene chronology (Sudoł-Procyk/Krajcarz 2021).

The research revealed the presence of a very large flint material in all trenches. A great majority of flint artefacts were encountered within the redeposited loess sediments recorded in the higher parts of the slope. On a small area, in total, nearly 2000 flint products were discovered. The artefacts lying on the ground surface or slightly below are more or less patinated (Fig. 5: A), which makes them different from those discovered within the deeper loess deposits. The latter is not covered with patina at all (Fig. 5: B).

The most numerous group are flakes (48%), followed by flint processing waste products (29%). Their bulbs are clearly visible, which indicates that they were detached with use of a hard hammer. Most of them come from the stage of initial preparation of cores, based on the occurrence of numerous cortical flakes. There is also a significant number of technical flakes, mostly core-tablets and platform rejuvenation flakes. Noteworthy categories amongst the assemblage are also those associated with natural concretions (8%), concretions with single scars (7%), and cores (5%). Within the group of cores, the forms with crested edges are distinctive; this kind of treatment was determined by a slab-like shape of natural flint concretions. The least numerous are blades (2%) and tools (1%). The latter are considered to represent mining tools, and they include sidescrapers, denticulated and notches pieces, as well as few burins (Sudoł-Procyk/Krajcarz 2021). A great majority of them are strongly charred, and in their closest surroundings, a large amount of charcoals was recorded.

During the research, archaeological features were documented in all trenches. These features were filled up with barren loess, in which there are numerous flint products and charcoals.

Raised by the issue of the chronology of the mine chocolate flint in the Udorka Valley are controversies, since the flint materials gathered there so far do not provide a basis for its undisputable dating. Further studies, especially the results of radiocarbon dating, should contribute to more accurate determining of this site chronology. Nevertheless, there is a number of premises indicating that, at least to some extent, human activity at this site can be associated with the Late Palaeolithic (Sudoł-Procyk 2020; Sudoł-Procyk/Krajcarz 2021). This reasoning is supported by stratigraphic data gathered in the surroundings of the prehistoric mine as well as results of studies conducted at the sites in Kleszczowa and Perspektywiczna Cave (Fig. 1: B; Sudoł *et al.* 2016), revealing a high contribution of chocolate flint and analogous nature of pre-cores and initial cores. Noteworthy is the fact that in the closest neighbourhood of these sites no younger workshops (e.g. Neolithic) were identified, the production of which was based on chocolate flint (Sudoł-Procyk 2020).

USE AND DISTRIBUTION OF CHOCOLATE FLINT IN THE KRAKÓW-CZĘSTOCHOWA UPLAND

Chocolate flint is one of the most renowned types of silicite raw materials used in prehistory, which occurs in the territory of Poland (Budziszewski 2008). Known and utilized since Middle Palaeolithic (Cyrek *et al.* 2010; 2014) to Iron Age (Lech/Lech 1997), it has a pick of popularity during Late Palaeolithic and is common in the Magdalenian and Swiderian lithic inventories.

In Kraków-Częstochowa Upland sites with inventories of chocolate flint dating back to all periods in prehistory have been recorded in the Upland, mainly in the central and southern parts. The earliest inventories are connected with the Middle Palaeolithic layers of the cultural sequence from the Biśnik Cave (Cyrek/Sudoł 2008) and the Ciemna Cave (Sobczyk/Valde-Nowak 2013). Besides, single specimens were documented in the Wylotne Shelter (Sudoł 2013). A series of siliceous artefacts that can be dated to the late phase of the Middle Palaeolithic and the early phase of the Upper Palaeolithic were registered when the collection of A. Jura and L. Sawicki from the Zwierzyniec 1 site was organised. Chocolate flint occurred in Gravettian inventories discovered at the Kraków-Spadzista site (Sobczyk 1995) and Jaksice II site (Wilczyński/Wojtal 2011). Chocolate flint from the late glacial period was identified, among others, in Magdalenian workshop sites near Brzoskwinia in the southern part of the Kraków-Częstochowa Upland (Sobczyk 1993). Its presence was confirmed at the Epigravettian Targowisko 10 site (Wilczyński

