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STARE BARAKI. A NEW MAGDALENIAN SITE IN EASTERN POLAND

ABSTRACT: The site in Stare Baraki is one of more interesting discoveries of the late Palaeolithic settlement in eastern Poland made in recent years. Situated on the boundaries of two physical-geographical macroregions, the Lublin Upland and the Sandomierz Basin, it is one of several settlements on the eastern frontiers of Magdalenian settlement. Materials from Stare Baraki are the first remains of the Magdalenian population uncovered inside the zone of Turonian flint outcrops (of, among others, Świeciechów flint), on the right bank of the Vistula, near Annopol.
Flint artefacts were found during surface surveys conducted in 2018, and were collected on the culmination of the loess plateau (geographical coordinates: N 50°49'0.81", E 22°3'9.77"). A total of 231 flint artefacts were obtained, among which 23 tools were distinguished. Most distinctive in this assemblage are perforators with massive Bec type tips/bits.
Technological analysis of flint materials revealed the use of en éperon preparation and the presence of characteristic spur butts (en éperon) on blades. These are closely connected with the application of a direct percussion technique, using a soft, organic hammer. The technique is typical of Magdalenian flint-working, and was intended to obtain blade blanks.
As regards Stare Baraki, the economic activity was presumably connected with the acquisition of Turonian flints of good quality, which were used to obtain blanks for the production of tools. Additionally, the distinguished, retouched forms included domestic tools, which indicates a more complex functional character of the settlement.
Currently, it is not possible to date the inventory from Stare Baraki accurately. The site should be dated within a broad time period between GS – 2a and GI – 1a, that is the late Magdalenian on Polish lands.

KEY WORDS: Central Europe – Late Palaeolithic settlement – Lithic analysis – Turonian flints

INTRODUCTION

The Magdalenian settlement in the eastern part of Central Europe is of peripheral character and is referred to in literature as the eastern Magdalenian province (Połtowicz-Bobak 2013). From the standpoint of the current state of research into Magdalenian settlement in Central Europe, the areas of eastern and south-eastern Poland constitute the eastern border of the range of this cultural unit (Maier 2015, 2–4, Fig.

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1.2, Bobak, Połtowicz-Bobak 2014, 2018, Połtowicz-Bobak 2013).

The oldest phase of Magdalenian settlement in Poland is associated with the middle Magdalenian, this being well demonstrated by finds from the Maszycka cave (18500 – 17500 cal BP) (Kozłowski *et al.* 2012). The major development and dispersal of Magdalenian settlement both on Polish lands and elsewhere in Central Europe occurred in the late Magdalenian. This falls in the period from the younger part of the Oldest Dryas to the Allerød interstadial (17500 – 13100 cal BP) (GS-2a – GI-1a) (Bobak, Połtowicz-Bobak 2014, Bobak *et al.* 2017).

The eastern frontier of Magdalenian settlement in Central Europe is focused on two rivers: the Vistula (within the Lesser Poland Vistula Gorge) and the San (a tributary of the Vistula) (Połtowicz-Bobak 2013). In almost every instance, Magdalenian sites in this area occur either on loess or loess-like areas. Settlements were established near the rivers, and frequently on exposed terrain (terraces, terrain culminations and hillsides), which was conducive to good observation of at least the immediate vicinity of the site. The geo- and biodiversity near river valleys provided the then human groups with suitable living standards (Maier 2015, Hołub *et al.* 2016).

The new trace of the remains of Magdalenian settlement in eastern Poland is in the administrative borders of the town of Stare Baraki (Zaklików commune, Stalowa Wola district, Podkarpackie province). The site can be found in the records of the Archaeological Map of Poland in sheet 86-76/22-1 (under the name of Salomin). It is located at the boundaries of two physical-geographical macroregions, the Lublin Upland and the Sandomierz Basin. The south-west part of the Lublin Upland, where the site was located, creates a narrow strip of loess, the thickness of which reaches approx. 15 m in places. The edge of the Lublin Upland is dissected by faults, which separate it from the Sandomierz Basin. It is also dissected by denudation valleys, at the bottoms of which young erosional ravines, for instance gorges, are currently developing (Libera *et al.* 1991/1992: 18–19, Kondracki 2009: 284). At a distance of approx. 4 km to the east (within the Lublin Upland) and the south (in the Sandomierz Basin) lies the Karasiówka river valley, and approx. 7 km to the north and west is the Tuczyn river valley. The site is 12 km to the west of the Vistula valley, which is the largest valley in the region. Terrain denivelations between the settlement in question and the bottom of the nearest Karasiówka valley reach as high as 100 m (*Figure 1: 1–3*).

METHODS

Archaeological research at the site was conducted in 2018 as part of the research project financed by the National Science Centre (2014/15/N/HS3/01766). The main purpose of the project was to explore traces of human activity in the period between the Last Glacial Maximum and the beginnings of the Holocene (the Preboreal period), in the western part of the Lublin Upland.

The research centred on the specific structure of activities. In the first place, the available archive data were analysed. On this basis, sites for verification surface surveys were selected. Following the positive outcome of these verifications, reconnaissance excavations were planned and conducted.

The above-mentioned pattern was also implemented at the site in Stare Baraki, which has been known since the mid-1980s. It was discovered during surface surveys conducted in 1985, as part of the Archaeological Map of Poland (AZP). These yielded a double platform core of Gościeradów flint, the chronology of which was determined to be of the late Palaeolithic (Libera 1998: 92–93, 2002: 39).

In the spring of 2018, surface prospecting was conducted, which yielded new flint materials. All artefacts were collected on the culmination of the loess plateau situated at 267 metres above sea level (geographical coordinates: N 50°49'0.81", E 22°3'9.77"). They were tracked with the use of a Garmin GPSMap 64st device, resulting in the creation of a map of artefact distribution. In this way, the surface area of the site was estimated to be approx. 2000 square metres (0.2 hectare).

Due to the fact that numerous finds were discovered on the surface of the site, excavations were conducted in the summer of 2018. As part of these works, samples were collected for specialist analysis (micromorphology, C14 AMS, OSL) (Wiśniewski 2019). The results of excavations and conducted analysis will be presented in a separate publication.

The subject of this study are flint materials from surface surveys conducted in 2018.

MATERIALS

During surface surveys carried out in 2018, a total of 231 flint artefacts were collected, among which the following types were distinguished: seven cores, 65 blades and bladelets, 114 flakes, 16 chips, six pieces of natural debris and 23 retouched forms (*Table 1*).

