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Neolithic materials from the main chamber of Ciemna Cave, southern Poland (excavation between 2007 to 2012)

ABSTRACT

This paper presents the results of the detailed analysis of Neolithic ceramic, stone and bone artefacts found in the main chamber of Ciemna Cave during excavations between 2007 and 2012. The Neolithic materials from Ciemna Cave are connected with Linear Pottery culture, the Lengyel-Polgár cycle (the Malice culture, the Pleszów group, and the Wyciąże-Złotniki group), Funnel Beaker culture and Baden culture. The assemblage is dominated by artefacts linked mainly with the Pleszów group and Baden culture. A noteworthy achievement is the establishment of a stratigraphic correlation between Neolithic materials and artefacts from other archaeological periods. Ciemna Cave is one of Poland's most influential Neolithic cave sites with numerous diverse Neolithic materials.

KEYWORDS

Ciemna Cave, Neolithic settlement in caves, Ojców, Kraków-Częstochowa Upland



I. INTRODUCTION

Ciemna Cave is widely known for Middle Paleolithic industries, although it has also yielded intensely varied Neolithic assemblages. Most of the Neolithic artefacts from Ciemna Cave were analysed by Ewa Rook and published in 1980 in a summary article about the Neolithic settlement in caves of the Kraków-Częstochowa Upland (Rook 1980; Valde-Nowak *et al.* 2014). Research has shown that Ciemna Cave is a representative site for all the caves with Neolithic traces.

Ciemna Cave is located on the left bank of the Prądnik Valley in the Ojców National Park, is one of the most significant archaeological cave sites in the Kraków-Częstochowa Upland (Fig. 1). It is located 372 meters above sea level, at an elevation of 62 meters above the bottom of the Prądnik Valley.

The total length of Ciemna Cave is 209 meters, partially composed of the main chamber with a corridor and a tunnel. The integral elements of Ciemna Cave are primarily open parts of the cave, such as Oborzysko Wielkie (roofed), Ogrójec (roofless) and the Tunnel (roofed), which was once part of the cave's main chamber. The appearance of Ogrójec was transformed by a partial collapse of the roof, resulting in numerous erosion processes. The main chamber of Ciemna Cave is 88 meters long, up to 10 meters high and up to 23 meters wide, which makes it the largest among the caves of the Kraków-Częstochowa Upland (Fig. 1) (Gradziński *et al.* 2020, 469–498).

An archaeological interest in Ciemna Cave began when Jan Zawisza, an amateur archaeologist and the owner of Ojców, in the second half of the 19th century, initially recognised several caves in Ojców, including Ciemna Cave (Zawisza 1871; Lech 2001a, 129). The first archaeological excavations in Ciemna Cave were carried out independently by Stanisław Jan Czarnowski in 1901–1908, and with the collaboration of Leon Kozłowski and Robert Rudolf Schmidt in 1912. The research concentrated on the area of Oborzysko Wielkie and partly on a small fragment of Ogrójec. Stanisław Jan Czarnowski narrowed exploration to the Holocene layers (Czarnowski 1924, 5–14; Partyka 1992, 78; Gradziński *et al.* 2020, 469–498). The main success of his excavation was the discovery of numerous and diversified ceramic, metal, bone and stone artefacts, predominantly associated with the Holocene (Czarnowski 1911, 41–42; Rook 1980, 93). Two more archaeological expeditions in the open parts of Ciemna Cave system were led by Stefan Krukowski in 1918–1919 and Stanisław Kowalski in 1963–1968 (Fig. 1). Both researchers focused mainly on the Middle Paleolithic layers. Based on discovered flint artefacts, Stefan Krukowski

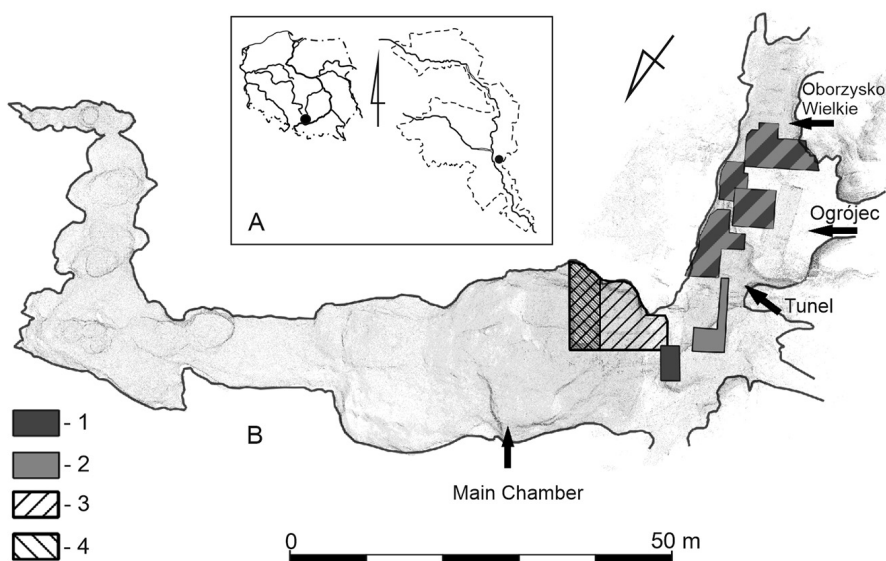


FIG. 1. Ciemna Cave, Ojców. A- localisation of Ciemna Cave; B - plan of Ciemna Cave system with the position of trenches (1 – area excavated by Stefan Krukowski; 2 – area excavated by Stanisław Kowalski; 3 – area excavated from 2007 to 2020; 4 – area excavated from 2007 to 2012, trench 1 and 2) (Drawn by D. Stefański)

created the concept of the Middle Paleolithic “Ojców industry”, and a tool called the “Prądnik” knife. The primary intent of the excavations undertaken by Stanisław Kowalski was to determine the site of the research carried out by Stefan Krukowski and verify and complement the site’s stratigraphy (Krukowski 1924; Lech 2001a, 138; Kowalski 2006; Valde-Nowak *et al.* 2014, 129). In 2007, an archaeological study in Ciemna Cave resumed again, focusing on the main chamber. An interdisciplinary team mainly associated with Institute of Archeology of the Jagiellonian University and Archaeological Museum in Kraków, led by Paweł Valde-Nowak and Krzysztof Sobczyk, conducts the excavations (Fig. 1). The fascinating findings included Neanderthal remains, an adult’s tooth and a child’s hand bones (Sobczyk, Valde-Nowak 2012; Willman *et al.* 2019a; 2019b; Gradziński *et al.* 2020, 473).

II. ANALYSIS OF NEOLITHIC ARTEFACTS FROM THE MAIN CHAMBER OF CIEMNA CAVE

The subject of the analysis is Neolithic materials, including stone, ceramic and bone artefacts, discovered in trenches 1 and 2 during the research conducted from 2007 to 2012 in the main chamber of Ciemna Cave.

