

TWO METHODS OF BLADE PRODUCTION AMONG ARCH-BACKED POINT GROUPS – A CASE STUDY FROM THE WESTERN POLISH LOWLAND

The purpose of the paper is to investigate the lithic technology of the Arch-Backed Point (ABP) groups. The research consisted of analyses of reduction processes and morphological features of debitage. Until recently, Polish archaeology was dominated by studies which employed the dynamic technological classification, infrequently accompanied by the results of application of refitting methods, mostly related to spatial analyses. Having obtained data on the »chaîne opératoire« of two ABP assemblages by dint of the refitting method, we compared them with each other in order to demonstrate two variants of reduction sequences for blade production.

MATERIALS

The Late Palaeolithic inventories of the ABP technocomplex (*sensu* Burdukiewicz 2011; Schild 1996) that will be compared in this study came from two excavation sites: Świąty Wojciech 7 (Międzyrzecz commune) and Rogalinek 1 (Mosina commune), which are located in the western part of the Polish Lowland (**fig. 1**). The principal toolkits of these assemblages consist of more or less curved backed pieces – the retouch is from one side or may be crossed – and less distinctive tools like truncated blades, end-scrapers, or burins. Unfortunately, there are no hard data to support a detailed identification of the beginning of the settlement. It should be noted that the geomorphological situation resembles those registered at most sites related to ABP groups on the Polish Lowland, in as much as these sites are typically located on sands that rarely provide stratigraphy or context for absolute dating.

The first site, i. e. Świąty Wojciech, is situated on the Zbąszyń Furrow, in the eastern part of the Lubuskie Lake District (Kondracki 2009, 136-137). As regards the micro-regional scale, it is located on a dune strongly elevated above the valley of the Obra River. The slopes of the dune falls lightly toward the east and west. During the years 1997-2006 an area of 1,444m² was excavated. Rescue excavations produced 930 features and almost 40,000 artefacts, including about 11,500 lithic materials. A preliminary analysis has revealed that this area was occupied from the Late Palaeolithic until the medieval period



Fig. 1 Location of Rogalinek 1 and Świąty Wojciech 7 sites. – (Map J. Pyżewicz).