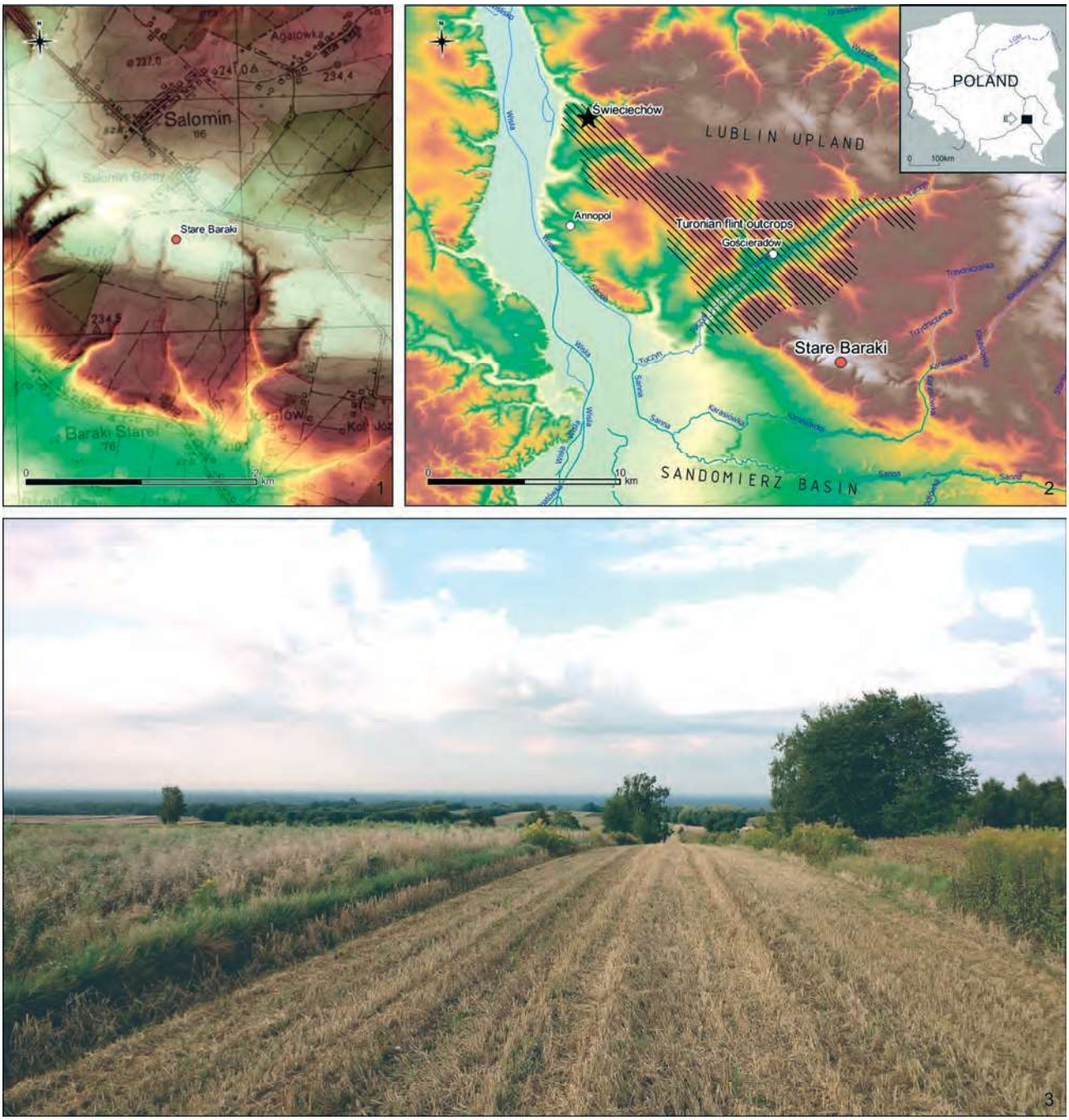

FIGURE 1: Location of the Magdalenian site in Stare Baraki. 1: local position of the site, 2: the site against the background of the occurrence of Turonian flints; black asterisk symbol: the main outcrop of Świeciechów flint in Świeciechów-Poduchowny, 3: the view of the site from the north (based on Szeliga 2014; source of the map: www.geoportal.gov.pl; developed and photo by Author).

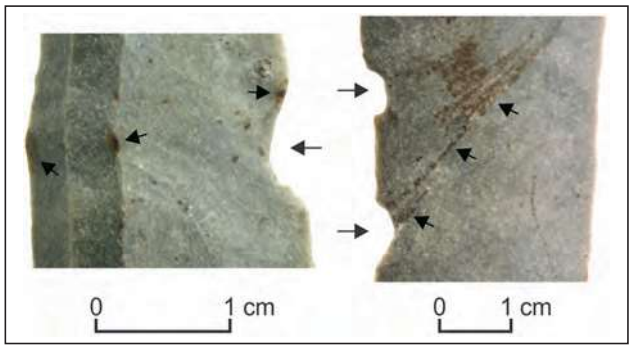

FIGURE 2: Traces of modern damage resulting from field works (mechanical damage, accompanied by rusty discolouration – iron oxide precipitations). Photo by Author.

Nearly all artefacts bear traces of modern damage resulting from field works. The surfaces of artefacts reveal characteristic traces of mechanical damage, accompanied by rusty discolouration. These are iron oxide precipitations resulting from contact between a flint artefact and an iron tool, most likely an element of agricultural machinery (*Figure 2*). In view of this, the careful and selective analysis of retouched forms was carried out, as some modern damage might resemble intentional retouch on the edges of blades or flakes. Only few of them were slightly covered with patina. The vast majority of artefacts in the analysed assemblage were not patinated, which made it more difficult to differentiate between modern damage and intentional retouch. However, it enabled almost complete identification of raw materials used for flint processing.

RAW MATERIALS

In the south-west part of the Lublin Upland, in the area of the Annopol anticline (previously known as the Rachów anticline) and Gościeradów, various types of flint of the Turonian age are found in chalk deposits. These raw materials are technically good-quality rocks, the most well-known variety of which is Świeciechów flint (Balcer 1975: 45–53, Libera, Zakościelna 2002, Szeliga 2014). Grey Turonian rocks occurring in this region are very diverse macroscopically. Several variants can be distinguished, including grey white-dotted flint (Świeciechów flint), grey-spotted flint (Gościeradów flint), plain grey flint and black flint (blackish) (Libera, Zakościelna 2002: 96).

Nearly all above-mentioned types, except for black flint, were distinguished in the inventory from Stare Baraki. In the analysed assemblage they amounted to 84% of the whole raw material structure (*Table 1*). They are now widely available on the surface of the terrain at a distance of approx. 3–5 km to the north-west of the site. The distance between the town of Świeciechów-Poduchowny, where the main outcrop of

TABLE 1: General structure of the inventory.

Categories	Turonian flints			Erratic Cretaceous flint	Undetermined	%	Total
	Świeciechów type	Gościeradów type	plain grey type				
Cores	2	1	3	1	0	3	7
Blades and bladelets	27	14	19	5	1	28.4	66
Cortical	10	4	0	1	0	22.7	15
Crested	1	3	4	0	0	12.1	8
Flakes	21	28	44	18	3	49.1	114
Cortical	11	17	15	10	2	48.2	55
Unidirectional	6	14	19	6	2	39.5	45
Multidirectional	11	13	17	4	2	41.2	47
Removal flakes (tablets) and rejuvenation flakes	1	2	4	0	0	6.1	7
Chips	3	4	9	0	0	6.9	16
Debris	0	1	0	5	0	2.6	6
Retouched forms (tools)	5	7	7	3	1	9.9	23
Total	58	55	82	32	5	100	232

Świeciechów flint was located, and the site is approx. 20 km (*Figure 1: 2*). Apart from grey Turonian raw materials, the inventory included artefacts of erratic Cretaceous flint (13.9%), the occurrence of which was confirmed at a distance of approx. 2 km to the south-east of the site (Libera *et al.* 1991/1992: 25, Fig. 4.). The inventory also includes artefacts of indeterminate raw material (2.2%).

The above-mentioned diversity of Turonian flints is based mostly on macroscopic observation. In the vicinity of the site there is a great number of types of this material. There are numerous examples indicating the occurrence of the said types in one flint concretion. The analysed inventory also includes artefacts, in the silica mass of which one can distinguish both the Świeciechów and Gościeradów variants (*Figure 3: 1a–b*), and a grey type combined with blackish flint (*Figure 3: 2a–b*).

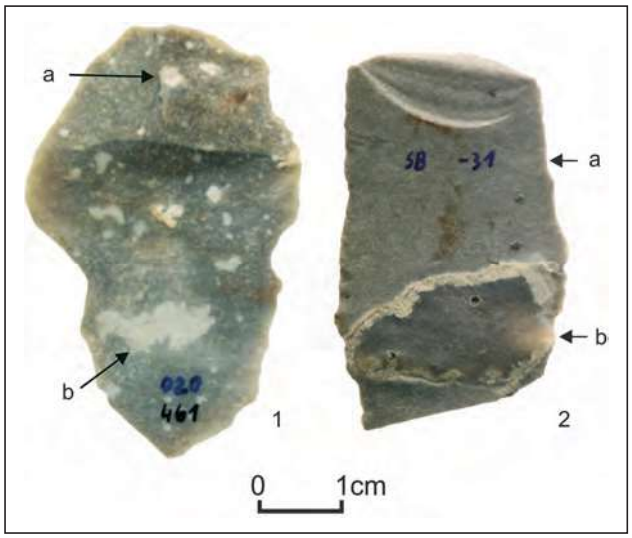

FIGURE 3: Examples of the silica mass of some analysed artefacts. 1a–b: the Świeciechów and Gościeradów flint variants, 2a–b: a grey type combined with blackish flint (Gościeradów type?). Photo by Author.

ARTEFACTS

Cores

Most cores in the analysed inventory were produced from Turonian flints. Only one specimen was made of erratic Cretaceous flint. Among Turonian flints, one can distinguish three specimens of the plain grey variety, two others of the Świeciechów type, and a single one of the Gościeradów type. Raw materials used for the exploitation of cores originated from secondary deposits, the evidence of which are preserved aeolian surfaces and heavily worn-off chalk cortex. The metric data of cores are presented in *Table 2*.