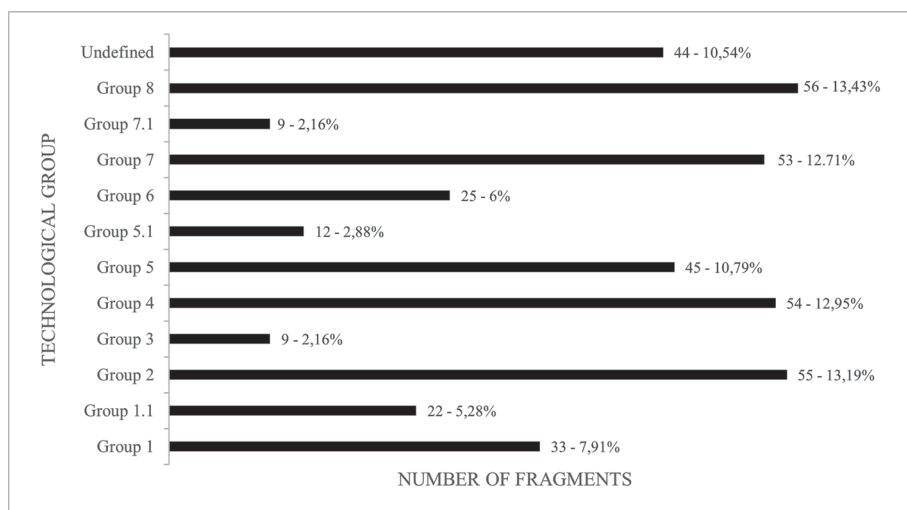
Analysis of technological attributes of Neolithic pottery

The analysis of the Neolithic pottery concentrated on creating a database that contained technological, stylistic, and formal factors. A detailed study was conducted on an assemblage of 417 pottery sherds. The specificity of the Neolithic ceramics from the main chamber of Ciemna Cave is high fragmentation. 98% of the fragments do not exceed a dimension of 25 cm². Besides, widespread whitish coating, i.e. calcite precipitates, and the relatively small set of distinctive fragments made the analysis challenging.

Furthermore, 351 body fragments, 48 rims, nine vessel bases, three handle parts, and six fragments of the one bowl on an empty foot occurred in the analysed Neolithic pottery. The studied assemblage of sherds from Ciemna Cave was dominated by 269 medium-walled ceramics (7-10 cm) and 127 thin-walled ceramics (4-6 cm). Only three fragments were thick-walled (over 10 cm). The wall thickness of the remaining 18 fragments was not determinable.

To examine the changeability of the ceramic materials, a particular set of pottery fragment characteristics was taken into consideration: amount of temper (small, medium, large), granulation of temper (fine-grained, medium-grained, coarse-grained), type of temper (broken sherds, mineral), surface processing (smoothed, polished, burnished), colour (beige, grey, brown, black) and hardness. The analysis made it possible to distinguish between 12 technological groups of Neolithic pottery.

Graph 1 exhibits the amount and percentage of Neolithic pottery fragments belonging to particular technological groups. No particular group was observed to be dominant. The Neolithic pottery associated with groups 1.1, 2, 4, 5, 5.1, 7, 7.1, and 8 mainly features a medium amount of temper, primarily consisting of fine-grained and middle-grained broken sherds, as well as a small amount of mineral temper. Only the temper of group 6 is dominated by a medium quantity of sand, and infrequently with a small amount of chamotte. Group 1 is characterised by a medium quantity of temper consisting of fine-grained and middle-grained broken sherds, usually sand. The temper



GRAPH 1. Share of technological groups among the Neolithic pottery from the main chamber of Ciemna Cave (Drawn by: A. Gaszka)

used in group 3 mainly comprises a large amount of coarse-grained chamotte with a small amount of mineral temper.

Furthermore, in the case of groups 1, 1.1, 2, 5, 5.1, 6, 7, 7.1 and 8, the outer surfaces predominantly feature traces of smoothing and polishing and some slight burnishing is usually visible. The inner surfaces are mainly smooth and matte. Due to the thickness and amount of temper in the pottery sherds pertaining to the third technological group, both surfaces remained slightly rough. Moreover, both surfaces of ceramics of the group 4 are smooth and matte but not carefully polished. The strong diversity in surface colours does not indicate any tendencies. Hard pottery sherds are prevalent in the analysed collection, and the fragments associated with technological groups 7.1 and 8 are characteristically soft.

Stylistics of Neolithic pottery

The analysed pottery assemblage contained only 25 ornamented fragments. A predominance of plastic ornamentation is observable, especially diversely shaped knobs mainly various oval or circular, usually cylindrically or conically shaped, sometimes with a flattened upper surface (Fig. 2: 1–3, 5–9). The other plastic ornaments were horizontal knobs shaped as strips or as a handle

(Fig. 2: 4, 10). Due to the severe fragmentation, only a small selection of the ceramic materials could be typologically identified. Technological group 2 incorporates a collection of distinct pottery fragments, undoubtedly the remnants of 2 or 3 small medium-walled vessels (Fig. 3: 4–5). Another six pottery fragments with a distinctive edge thickening were part of one bowl on an empty foot (Fig. 4: 1).

A noteworthy type of ornamentation appeared as a fingernail ornament in a row of three fingernail imprints, assumably with a remnant of the second row. This fragment was probably a part of a large, thick-walled pot with a short, slightly leaning outward neck (Fig. 4: 3). Additionally, the decorative elements also included several fragments with handles and parts of handles. One fragment with a preserved knee-shaped handle is worth mentioning as it was a part of a relatively small medium-wall funnel beaker (Fig. 4: 2). Moreover, three fragments of a band-shaped handle were probably attachments from semi-spherical cups (Fig. 4: 5).

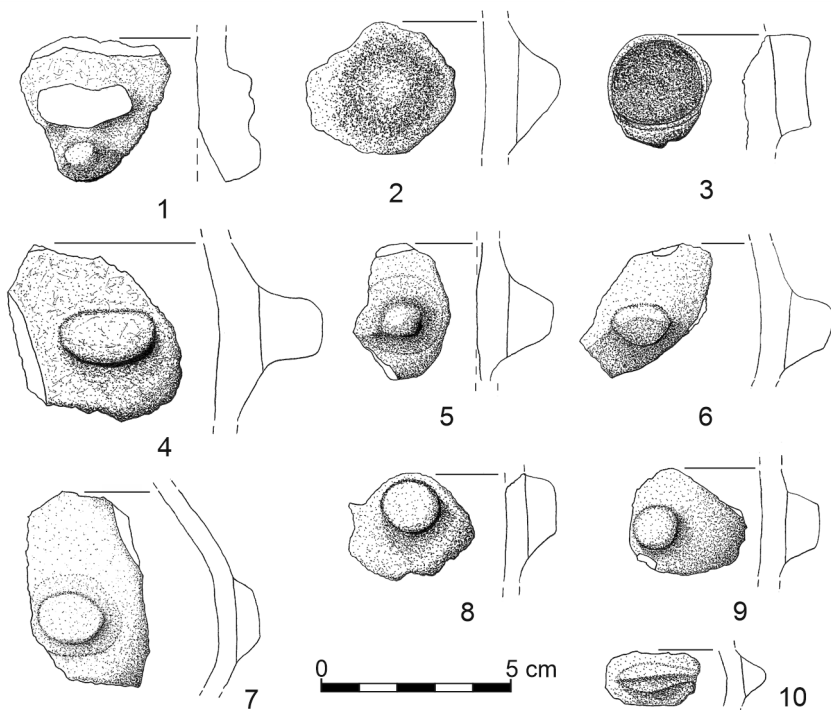


FIG. 2. Ciemna Cave, Ojców. Pottery fragments with plastic ornamentation found in the main chamber. 1-10 – Lengyel-Polgár cycle (Illustrations by A. Gaszka)

