MULTAS PER GENTES ET MULTA PER SAECULA

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CONTENTS

Keilmesser with tranchet blow from Grotte de la Verpillière I (Germolles, Saône-et-Loire, France)

Jens Axel Frick, Klaus Herkert, Christian Thomas Hoyer, Harald Floss

This contribution is dedicated to J.K. Kozłowski, R. Desbrosse and J. Zuate y Zuber whose groundbreaking study enlarged, 40 years ago, the knowledge about this Middle Paleolithic tool.

Abstract: This paper is centered on *Keilmesser* with a lateral tranchet blow modification on the cutting edge from Grotte de la Verpillière I in Germolles, France. It is demonstrated that the production of these lithic objects follows specific rules, regardless of the matrix used, resulting in a vast range of morphologies. Different assemblages from the site contain *Keilmesser* with tranchet blows as well as corresponding tranchet-blow blanks. They are known from the first excavation on site in 1868, from surface collections in the 1950s and 1970s, as well as from the newly performed excavations on site. Analysis of the production sequences clearly demonstrate that the performance of a tranchet blow can be an additional task for re-sharpening, but mostly the performance of a tranchet blow was an integral part of the production. Moreover, the entire production is targeted and planned to perform such a tranchet blow, whose performance is thus comprehended as important cutting edge regularization and part of the regular production sequence of these tools.

Keywords: *Keilmessergruppen*, Middle Paleolithic, Prondniks, Eastern France, Litho-technological study

Introduction

In the course of the entire Paleolithic research history bifacial lithic objects were consistently part of studies and contributed to definitions of definitions of cultural entities such as the *Chelléen*, *Acheuléen* or the *Moustérien* by de Mortillet (1883). Within the typological facies definition of Bordes (e.g., Bordes, Bourgon 1951) bifaces were a definitional part of the *Moustérien de tradition acheuléenne* (MTA). In Central Europe particular lithic objects were also used to define entities, namely the *Keilmessergruppen* (KMG, Mania 1990) and *the Blattspitzengruppen* (e.g., Bolus, Rück 2000) in the Middle Paleolithic or the *Federmessergruppen* at the final Paleolithic (Schwabedissen 1954).

40 years ago, under the guidance of Desbrosse, some highly characteristic bifacial tools from Grotte de la Verpillière (hereafter VP I) were analyzed (Desbrosse, Texier 1973; Desbrosse *et al.* 1976), deriving from the collection of Jeannin and unearthed during the 1868 excavation directed by Méray (see Méray 1869). Studies from the 1970s compared these lithic objects with similar types from other Middle Paleolithic sites in Central Europe such as Ciemna cave (Poland) or Buhlen (Germany). As type designation for backed knives the frenchified term *Prondnik* was used for these tools, a name adopted from the Polish term *Prądnik* established by Krukowski (1939-1948). As far as we know, these studies were the first that described such outstanding tools from western European assemblages detailed.

Since 2003, new research under the auspices of Floss focusing on the assemblages of VP I have been conducted with the aim to collect all available data about the site, the assemblages of ancient excavations and surface collections (Frick 2010; Dutkiewicz 2011; Dutkiewicz, Floss 2015; Floss 2005) as well as performing new excavation on the site (see e.g., Floss *et al.* 2013; Floss *et al.* 2015; Floss *et al.* 2017; Hoyer, Floss 2016; Hoyer *et al.* 2016; Frick, Floss 2017). In 2006, the former Grotte de la Verpillière was renamed in Verpillière I (VP I), because on the same sub-district Verpillière another Middle Paleolithic site (VP II) was detected and is under research since then (e.g., Frick, Floss 2015; Frick, Floss 2017; Frick 2016a; 2016b).

Both sites are situated on the eastern cliff face of the Jurassic Montadiot massif in the small Orbize valley in the village Germolles (*commune* Mellecey) around 10 km West of Chalon-sur-Saône, Saône-et-Loire department in Eastern France (Fig. 1). Therefore, the site is often called Grotte de Germolles or just Germolles.

This paper is prevalently focusing on technological analysis of the outstanding tools called *Keilmesser* (abbrev. KM) with tranchet blow (TB) and their corresponding tranchet-blow blanks (TBB) from VP I, succeeding the general overview of lithic analysis of bifacial objects from both sites (Frick, Floss 2017) and to round off the first analyses of Desbrosse and colleagues.

The dating attempts of GH 3 and GH 4 of VP II (also placed within the KMG) suggest an early OIS 3 context for these assemblages (Richard *et al.* 2016; Zöller, Schmidt 2016; Heckel *et al.* 2016). Preliminarily, this age suggestion seems also valid for the *Keilmesser* with tranchet blow and corresponding TBBs from VP I.

In this context, the name *Keilmesser* is favored as synonym for asymmetrically (bifacially) backed knives (ABBK), because it combines its wedge shape (German *Keil*) in cross section and the supposed function as knife (German *Messer*). They are, "*in general, bifacially worked core tools possessing a single sharp working edge, which is formed by bifacial retouch from one side after the other, opposed by an unworked or roughly worked (in rare cases more carefully worked) back* […]*. In the terminal part of the tool the back often changes to a second, quite sharp edge, which converges with the distal end of the working edge to form a more or less pointed tip (*[...]*).*" (Jöris 2006: 292).

Research history

The research history shows a strong connection between KMs and the Micoquian (Frick *et al. in print)*. The beginning of analysis of KMs with TB can be seen in the seminal work of Krukowski (1939-1948) in the 1930s. Jacob-Friesen (1949), the first using the term KM in a Paleolithic context (to our knowledge) described special forms of backed bifaces. In the 1960s, Bosinski used the term KM for ABBKs from the *Micoquien* assemblages from the western part of Central Europe (e.g., Bosinski 1967), with a clear connection to La Micoque N/6 (Bosinski 1970).

From the 1990s onwards, confusion in term use was intensively re-examined. At first Mania (1990), introduced the KMG for *Keilmesser*-bearing assemblages from Europe, which was preferred by scholars such as Veil *et al.* (1994) or Jöris (2001) and even adopted by Bosinski (2000-2001). The linkage between assemblages from Central Europe and La Micoque (mainly layer N(6)) was strongly questioned and resulted that insecure stratigraphic information and impossibilities in dating layer N(6) of La Micoque (see e.g., Falguères *et al.* 1997; Rosendahl 2004) disqualifies the assemblage as serving to name assemblage entities (see discussions in Veil *et al.* 1994; Jöris 2003). In using the term KMG we are following the attempt of other scholars, e.g., Blaser and Chaussé (2016: 176): "*It would nonetheless be advisable, following the example of the German works, to abandon the term Micoquian, and to find* […] *new name*[s] *to denote th*[ese] *archeological entit*[ies]*.*"

Because of the presence of bifaces at VP I, the Middle Paleolithic component of the assemblages was set into different entities, such as the *Moustérien de tradition acheuléenne* (Delporte 1955; Desbrosse *et al.* 1976), *Acheuléen* (Gros, Gros 2005), *Micoquien* (Gouédo 1999), *Charentien de influence micoquienne* (Farizy 1995), *Moustérien mit Micoque-Option* (Richter 1997) or the KMG (Jöris 2003).

This and other studies (Frick 2010; Frick *et al. in print*; Frick, Floss 2017; Frick 2016a; 2016b) contribute to find a useful denomination of the Middle Paleolithic components at the site. The new excavation found evidence for a Middle Paleolithic occupation under the ancient rock shelter (Litzenberg 2015; Hoyer *et al.* 2016) containing Levallois elements and a bifacial preform, as well as indications in front of the rock shelter of the old Méray trench from 1868 and many additional KMTBs and TBBs from the back dirt and in colluvium sediments there (Hoyer *et al.* 2016). A much earlier occupation is indicated by the presence of double symmetrical bifaces from the old collections, as well as from one biface-preform in a trench downwards the hill in front of the site (Hoyer *et al.* 2016; Frick, Floss 2017).

Morphological and techno-functional description

Morphologically, a KM possesses a lithic volume surrounded by (at least) one cutting edge, a back, a bow and a base (Fig. 1:2). The (main) cutting edge

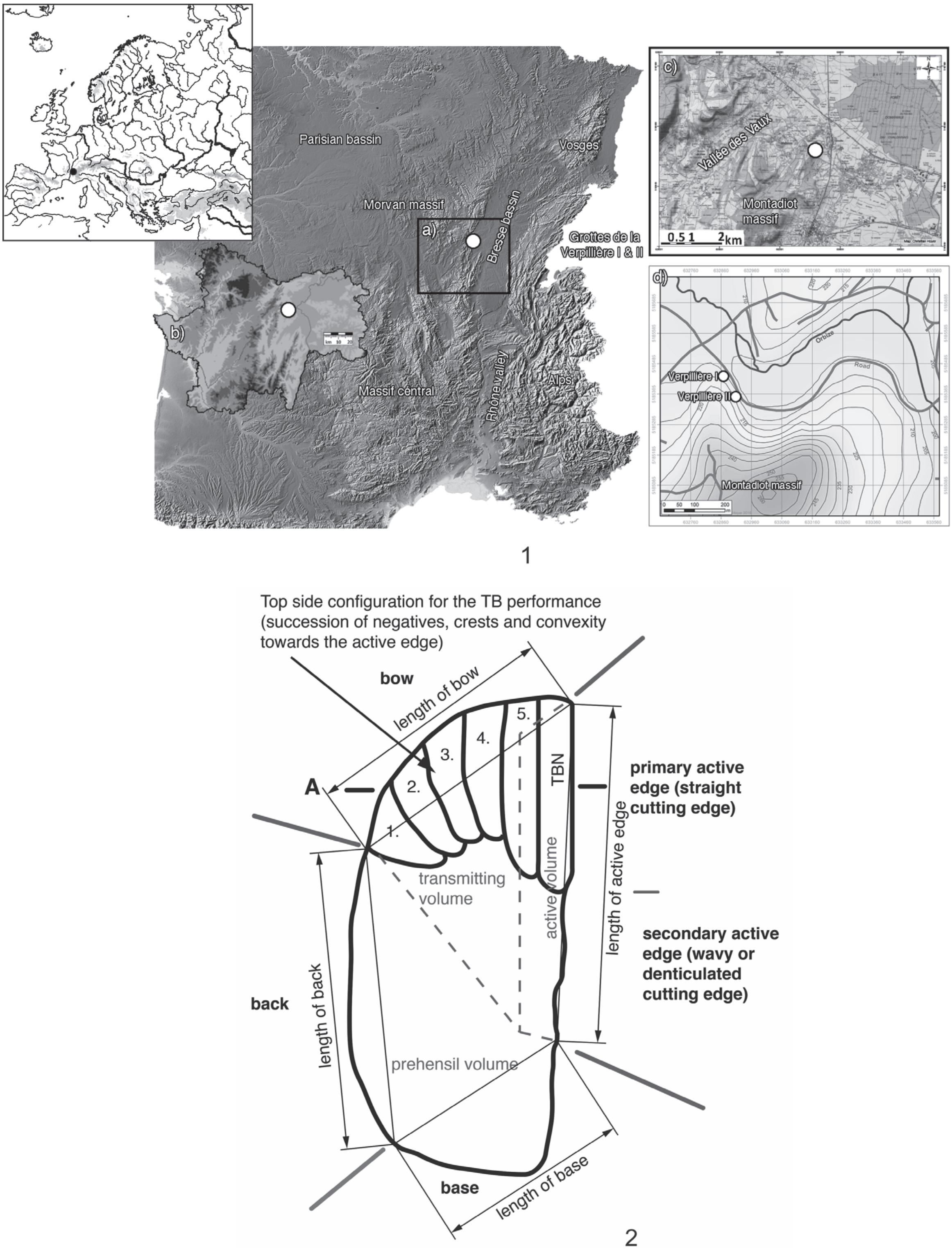

Fig.1. 1. Location of Grotte de la Verpillière I & II (white point with black fringe). a) Position of VP I on a relief map in Eastern France. The frame shows the positon of the Saône-et-Loire departemnt (base map: NASA, SRTM 2000, www.pacha-cartographie.com); b) Position of VP I on a relief map of Saône-et-Loire department (base map: NASA, SRTM 2000 from S.R.A. Bourgogne); c) Position of VP I on a topographical map of the Côte chalonnaise, the logistic area around the site (base map: 25k TOP map, Beaune-Chagny from the Institut géographique national, IGN 2005, coordinates in UTM T31N, GIS: Hoyer) and d) Positon of VP I and II on a topographical map of the immediate surrounding of the sites (base map: 25k TOP map, Beaune-Chagny from the Institut géographique national, IGN 2005, coordinates in UTM T31N, GIS: Hoyer); 2. Schematic illustration of a KMTB showing measurements used, top side configuration and techno-functional volumes.