2009). Moraines were indicated as a possible source of some flint from this site. Research conducted in recent years in the southern part of the Ryczów Upland contributed to the discovery of sites that confirm the presence of flint outcrops and exploitation. The inventories from the Perspektywiczna Cave in the Udorka Valley and the nearby open site in Kleszczowa support the opinion that local chocolate flint was used in the periods of Upper and Lower Palaeolithic (Sudoł *et al.* 2016; Sudoł-Procyk *et al.* 2018). The use of chocolate flint in the Epipalaeolithic is relatively well confirmed in the inventories of the Swiderian culture at the Kraków-Bieżanów 15 site (Stefański/Wilczyński 2012). The presence of chocolate flint in this culture lasted until the late Epipalaeolithic and was recorded, among others, at the Kraków-Kurdwanów 10 site dated to the Boreal (Roczkalski/Włodarczyk 2002; Stefański 2017). Chocolate flint was also found at a Mesolithic site in Głanów (Zajac 2001).

The fact that chocolate flint can be found in the Neolithic inventories of the Upland is also extremely interesting. Generally, the deposits of this raw material are scarce; nevertheless, considerable amounts were recorded at the border sites in the south of the Upland, e.g. Targowisko 10 and 11 (Wilczyński 2014). A significant amount of chocolate flint – considered as an import from the Holy Cross Mountains – was found in the area of Wieliczka Foothills in the communities of Linear Pottery and Malice Cultures. This is extremely interesting because it seems that these communities use mainly local deposits and conduct flint-making activity in deposits. Comprehensive research into the southern part of the Upland and the border areas in terms of the verification of chocolate flint deposits together with a description of the petrological features of the artefacts could explain why so much chocolate flint was recorded in the Neolithic communities that lived in the Wieliczka-Bochnia area and usually processed local flint raw materials.

CONCLUSIONS AND RESEARCH PERSPECTIVES

Chocolate flint-bearing strata both in the Holy Cross Mountain and in Ryczów Upland are close in a stratigraphic sense to the boundary between Oxfordian and Kimmeridgian geological stages (Pieńkowski/Gutowski 2004; Sudoł-Procyk *et al.* 2018). Due to a monoclinical structure of Kraków-Częstochowa Upland, the outcrops of the Oxfordian-Kimmeridgian boundary occur close to the north-east edge of the upland (Krajcarz 2017; Krajcarz, *in press*). This situation suggests that the outcrops of rocks that may contain chocolate flint are possibly concentrated along the entire eastern edge of the Kraków-Częstochowa Upland (Krajcarz/Sudoł-Procyk 2019a). The awareness of the importance of discovering new chocolate flint outcrops and exploitation sites in the Ryczów Upland, resulted in the decision to expand the research area to the entire Kraków-Częstochowa Upland. These works will be possible thanks to the implementation of a five-year grant from the National Science Center, under the title “Chocolate flint on the Kraków-Częstochowa Upland. Mining, use and distribution”.

The main objective of the project is a detailed examination of the distribution of chocolate flint deposits throughout the entire Kraków-Częstochowa Upland, in the context of its exploitation sites and the role that this raw material played in particular periods of prehistory.

Raw material identification by method Multi Layered Chert Sourcing Approach (MLA) has successfully been used previously for chert materials from other parts of Europe (Brandl 2016; Brandl *et al.* 2018), and therefore it is planned to apply this method to this project.

The answer to the question about the route travelled by a particular flint product (i.e. where the raw material was excavated and what happened to it) is crucial for understanding the mechanisms of human activity in the past. Scheduled research tasks, such as geological mapping of deposits, excavation at the chocolate flint exploitation site (mine) in the Udorka Valley and a thorough archival analysis of inventories based on this raw material, are particularly important for studies on the use of local resources and determining the share of so-called imports in the inventories of prehistorical sites located in the area of the Polish Jura.