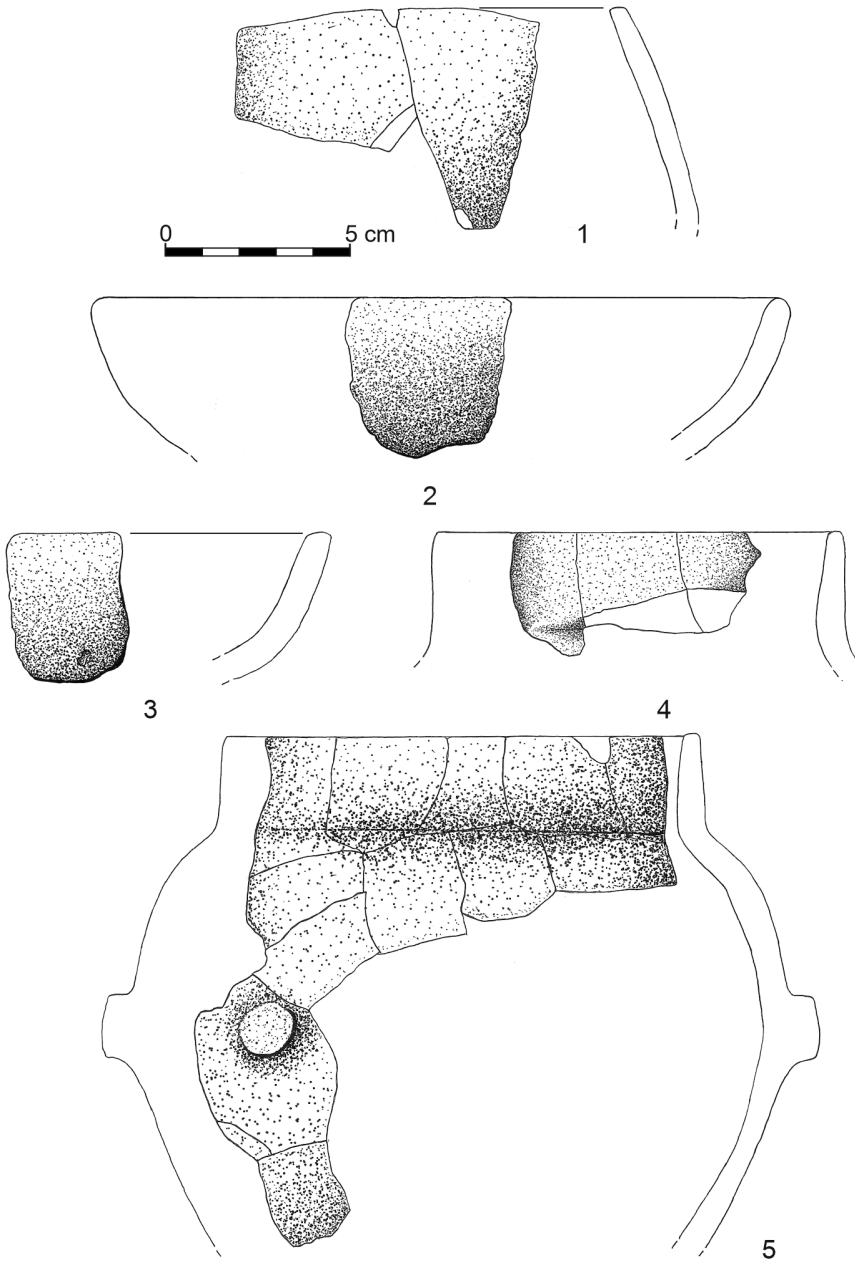


FIG. 3. Ciemna Cave, Ojców. Characteristic pottery fragments found in the main chamber. 1 – Linear Pottery culture; 2-3 – Lengyel culture; 4-5 – Pleszów group (Illustrations by A. Gaszka)

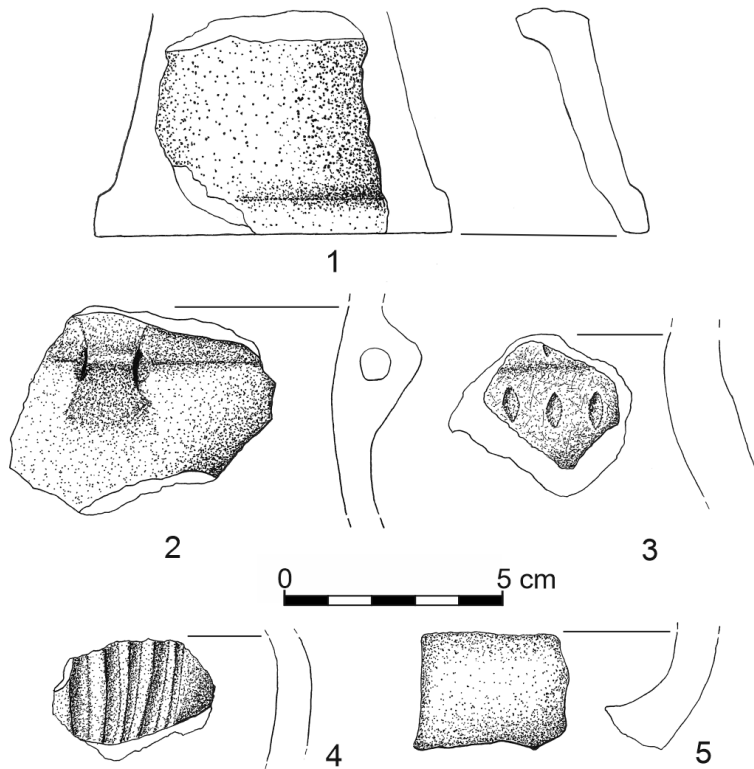


FIG. 4. Ciemna Cave, Ojców. Characteristic pottery fragments found in the main chamber. 1 – Wyciąże – Złotniki group; 2 – Funnel Beaker culture; 3 – Malice culture; 4-5 – Baden culture (Illustrations by A. Gaszka)

The following two pottery sherds were part of low, biconical, medium-walled bowls with a large spout diameter (Fig. 3: 2-3). The reconstructed rim fragment was most likely part of a thin-walled bowl with the rim slightly leaned inwards (Fig. 3: 1). Probably a pottery sherd with oblique grooves creating a decorative motif, the so-called ornament of hanging triangles was the body part of the small bowl (Fig. 4: 4).

Analysis of stone inventory

The study of the stone artefacts mainly concentrated on techno-typological analysis. Metric and raw material factors were also taken into consideration.

The examined stone materials consisted of 93 artefacts, including three cores, one core fragment, one pre-core form, 23 tools and 65 debitage elements. The remnant of the cortex appeared on 36 artefacts, and in 21 cases, it occupied over 30% of the surface. Patina of varying intensity was observed on 26 artefacts.