is interpreted as being for mostly longitudinal cutting-in (Jöris 2006; Urbanowski 2003) or transversal whittling (cutting-off, pers. comm. O. Jöris in 2015). This edge can be confected using retouch (retouch negatives are oriented orthogonally to the edge) and TB techniques (tranchet-blow negatives (TBNs) are oriented along the edge). Before the performance of a TB mostly the prospective cutting edge is bifacially worked in the manner similar to the *wechselseitig-gleichgerichtete Kantenbearbeitung* (term could be translated into alternating unidirectional edge regularization, AUER) as described by Bosinski (1967). The subsequent TBN is normally situated lateral on the more convex surface (top side) of the object. Afterwards the cutting edge can be regularized using unifacial or bifacial retouch techniques. In many cases, the active edge is separated into two sections, a straight (if viewed from lateral) possessing the TBN and a wavy or denticulated one. In opposition to the cutting edge (on the other lateral side) a back is placed, which can be natural (e.g., cortical) or worked. The back continuous into the terminally situated bow, which consists a truncation as striking platform and convex surface modification for guiding the TB. In a techno-functional approach (see Fig. 1:2) a KMTB consists a volume at back and base as handle (prehensile part), a volume represented at the bow (transmitting part) and the active-edge volume as transformative part. KM and KMTB are prevalently interpreted as being hand-held and not fixed in a haft (e.g., Jöris 2006).

General production sequence of KMTBs

The general production sequence (*chaîne opératoire*) for KMTBs is quite well understood (see Bosinski 1967, 1969; Jöris 2001, 2006; Koulakovskaya *et al.* 1993; Krukowski 1939-1948; Urbanowski 2003) and listed in the following (see also: Frick, Floss 2017):

1. Selection of a suitable matrix (raw piece, core, frost shard or blank).
2. (If necessary) roughing out or coarse shaping.
3. Production of a back or using a natural back.
4. Shaping of the flatter surface (bottom side) or using a flat surface (e.g., ventral face).
5. Shaping of the more convex surface (top side).
6. Production of a striking platform at the bow (truncation).
7. (If necessary) bifacial shaping of a lateral crest on the future active edge.
8. Production of crests or an adequate convexity on the top side for guiding the TB.
9. Removal of the TBB.
10. (If necessary) regularization of the active edge which can have a bipartition (primary active edge is straight in lateral view and secondary is wavy or denticulated).

Assemblages of KMTBs and TBBs from VP I

Altogether there are until now n=44 KMTBs known from VP I deriving from different assemblages (Table 1). On the one hand, they are known from the first excavation by Méray in 1868 stored in different collections. On the other hand they derive from the newly performed excavations of Floss from the years 2011, 2015 and 2016 (n=26) that could evaluate the

Table 1. Assemblages of KMTBs (*Keilmesser* with tranchet blow) and TBBs (Tranchet-blow blanks) from VP I

Denomination	**Collection**	**Activity**	**Year**	**Number**
Keilmesser with tranchet blow	Méray	Méray excavation	1868	4
Keilmesser with tranchet blow	Jeunet	Méray excavation	1868	5
Keilmesser with tranchet blow	Jeannin	Méray excavation	1868	9
Keilmesser with tranchet blow	Floss	Floss excavation	2011, 2015 & 2016	26
Tranchet-blow blank	Jeannin	Méray excavation	1868	1
Tranchet-blow blank	Pelatin	Surface collection or excavation	1970s	4
Tranchet-blow blank	Aimé	Surface collection or excavation	1970s	1
Tranchet-blow blank	Gros	Surface collection or excavation	1950s	3
Tranchet-blow blank	Floss	Floss excavation	2015 & 2016	46
Total				**99**

position of the majority of the old excavation trenches (Hoyer *et al.* 2016). With the exception of one KMTB from the interior of the rock shelter (found in a mixed sediment unit, GH 15/18) all other pieces were situated directly in front of the former rock shelter and its entrance in colluvial sediment units.

The distribution of the known n=55 TBBs is slightly different. They are also present in old collections but their majority (n=46) derives from the recent excavations from the front of the rock shelter. A selection of these TBBs is displayed in Fig. 2.

KMTBs and TBBs can be described as left- and right-sided (Table 2) because of a more convex and a flatter surface. In addition, the TBBs as waste product of the production of the TBNs on the KMTBs can therefore also be described as left and right sided. Summarizing, there are n=7 left-sided KMTBs, in opposition to n=36 right-sided KMTBs. One KMTB can be described as left- and right-sided, because either side possesses a TBN. For TBBs, there are n=11 left-sided and n=44 right-sided TBBs. As Table 2 demonstrates, there are much more right sided KMTBs, as well as TBBs available (left/right for KMTBs 7/35 and for TBBs 11/44). Nevertheless, the amount of left-sided objects is much higher than percentages Jöris (2001: 34) presented for Buhlen. There, more than 90% of the KM are right-sided and respectively 85,4% of the TBBs. Buhlen yielded n=2 "*Pradnik-Schaber*" that possess TBNs on either side. This double installation of TBNs is also visible on one KMTB from VP I (see Fig. 3:1a).

Table 2. Amount of left- and right-sided KMTBs and TBBs from all collections

Denomination	Méray excavation in 1868 (coll. Jeannin, coll. Jeunet & coll. Méray	Coll. Gros from the 1950s	Coll. Pelatin and coll. Aimé from the 1970s	Floss excavation in 2011	Floss excavation in 2015	Floss excavation in 2016	Total
Left sided KMTB	4	0	0	0	0	3	7
Right-sided KMTB	13	0	0	1	9	12	36
Left- and right-sided KMTB	1	0	0	0	0	0	1
Left-sided TBB	0	1	1	0	4	5	11
Right-sided TBB	1	2	4	0	7	30	44
Total	**19**	**3**	**5**	**1**	**20**	**45**	**99**

Reduction-sequence reconstruction of KMTBs

For the production of the KMTBs prevalently flakes (n=33) are selected as production matrix (examples in Fig. 3:1a and Fig. 3:2b), followed by frost shards (n=6), blades (n=2) and formerly entirely cortical raw pieces (n=2, example in Fig. 3:1c). The predominant use of blanks (flakes and blades) as matrix is also visible in other sites, such as Abri du Musée (Bourguignon 1992), whereas in other assemblages, such as Buhlen (Jöris 2001) flat raw pieces are preferred. One advantage in using flakes for the production is that a specific flake morphology can be selected that possesses an asymmetrical but plano-convex cross-section. Such a morphology is close to the resulting one in shaping a KMTB out of a raw piece and therefore some production steps are not necessary to perform.

The majority (n=36) of the KMTBs is made from local flint from the *argiles à silex* (FAS). Another n=4 are made from *Chaille* (local Jurassic chert) and n=3 are made from a yet unknown variety of flint. For the TBBs, n=52 are made from FAS, one is made from an oolithic chert variety and n=2 from local *Chaille*.

As visible in the "standardized" production-step sequence (see above), normally, at first, a back is created. At VP I, this is only true for n=10 KMTBs. All other KMTBs use existing edges and surfaces as back, without any modification (see Fig. 3:2b). Therefore, another n=28 possess a cortical back (see Fig. 3:1c), for n=1 the platform of the blank functions as back and n=4 use old surfaces of the blank as back. But regardless if created or existing, the back is the starting point of KMTB shaping. On n=29 pieces the bottom side is shaped first and on n=14 the top side. On another n=3 the base is shaped first (see Fig. 3:2a and 3:2b) and on one a flake from an old KMTB is used to produce a new one (see Fig. 3:2c). Before performing the TB on all of the KMTBs the surface where the TBN will be situated is shaped by creating some negatives on the more convex surface (top side) as crests (exemplified in Fig. 3:1c). A stumping of the active edge as additional crest for guiding the TB performance, as described by Jöris (2001),

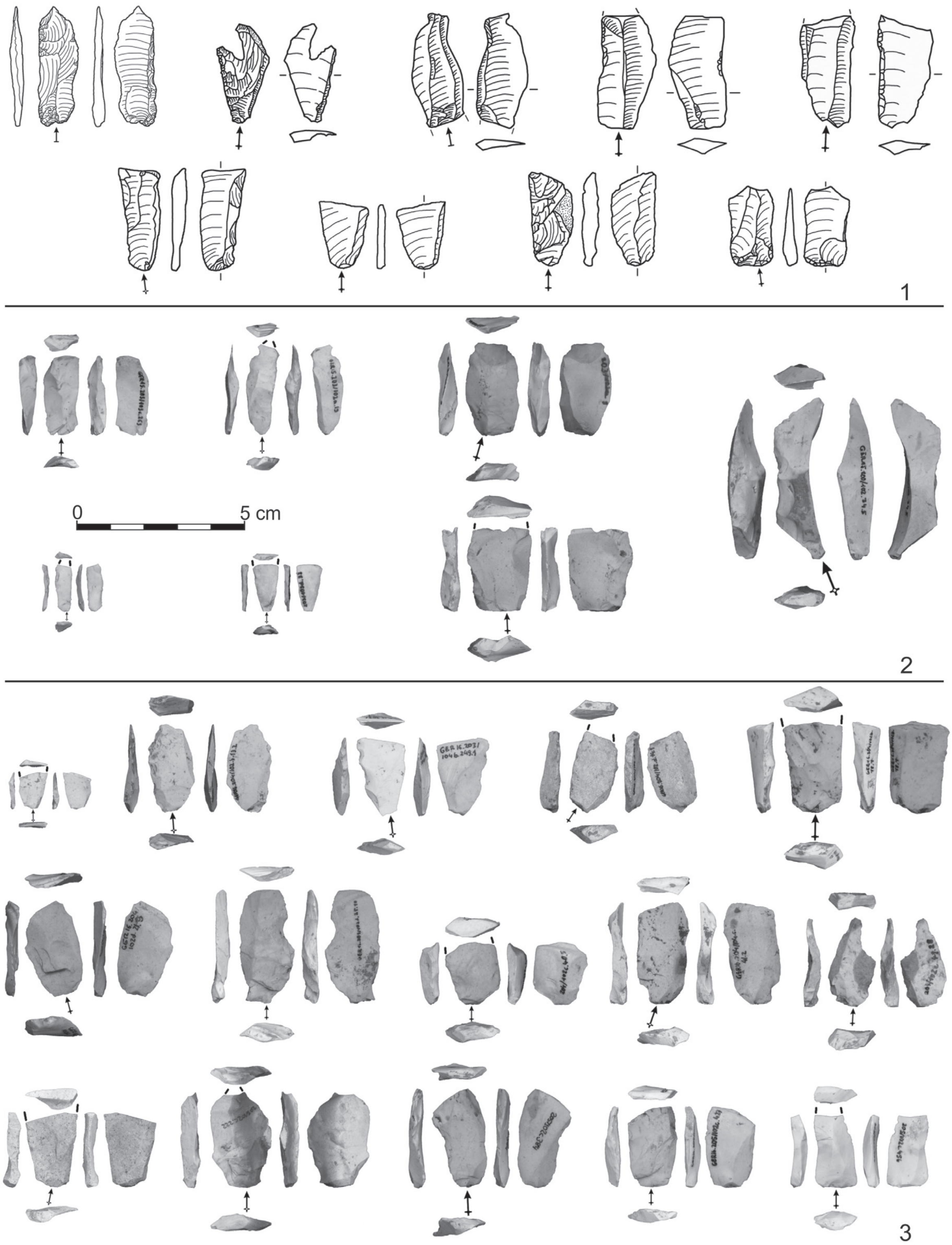

Fig. 2. Selection of TBBs from VP I. 1. TBBs from ancient collections; 2. TBBs from the 2015 excavation and 3. TBBs from the 2016 excavation campaign.

is only visible on n=4 KMTBs, whereas n=17 TBBs show such. On n=14 KMTBs, after the performance of the TB, the active edge was regularized with some retouch negatives (see Fig. 3:2c).