The discovery of chocolate flint outcrops in the central part of the Upland and – in the context thereof – the Late Palaeolithic open-air and cave sites and workshops (Fig. 1: B, C), constitutes an important criterion for considering the exploitation of local deposits and their use in particular periods in prehistory. Earlier interpretations indicated that the chocolate flint found at prehistoric sites in the Kraków-Częstochowa Upland was imported from the outcrops in the north-eastern part of the Holy Cross Mountains (Cyrek/Sudoł 2008).

An important part of further research will be the accurate identification of other potential chocolate flint extraction sites in the Kraków-Częstochowa Upland and determining their nature and extent. The results will provide ground for future research in the Upland itself and other regions situated in Poland (Silesia, Wielkopolska, Podkarpacie) and abroad (Moravia, Bohemia, Slovakia).

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Wychodnie krzemienia czekoladowego na Wyżynie Krakowsko-Częstochowskiej

Stan wiedzy nad wydobywaniem, użytkowaniem i dystrybucją surowca oraz perspektywy badawcze

Magdalena Sudoł-Procyk

Streszczenie

Z terenu Polski wyróżniającym się pod kątem walorów technicznych jak i wizualnych surowcem jest krzemień czekoladowy. Do niedawna znany był wyłącznie z wychodni *in situ* w NE rejonie Gór Świętokrzyskich. W ostatnich latach poza tą strefą Gór Świętokrzyskich, krzemień czekoladowy został stwierdzony także w ich SW części. Te ustalenia dały przesłanki do dalszych badań, nad występowaniem krzemienia czekoladowego w szerszym zakresie niż pierwotnie uważano, tzn. na całej powierzchni wychodni skał górnego Oksfordu i dolnego Kimerydu, włączając Wyżynę Krakowsko-Częstochowską. Wyjątkowo interesujący okazał się rejon SE części Wyżyny Częstochowskiej, gdzie ujawniono duże zróżnicowanie surowców krzemiennych z wyróżniającymi się na ich tle wychodniami wysokiej jakości krzemienia czekoladowego zlokalizowanymi w rejonie Doliny Udorki.

Badania w Dolinie Udorki doprowadziły do odkrycia w rejonie wychodni krzemienia czekoladowego dołów o charakterze antropogenicznym (stan. Poręba Dzierżna 24, gm. Wolbrom, woj. małopolskie). W 2018 i 2019 roku przeprowadzono badania sondażowe, które potwierdziły obecność szybów o charakterze górniczym, dochodzących do złóż krzemienia czekoladowego w skale. Dotychczasowe badania wykazały, że większość wyrobów krzemiennych wystąpiła w redeponowanych osadach lessowych.

Dalsze badania na stanowisku, zwłaszcza wyniki datowań radiowęglowych oraz OSL, powinny przyczynić się do dokładniejszego określenia chronologii tego miejsca. Na podstawie dotychczas pozyskanych danych (stratygraficznych, techno-typologicznych i porównawczych), można wnioskować, że przynajmniej w pewnym stopniu działalność człowieka na stanowisku może być związana z późnym paleolitem i mezolitem. Na uwagę zasługuje fakt, że w najbliższym sąsiedztwie zidentyfikowano schyłkowopaleolityczne i mezolityczne pracownie oparte na krzemieniu czekoladowym (np. Kleszczowa, Jaskinia Perspektywiczna), natomiast zupełnie brak młodszych (np. neolitycznych).

Świadomość rangi odkrycia nowych wychodni krzemienia czekoladowego i miejsc eksploatacji surowca w Dolinie Udorki, zaowocowała decyzją o rozszerzeniu obszaru badań na całą Wyżynę Krakowsko-Częstochowską, w ramach pięcioletniego grantu finansowanego przez Narodowe Centrum Nauki pt. „Krzemień Czekoladowy na Wyżynie Krakowsko-Częstochowskiej. Wydobywanie, użytkowanie i dystrybucja”. Zaplanowane zadania badawcze, takie jak mapowanie geologiczne złóż, badania kopalni oraz analiza archiwalnych inwentarzy opartych na krzemieniu czekoladowym, są szczególnie istotne dla badań nad wykorzystaniem lokalnych zasobów tego surowca oraz określeniu udziału tzw. importu w inwentarzach prehistorycznych stanowisk położonych w Polsce, jak i zagranicą (Morawy, Czechy, Słowacja).