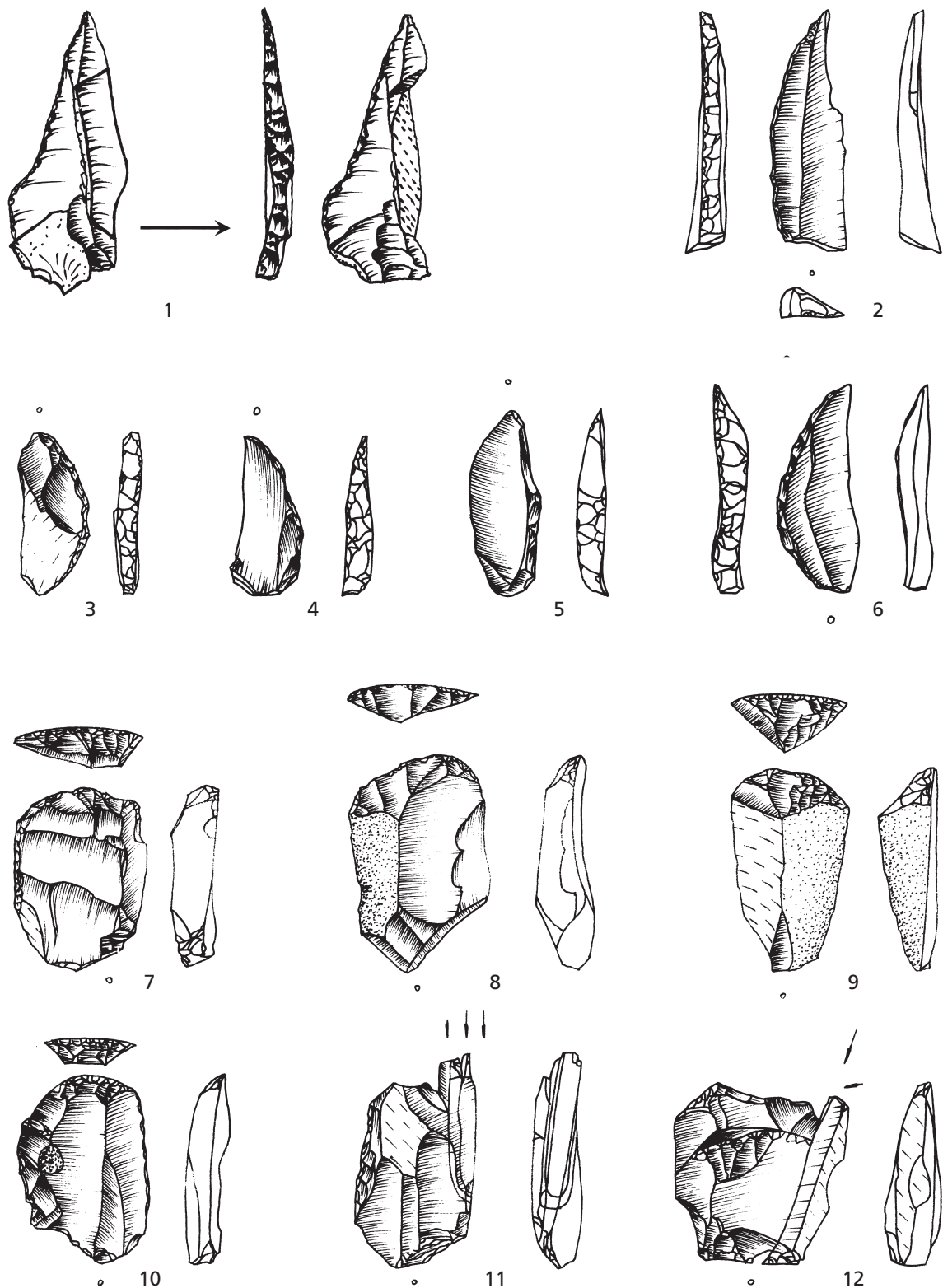


Fig. 2 Lithic tools from Rogalinek 1 (1) and Święty Wojciech 7 (2-12): 1-6 arch-backed points. – 7-10 end-scrapers. – 11-12 refitted burins. – (Drawings K. Pyżewicz, after P. Dmochowski and A. Rakoca). – Scale 1:1.

(Indycka/Łaszkiewicz 2006). The lithic assemblage related to the ABP consists of numerous slender or short arch-backed pieces, short end-scrapers, and dihedral burins, or burins on a truncation (**fig. 2, 2-12**). Debitage pieces, i. e. blades, flakes, crested blades, and cores are the most numerous group in the assemblage. Rogalinek 1, the second site to be discussed here, is located on one of the terraces of the Warta River near Poznań, which is part of the Wielkopolska Lake District on a macro-regional scale (Konracki 2009, 141-142). Over 800 lithic artefacts were collected during field surveys carried out in the early 20th century. The inventory of lithic materials is dominated by flakes, blades, chips, and cores. Almost all the specimens are similar in terms of technology. A few registered tool forms were limited to a backed blade (**fig. 2, 1**), truncated blade and single retouched blades. The refitting process was performed by Piotr Dmochowski, and the results of these studies were published in a separate paper (Dmochowski 2003). In order to better understand the methods of blade production among the ABP groups and to compare them, we endeavoured to reinterpret the refittings.

METHODS

In order to interpret the stages of the »chaîne opératoire«, we combined the refitting method with a morphological analysis of flint materials. We examined the morphological characteristics and macroscopic features associated with the applied technology. We analysed all refitted cores and blades along with artefacts that were similar to refitted pieces in their form and raw material variety. This group comprises almost all flint artefacts collected from Rogalinek 1 (the assemblage being fairly homogeneous) and some lithic materials from Święty Wojciech 7. Since technological and typological analyses of the assemblage from Święty Wojciech have shown that a number of artefacts were related to the Swiderian or post-Palaeolithic groups like Komornica (according to Kozłowski 2009, 354-361), these were excluded from our studies. Our exclusion of Swiderian lithics was based on technological features described in the literature (i. e. Dziewanowski 2006; Fiedorczuk 1992; Gruzdź et al. 2012; Klimek 2006; Migal 2007; Przeździecki 2006; Schild 1969). More problematic was the distinction between the debitage of ABP and Komornica assemblages. Although ABP materials were present in different lithic scatters, we were able to refit some of the Late Palaeolithic tools to the blade reduction sequences. We compared the results to the lithic production strategies identified at other sites related to ABP groups.