KMTBs from VP I possess a maximum length between 34.9 mm and 99.6 mm, a width between 21.0 mm and 58.1 mm and a thickness between 7.5 mm and 25,8 mm. For specific dimensions of

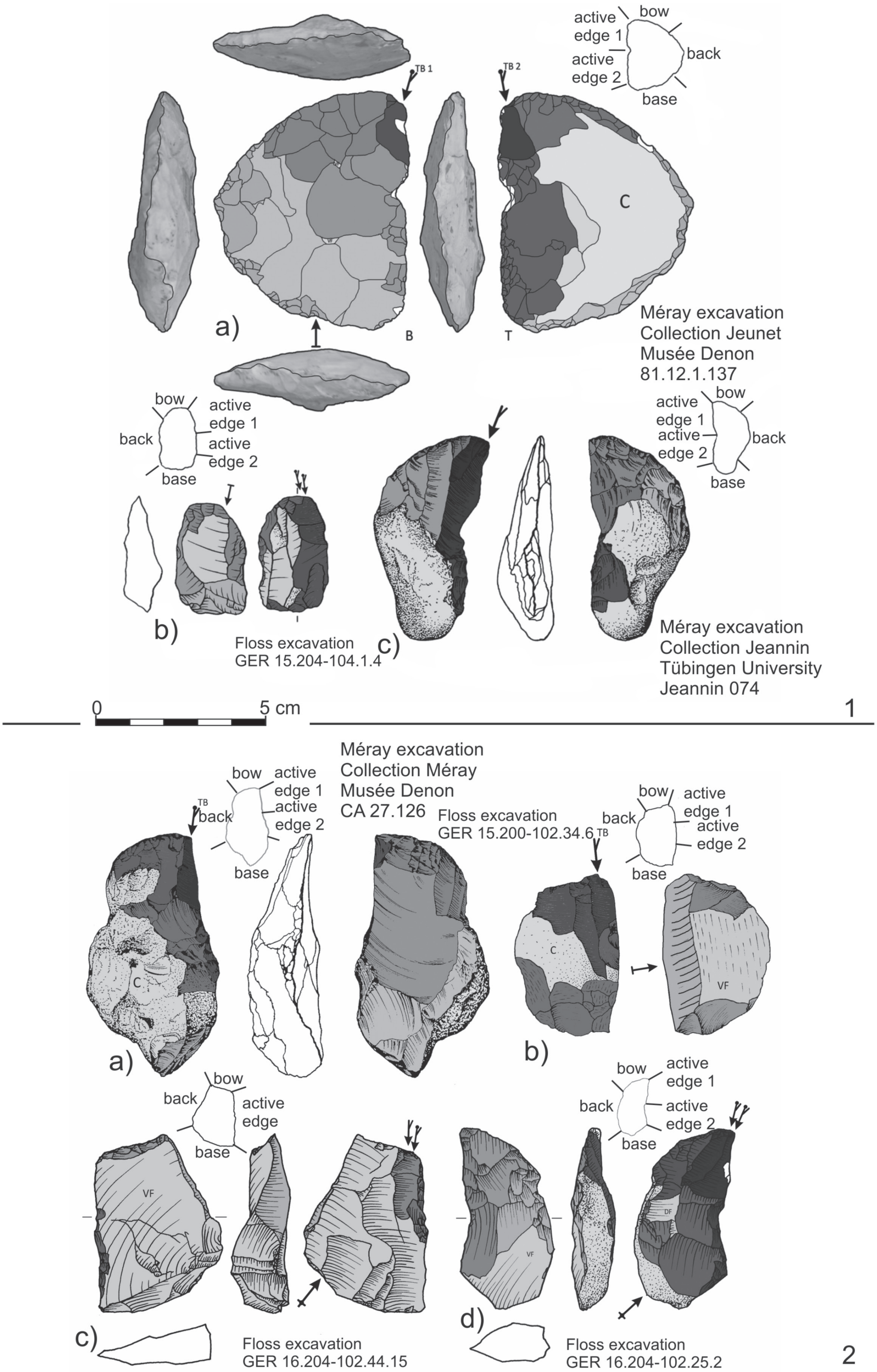

Fig. 3. 1. Selection of KMTBs from VP I. a – double-sided TBNs; b – TBNs in succession and c – repeated TBs performed on a nodule; 2. Selection of KMTBs from VP I. a – base is shaped first; b – base is shaped first, existing surface and edge used as back; c – an old KM on flake is used to produce a new KMTB and d – a cortical flake is used.

parts of the outline of KMTBs from VP I (Fig. 3) we note that the length of the bow varies between 6.5 mm and 39.3 mm, those of the back between 21.7 mm and 76.2 mm and the length of the base varies between 11.7 mm and 43.3 mm. Compared to these measurements, the active edge seems quite short and ranges between 22.0 mm and 88.9 mm, with a mean of 41.4 mm.

Concerning the TBBs, they range in length between 11.8 mm and 51.2 mm, between 4.9 mm and 32.5 in width, as well as 1.9 mm and 9.0 mm in thickness. A linear correlation between length and thickness is visible for most of the TBBs situated at around L=8T. Most of the time, the performance of a TB lowered the angle of the active edge, a fact which is evident for KMTBs as well as for TBBs. But it is also visible that in some cases the active-edge angle was not lowered under a threshold of 60°, a value Gladilin (1976) used to separate knifes from scrapers. Unfortunately, the patina on the artifact seems too dense to perform use-wear analyses on the active edges to find evidence for the use as knives.

Altogether the n=44 KMTBs show the performance of n=77 TBNs. There are n=21 KMTBs with one TBN, n=20 KMTBs show two TBNs, n=1 KMTBs possess five TBNs and n=2 KMTB shows even six TBNs. In dimensional comparison (length and width), TBNs and TBBs overlap in ranges but are not congruent. Self-evidently, this makes sense for the width comparison because they cannot be equal (the reason is that TB removes material from the active edge and the resulting TBN on the KMTB is always narrower as the TBB). On the other hand, the length bandwidth of TBNs is slightly different to them of the TBBs. This circumstance could be a hint that the entirety of the KMTBs and corresponding TBBs is not complete. An impression that is supported by the fact that up to now all refitting attempts between KMTBs and TBBs from the new excavation were unsuccessful.

Conclusion

The production sequences of the KMTBs from VP I demonstrate clearly that the performance of a TB was not an option on these lithic objects. Even more, the entire production was targeted and planned in advance to perform a TB on the active edge to create a straight, sharp and low angled cutting edge. The succession of production steps of the KMTBs is in congruence to other analyses (see Jöris 2001; Urbanowski 2003). The only difference is that at VP I a vast amount of KMTBs were produced using blanks as matrix. Therefore, the production of a flat bottom side, as well as the installation of a back was not always necessary to fulfill the requirements of the concept *Keilmesser* with tranchet blow. The presence of KMTBs as well as TBBs on the site demonstrate that the performance of TB was done on site (if TBBs are seen as waste products and if the explicite import of TBBs is excluded).

Since the 1970s studies of Desbrosse and colleagues (Desbrosse, Texier 1973; Desbrosse *et al.* 1976) the inventory of KMTBs, as well as TBBs could be massively increased. Desbrosse *et al.* (1976) described n=9 KMTB from the coll. Jeannin (Méray excavation in 1868) and displayed n=7 of them. This study could add another n=90 items (n=55 TBBs and n=35 KMTBs) to the assemblage of these protruding lithic objects from VP I and demonstrates that the presence of these items is not a singularity but an important part of the Middle Paleolithic lithic assemblages of the site. In addition to the KMTBs from VP I, new studies could evaluate that there are more sites in the surrounding *Côte chalonnaise* that possess also such items (Frick *et al. in print*; Herkert *et al.* 2015; Frick, Floss 2017; Frick 2016a; 2016b) and thus, supports hypothesis about regional patterns in the late Middle Paleolithic of this area.

In addition to the presence of KMTBs and TBBs, the presence of other phenomena makes it possible to classify these assemblages as part of the KMG (Micoquian *sensu* Bosinski). Such phenomena are a) a morphological diversity of other bifacial objects (produced in the framework of specific rules), b) the prevalent production of blanks using the Levallois concept, c) small amount of blades and *Groszaki*, d) ventral reduction for the configuration of Levallois cores and bulb reduction of blanks, e) minor presence of other blank-production concepts, f) small amount of an “Upper Paleolithic” tool component, g) high diversity of modifications on cores and blanks for the tool production and h) morphological evidences for hafting of unifacial objects (Frick, Floss 2017; Frick 2016a; 2016b).

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The new Upper-Palaeolithic cave site in the Polish Jura (Ogrodzieniec-Podzamcze, shelter Birów IV)

Krzysztof Cyrek

Abstract: The article describes the results of excavations at the Birów IV shelter, during which two cultural levels were unearthed. They contained flint artefacts linked with forms characteristic of the Aurignacian culture. The incomplete documentation and lack of absolute dating makes spatial analysis impossible and hinders a detailed stratigraphic analysis. The forms which are worth mentioning include keel-shaped scrapers-cores, keel-shaped/carinated burin, end-scrapers, micro-blades and Aurignacian retouched blades. A fragment of an antler decorated with a pointille technique stands out as a unique artefact.

Keywords: Rock shelter, Polish Jura, the Aurignacian culture, flint artefacts, decorated antler

The location and history of the excavations at the site

Cave IV at Birów (no 422 in the catalogue created by K. Kowalski, 1951), also known as Northern Shelter is situated at the bottom of the northern slope of the Birów Mountain – an upper Jurassic limestone inselberg (Fig. 1). It is part of the Zborów-Ogrodzieniec Range located in the southern part of the Częstochowa Upland (Fig. 2). The nearest hills encompass the Niegownice-Smoleń Hills from the south and south-east (Fig. 1) and the Morsko Rocks from the north. Further on the Rzędkowice, Podlesice and Kroczyce Rocks extend. About 200 m south-west of that area, there is a visible tectonic fault, and 10 km further away – the edge of the Jurassic cuesta. Within a few hundred metres from Birów Mountain (430 m above sea level) there is a plateau – several hundred metres high, which is void of hills and larger inselbergs. The formidable elevation, reaching *c.* 60 m above the surface of the surrounding area, enables excellent visibility from the entrance holes which face north and west. From the eastern and south-eastern side, in the nearest vicinity of Birów Mountain, there is currently a dry valley, which constitutes an essential part of the landscape around the cave.

Shelter Birów IV was excavated in the period between 1992-1994 and 1996 by the Team of Conservatory Research supervised by B. Muzolf within the auspices of comprehensive archaeological excavations, which encompassed several sites located in the area of Birów Mountain (Muzolf 1994). The excavation works in the cave were carried out by B. Maryniak, with the consultation of T. Madeyska, T. Wiszniowska and K. Cyrek. The first publication, besides the study of flint artefacts, was published in 2009 (Muzolf *et al.* 2009).

An area of approximately 40 square metres was excavated, divided into 6 trenches (from I to VI). The explored sediments extended 230 cm from the surface (Fig. 3:1). The following objects were obtained: 47 Palaeolithic flint artefacts, 12,000 fragments of animal bones, and several hundred fragments of prehistoric and late medieval pottery (Muzolf 1994).