The group of cores is represented by specimens in various stages of core processing (*Table 2*). Most of them are moderately exhausted (four specimens – *Figures 4: 1, 5: 1–3*) and highly exhausted (two specimens – *Figure 4: 2, 6: 1*). The early stage of exploration is represented by the only core made of erratic Cretaceous flint (*Figure 6: 2*).

The most numerous specimens are blade forms (five specimens) and single specimens of flake and

TABLE 2: Data for cores.

Lp.	Raw material	Lenght × width × thickness	Angle	Core types	Blanks	Exploitation stage	Figure
1.	Turonian flint (Świeciechów type)	126×60×78	85°	1p	Blade	Moderately exhausted	4: 1
2.	Turonian flint (Gościeradów type)	83×53×42	76°/85°	2p	Blade-flake	Highly exhausted	4: 2
3.	Turonian flint (plain grey type)	84×58×54	74°	1p	Blade	Moderately exhausted	5: 1
4.	Turonian flint (plain grey type)	114×50×72	73°	1p	Blade	Moderately exhausted	5: 2
5.	Turonian flint (plain grey type)	89×38×52	74°	1p	Blade	Moderately exhausted	5: 3
6.	Turonian flint (Świeciechów type)	64×56×68	75°	1p	Flake	Highly exhausted	6: 1
7.	Erratic Cretaceous flint	92×34×58	86°	1p	Blade	Early	6: 2

blade-flake forms. Predominant are single-platform cores (six specimens). One double-platform specimen was also distinguished (*Table 2*).

Convex flaking surfaces were preserved on most cores, on their narrower sides. One can also distinguish preparation of the sides and rear parts of cores. Traces of striking platform preparation demonstrate that the core angle was modified in order to obtain the right point of percussion (one of the cores forms a refitting with a removal flake (tablet) – *Figure 4: 1.* Core angles of five single platform specimens range between 73°–76°, in one instance being 85°. On a double platform core, the angles are 76° and 86° respectively. On flaking faces one can distinguish negatives of short blades/flakes, usually terminated with a hinged scar. In the distal parts of some cores there are negatives of flakes, the detachment of which was a repair procedure forming the tip of the core and enabling further exploitation of flaking faces.

The above-mentioned observations confirm the advanced degree of exploitation and residual character of most cores from the discussed assemblage. One specimen made of erratic Cretaceous flint differs from them. It is a core with partial preparation of wider sides and back. Unlike other specimens from this collection, there are no traces of a carefully faceted striking platform. The core forms a refitting with a flake on one of the sides. The negative on the core indicates that the flake was detached from it in an uncontrolled way,

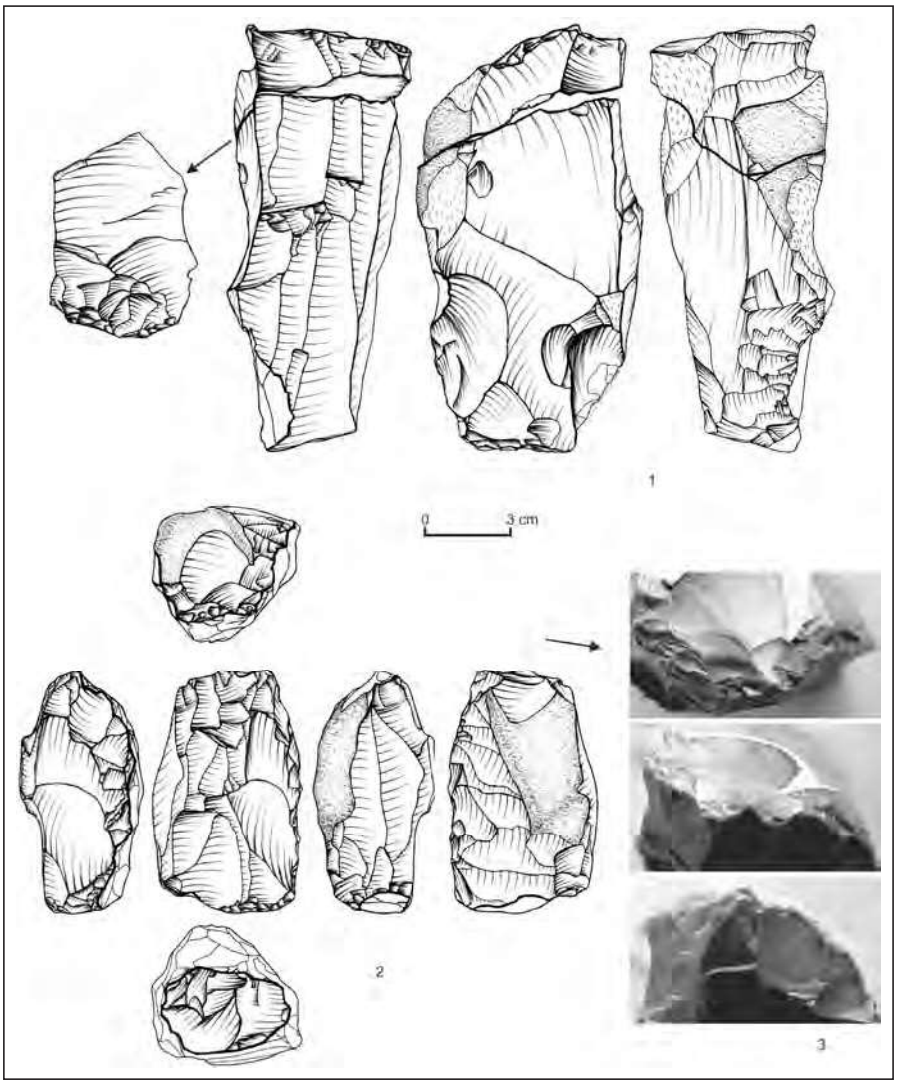

FIGURE 4: Cores. Drawn and photo by Author.

most likely due to the weathering of flint concretion. This may have happened while detaching the blade from a flaking face placed on the narrower side of a core (*Figure 6: 2*). On the blade negative one can observe a marked trace of a bulb, and clear ripples. This, combined with almost complete lack of preparation of the striking platform and a quite large core angle (86° – *Table 2.*) might suggest that, in this case, a direct percussion technique was employed, using a hard hammer, or soft stone hammer (Pelegrin