Ryc. 1. Lokalizacja regionów i stanowisk objętych projektem. A – mapa Polski z zaznaczonym obszarem Wyżyny Krakowsko-Częstochowskiej i stanowiskami opisanymi w tekście (1 – Poręba Dzierżna 24; 2 – Orońsko; 3 – Sępów; 4 – Bębło; 5 – Zelków; 6 – Mników); B – rejon Doliny Udorki z lokalizacją stanowisk związanych z eksploatacją i dalszą obróbką krzemienia czekoladowego (za Sudoł-Procyk/Krajcarz 2021, ze zmianami); C – mapa surowców na Wyżynie Ryczowskiej (za Sudoł-Procyk/Cyrek, *in press*, ze zmianami).

Ryc. 2. Poręba Dzierżna 24, gm. Wolbrom, woj. małopolskie. A, B – zdjęcie LiDAR przedstawiające wychodnie krzemienia czekoladowego w Dolinie Udorki i antropogeniczne zagłębienia na ich obszarze (za Sudoł-Procyk *et al.* 2018 ze zmianami); C – geomorfologia i zasięg prac archeologicznych (za Krajcarz/Sudoł-Procyk 2019b, ze zmianami).

Ryc. 3. Poręba Dzierżna 24, gm. Wolbrom, woj. małopolskie. Przekrój wzdłuż dolnej części stoku (profil S) na obszarze kopalni krzemienia czekoladowego w Dolinie Udorki (za Krajcarz/Sudoł-Procyk 2019b). Opis warstw: 1 – jasnoszare osady ilaste z dużą ilością zwietrzałego drobnego gruzu wapiennego; 1a, 1b – jasnoszare osady ilaste z dużą ilością zwietrzałego drobnego gruzu wapiennego (redeponowana warstwa 1?); 2 – pomarańczowa glina ilasta z naturalnymi zwietrzalymi konkrecjami krzemiennymi; 2a – pomarańczowa glina (redeponowana warstwa 2, ewentualnie zmieszana z warstwą 11a); 3 – ciemnoszarobrązowy less z drobnymi kawałkami wapienia; 4 – szary

less; 5 – czarny osad próchniczny z dużą ilością płyt i okruchów wapiennych; 6 – pomarańczowy less (poziom Bt gleby kopalnej), bez artefaktów krzemiennych; 7 – jasnoszary less (poziom Et gleby kopalnej), z wyrobami krzemiennymi; 8 – żółtawy less redeponowany (poziom BC współczesnej gleby), z artefaktami krzemiennymi; 8a – żółtawy less zbliżony do warstwy 8, ciemniejszy; 9 – ciemnoszary próchniczny osad pylasty (horyzont AE współczesnej gleby), prawdopodobnie częściowo redeponowany procesami koluwalnymi; 10 – humus (poziom O współczesnej gleby); 11 – pomarańczowo-brązowy pył z drobnymi kawałkami wapienia, warstwa z artefaktami krzemiennymi; 11a – pomarańczowo-brunatny pył z drobnymi i grubymi kawałkami wapiennia (redeponowana warstwa 11, zasypisko wkopu), pojedyncze wyroby krzemienne; 12 – szarobrazowy piasek pylasty z dużą zawartością gruzu wapiennego; 12a – szarobrazowy piasek pylasty z licznymi wtrąceniami jasnoszarego pyłu (podobnie jak w warstwie 1), z dużą ilością rumoszu wapiennego, być może zbudowany z mieszanego materiału warstw 12, 3a i 1a (redeponowana warstwa 12, zasypisko wkopu).

Ryc. 4. Poręba Dzierżna 24, gm. Wolbrom, woj. małopolskie. Dwa poziomy krzemienia czekoladowego w skale (foto M. Sudoł-Procyk).

Ryc. 5. Poręba Dzierżna 24, gm. Wolbrom, woj. małopolskie. Stan zachowania wyrobów z krzemienia czekoladowego. A – na powierzchni; B – z osadów lessowych (foto M. Sudoł-Procyk).

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