The exploration was carried out by excavating layers designated by levelling (5 and 10 cm thick) and dry sieving the whole filling. The upper sections contained fragments of medieval pottery and metal objects (arrowheads and crossbow bolts). These are traces of settlement, contemporaneous with the stronghold situated at the top of the mountain and inhabited in the 13th and 14th century. The same

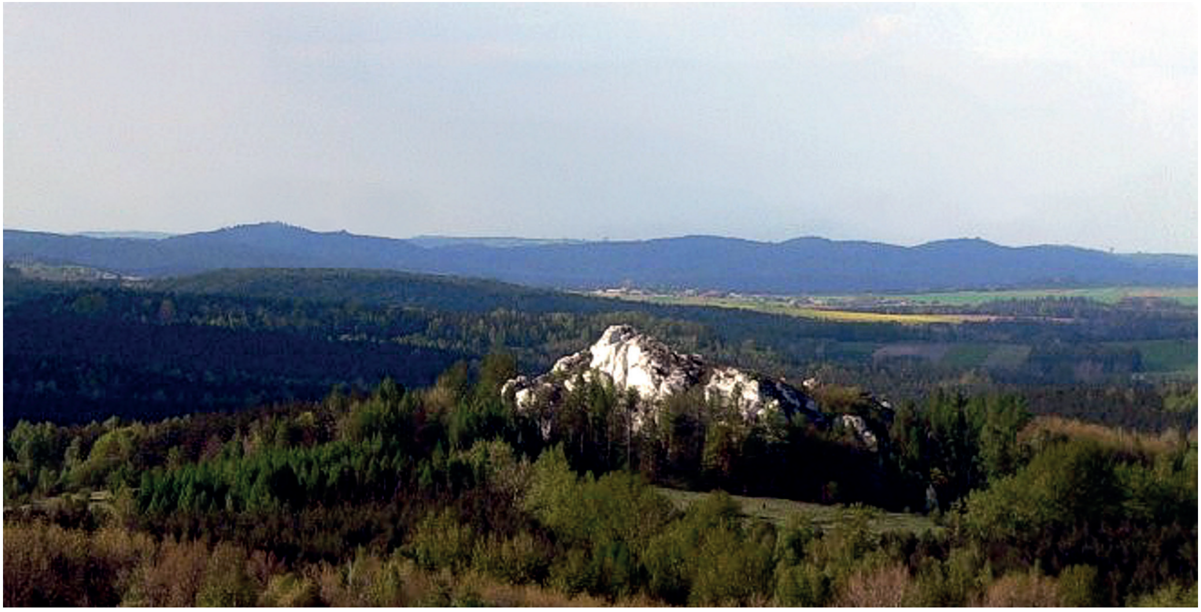

Fig. 1. General view from the Birów Mountain, from the north (photo by K. Cyrek).

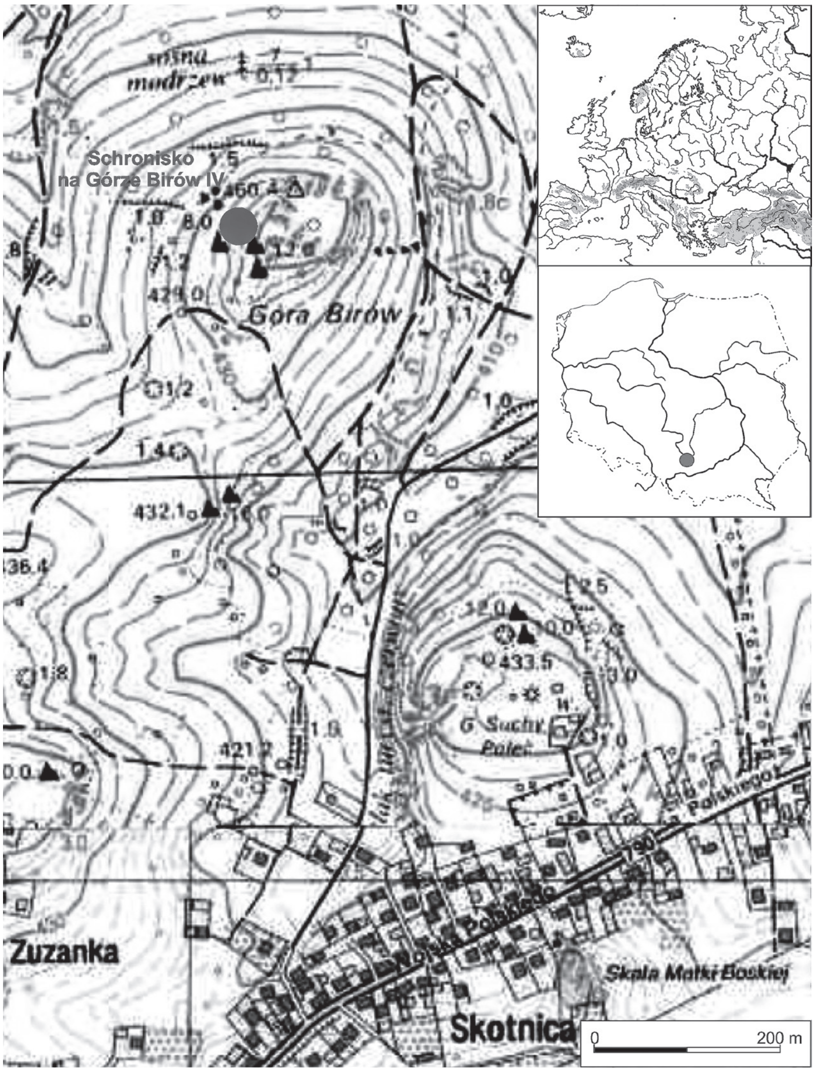

Fig. 2. Shelter Birów IV. Location of the site (drawing by Ł. Czyżewski).

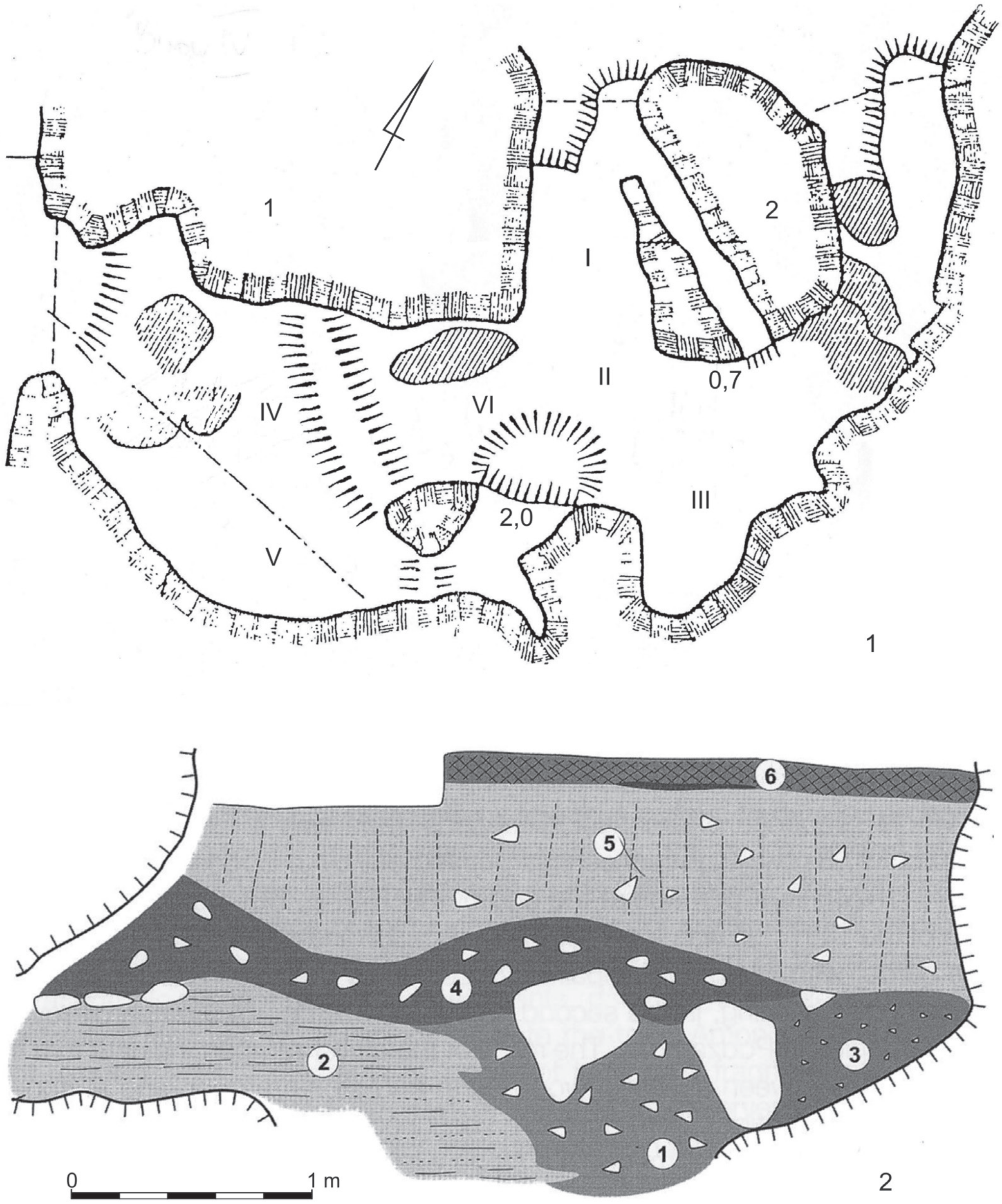

Fig. 3. 1. Birów IV. Map of the cave (sketch) with the rough location of the archaeological trenches (I-VI); 2. Stratigraphy of shelter Birów IV (after Mirosław-Grabowska 1995, Muzolf *et al.* 2009). Explanations in the text.

level contained several dozen fragments of artefacts of the Corded Ware culture, scattered all over the excavated area. Palaeolithic artefacts were found in the lower sections of the loess sediments.

The excavations of the cave in the 1990s did not encompass the whole feature. Moreover, no specialist analyses were carried out. Consequently, the cave research is planned to resume in 2017, as part of the NCN project 'Processes which have influenced Palaeolithic cave sites – a multifaceted analysis of cultural levels in the Pleistocene cave sediments (with regard to the middle part of the Polish Jura)'.

Stratigraphy

The cave stratigraphy, made by J. Mirosław-Grabowska and T. Madeyska has already been published (Mirosław-Grabowska 1995; Muzolf *et al.* 2009). Therefore, its synthetic description will be presented here (Fig 3.2). The oldest sediment (1), deposited directly on the rock is made up of rusty-brown loams and sands with large rock blocks. The amount of loams indicates the erosive character of the sediment, formed in the Pliocene and early Pleistocene. The next sediment was deposited on the rocky base, next to layer 1. The layer is not homogenous, and it underwent secondary deformation. It is made up of fine-grained rusty laminated sands of fluvial origin (2). The next layer consists of beige dusty loam with the admixture of sand and a small percentage of fine-grained rubble (3). The proportion of sand and dust indicates the influence of fluvial and aeolian processes on the way it was formed. This is the oldest cave layer, which includes animal bones. Layer 4 consists of brown loam with a large percentage of varied (smoothed and sharp-edged) rubble and the remains of animal bones. The character of a large part of rubble points to a relatively warm climate. Beige loam, dusty sand and sharp-edged rubble with differently preserved surfaces constitute layer 5, which is marked by the greatest thickness in the cross-section. A considerable percentage of dust indicates the loess nature of the sediment, formed in the periglacial climate of I maximum of cold of the last glaciations. This layer also contained Palaeolithic artefacts.

It should be mentioned that two radiocarbon dates have been made with the use of the AMS method. They were obtained from animal bones (fox and ptarmigan) found in layer 5. They are as follows: 27,980 ± 220 BP (Poz-27279) and 12,590 ± 60 BP (Poz-27244). However, due to the lack of documentation referring to the exact location of the samples, it is impossible to use the dating reliably in order to determine the chronology of the Palaeolithic finds. The surface of the silt was covered with a grey layer containing charcoals, formed during the Holocene phases of the cave inhabitation (layer 6, see above).