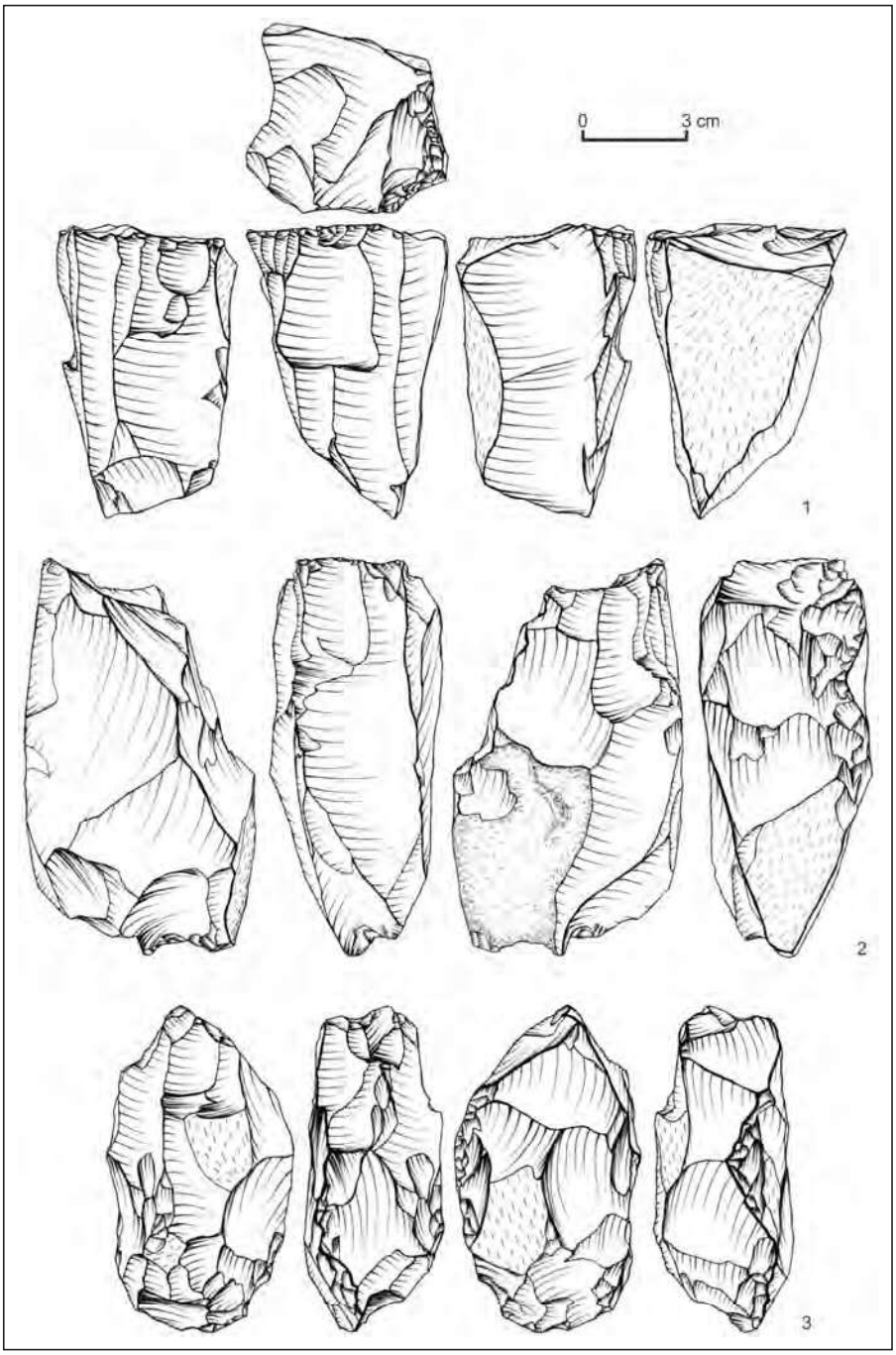

FIGURE 5: Cores. Drawn by Author.

2000). This indicates a different method of raw material detachment in comparison with other cores.

Flakes, chips and debris

A total of 114 flint flakes were distinguished (*Table 1*). Almost half of them (55 specimens – 48.2%) are cortical specimens or have aeolian (natural) surfaces. Flakes with unidirectional (45 specimens – 39.5%) and multi-directional (47 specimens – 41.2%) negative scars on dorsal faces make up almost half of them. Considering numerous and clearly marked bulbar scars, one can assume that a direct percussion technique using a hard hammer was employed for flake removal (Pelegrin 2000: 76).

Most flakes were made of grey Turonian flints (93 specimens – 81.6%), which are predominant in this group. Among the identified specimens were flakes from erratic Cretaceous flint (18 specimens – 15.8%) and indeterminate material (three specimens – 2.6%).

The dimensions of the flake group range as follows: length 7–90 mm, width 9–78 mm, thickness 1.5–22 mm.

In the flake group, seven (6.1%) core rejuvenation products were also distinguished. These are forms chipped off while shaping or modifying the core platform (tablets and rejuvenation flakes).

The inventory also included 16 chips of Turonian flint, five natural chunks of erratic Cretaceous flint and one of Turonian flint (*Table 1*).

Blades and bladelets

The group of blades and bladelets comprises 66 specimens (*Table 1*). The criterion for distinguishing blades and bladelets was the width, which for bladelets is ≤10 mm. Based on this, only four specimens were identified as bladelets, three of which were produced from Turonian flint, and one from erratic Cretaceous flint (*Figures 7-8*) .

In the discussed artefact group, only five complete artefacts were distinguished. The remaining 61 specimens are proximal, medial and distal fragments (*Table 5.*).

The vast majority of blades and bladelets were produced from Turonian flints (60 specimens – 90.9%), and the rest from erratic Cretaceous flint (five specimens – 7.6%). The raw material of one artefact (1.5%) remains undetermined. The Świeciechów variety is predominant among Turonian flints. The share of other types is slightly smaller. Most specimens do not have cortex or aeolian surfaces on their dorsal faces (48 specimens – 73.8%).

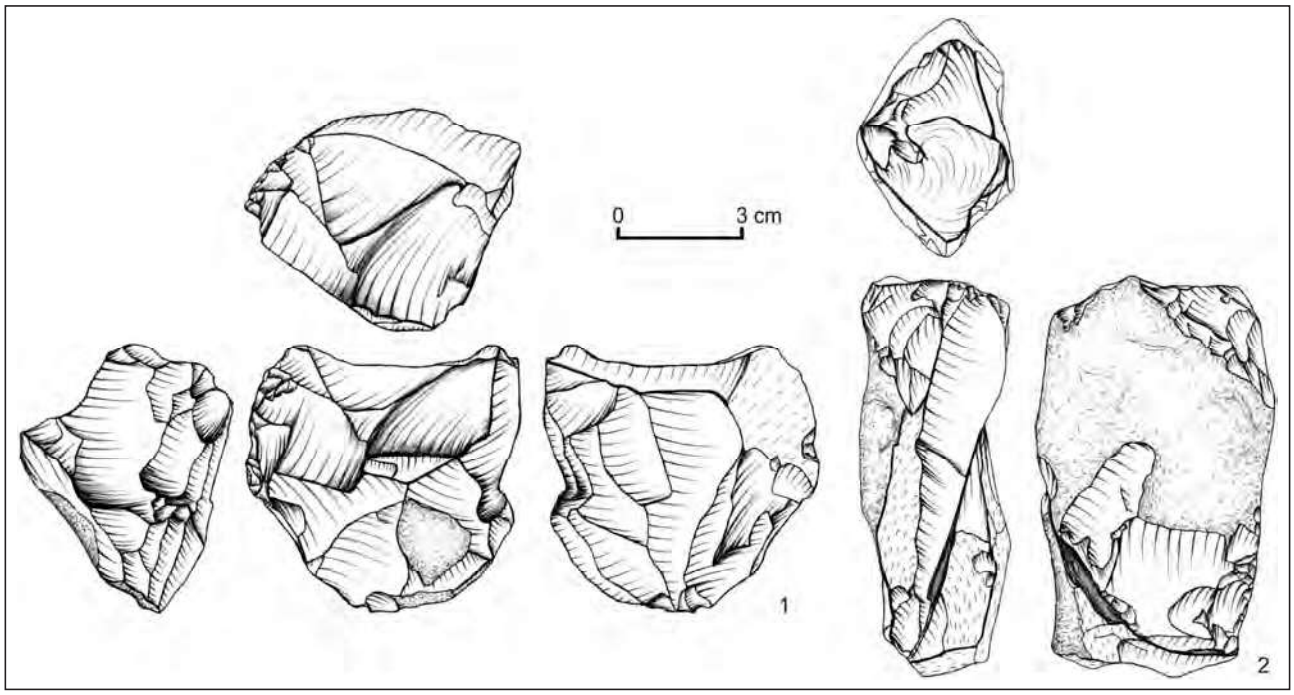

FIGURE 6: Cores. Drawn by Author.

This group also comprises core rejuvenation products, with eight specimens of crested blades (*Figures 7: 7, 10: 1*). They were used for initial core exploitation and introduced correction strikes of the flaking face during advanced core exploitation. All crested blades were produced from different variants of Turonian flints. Four specimens revealed natural and cortical surfaces. Dimensions of all blades and bladelets are presented in *Table 3.*

Tools

The inventory included a total of 23 retouched forms (16 blade and seven flake forms) (*Table 4)*. Most of them are retouched blades (six specimens – 26.1%) (*Figure 6: 1-2*). There are also perforators with massive *Bec* type tips/bits (five specimens – 21.7%) (*Figure 9: 3-6*). Four burins (17.4%) were also distinguished, two of which were produced from flakes and two others from blades (*Figure 10: 1-3*). One specimen made of a massive flake resembling a burin on truncation is particularly conspicuous (*Figure 10: 4*). Another one is also made of a quite large flake, yet due to modern damage it is difficult to determine its type conclusively. Among two-blade burins are a dihedral burin and single-blow burin (*Figure 10: 2, 10: 1*). Retouched forms also included four truncations (17.4%) (*Figure 9: 7-9*),