The analysed assemblage was made mainly of local Jurassic flint, and could be typed as varieties A and C according to the classic categorisation devised by Małgorzata Kaczanowska and Janusz K. Kozłowski from 1976 (Kaczanowska, Kozłowski 1976; Přichystal 2013, 102–104). However, two artefacts were classified as G variety Jurassic flint. The outcrops of which are located in the central part of the Kraków-Częstochowa Upland (Kaczanowska, Kozłowski 1976; Kopacz, Pelisiak 1992; Pelisiak 2003; 2006; Přichystal 2013, 103–104). Only one obsidian artefact occurred in the collection, whose closest deposits are located in south-eastern Slovakia (Přichystal 2013, 158–163). The raw material of 18 artefacts could not be determined.

Cores and precore forms are represented by five artefacts. The first is a carinated blade core, with the surface covered mainly with the cortex. The artefact has a narrow triangular flaking surface and striking platform prepared by a single strike. The back of the core is characterised by crushing, probably caused by intentionally hitting this part on a hard surface. The two visible scars may suggest a willingness to create another striking platform (Fig. 5). The next artefact is a blocky blade core with changed orientation. The core is in an advanced stage of wear, and part of the left side is a natural surface (Fig. 6). Likewise, another core is a blocky blade core with a repeatedly changed orientation at the final exploitation stage used as a hammerstone. A small fragment of a flake core, with some crushing on its surface, was discovered. It is possible that it was also used as a hammerstone. One precore form bearing a trace of an attempt to prepare a striking platform was most likely abandoned due to an apparent raw material defect.

The entire assemblage of blades and their fragments (including ten tools made of blades) includes 24 artefacts. Eight complete forms, six distal parts, four proximal parts, and six middle parts, have been preserved. Types of striking platforms were determined for 10 blades. Four artefacts have striking platforms formed by a single strike, two by more than one strike, and three blades have natural striking platforms and one striking edge platform. In addition, in all cases, the scars are compatible with the direction of the blow. The length of the fully preserved blades ranges from 21 mm to 67 cm. Only one of them exceeds 60 mm (Fig. 7: 1). The blades' width and fragments vary from 7 mm to 24 mm, with only four fragments being wider than 20 mm. 17 artefacts

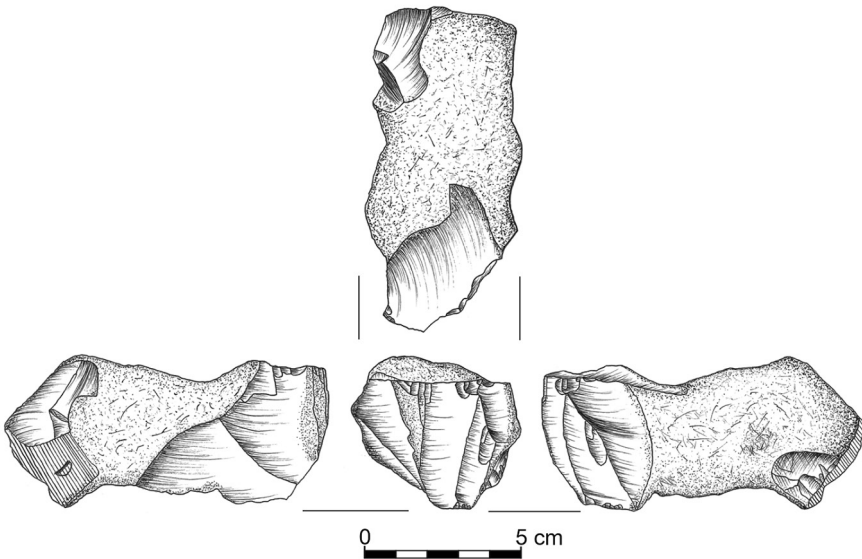


FIG. 5. Ciemna Cave, Ojców. Carinated blade core made of local Jurassic flint found in the main chamber (Illustration by A. Gaszka)

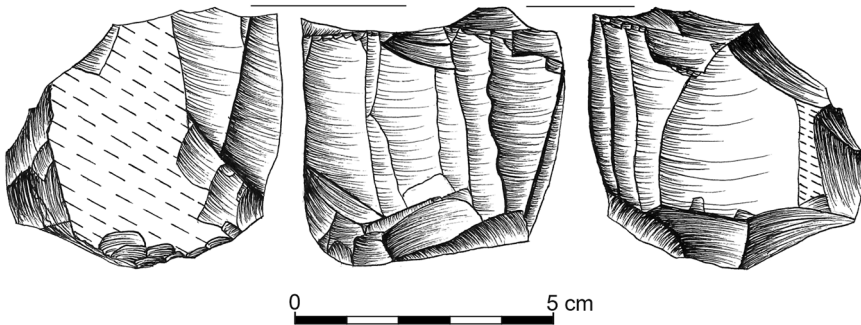


FIG. 6. Ciemna Cave, Ojców. Blocky blade core made of local Jurassic flint found in the main chamber (Illustration by A. Gaszka)

are likely to be the remnants of small blades not exceeding 60 mm in length and 20 mm in width.

The most numerous group of the analysed stone assemblage is 56 different types of flakes (including six tools made of flakes). The striking platform was possible to determine in 22 artefacts. The striking platforms formed by a single

strike are the most numerous (11 artefacts), followed by striking platforms prepared by more than one strike in 6 cases and natural striking platforms in 5 cases. The group also includes 14 chips (i.e. micro-flakes not exceeding 1cm x 1cm). A noteworthy element is one flake and one chip from the polished axe. The collection also contained three technical scar flakes, including a crested blade, one spall, chunk and three scaled flakes.

Four burins occur in the analysed material, and three were produced of concretions. Two dihedral angle burins (Fig. 8: 3–4), one dihedral symmetric burin (Fig. 8: 2) and one angle burin against a truncation (Fig. 8: 1) were observed. Only one was made of the retouched cortical blade, formerly a sidescraper (Fig. 8: 1).

The following toolset includes endscrapers. The first is a slightly curved in the longitudinal section blade endscraper, with a rounded working edge made by semi-abrupt retouching (Fig. 7: 1). Another artefact is the distal end of an endscraper, with an almost straight working edge formed by an abrupt retouch (Fig. 7: 2). The last is a small endscraper made of the cortical blade with a slightly rounded working edge created by a semi-abrupt retouch (Fig. 7: 3).

Three perforators and one borer appear among the assemblage. All perforators were made of flakes and have stings formed by an abrupt retouch. Two of them have separated stings (Fig. 7: 5–6). The only example of a borer was made of a small bladelet. It is characterised by a separated, thin sting obtained by an alternate retouch in the distal end (Fig. 7: 7). A single example of a micro-lithic trapeze made of the middle part of a small bladelet has its lateral edges formed by abrupt retouching (Fig. 7: 8). Four retouched blades were discovered among the analysed material. The first is a blade with a delicate retouch on the tip and the part of the right edge. A delicate retouch was also observed in the proximal end (Fig. 9: 1). The following example is the distal part of a retouched blade with a broken tip (Fig. 9: 2). The last two fragments are the proximal parts of the blades, one with semi-abrupt retouching of all edges (Fig. 9: 3) and the other with relatively far overlapping, low angle retouching of both edges on the ventral face (Fig. 9: 4). Only two retouched flakes were discovered, including one with a delicate denticulate retouch of the left edge (Fig. 9: 6) and a distal fragment of the flake with a continuous retouch of all edges (Fig. 9: 5). The assemblage of tools also includes a flake with a single notch, a scar spall with a notch and a sidescraper-shaped tool with an abrupt retouch of one of the sides made of concretion. Two functional tools with use retouch were interesting finds, one made of a natural flake without any traces of knapping, while the other was made of technical spall from the core.