Spatial analysis

As previously mentioned, Palaeolithic artefacts occurred in layer 5. Unfortunately, due to the lack of some field documentation (which may have been lost?), it is not possible to analyse the spatial distribution of the artefacts. On the basis of maps of some of the layers designated by levelling, only the area and the general location of the trenches has been reconstructed (Fig. 3:1). However, it is possible to try and recreate their location in particular square metres, within the 10 metre-thick layers designated by levelling, on the basis of the notes in the inventory book. It was also possible to correlate the levels of artefact deposition with the consecutive natural layers, distinguished in the spatial analysis. Each artefact bears a number of "natural layers" (from I to IV) as well as layers designated by the levelling (from I to IX). It seems that the above mentioned natural layers can be correlated with sediments distinguished in the spatial analysis of the cave (Fig. 3:2) (Muzolf *et al.* 2009). Layers designated by levelling form subsequent sections from [+10] to [-90]. As a result, an attempt has been made to identify the level of deposition of artefacts with subsequent layers designated by levelling and with natural layers.

Analysis of the above-mentioned data and notes preserved in the field notebook reveals that almost all Palaeolithic artefacts were deposited in the layer of loess and rubble, marked as no 5, with the exception of several artefacts which were found on the surface of the contemporary spoil tip at the cave entrance. They occurred next to flint objects from the late Neolithic, whose primary deposit was Holocene humus (layer 6). The latter came from the cluster of artefacts, which may be described as a polyhedral axe workshop of the Corded Ware culture (presence of characteristic pottery), but which were widely different from Palaeolithic objects in terms of morphology and state of preservation.

Based on the analysis of levelling depths, Palaeolithic artefacts occurred almost in the whole thickness of layer 5, with varied intensity. The largest number of artefacts was found in the middle and upper section of sediment, at a depth of between [0] and [-50]. Below, at a depth of between [-60] and [-70] no artefacts occurred, whereas in level [-80] – [-100] i.e. at the bottom part of layer 5, they are present, but less numerous. As a result, two levels of artefact occurrence have been distinguished: upper (younger) and lower (older).

Description of artefacts

Artefacts from the upper level of layer 5 [0]–[-50]

1. Side blade removed from prepared pre-flaking surface, with two negative scars on the blades and no traces of two platform core exploitation. Butt of striking platform, with removed bulb of percussion. Grey, Jurassic flint, with a strong patina, cream in colour, 104 x 31 x 13 mm (Fig. 8:6).

2. High and massive Aurignacian retouched blade with two retouched edges, made from a cortex blade, shortened by transverse processing. Grey, Jurassic flint, with a cream patina. 44 x29x16 mm (Fig. 6:4).

3. Two blades with negative scars only, trapezium in cross-section. One specimen has a prepared butt of the striking platform; the other one is broken at the butt of the striking platform. Visible usage retouch on the edges. Grey, Jurassic flint, with a cream patina. 90x23x10 mm, 67x17x5 mm (Fig. 7:1-2).

4. Flake with negative scars only, damaged on the distal edge, with heavily processed butt of the striking platform (28x22x3 mm). Grey, Jurassic flint, with a white patina (Fig. 8:7).

5. Blade, trapezium in cross-section, with no traces of double-platform core exploitation, with partially removed prepared, pre-flaking surface, shortened on the distal edge, butt of the striking platform with negative scars partially removed, along with the bulb of percussion. Usage retouch visible on both edges? Specimen broken during excavations. Chocolate flint, with a grey patina. 116x21x11 mm (Fig. 8:1).

6. Dihedral angled burin (carinated), multiplied, in the shape resembling the beak of a parrot, made from a regular, massive secondary blade removed from the prepared pre-flaking surface, with denticulate usage retouch on the edge. Chocolate flint, with a light grey patina. 64x32x9 mm (Fig. 6:3).

7. Arched, blade end-scraper, made from a distal edge, with a shortened blade with negative scars only, trapezium in cross-section, with no traces of two-platform core exploitation. Jurassic flint, with a ginger patina. 35x24x8 mm (Fig. 6:1).

8. Arched, blade end-scraper with a working edge on the distal part of a blade with negative scars only, trapezium in cross-section. Chocolate flint, with a light white patina. 53x28x7 mm (Fig. 6:2)

9. Two fragments of blades broken from proximal and distal edges, with no traces of two-platform core exploitation. Grey, Jurassic flint, with a white patina. 40x22x8 mm (Fig. 7:3, 5).

10. Blade with negative scars only, with no traces of two-platform core exploitation, with a negative butt of the striking platform, with a broken distal edge. Jurassic flint, with a white patina. 40x22x6 mm (Fig. 7:6).

11. Two bladelets broken from distal and proximal edges (inserts?). Chocolate flint, with a light white patina, 15x6x2 mm, 12x7x2 mm (Fig. 7:7-8).

12. Blade with two butts of striking platforms with a fragment of prepared pre-flaking surface. Grey, Cretaceous flint, with a light white patina. 95x17x8 mm.

13. Two flakes. Jurassic and chocolate flint, with a light, white patina. 40x33x5 mm, 15x25x5 mm (Fig. 8:5, 8).

14. Massive rejuvenated blade

15. Massive rejuvenated blade (?) removed from a core with a prepared and rejuvenated platform and prepared platform edge. Jurassic flint with a light, milky patina. 55x40x22 mm (Fig. 6:5).

16. Blade with negative scars only, with distal and proximal edges broken with no traces of two-platform core exploitation. Jurassic flint, with a light milky patina. 36x11x3 mm (Fig. 7:5).

17. Flake with unidirectional negative scars only and cortex on the distal edge. Negative butt of the striking platform with a prepared edge. Chocolate flint, with a milky patina. 25x35x7 mm (Fig. 6:7).

18. Flake with negative scars only with cortex on the side and distal edges, broken from proximal portion. Jurassic flint (?) with a light, milky patina. 41x34x8 mm.

19. Fragment of proximal portion of regular, shortened blade with negative scars only, with no traces of two-platform core exploitation, with a point-like butt of the striking platform and traces of usage on the edges. Jurassic flint with a cream patina. 36x18x4 mm (Fig. 7:6).

20. Fragment of proximal portion of blade with negative scars only with no traces of two-platform core exploitation with a prepared butt of the striking platform. Jurassic flint with a cream patina. 26x18x6 mm (Fig. 8:2).

21. Fragment of proximal portion of a massive flake or blade with a negative, wide butt of the striking platform and negative scars removing the bulb of percussion. Jurassic flint with a light patina. 20x30x10 mm.

22. Flake with negative scars only with the edge butt of the striking platform and cortex on the distal edge. Cretaceous flint with a light, white patina. 22x23x7 mm.

23. Plate-like concretion of grey, Jurassic flint with initial processing. 95x75x40 mm (Fig. 9:1).

24. Micro-blade, slightly bent, with no traces of two-platform core exploitation and a point-like butt of the striking platform. Artefact covered with a strong, grey patina. 23x10x3 mm (Fig. 6:8).

25. Flake with negative scars only and a prepared butt of the striking platform and a fragment of a similar flake. Jurassic flint with a light, grey patina. 29x32x6 mm.

26. Flake with negative scars only, with a strong, grey patina. 22x20x4 mm.

27. Four flint chips. Chocolate and Jurassic flint.

28. Bladelet with traces of two-platform core exploitation, broken from the proximal portion. Jurassic flint. 12x5 mm.

29. Medial portion of blade with negative scars only, with no traces of two-platform core exploitation, straight in cross-section, trapezium in longitudinal section. Jurassic flint, with a cream patina. 22x6 mm (Fig. 7:5).

Artefacts from the lower (older?) level of layer 5 [-80]–[-100]

1. Massive end-scraper, combined with a retouched blade (end-scraper with denticulate retouched edges). End-scarper made from a massive blade, with a high carinated working edge, situated at the end of the semi-product. Grey chert, with a light patina. On the surface there are some preserved remains of orange sediment (loess). 95x45x22 mm. (Fig. 5:1).

2. Blade with negative scars only and no traces of two-platform core exploitation (butt of the striking platform with negative scars only and a clear bulb of percussion) with the initial working edge on the distal surface, with usage traces (?) on the edges. Grey, Jurassic flint with a light, white patina. 84x33x8 mm (Fig. 5:2).

3. Single-platform core for blades, heavily exploited, with flat flaking surface, partially covering the sides, with negative scars of pre-flaking surface of the side and rejuvenating oblique core platforms, transformed into a dihedral burin (?). Dark grey, Jurassic flint with a white patina. 48x32x30 mm. (Fig. 4:1).

4. Double platform core for blades, vestigial with convex flaking surface, covering the sides, with rejuvenated, oblique core platforms, transformed into a high end-scraper with a convex (Aurignacian) working edge and a prepared edge of the striking platform. Jurassic flint with a white patina. 47x40x28 mm. (Fig. 4:2).

5. Massive blade resembling prepared pre-flaking surface, with a high retouch of one proximal edge (retouched blade?). The other edge bears traces of usage retouch. Jurassic flint, with a cream patina. 65x30x13 mm. (Fig. 5:3).

6. Proximal portion of a massive blade, triangular in cross-section and partially cortex, with the butt of the striking platform bearing negative scars only and removed bulb of percussion. Usage retouch present on one edge. Grey-beige, Jurassic flint, partially covered with a patina. 45x30x13 mm (Fig. 4:6).

7. Blade with negative scars only and no traces of two-platform core exploitation, shortened at distal portion. Jurassic flint with a cream patina. 45x13x5 mm (Fig. 4:3).

8. Secondary blade removed from prepared pre-flaking surface, shortened at the distal portion, partially cortex, with the edge butt of the striking platform and usage traces on the edges. Jurassic flint with a cream patina. 53x16x6 mm (Fig. 4:4).

9. Flake with unidirectional negative scars, with the cortex at the distal portion and edge butt of the striking platform. Artefact from the preparation of the surface of the core side (?). Undetermined flint with a strong white patina. 26x23x4 mm.

10. Cortex blade with a single negative scar of the removed blade, shortened at the proximal portion. Jurassic flint with a cream patina. 42x18x5 mm.

11. Blade with no proximal portion, with traces of two-platform core exploitation. Jurassic flint with a grey patina. 45x25x7 mm (Fig. 4:5).

12. Two flakes with negative scars only, with prepared butts of the striking platforms. Jurassic flint with a cream patina. 32x30x5 mm, 19x19x3 mm.

13. Blade with negative scars only and no traces of two-platform core exploitation, broken at the distal and proximal portions, with usage retouch on one edge. Jurassic flint with a grey patina. 51x23x5 mm.

14. Distal portion of a bladelet. Jurassic flint with a white patina (Fig. 4:7).

Analysis of the finds

The analysis of the upper cultural level

On the basis of incomplete documentation (compare above), most of the above-mentioned artefacts occurred in a cluster that was not too compact, on an area of 8 square metres. The raw material composition was diversified. The assemblage consisted of 32 artefacts: 16 objects made from Jurassic flint, 3 objects made from Cretaceous flint, and 10 from chocolate flint. In three cases the identification of the raw material was impossible to determine due to the very thick patina. Taking into consideration the recent discovery of the chocolate flint deposits in the middle part of the Kraków-Częstochowa Upland (Krajcarz *et al.* 2012), it can be assumed that chocolate flint present in the assemblage was obtained from those deposits.