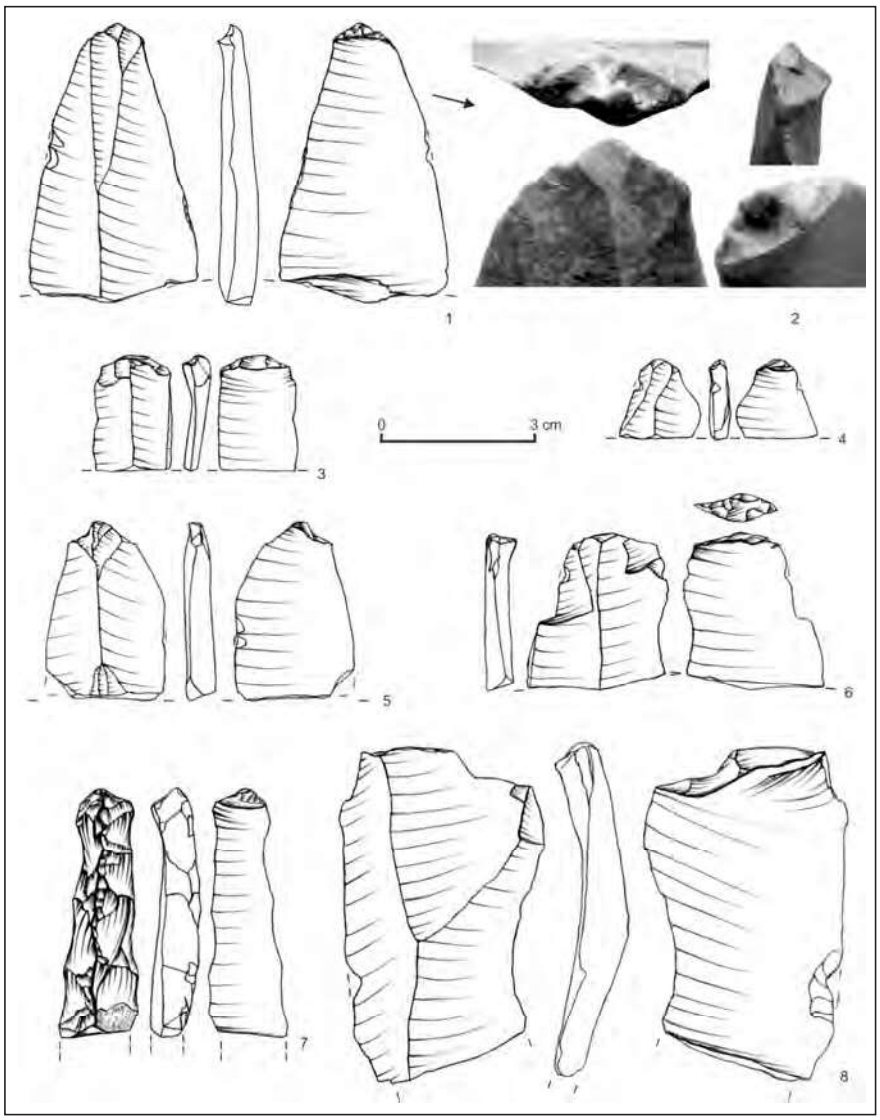

FIGURE 7: Blades. Drawn and photo by Author.

TABLE 3: Dimensions of blades with bladelets and flakes.

Blank	Blades+bladelets	Flakes
Length min.	15	10
Length max.	65	90
Length average.	36.2	38.8
Length stdev.	17.7	17.8
N	**27**	**73**
Width min.	8	9
Width max.	35	113
Width average.	17.6	32
Width stdev.	13.7	14
Thickness min.	1.5	1.5
Thickness max.	12	25
Thickness average.	4.7	6.2
Thickness stdev.	5.9	5.9
N	**34**	**106**

three retouched flakes (13%) and one combined tool, burin + perforator (4.6%) (*Figure 10: 3*).

The vast majority of retouched forms were produced from Turonian flint (82.6%), 13% from erratic Cretaceous flint, and 4.3% were made of indeterminate raw material (*Table 4*).

Blade technology analysis

Technology analysis was carried out for a selected sample consisting of 27 specimens. Only fully preserved blade forms and their proximal parts with butts underwent analysis (*Table 5*). The description scheme of analysed features of blades was based mainly on works by A. Maier (2015) and M. Sørensen (2013, after S. Söderlind 2016). The results of research into the technology of Magdalenian flint-working for sites known from the neighbouring Kielce Upland were also used (Przeździecki *et al.* 2009–2010, Pyżewicz *et al.* 2014).

In the analysed assemblage, 63% of blades display faceted butts (*Figures 7: 6, 8: 1, 5*). They also include characteristic spurr butts (*en éperon*) – *Figure 7: 1-5, 7* – (Surmely, Alix 2005, Pigeot 2004: 67–72). Butts are most often oval/pointed (44.4%) and triangular and irregular (22.2%; 18.5%). In almost half of the assemblage, butts display bulbar scars (51.8%) (*Figure 8: 1, 3*).

On dorsal surfaces, in proximal parts, traces of reduction in the form of pointed negatives or/and hinges were observed in 48.1% of specimens (*e.g. Figures 7: 1, 5, 8: 5)*. No traces were found on 22.2% of artefacts.

Most blades display a characteristic sharp core angle. For the range 70–79° it occurs in 40.7% specimens, and for the range 60–79° it makes up 70.4%. Many blades display a characteristic lip on butts (37%) and slightly marked, diffuse bulbs (66.7%). In 82.5% instances no traces of impact point were observed. Such features on blades and bladelets indicate the application of a direct percussion technique using a soft, organic hammer (Pelegrin 2000: 78). In some instances, a percussion technique with a punch, or both techniques, might have been used at the same time (Pyżewicz *et al.* 2014: 76).

Blades are rather irregular (66.6%), with predominant specimens being slightly bent in the middle (79.2%). Blades with either a twisted (48%) or straight profile (52%) are also quite frequent. Blades, often bent and twisted, were used mostly for the production of tools (burins, perforators, etc.). Simple bladelets, almost absent in the analysed inventory, were used mainly for the production of elements of throwing weapons (backed bladelets) – (Valentin 2008: 16).

TABLE 4: Data for retouched forms.

Categories	Turonian flints Świeciechów type	Gościeradów type	Plain grey type	Erratic Cretaceous flint	Undetermined	%	Total
Retouched blades	1	1	2	1	1	26.1	6
Bec		3	2			21.7	5
Burins	2	1	1			17.4	4
Truncations	1	1	1	1		17.4	4
Retouched flakes	1	1	1			13	3
Combined tool				1		4.3	1
Total	5	7	7	3	1	100	23

The application of the *en éperon* technique was confirmed in 29.6% of instances. The use of this characteristic technique manifests itself in the analysed material. Its traces are clearly visible on blade butts and in the method by which core butts were prepared (*Figure 4: 3)*. As it has already been mentioned, striking platforms were prepared in a way which enabled the shaping of an isolated spur for striking before blade detachment (Pigeot 2004: 69, Fig. 40).

The above-mentioned analysis also revealed what we refer to as inherent *éperon* (11.1%), whereby, upon blade detachment, a form of spur (spur-like) appears on a striking platform of a core without preparation. This spur was used as a percussion point for chipping off the next blade (Maier 2015: 33) (*Figure 7: 8*).