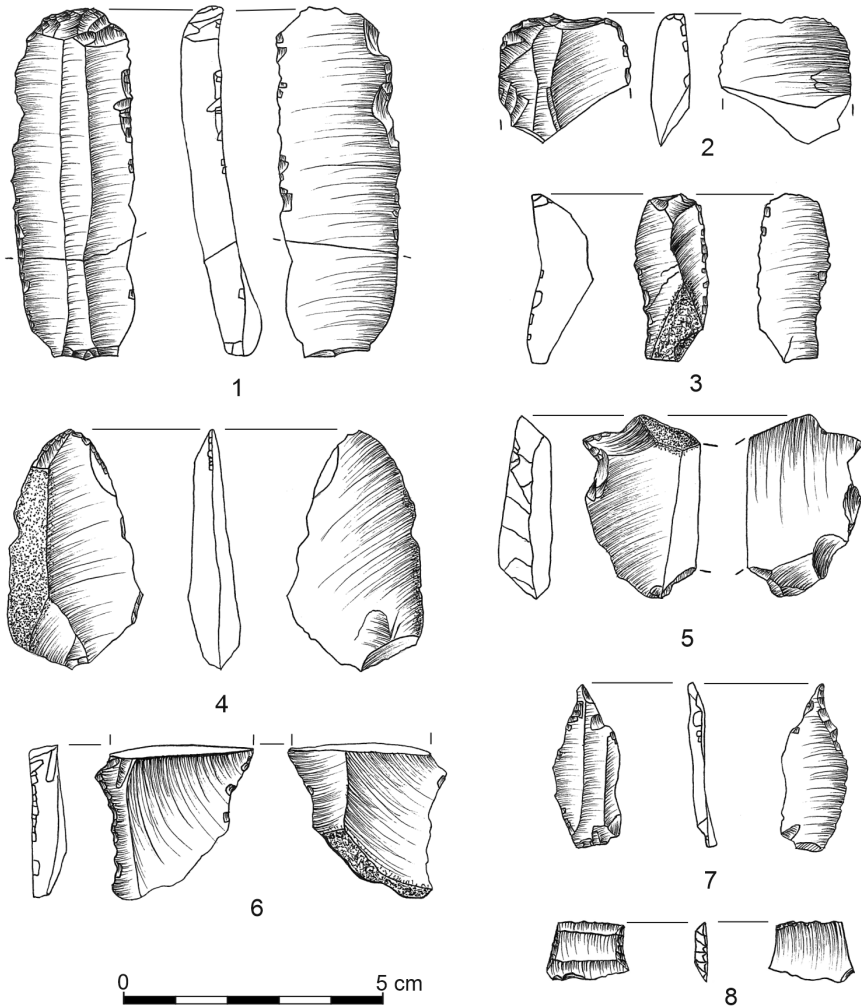


FIG. 7. Ciemna Cave, Ojców. Lithic tools all made of local Jurassic flint found in the main chamber. 1-3 – endscrapers; 4-6 – perforators; 7 – borer; 8 – microlithic trapeze (Illustrations by A. Gaszka)

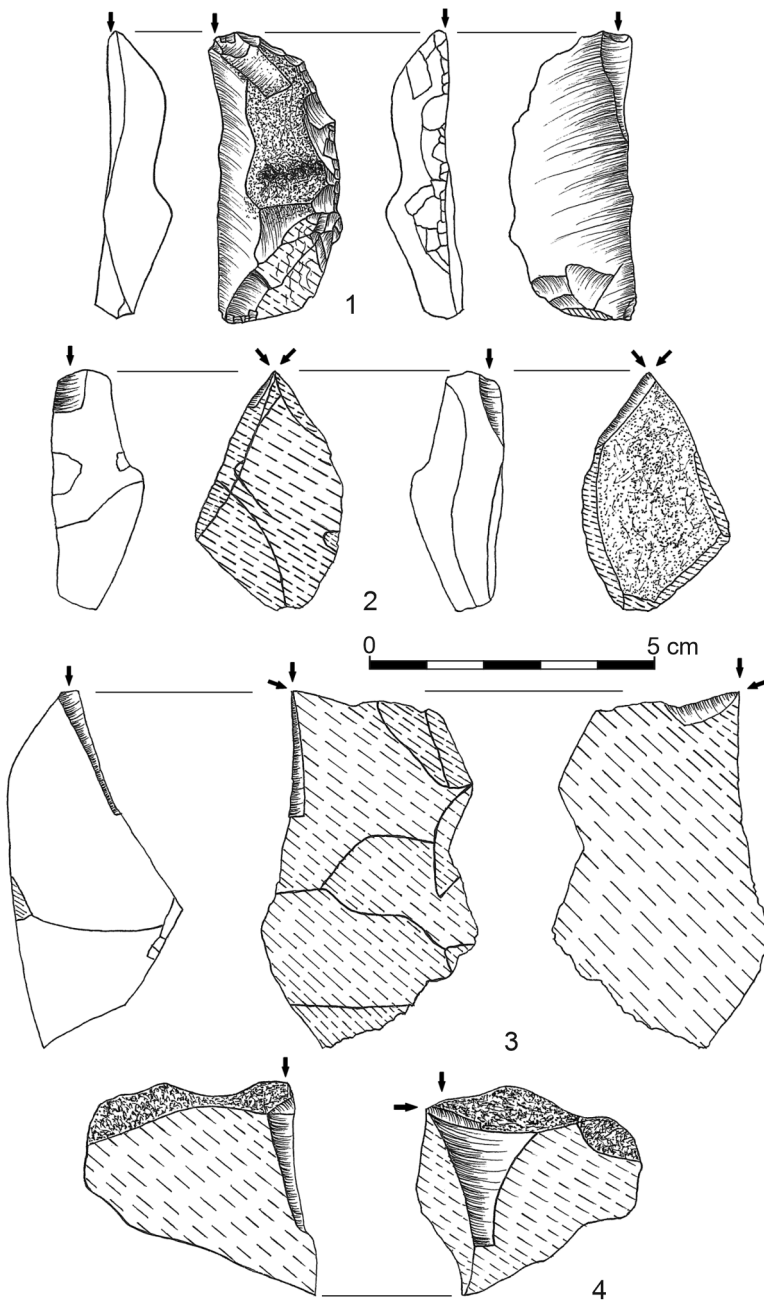


FIG. 8. Ciemna Cave, Ojców. Burins all made of local Jurassic flint found in the main chamber (Illustrations by A. Gaszka)