Due to the absence of cores, the method of obtaining the semi-product can be reconstructed on the basis of the analysis of flakes and blades, including technological forms. The blades are characterised by slightly bent longitudinal section, and mostly trapezoid, but also triangular in cross-

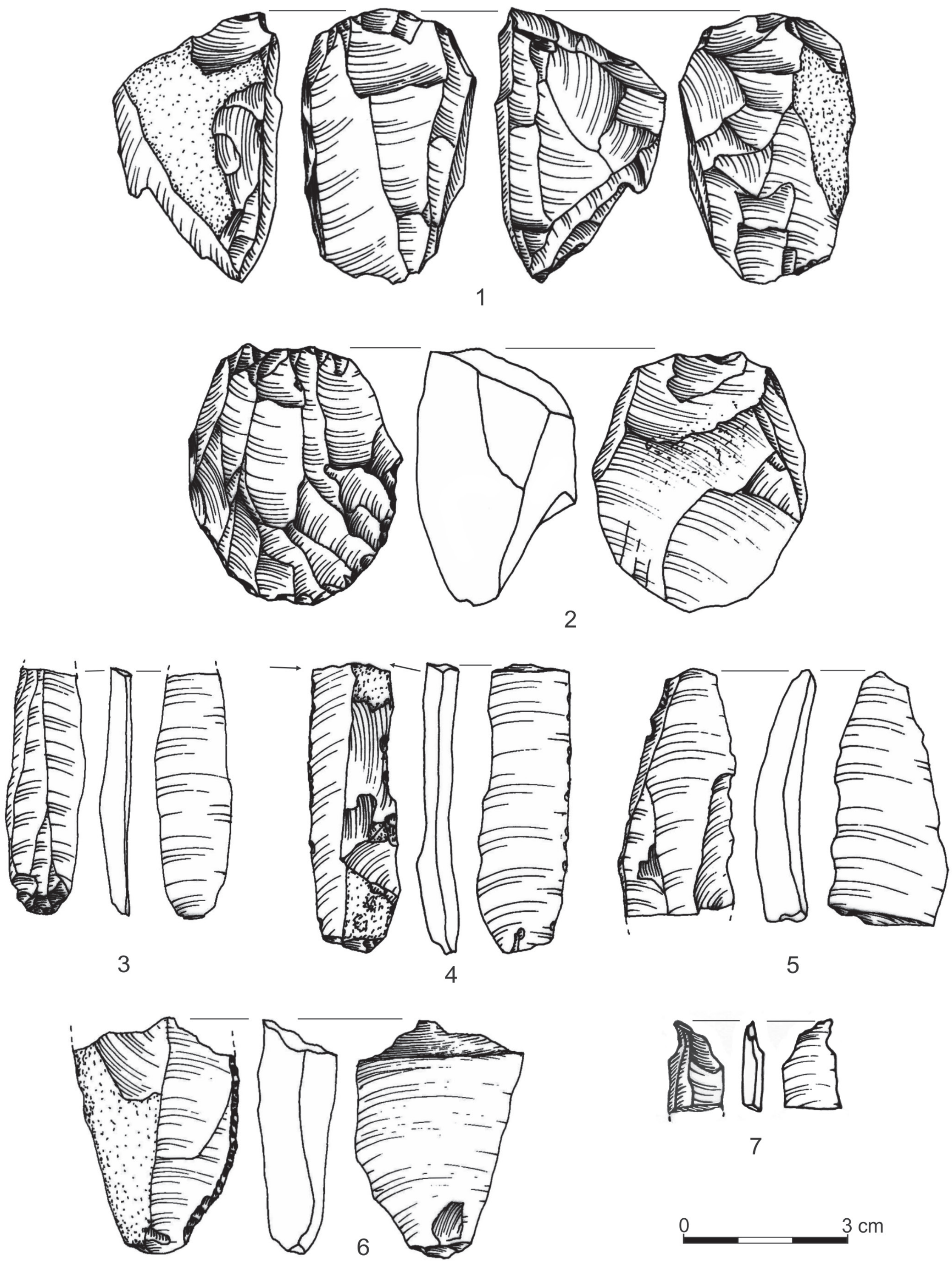

Fig. 4. Birów IV. Older cultural level: 1, 2. cores; 3-5. blades; 6. retouched blade; 7. fragment of a bladelet (drawing by M. Sudoł).

section (Fig. 7:1-6). The butts of the striking platforms are delicate, with negative scars only edge-shaped, with a clear bulb of percussion, which in one case was removed (Fig. 7:1). Out of nine blades, two bear traces of two-platform core exploitation on the dorsal surface. The blades are strongly diversified in metrical terms, including some that are long (117 mm in length) and massive as well as micro-blades. The flakes, present in the assemblage (9 artefacts) consist of usually delicate butts of striking platforms

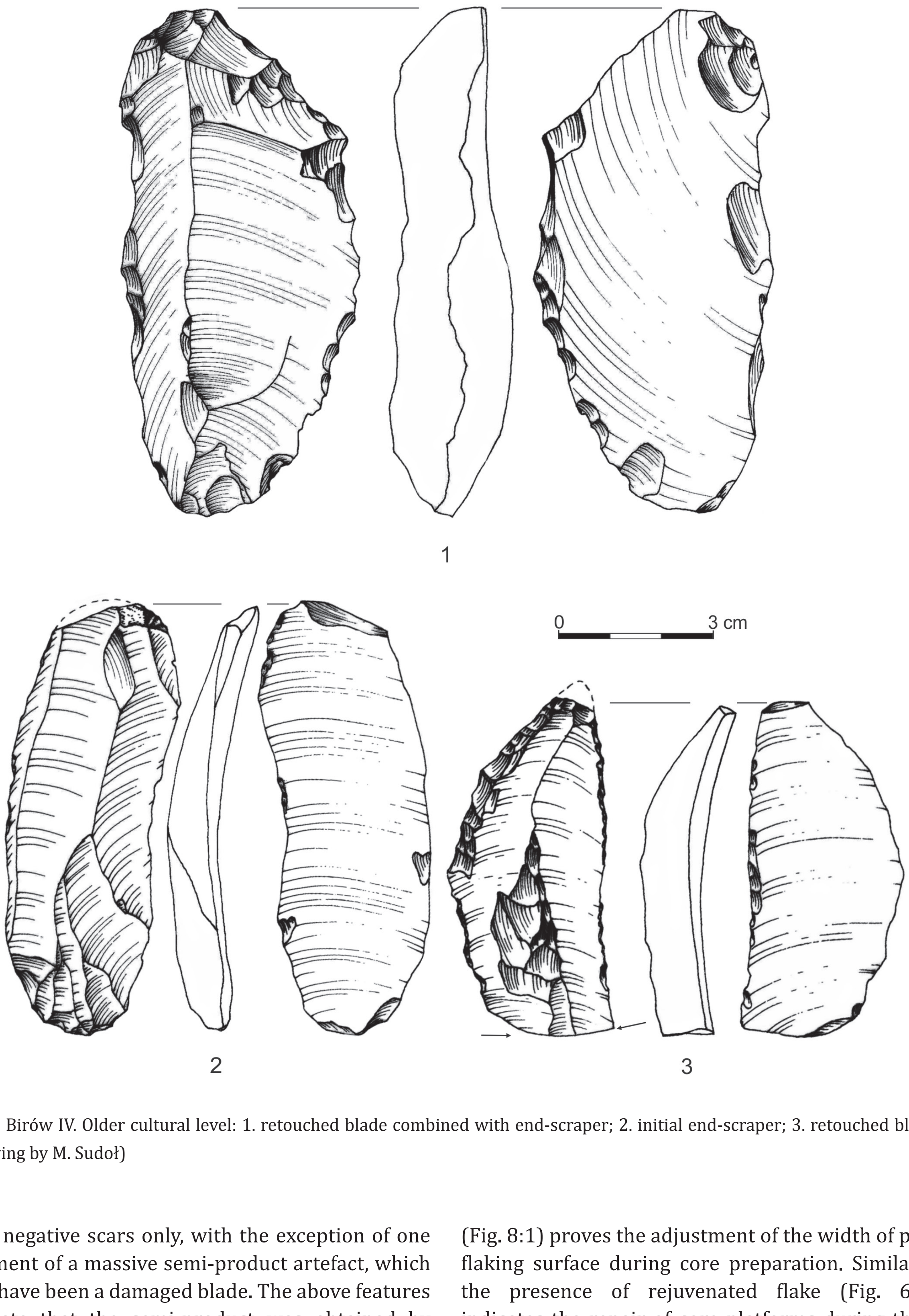

Fig. 5. Birów IV. Older cultural level: 1. retouched blade combined with end-scraper; 2. initial end-scraper; 3. retouched blade (drawing by M. Sudoł)

with negative scars only, with the exception of one fragment of a massive semi-product artefact, which may have been a damaged blade. The above features indicate that the semi-product was obtained by means of an organic initial processing from the double platform cores (in the initial phases of processing) and single platform ones in the later phases of processing. The presence of secondary blades removed from prepared pre-flaking surface (Fig. 8:1) proves the adjustment of the width of pre-flaking surface during core preparation. Similarly, the presence of rejuvenated flake (Fig. 6:5) indicates the repair of core platforms during their exploitation. The size of negative scars on blades and the presence of micro-blades (Fig. 7:7-8) imply that the latter were obtained while striking ordinary blades, without forming special cores designed only for the production of bladelets.

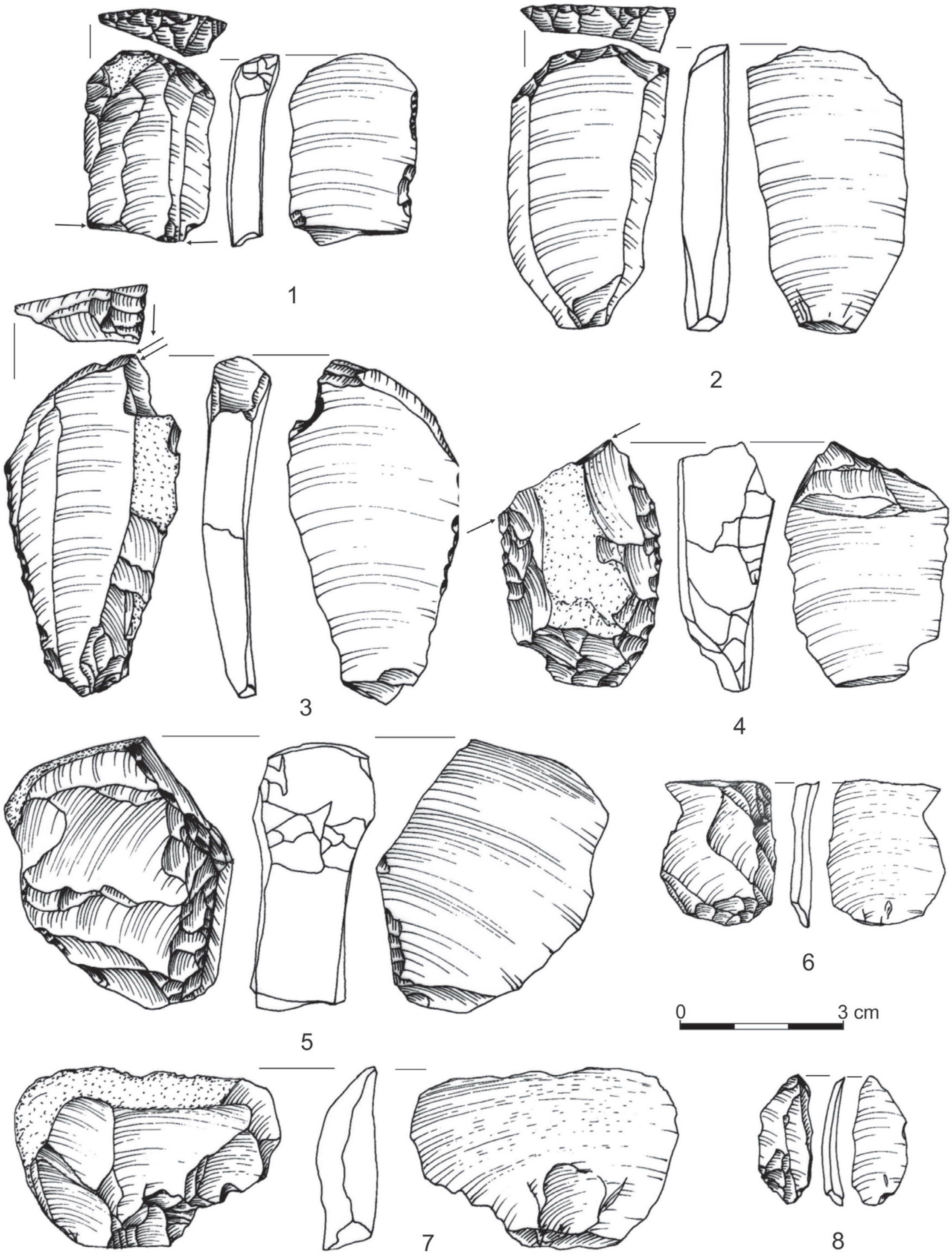

Fig. 6. Birów IV. Younger cultural level: 1, 2. end-scrapers; 3. burin; 4. retouched blade; 5. flake-rejuvenator; 6, 7. flakes; 8. micro-blade (drawing by M. Sudoł).