Blades were also detached with a percussion using a soft stone hammer (e.g. made of sandstone). Characteristic scars called *esquillement du bulbe* found on ventral sides of blades constitute another determinant of using this technique (Pelegrin 2000: 79–80) (*Figure 8: 1, 3*). Only 7.4% of analysed blades from the inventory in Stare Baraki bear such traces. Small butts measuring ≤ 5 sq. mm, which make up only 3.7% of the analysed sample, are also associated with

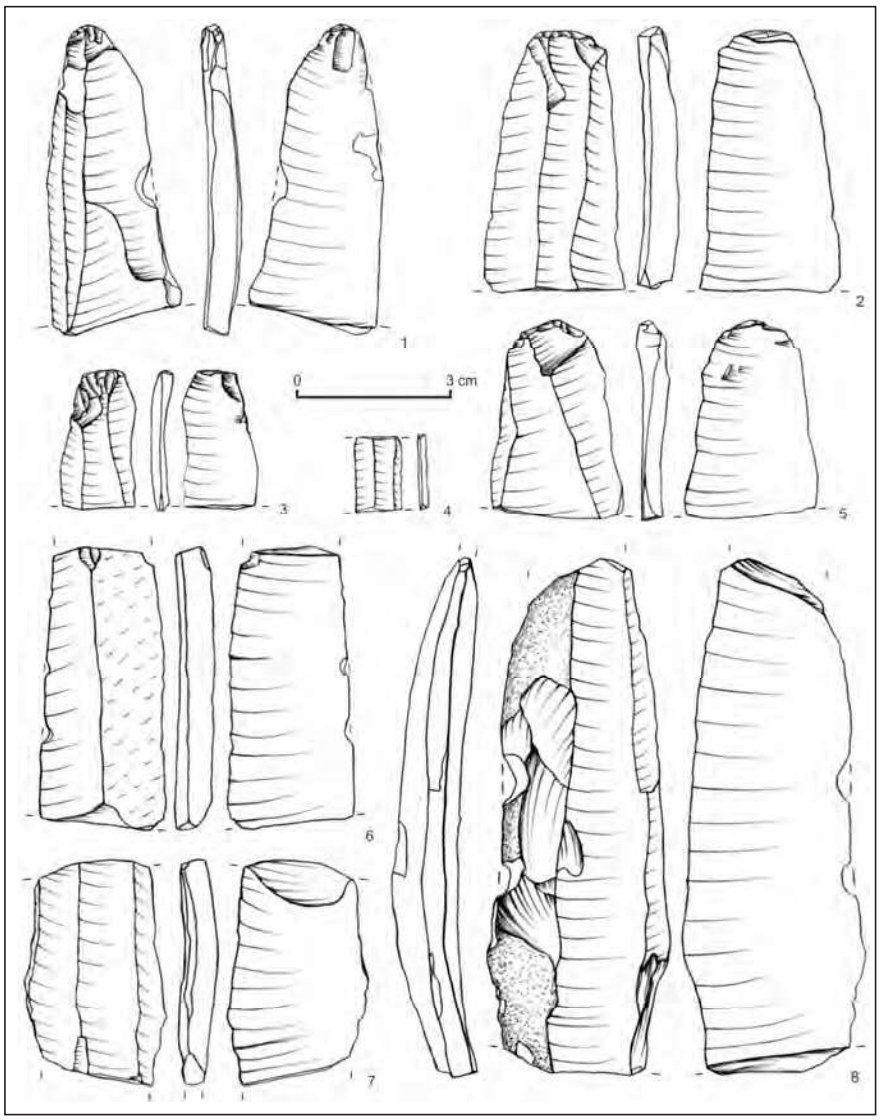

FIGURE 8: Blades (1–3, 5–8) and bladelet (4). Drawn by Author.

TABLE 5: Technological characteristics of the blades.

Features	N	%
Butt: type	**27**	**100**
Cortex	0	0.0
Cleft	1	3.7
Smooth	9	33.3
Faceted	17	63.0
Butt: shape	**27**	**%**
Oval/pointed oval	12	44.4
Linear	0	0.0
Triangular	6	22.2
Rectangular	2	7.4
Irregular	5	18.5
Ventral-sided splintered	2	7.4
Butt: size	**27**	**%**
5 mm^2	1	3.7
6–10 mm^2	5	18.5
11–20 mm^2	7	25.9
21–30 mm^2	6	22.2
> 30 mm^2	8	29.6
Lip	**27**	**%**
Absent	17	63.0
Present	7	25.9
Lateraly marked	3	11.1
Bulb	**27**	**%**
Absent	2	7.4
Diffuse	18	66.7
Marked	6	22.2
Double	1	3.7
Bulbar scar	**27**	**%**
Absent	13	48.1
Present	12	44.4
Multiple	2	7.4
Dorsal reduction	**27**	**%**
None	6	22.2
Pointed negatives	7	25.9
Hinges	6	22.2
Abrasion	1	3.7
Pointed neg. & abrasion	2	7.4
Hinges. & abrasion	2	7.4
Pointed neg. & hinges	2	7.4
Impact point	**27**	**%**
Absent	23	85.2
Present	4	14.8
Flaking angle	**27**	**%**
40–59	4	14.8
60–79	8	29.6
70–79	11	40.7
80–90	4	14.8
esquillement du bulbe	**27**	**%**
Absent	25	92.6
Present	1	3.7
Marked	1	3.7
***en épron* preparation**	**27**	**%**
Absent	16	59.3
Present	8	29.6
Inherently present	3	11.1
Regularity	**27**	**%**
Irregular	18	66.7
Regular	9	33.3
Very regular	0	0.0
Profile	**24**	**%**
Straight	5	20.8
Slightly curved	19	79.2
Heavily curved	0	0.0
Twisting	**25**	**%**
No	13	52.0
Yes	12	48.0
Fragmentation	**66**	**%**
Complete	6	9.1
Proximal	21	31.8
Medial	20	30.3
Distal	19	28.8

this technique (Sano *et al.* 2011: 1476–1477). The only core made of erratic Cretaceous flint also bears features which might relate to the technique.

The technology analysis also included six blade tools. Two of them are partially covered with cortex, butts are most often flat and faceted, specimens have preserved lips, and the majority of bulbs are diffused. No characteristic *esquillement du bulbe* scars have been observed. The aforementioned features indicate that it was mainly an

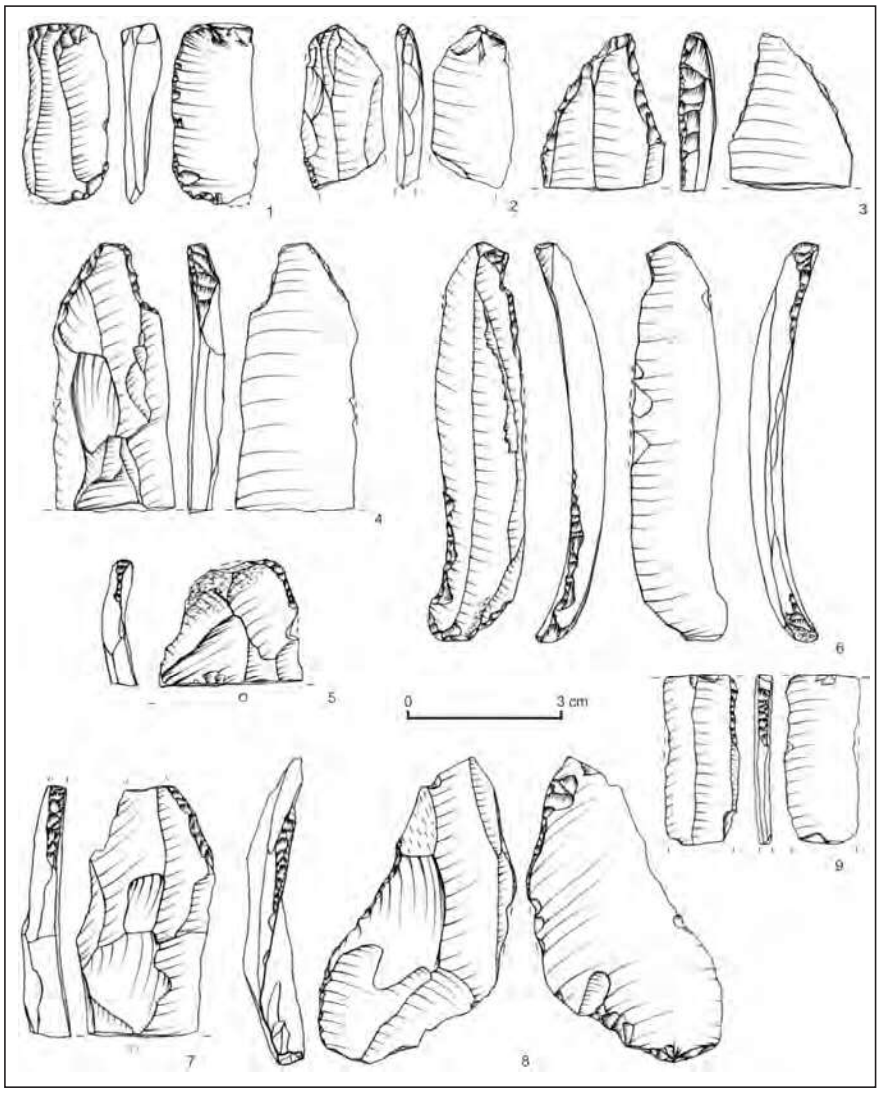

FIGURE 9: Tools. 1–2: retouched blades, 3–6: *becs*, 7–9: truncations. Drawn by Author.

organic hammer that was used to obtain blade blanks for the production of tools in Stare Baraki. Blades were chipped off the core upon careful preparation of the striking platform using the *en éperon* technique, as evidenced by the observations of cores and blade blanks.