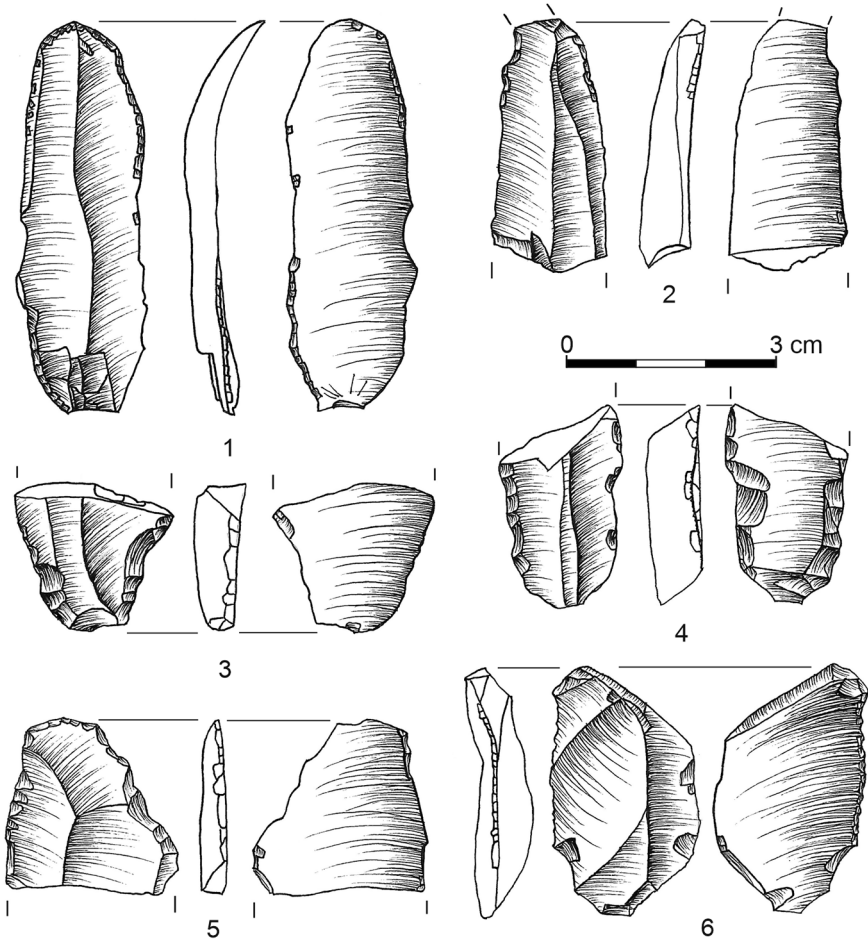


FIG. 9. Ciemna Cave, Ojców. Lithic tools all made of local Jurassic flint found in the main chamber. 1-4 – retouched blades; 5-6 – retouched flakes (Illustrations by A. Gaszka)

Bone artefacts

Six bone artefacts probably associated with Neolithic communities have been found in the main chamber of Ciemna Cave. These are a flat polished bone made of split bone, the two fragments of needles and a piece of an awl with a concave-convex cross-section. Besides, two bone pendants, including one made of an animal tusk, were discovered (Mycielska, Rook 1965, Fig. VIII; Rook 1980, 58–60).

III. THE DISTRIBUTION AND STRATIGRAPHIC RELATION OF THE NEOLITHIC MATERIALS FROM THE MAIN CHAMBER OF CIEMNA CAVE

Systematic research conducted in the main chamber of Ciemna Cave resulted in the distinction of 19 geological levels, including nine archaeological layers. The first archaeological unit is associated with the Holocene occupation from Neolithic to modern times. The second level contained mixed Holocene, Upper Paleolithic, and Middle Paleolithic artefacts (Valde-Nowak *et al.* 2014, 128–132). The vast majority of Neolithic pottery sherds were discovered in the southern part of the trench by the cave wall, while in other sections quantity of artefacts was significantly smaller (Fig. 10).

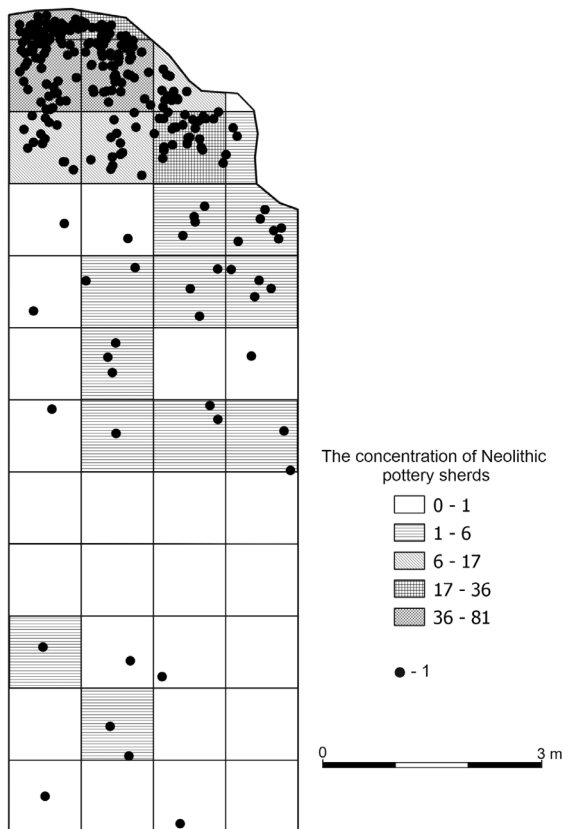


FIG. 10. Ciemna Cave, Ojców. Distribution of Neolithic pottery sherds found in trenches 1 and 2, explored between 2007 and 2012 (Made by D. Stefański)

Difficulties in analysing the stratigraphic situation of Neolithic artefacts partly resulted from the lack of archaeological objects. Such structures are distinctively absent in the caves with Neolithic traces of the Kraków-Częstochowa Upland (Rook 1980).

However, the stratigraphical analysis indicated discrepancies in the concentration of Neolithic artefacts compared to other Holocene ceramics. A noticeable accumulation of Neolithic pottery is visible in the lower layers, especially at depths of 50–60 cm, in contrast to ceramics from other archaeological periods, which were found predominantly 20–30 cm deep and in different sections of the trench (Fig. 11, Fig. 12). A similar stratigraphic situation was observed in the open parts of Ciemna Cave, where two archaeological layers were distinguished in Holocene humus. The lower unit contained Neolithic and Early Bronze Age artefacts, while materials from the upper layer were associated with younger archaeological periods (Rook 1980, 63).