The analysis of the lower cultural level

Only 15 artefacts were found in an area of several square metres (a more precise determination is impossible to be made), *c.* 25cm thick. All the artefacts (except one) were made of Jurassic flint. They were all covered by an equal layer of white or cream patina, which implies similar post-deposition conditions. One artefact was made from a grey, weakly silicate rock of chert type.

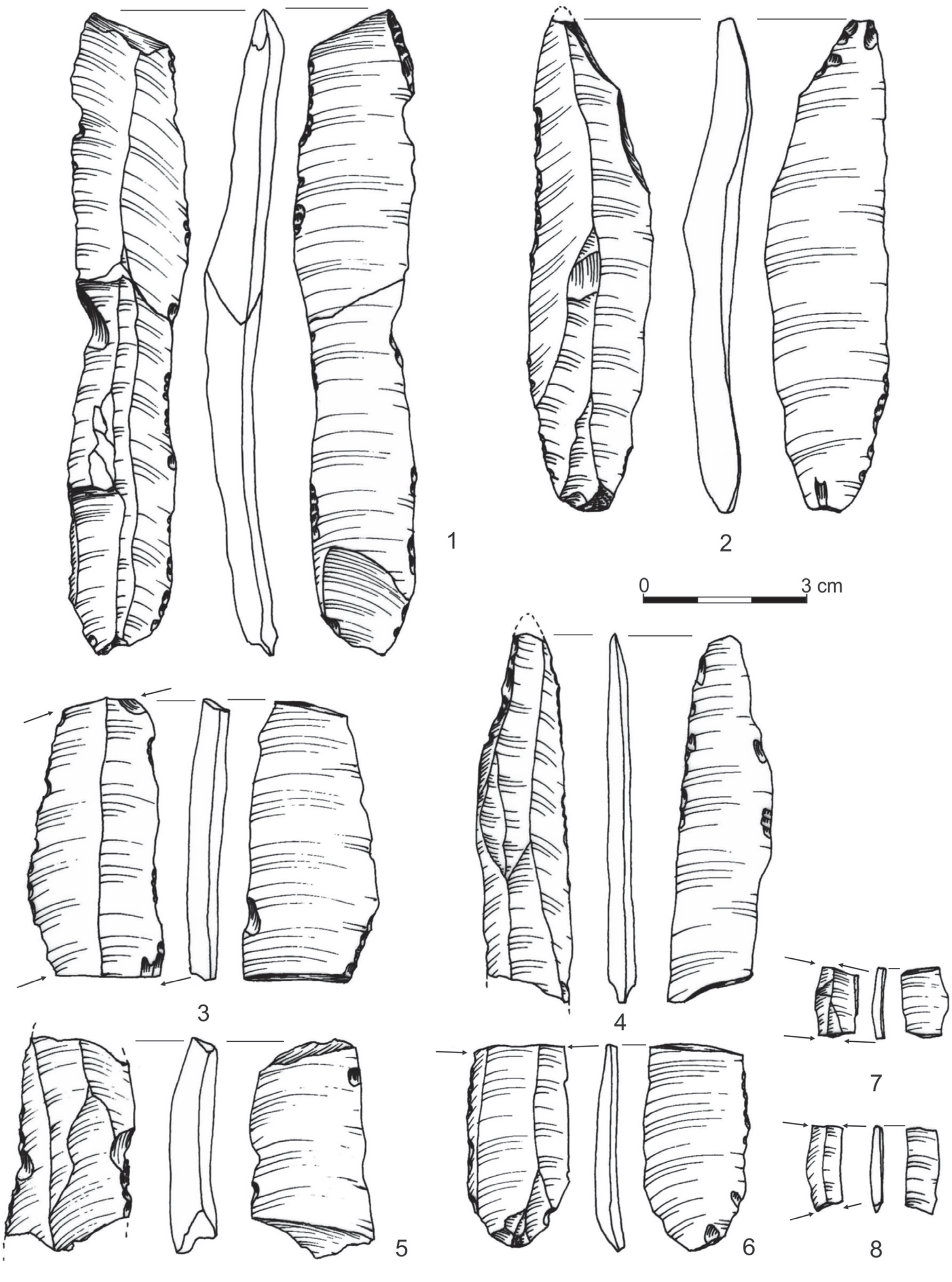

Fig. 7. Birów IV. Younger cultural level: 1-6. retouched blades; 7, 8. micro-blades (drawing by M. Sudoł).

Despite their vestigial character, the presence of two cores (Fig. 4:1-2) enables us to describe the method of removing the cortex and the way the semi-product was obtained. One of the cores bears traces of fragments of negative scars from the flat core preparation of both sides, stemming from pre-flaking the surface or rather proto pre-flaking the surface. Both specimens bear traces of core platform rejuvenation and preparation of core edges. On both cores there are traces of cortex fragments on the back

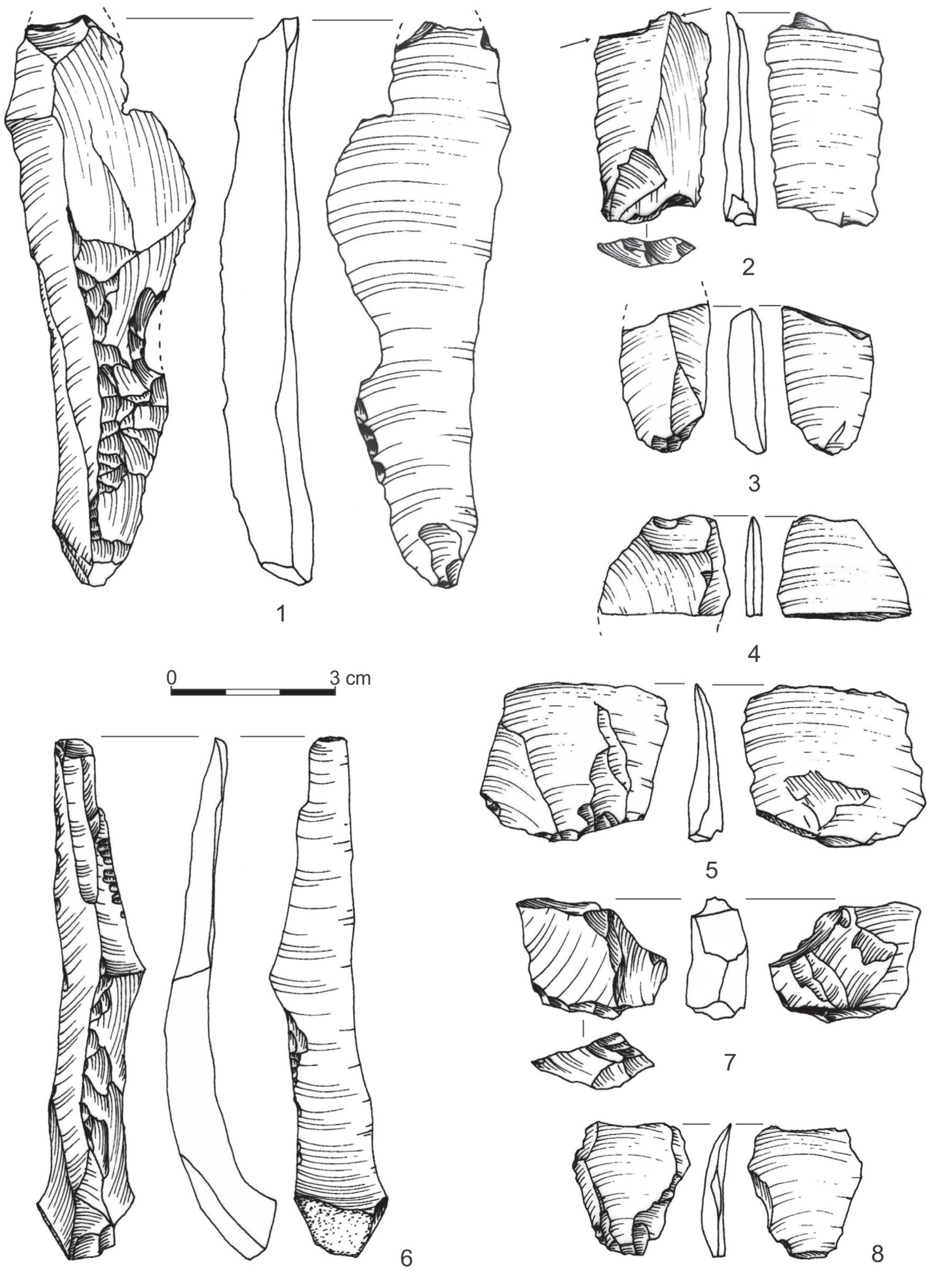

Fig. 8. Birów IV. Younger cultural level: 1, 2. secondary blades from prepared pre-flaking surface; 3-5. fragments of blades; 6-8. flakes (drawing by M. Sudoł).

and side of the artefact. One of them bears traces of flat core preparation on the back of the artefact. In the final stage of exploitation both cores were exploited from one platform. However, there are fragments of negative scars of removed blades struck from clearly formed opposite platforms, which points to the double-platform character of core exploitation or a change of orientation in the earlier phase of

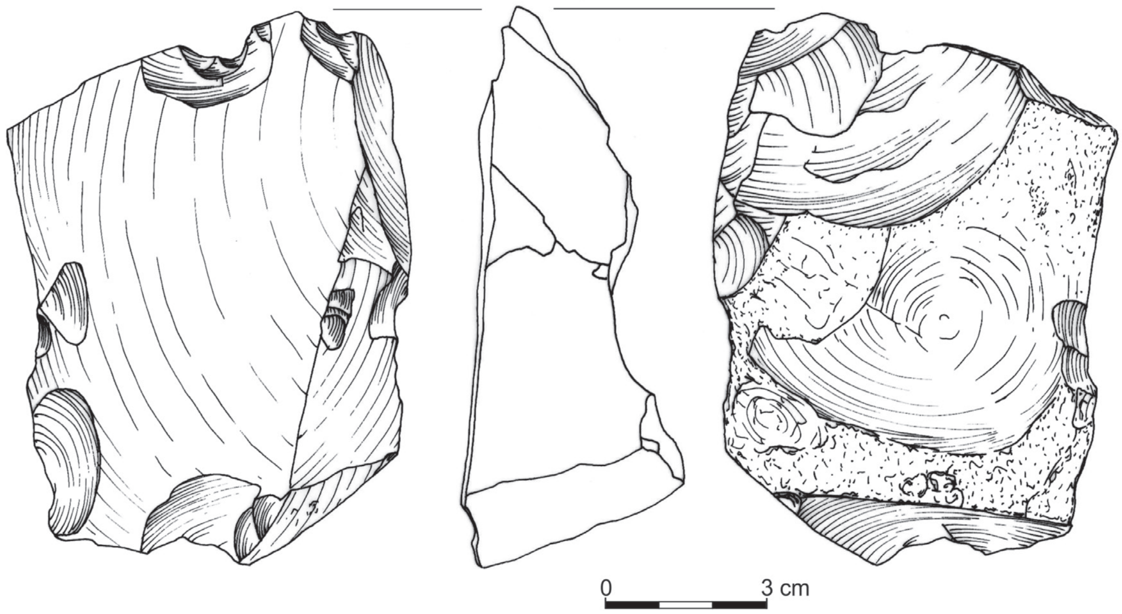

Fig. 9. Birów IV. Younger cultural level. 1. pre-core (drawing by M. Sudoł).

processing. Moreover, both specimens show traces of pre-flaking the surface covering the sides of the core. In one case it is a convex pre-flaking surface, whereas in the other these are two flat pre-flaking surfaces, located on different sides, like in the case of cores with a changed orientation.