DISCUSSION AND CONCLUSION

Based on typological and technological evidence, the presented assemblage of flint artefacts from Stare Baraki should be associated with traces of the population of the Magdalenian culture.

The tool group is the most diverse part of the inventory. Perforators with massive *Bec* type tips/bits seem to be most characteristic in this assemblage (*Figure 9: 3-6*). This also applies to various types of burins and a single combined tool (burin + perforator). The distinguished forms are common elements of Magdalenian tool inventories. Other retouched forms, among which truncations, blades and retouched flakes were distinguished, also have their analogies in Magdalenian inventories (Demars, Laurent 1989, Połtowicz-Bobak 2013, Mayer 2015).

The flint-working technology applied in Stare Baraki was based on the exploitation of single-platform

cores. Almost all of them share some common characteristics (they refer to six specimens made of Turonian flints). These are mainly similar core angles and careful preparation of striking platforms.

Cores from the said assemblage have sharp core angles, in most instances not exceeding 75° (*Table 2*). This value is the approximate upper limit enabling effective detachment of a blade blank using an organic hammer (Maier 2015: 33).

Striking platforms of cores were prepared in a way which enabled the shaping of an isolated spur for striking (*en éperon preparation*) before blade detachment. The use of this technique is associated with detaching blades off the core employing the technique of a soft, organic hammer. It is a typical Magdalenian flint-working procedure aimed at obtaining blade blanks (Valentin, Pigeot 2000: 134, Pelegrin 2000: 78, Pigeot 2004: 67–72, Floss 2012: 384, Pyżewicz *et al.* 2014: 69, Królik 2014: 187, Maier 2015: 33).

The application of this technique was also proven by technology analysis, which was conducted for blades and bladelets. The most characteristic and common element of a blade blank in the said assemblage are *en éperon* spur butts (e.g. Valentin, Pigeot 2000: 134) (*Figure 7: 1–5, 7*). They are tightly connected with the use of *en éperon preparation*. Blades are usually bent in their medial parts and have twisted or straight profiles.

The only core of erratic Cretaceous flint seems to differ slightly from other artefacts (*Figure 6: 2*). This may be a result from the uniqueness of erratic material (small concretions), which was often subject to uncontrollable damage by erosion. However, one can detect characteristics similar to those of other cores, that is a flaking face situated on the narrower side, or the use of the procedure of detaching a flake in the distal part, which was to keep the flaking face in a suitable condition. Some of the features on the core might indicate a different method of raw material detachment

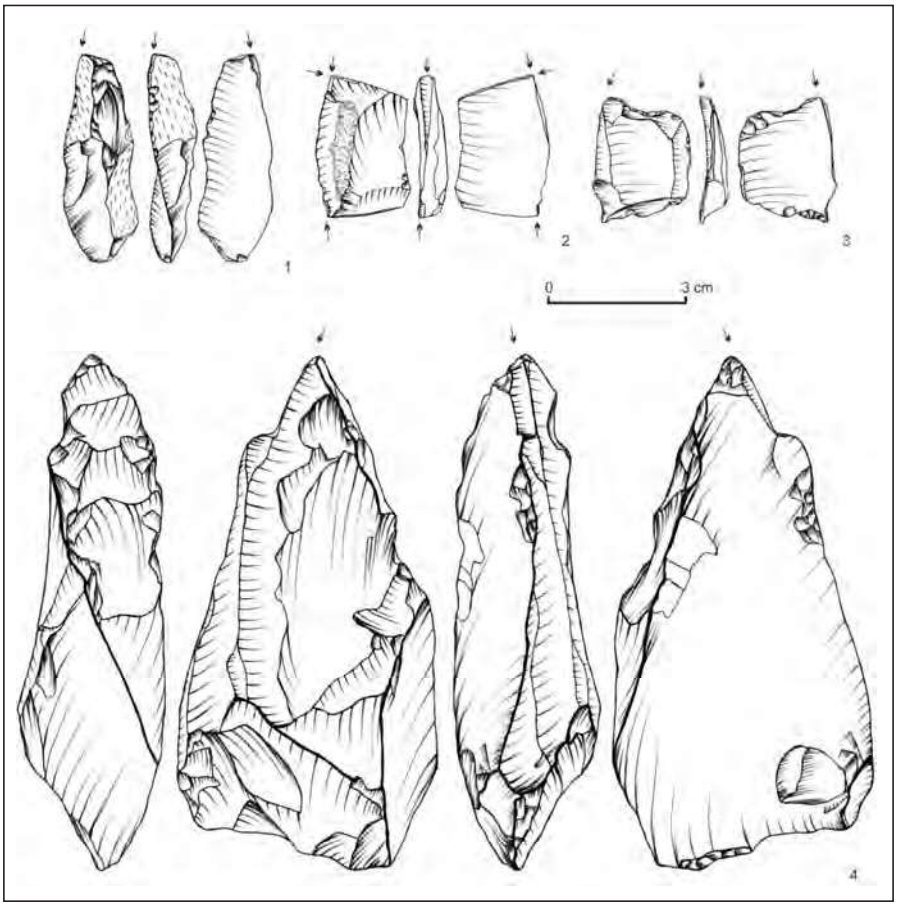

FIGURE 10: Tools. 1–2, 4: burins, 3: combined (burin+perforator). Drawn by Author.

in comparison with other cores. This might have been done with the use of a direct percussion technique with a soft stone hammer (Pelegrin 2000). The use of this procedure has been proven in Magdalenian inventories (e.g. Maier 2015: 27–28, Sano *et al.* 2011: 1476–1477).

The location of the site in Stare Baraki on a plateau guaranteed excellent visibility, particularly when observing the area in the south, towards the Sandomierz Basin. Nowadays, the visibility under average weather conditions might reach even up to 30 km in a straight line (*Figure 11*). Thus, the choice of a well-exposed place was connected with the possibility of controlling a large territory, which certainly enabled the observation not only of game but also of potential threats. The conducive location of the settlement was also connected with a good location relative to flows, which were available within a 4–7 km radius of the site (*Figure 1*).

Materials from Stare Baraki are the first traces of the Magdalenian people situated inside the zone of Turonian flints outcrops on the right Vistula bank near Annopol (*Figure 1: 2*). Among many distinguished sorts of flint, Świeciechów flint (or spotted flint) is most characteristic and was commonly used by the Magdalenian communities. Single artefacts produced from this material were also found at distant Magdalenian sites, in eastern Germany (Ginter 1974: 10, 64) and Moravia (Bednarz 1998, Valoch 2009). The largest share of Świeciechów flint in the raw materials has been noted at sites closest to the outcrop, that is central-east and south-east Poland. The presence of Świeciechów flint has been confirmed at several sites in this region. These are Wilczyce (Schild 2014), Klementowice (Wiśniewski 2015), Podgrodzie, Ćmielów (Przeździecki *et al.* 2009–2010, Pyżewicz *et al.* 2014), Wierzawice (Bobak *et al.* 2017), Łąka (Bobak *et al.* 2014) and Hłomcza (Łanczont *et al.* 2002) (*Figure 12*). These sites vary in size (large and small), function (basic and hunting) and duration of settlement (long-term and short-term).

Based on the available data, the settlement in Stare Baraki can be defined as a flint processing place near the outcrop of Turonian flints of good quality (workshop). Remains of all phases of *chaîne opératoires* flint processing attest to this. Beginning with preliminary preparation (manifested by cortical and preparation specimens), through the stage of obtaining blades, repairing tools (removal of tablets and rejuvenation flakes), to the production of tools. Among 23 tools (retouched forms) are also domestic tools (e.g. *Becs*, retouched blades), which probably suggests a more complex functional character of the settlement (Richter 1990).