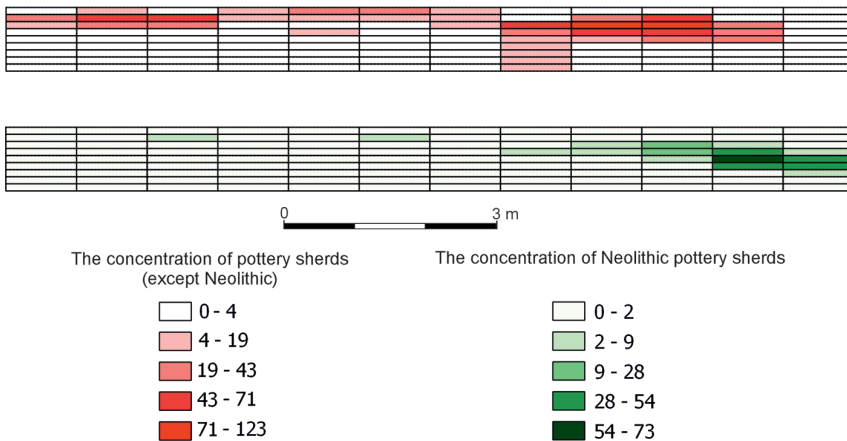


FIG. 11. Ciemna Cave, Ojców. Stratigraphic relation between the pottery sherds found in trenches 1 and 2, explored between 2007 and 2012 (Made by D. Stefański)

IV. AN ATTEMPT AT CULTURAL AFFILIATION OF ANALYSED MATERIALS

Considering the specificity of the ceramic materials, the cultural affiliation of the large portion of the artefacts was unattainable. Consequently, 347 ceramic fragments were classified into the Neolithic/Bronze Age pottery group,



FIG. 12. Ciemna Cave, Ojców. Part of the western profile of trenches 1 and 2, explored between 2007 and 2012 (Photo by D. Stefański)

which was not a subject of the versatile analysis. Despite careful technological and formal analysis, 196 pottery fragments were incorporated into a broad group of Neolithic ceramics. Moreover, a younger chronology is possible for the stone and bone artefacts.

There is a noticeable lack of pottery fragments unequivocally associated with early farming communities. However, the reconstructed part of a bowl's rim presents the formal and technological features of Linear Pottery culture ceramics (Fig. 3: 1). The absence of incised ornamentation on its surface does not allow for an unambiguous cultural association (Kulczycka-Leciejewiczowa 1969, Fig. II, III; 1979, 48–67; Rook 1980, 11; Kozłowski, Nowak 2019, 51–55). A borer made of a small blade is, in all likelihood, correlated with Linear Pottery culture (Fig. 7: 7) (Kulczycka-Leciejewiczowa 1979, Fig. 29: 5, 9; Balcer 1983, 64–66). The carinated blade core and the blocky blade cores might also be a trace associated with this culture (Fig. 5; Fig. 6). Considering the greater intensity of settlement of the Lengyel-Polgár cycle groups in the area of the Kraków-Częstochowa Upland, the described cores are more likely

to be associated with those societies. Similar specimens are widely known from nearby Early Neolithic flint mines (Dzieduszycka-Machnikowa, Lech 1976; Kulczycka-Leciejewiczowa 1979, 78–82, 133–139; Lech 1981, 277–284; Balcer 1983, 60–62, 83–87).

An analysis indicated that 67 ceramic fragments were produced by the Lengyel-Polgár cycle groups. It is highly probably that most examples of plastic ornamentation in the form of knobs are related to the Lengyel-Polgár cycle (Fig. 2) (Kulczycka-Leciejewiczowa 1969; Kaczanowska 2006, 38–45; Kadrow 2006b). Two fragments of low, biconical bowls can be associated with the Lengyel culture (Fig. 3: 2–3) (Kulczycka-Leciejewiczowa 1969, Fig. VIII: 1, 2, 6). Additionally, a not significantly distinctive group of 71 ceramic fragments has been generally linked with the Lengyel-Polgár cycle or the Baden culture.

One fragment of a thick-walled pot with a fingernail impression occurred among the ceramic materials and is undoubtedly associated with the Malice culture (Fig. 4: 3) (Kamieńska 1973; Kaczanowska 1996; Kadrow 2006b). The obsidian bladelet might be a residue of representatives of this community, but it could also be associated with Linear Pottery culture or the Pleszów group (Rook 1980; Balcer 1983, 70–71, 82; Wilczyński 2014; 2018).

Another cluster of 70 pottery fragments is with high certainties associated with the Pleszów group. The artefacts of this cultural group are two reconstructed fragments, a vessel with a plastic knob and the fragment of the spout, probably from a similar type of vessel (Fig. 3: 4–5) (Kulczycka-Leciejewiczowa 1969, Fig. XXVII: 2, XXVIII: 11; Rook 1980, Fig. IV: 7–8; Kaczanowska 2006, 39). Additionally, some plastic knobs are also certainly related to the Pleszów group. This type of plastic ornamentation occurs mainly on pots, but it also appears on the bowls with the empty foot, bowls, and vessels characteristic of the Pleszów group (Fig. 2) (Kaczanowska 2006, 38–41; Czekał-Zastawny, Przybyła 2012, 142–144).

The majority of the blades and fragments of them, which do not exceed 6 cm in length and 2 cm in width, can be associated with Linear Pottery culture and communities from the older period of the Lengyel-Polgár cycle. Additionally, the endscraper (Fig. 7: 3) and the microlithic trapeze (Fig. 7: 8) are probably remnants of the older Neolithic groups (Balcer 1983).

The lithics only contained two blades, including one endscraper (Fig. 7: 1), whose length perhaps exceeded 6 cm, assumably associated with the younger phases of the Lengyel-Polgár cycle (Dzieduszycka-Machnikowa, Lech 1976; Kulczycka-Leciejewiczowa 1979, 138–145; Balcer 1983; Kaczanowska 2006, 48–50).

Furthermore, six fragments of the bowl on the empty foot with a distinctive thickening of the foot edge are linked to the Wyciąże-Złotniki group. One of the fragments is characterised by an intense sheen on the outer surface (Fig. 4: 1). An analogous example comes from the research in Oborzysko Wielkie (Kulczycka-Leciejewiczowa 1969, Fig. XXXIX: 10, 13, 14; Kulczycka-Leciejewiczowa 1979, 125; Rook 1980, Fig. IX: 11; Kozłowski 2006, 57).

The burins that occurred in the analysed material are likely to be associated with later Neolithic groups, as a significant increase in the burins in the Neolithic stone inventories began at the end of the middle phase of the Lengyel-Polgár cycle in the Modlnica group (Fig. 5) (Kulczycka-Leciejewiczowa 1979, 138–145; Balcer 1983, 119; Kaczanowska 2006, 48–50; Kozłowski 2006, 54; Kozłowski, Nowak 2019, 182).

Only one ceramic fragment with a knee-shaped handle might be associated with the Funnel Beaker culture. This is highly likely to be a fragment of a small funnel beaker (Fig. 4: 2) (Wiślański 1979; Rook 1980, 26–28, Fig. X).

Only four pottery fragments might be directly linked with the Baden culture. The first is a bowl fragment decorated with oblique grooves creating a decorative motif – so-called hanging triangles (Fig. 4: 4) (Godłowska 1979, 307–308; Rook 1980, Fig. XII: 1, 2, 3, 7; Zastawny, Nowak 2012, 65; Zastawny 2015, 132). Another example is a body fragment with an intentionally roughened outer surface (Rook 1980, 32). The last two pottery sherds are fragments of band-shaped handles, and both were presumably the lower attachment of the semi-spherical cups (Fig. 4: 5) (Godłowska 1979, 307; Zastawny 2015, 132).