Possibly due to their vestigial character, both cores look as if they were transformed into tools. This is more clear in the case of the specimen presented in figure 4: 2, on whose proximal or distal edge, a regular, arched, steep and high working edge was formed with the use of micro-blade negative scars. Its edge was smoothed by the micro-retouch of the edge and highlighted by the negative scars of a flake, previously struck in order to rejuvenate the original core platform. At the same time, the specimen indicates that bladelets were obtained in the final stage of the exploitation of core for blades. In the case of the second core, the acute angle formed between two pre-flaking surfaces resembles the form of dihedral burin with multiple negative scars. The assemblage consists of 8 blades, 7 of which show a significant morphological similarity, based on a straight or slightly bent longitudinal section, a triangular cross section and small butt of striking platform with negative scars only or edge-shaped, accompanied by a faintly discernible bulb of percussion. These features also refer to the largest massive blade (made of a different kind of raw material of the chert type) on which an end-scraper was formed. Negative scars on the dorsal surface are unidirectional; in two cases, negative scars intersect the axis of the artefact. These are traces of secondary blades removed from prepared pre-flaking surfaces. In three cases, the cortex surfaces were preserved. In one case involving a massive, partly cortex blade, the negative butt of the striking platform is accompanied by a negative scar, removing the bulb of percussion. The blades are diversified in size, although their precise description is difficult to be made due to their fragmentary state of preservation. Negative scars on the "core-shaped" end-scraper indicate that in the final phase of the core reduction, bladelets were also obtained.

The flakes found in the assemblage are also characterised by delicate butts of striking platforms and bulbs of percussion. One of them has features of a flake, coming from a flat pre-flaking surface or the side of a core.

The above features, visible both on the negative scars of the blades, preserved on the cores and the semi-product indicate the dominant method of core reduction in order to obtain the blade semi-product. Sides, platforms and possibly pre-flaking surfaces were prepared in the initial stage, although not completely. It seems that during the exploitation, the number and orientation of platforms for blade preparation changed. This means that the same cores were either of single or double platform character, or changed orientation during various phases of processing. During the core exploitation, the edges of specific sides were corrected, as well as the arrises between the negative scars by the formation of short secondary pre-flaking surfaces. This was done with the use of a light hammer and an organic punch.

Summary of both inventories

The reconstruction of core reduction (core preparation)

The description of the cores and semi-product from the older and younger level of artefact occurrence points to their close similarity. As a result, it can be assumed that the process of core preparation during both phases of the cave inhabitation was similar despite some differences in the raw material structure.

The main aim of the core preparation was to obtain blades and bladelets. To this end, the cores were formed from concretions of Jurassic flint (in the younger level one pre-core was found (Fig. 9:1). The cores underwent core preparation, which involved the flat or pre-flaking (edge) preparation of the proto core-flaking surface, sides and back of the core. During core reduction, the shape of the pre-flaking surface was adjusted by forming secondary pre-flaking surfaces on the side edges, which were subsequently removed. On the other hand, the core platforms were mended by striking rejuvenators. During the process of reduction, the same cores became single or double platforms, with modified orientation. It seems that the bladelets were obtained from the cores for blades in the final stage of their exploitation, and while making end-scrapers from the vestigial cores. The size of the blades and bladelets was strongly diversified, depending on the stage of core usage. Reduction was made with the use of an organic punch. All the above features of core preparation are typical of the Aurignacian method of core reduction, found on the site at La Ferrassie (Blades 2009). In all the assemblages distinguished at the site, the methods of core reduction are diversified, and at the same time combined into one cycle of core preparation. The borders between the particular types of cores (one and two-platform, or with changed orientation) are fluid. The blade semi-product is morphologically and metrically diversified. As in Biró w, blades were obtained in the final stages of blade core reduction. They were also made from massive flakes, which was not observed in Biró w (Blades 2009: 186-190). Due to the small number of artefacts, including cores, it is difficult to draw definite conclusions on whether special cores made from small raw material concretions were used in Biró w for the production blades, as was the case in La Ferrassie. Equally diversified cores with similar features occurred in Aurignacian assemblages from Piekary (Sachse-Kozłowska, Kozłowski 2004, Pl. LXXXVI-LXXXIX) or in Zwierzyniec (Jarosińska 2006, Pl. 125-126). Also the keel-shaped character of both cores from the older level in Biró w resembles classical cores from the older phase of the Aurignacian tradition (Djindjian *et al.* 1999).

Typological-stylistic analysis

The Aurignacian character of the assemblage is also indicated by the typological-stylistic description of retouched forms. In the older level, apart from the retouched blades, only two forms can be described as tools. These are: a massive end-scraper combined with a retouched blade (Fig. 5:1) and a keel-shaped end-scraper (Fig. 4:2), which can also be treated as a core for bladelets. Such an interpretation is commonly applied with reference to Aurignacian artefacts in France (Blades 2009: 188). We should also mention the study of core-shaped forms from the Puławska Mountain (Nowak 2015), which indicates that they could have played the role of cores for blades and end-scrapers. Analogous forms can be found in Aurignacian assemblages, such as Zwierzyniec I, w. 4 (Jarocińska 2006, Pl. 127-128) Piekary IIE, I/54 (Sachse-Kozłowska, Kozłowski 2004, Fig. LV: 8 - 10) or the Mamutowa Cave (Chmielewski 1975, Tab. 47: 4). With regard to an end-scraper made from a massive blade, combined with a retouched blade (Fig. 8:1), similar forms occurred in the Mamutowa Cave (Chmielewski 1975, Tab. 47: 1) and the Puławska Mountain (Nowak 2015, Tab. 48: 3).

In the case of the younger cultural layer, both arched end-scrapers (Fig.6:1-2) and a keel-shaped/carinated burin (Fig. 6:3) – typical of the Aurignacian culture (Stefański 2013) – have their equivalents in the Mamutowa Cave, Zwierzyniec, Piekary or the Obłazowa Cave – layer XXII (Valde-Nowak, *at al*. 2003). Other territorial analogies include: the Belgian assemblage from Goyet (Toussaint 2006) with characteristic keel-shaped end-scrapers and burins. Currently, the Biró w micro-blades with removed distal and proximal portions (Fig. 7:7-8) are considered to be a characteristic element of the Aurignacian tradition, such as a retouched blade with a high, steep edge retouch (Fig. 6:4).

The above analogies, technology and the overall shape of artefacts, both from the older and younger cultural level from Birów IV, indicate their link with the Aurignacian tradition (Djindjian *et al.* 1999: 161-180).

Decorated antler

The fragment of a decorated antler is an exceptional find (Fig. 10). Although no zoological analysis has been made, it probably belonged to a reindeer. The proximal part bears traces of primary fracture, whereas the distal section was probably damaged during excavations. The ornament consist of six rows of points, made with the *pointille* technique. The state of preservation of particular rows of the ornament is varied. There are in total 180 densely arranged points/dots. Obviously, it is difficult to determine the function of the fragmentarily preserved object. There are no exact analogies to the artefact. It is important to observe that the *pointille* technique was used in the Upper Palaeolithic, in the Aurignacian, Gravettian and Magdalenian cultures. Due to the Aurignacian character of the flint assemblage, the tradition can be considered as an example of mobile Palaeolithic art. A similar decoration technique was also applied to finds from Blanchard and Lartet (Marshack 1972; Bosiński 1987, Taf. 8) as well as Vogelherd and Geissenklosterle (Bosiński 1987, Taf. 4). However, in all these cases, points/dots have been distributed less densely than on the assemblage from Birów. Nevertheless, there is a striking similarity in the point making technique. The author of the technological-stylistic analysis of the artefact is T. Płonka, who kindly provided the author with the results of his study.

Summary

Due to the small number of artefacts, incomplete documentation of stratigraphy and lack of dating, it is difficult to establish which phase of the Aurignacian tradition the assemblage from Birów belongs to (Djindjian *et al.* 1999). The Gravettian character of the Birów artefacts cannot be completely ruled out, particularly those found in the younger cultural level, which could be suggested by the older radiocarbon date (?).

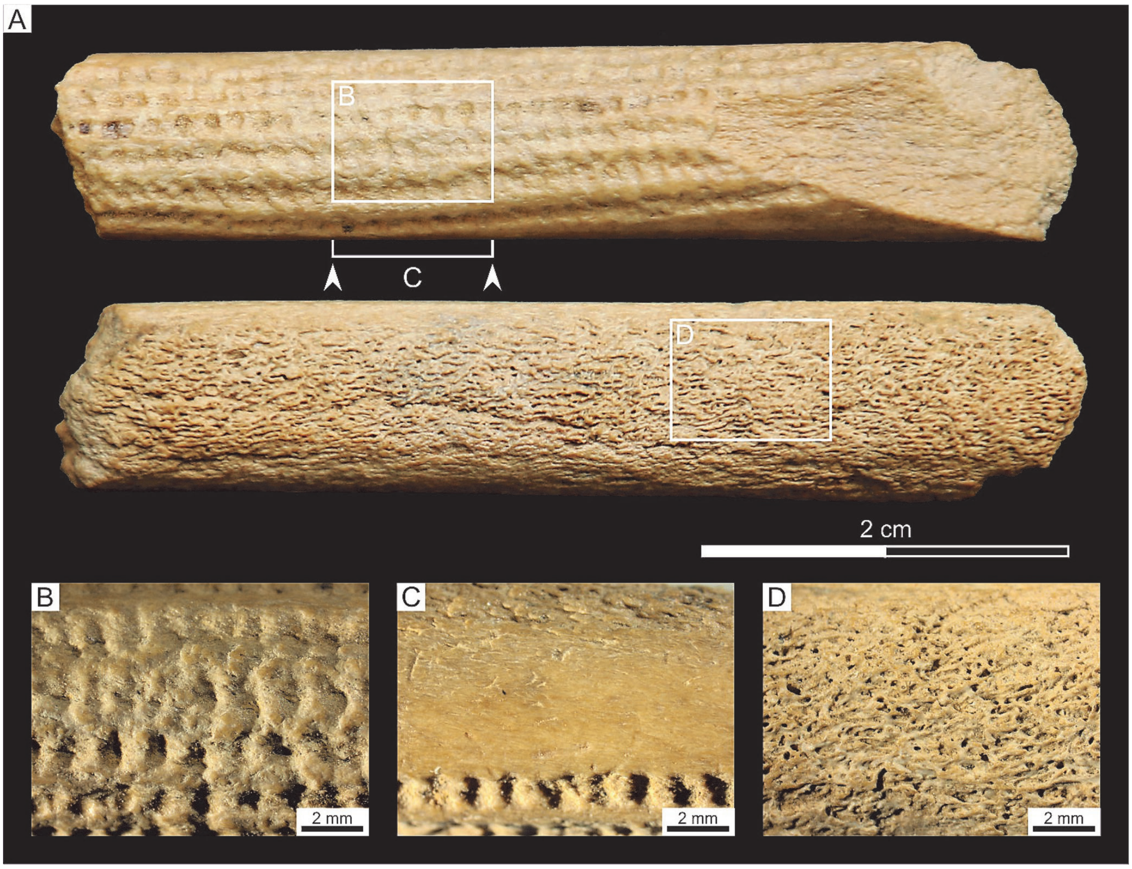

Fig. 10. Birów IV. Younger cultural level: A. decorated antler; B, C, D. magnified fragments (photo by M. Krajcarz).

The planned verification research aims at a more precise determination of stratigraphy and chronology of cultural levels (e.g. by dating of the above mentioned decorated antler), which should enable a more reliable cultural-chronological interpretation of the finds described in the current article. The article was written as part of the National Center for Science project no 2014/15/B/HS3/02472

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