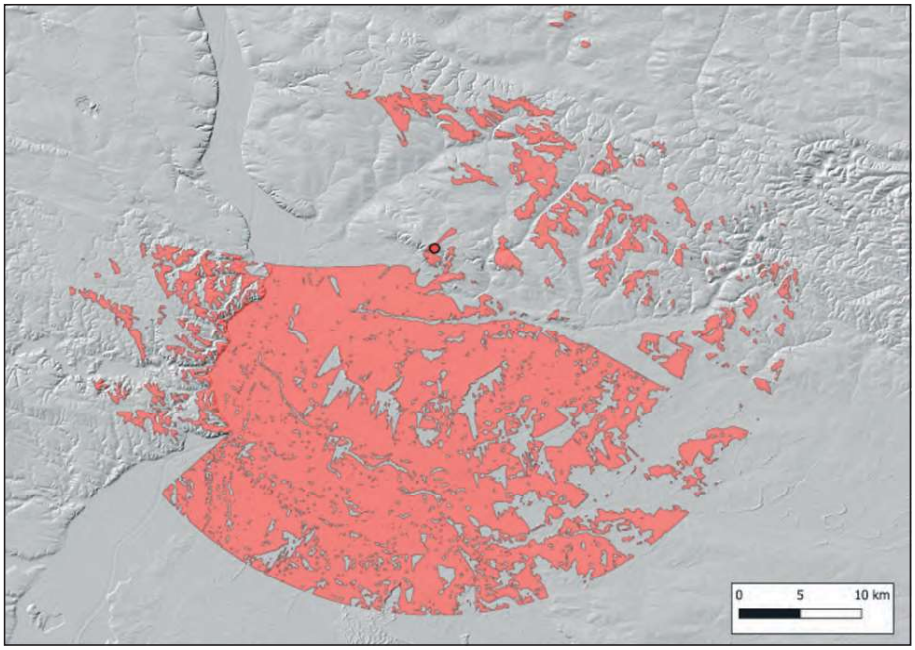

FIGURE 11: The range of visibility from the Magdalenian site in Stare Baraki (edited by M. Jakubczak).

Using radiometric methods, four sites have been dated (*Figure 12*). These are Wilczyce (Schild 2014), Klementowice (Wiśniewski 2015) and Hłomcza (Łanczont *et. al.* 2002), which are associated with Oldest Dryas cooling oscillation (GS – 2a), and Wierzawice, dated to the Allerød interstadial age (GI – 1d–e) and representing the youngest stage of Magdalenian settlement in Polish lands (Bobak *et al.* 2017).

At the moment it is not possible to date the inventory from Stare Baraki precisely, especially as we are dealing only with artefacts collected from the surface. Considering radiometric dating from the above-mentioned Magdalenian sites clustered around the Vistula and San valleys, the inventory from Stare Baraki should be dated to a broad time period between GS – 2a and GI – 1a, that is to the period of the late Magdalenian in the Polish lands (Połtowicz 2013, Bobak, Połtowicz-Bobak 2014).

The site in Stare Baraki has undoubtedly been one of more interesting discoveries of late Palaeolithic settlement in the Lublin Upland in recent years. It is at the same time a new trace of Magdalenian settlement in eastern Poland. On a regional scale it is the second, after Klementowice, Magdalenian culture site in the Lublin

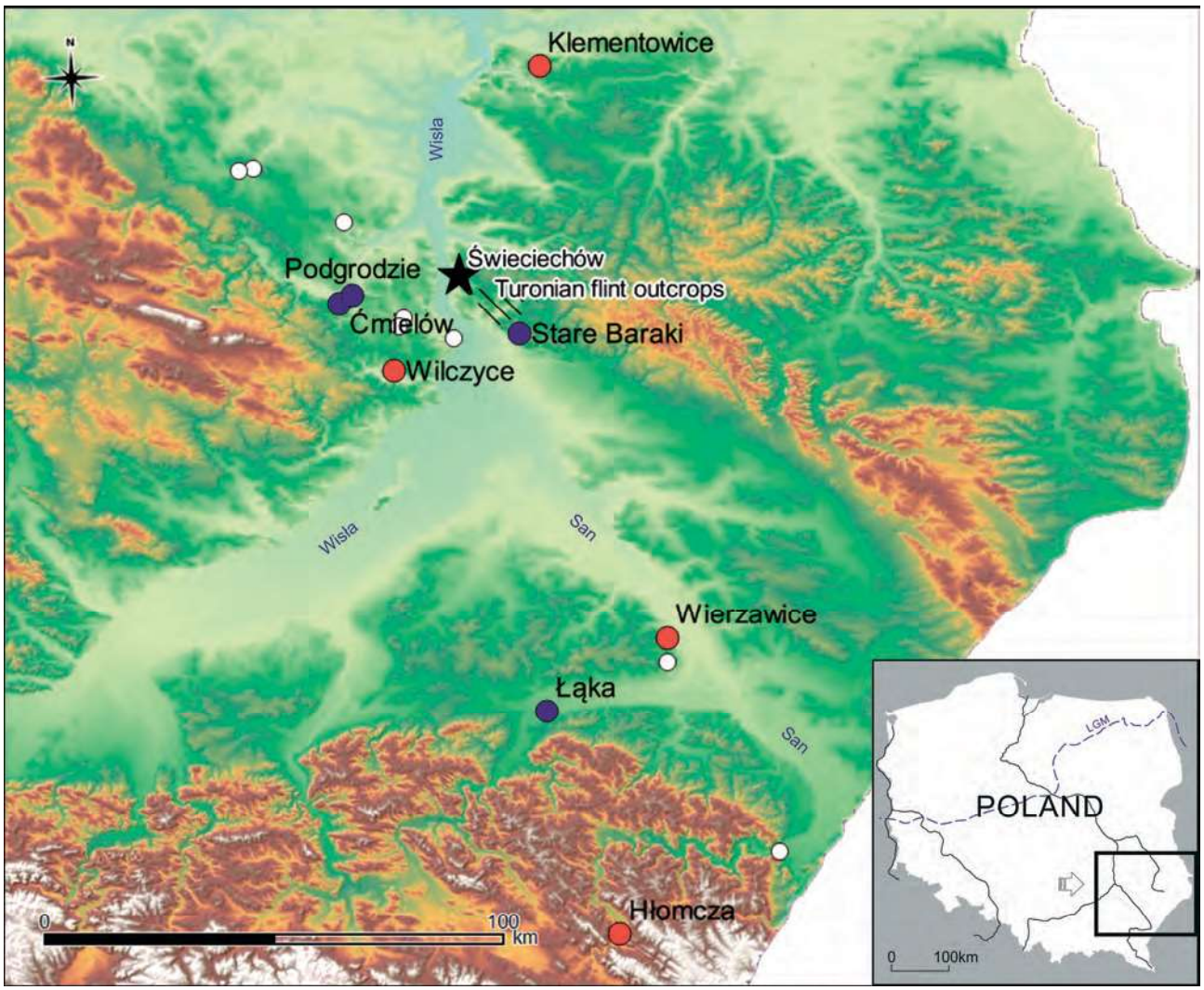

FIGURE 12: Schematic situation on the eastern border of the Magdalenian territory. Red dots: Magdalenian sites with radiometric data and Świeciechów flint; blue dots: Magdalenian sites with Świeciechów flint; white dots: other Magdalenian sites; black asterisk symbol: the main outcrop of Świeciechów flint in Świeciechów-Poduchowny (source of the map: www.geoportal.gov.pl; developed by Author).

Upland. Considering the sites known to date, Stare Baraki is the closest point of Magdalenian settlement in relation to the main outcrop of Turonian flints of the Świeciechów variety (approx. 20 km in a straight line). Currently, natural nodules of Świeciechów flint are found even at a distance of approx. 10 km from the site. Obtaining other varieties of Turonian raw materials of good quality (e.g. Gościeradów flint) is possible even within a radius of 3–5 km from the site.

The areas around the Vistula (within the Lesser Poland Vistula Gorge) and the San (a tributary of the Vistula) seem to form a system of area exploitation, where functionally different centres coexisted (Połtowicz-Bobak 2013: 167). The settlement in Stare Baraki is unquestionably one of the elements forming this system. In this case, economic activity was presumably connected with acquiring Turonian materials of good quality, which were used as blanks for the production of tools.

Discoveries made in Stare Baraki indicate that the question of the peripheral character of Magdalenian settlement in northern and eastern part of the Magdalenian presence on Polish lands, is still unresolved. The insufficient state of research conducted in this area seems to be the main reason why the character of Magdalenian settlement in the eastern part of this area is still undetermined.

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