Furthermore, a small flake and a chip from a polished axe were found. Both artefacts are made of G variety of Jurassic flint, which was used by the communities of the Baden culture (Godłowska 1979, 308; Trela 1998; Zastawny, Nowak 2012, 66–67). However, their connection with the Funnel Beaker culture or Corded Ware culture cannot be excluded because the materials of these groups also include numerous artefacts made of this type of flint (Kopacz, Pelisiak 1992; Pelisiak 2003; 2006, 74).

V. RELATION OF NEOLITHIC MATERIALS FROM THE MAIN CHAMBER AND THE OPEN PARTS OF CIEMNA CAVE

Comparing the Neolithic materials from Ciemna Cave, the difference in the number of artefacts from Oborzysko Wielkie, Ogrójec, and the main chamber is visible. Neolithic communities tended to use Oborzysko Wielkie and

Ogrójec area, which does not appear to be unexpected because the main chamber of Ciemna Cave is less suitable for various activities. However, all traces of Neolithic settlement from Ciemna Cave should be treated as the remains of probably the same population groups. Similarly, the materials from Oborzysko Wielkie, Ogrójec, and the main chamber are dominated by artefacts associated with the Lengyel-Polgár cycle, mainly of the Pleszów group, and with Baden culture (Rook 1980, 1995).

With high probability, most Neolithic materials were connected with short term occupation. For most Neolithic cultures present in Ciemna Cave, the assemblages are small and show features related to satisfying the primary necessities. They consisted of pottery probably brought from the permanent site and stone artefacts made of local flint ad hoc. However, the overwhelming amount of ceramic artefacts associated with the Pleszów group found in Oborzysko Wielkie and Ogrójec may suggest a more diverse and permanent usage of Ciemna Cave (Rook 1980; 1995).

VI. CIEMNA CAVE, IN THE CONTEXT OF THE NEOLITHIC SETTLEMENT IN THE OJCÓW JURA

Ciemna Cave, without a doubt, yielded an exceeding number of multicultural Neolithic artefacts. A relatively large amount of Neolithic materials appeared in several caves in the Ojców Jura. Worth mentioning are Okopy Wielka Dolna Cave, Główna Cave in Okopy, Maszycka Cave, Górna Cave in Ogrójec, Cave above Mosur Stary in the Prądnik Valley, and two caves in the Kluczwocka Valley Wierzchowska Górna Cave and Mamutowa Cave (Rook 1980, 1995; Lech 2006).

The usage of Ciemna Cave for the most occurring Neolithic units could be interpreted as a temporary occupation settlement and mainly related to the nearby outcrops of good quality flint raw material, which many Neolithic cultures used in varying degrees (Rook 1980; 1995; Lech 2006; Zastawny 2006). The exploitation begins with the Linear Pottery culture, while it is still uncertain which mines were used (Lech 2006, 400–402). The most important sites of exploitation and initial processing of raw materials were the mines in Sąspów, Jerzmanowice-Dąbrówka, Bębło and Zerków. The significant intensity of this enterprise is associated with the Lengyel-Polgár cycle, especially with the Pleszów group, and with the classical phase of the Baden culture (Dzieduszycka-Machnikowa, Lech 1976; Rook 1980; Lech 1981, 2001b, 2006;

Zastawny 2006; Trela-Kieferling 2017). Ciemna Cave, while occupied by various Pleszów group communities, could have been a part of a more complex settlement pattern. This speculation is based on the probability that Ciemna Cave was a permanent camp accompanying a nearby central site. Initially, the “Nad Jaskinią Ciemną” site at the top of Koronna Mountain was considered, while research has established that Ciemna Cave was probably the central habitation area. Regardless, there is a possibility that the location of the main site is yet to be found (Rook 1980, 83; Lech, Partyka 2001, 341).

An intriguing phenomenon is the intense use of flint mine in Sąspów by Modlnica group societies in the absence of the artefacts discovered in caves associated with these communities. Presumably, the proximity of the permanent sites resulted in the lack of the necessity of using caves as temporary places of settlement (Dzieduszycka-Machnikowa, Lech 1976; Rook 1980; Lech 2001a; 2001b; 2006).

The Ojców Jura was certainly of marginal importance for the Funnel Beaker societies, and it is represented by the small assemblages primarily from the caves, including Ciemna Cave (Rook 1980; Lech 2001a; 2006).

All the main phases of Baden culture communities are represented in Ojców Jura. Puchacze Rockshelter in Puchacza Rock and Górna Cave in Ogrójec yielded the only artefacts from Małopolska related to the Boleráz group. The penetration was probably related to identifying and potentially utilising the occurring flint outcrops (Rook 1980; Zastawny 2006). The intensification took place in the classical horizon of the Baden culture, which is mainly reflected in the artefacts found in caves, including Ciemna Cave. The last phase is related to the Bośaća group. In proximity to Ciemna Cave in the area of Puchacza Rock (Smardzowice site 38), traces of a permanent settlement of Baden culture have been found (Zastawny, Nowak 2012). In addition, a flint workshop was located at the top of Kopcowa Mountain, which, together with the nearby caves, most likely formed a kind of small settlement complex associated with Baden culture (Trela 1998; Zastawny 2006, 450). The occurrence of Corded Ware culture in Ojców Jura is very uncertain, and apart from a few stray finds, they are known only from four caves. Moreover, the materials from Ciemna Cave are most probably associated with the circle of sub-Neolithic cultures. The reassessment of cave ceramics by Barbara Witkowska should also be taken into account, as she questions any possibility of cave settlement of the Corded Ware culture communities in the caves of Ojców Jura (Rook 1980; Kadrow 2006a; Witkowska 2010).

Additionally, Ciemna Cave might have also been used by Neolithic communities as a temporary shelter during hunting and gathering expeditions or in case of danger. However, this is virtually undetectable archaeologically (Rook 1980). Particular archaeological findings could indicate using Ciemna Cave as a place of ritual practices. For instance, a child burial without grave goods – associated with a classical phase of Baden culture – was found in the main chamber of Ciemna Cave (Valde-Nowak *et al.* 2018). The skull fragment was discovered during research conducted by Stanisław Jan Czarnowski in Ciemna Cave-Oborzysko Wielkie (Czarnowski 1904; Rook 1980; Lech 2006, 419–423). Small funnel beakers found in Ciemna Cave could have been used during ceremonies for grinding pigments or spices (Rook 1980; Lech 2006, 422–423). An example of figural art associated with the Lengyel culture is a small fragment of an anthropomorphic clay figurine discovered in Ciemna Cave-Oborzysko Wielkie (Rook 1980, 39; Lech 2006, 419).

VII. CONCLUSIONS

The greatest concentration of Neolithic materials from caves occurred in Prądnik Valley in the Kraków-Częstochowa Upland. Undoubtedly, Ciemna Cave, with the most numerous and diverse traces, is the most significant among them. The Neolithic settlement in Ciemna Cave is characterised by artefacts associated with all important Neolithic cultures from Małopolska, dominated by materials connected mainly with the Pleszów group and Baden culture. The specificity of Neolithic artefacts found in the caves of Ojców Jura shows greater diversity than material from the surface surveys. It seems that materials from caves had a better prospect of surviving compared to artefacts from open spaces exposed to more post-deposition processes (Rook 1980; 1995; Lech 2006, 416–417).

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