RESULTS

The characteristics of the lithic materials from both sites clearly show them to be the remains of flint workshops, where flint knappers were focused on the detachment of blades and the production of tools. All phases, starting from preparing cores, through detaching blades and repairing processes, to the production of tools are confirmed by the refitted blocks.

All flint artefacts collected from the two mentioned sites were made from local varieties of Baltic erratic flint. The most common raw material in the Polish Lowland, erratic flint occurs in secondary deposits of the postglacial formations and is characterised by a relatively poor quality compared with the mined raw material from the south of Poland (Dmochowski 2006; Król/Migaszewski 2009). It seems that the similarities in the location of both flint workshops might have resulted from the potential lithic raw materials sources located in the vicinity.

Technological features		Rogalinek 1	Święty Wojciech 7
		number of analysed blades = 100 (100 %)	number of analysed blades = 182 (100 %)
Dorsal blade faces	cortex	3 (3.0 %)	1 (0.5 %)
	two (one cortex)	20 (20.0 %)	4 (2.2 %)
	three (one cortex)	27 (27 %)	3 (1.6 %)
	two	12 (12 %)	24 (13.2 %)
	three	8 (8 %)	25 (13.2 %)
	multiplied	27 (27 %)	117 (64.3 %)
	bilaterally crested blade	0 (0 %)	2 (1.1 %)
	two (one with scars of previous crest)	3 (3 %)	4 (2.2 %)
	three (one with scars of previous crest)	0 (0 %)	2 (1.1 %)
	two (one-sided cortex, one-sided crestring)	0 (0 %)	0 (0.0 %)
	two (one-sided crestring and trimming)	0 (0 %)	1 (0.5 %)
Blade termination	straight	45 (45 %)	104 (57.1 %)
	feathered	20 (20 %)	41 (22.5 %)
	plunging	6 (6 %)	5 (2.7 %)
	hinged	18 (18 %)	28 (15.4 %)
	lack of	11 (11 %)	4 (2.2 %)
Blade profile	straight	56 (56 %)	60 (33.0 %)
	slightly curved	34 (34 %)	115 (63.2 %)
	heavily curved	6 (6 %)	2 (1.1 %)
	lack of	4 (4 %)	5 (2.7 %)
Regularity	slightly regular	100 (100 %)	100 (100 %)
	extremely regular	0 (0 %)	0 (0.0 %)
Butt	cortical/natural	14 (14 %)	9 (4.9 %)
	plain	11 (11 %)	112 (61.5 %)
	dihedral	1 (1 %)	6 (3.3 %)
	facetted	46 (46 %)	27 (14.8 %)
	winged	0 (0 %)	6 (3.3 %)
	spur/»en éperon«	0 (0 %)	0 (0.0 %)
	linear	8 (8 %)	11 (6.0 %)
	punctiform	12 (12 %)	10 (5.5 %)
	none	8 (8 %)	1 (0.5 %)
Bulb	diffuse	32 (32 %)	54 (29.7 %)
	slightly marked	21 (21 %)	32 (17.6 %)
	pronounced	34 (34 %)	92 (50.5 %)
	double	3 (3 %)	4 (2.2 %)
	»esquillements du bulbe«	11 (11 %)	13 (7.1 %)
	»érailure«/bulb scar	75 (75 %)	125 (68.7 %)
Lip	slightly pronounced	50 (50 %)	172 (94.5 %)
	pronounced	50 (50 %)	0 (0.0 %)
Flaking angle	>90°	2 (2 %)	5 (2.7 %)
	90°	24 (24 %)	19 (10.4 %)
	71-89°	17 (17 %)	134 (73.6 %)
	<70°	51 (51 %)	8 (4.4 %)
	lack of	6 (6 %)	16 (8.8 %)
Blade preparation	unprepared	16 (16 %)	26 (14.2 %)
	abrasion/trimming	81 (81 %)	156 (85.7 %)
	lack of	3 (3 %)	0 (0.0 %)

Tab. 1 Rogalinek 1 and Święty Wojciech 7. Technological characteristics of the blades.

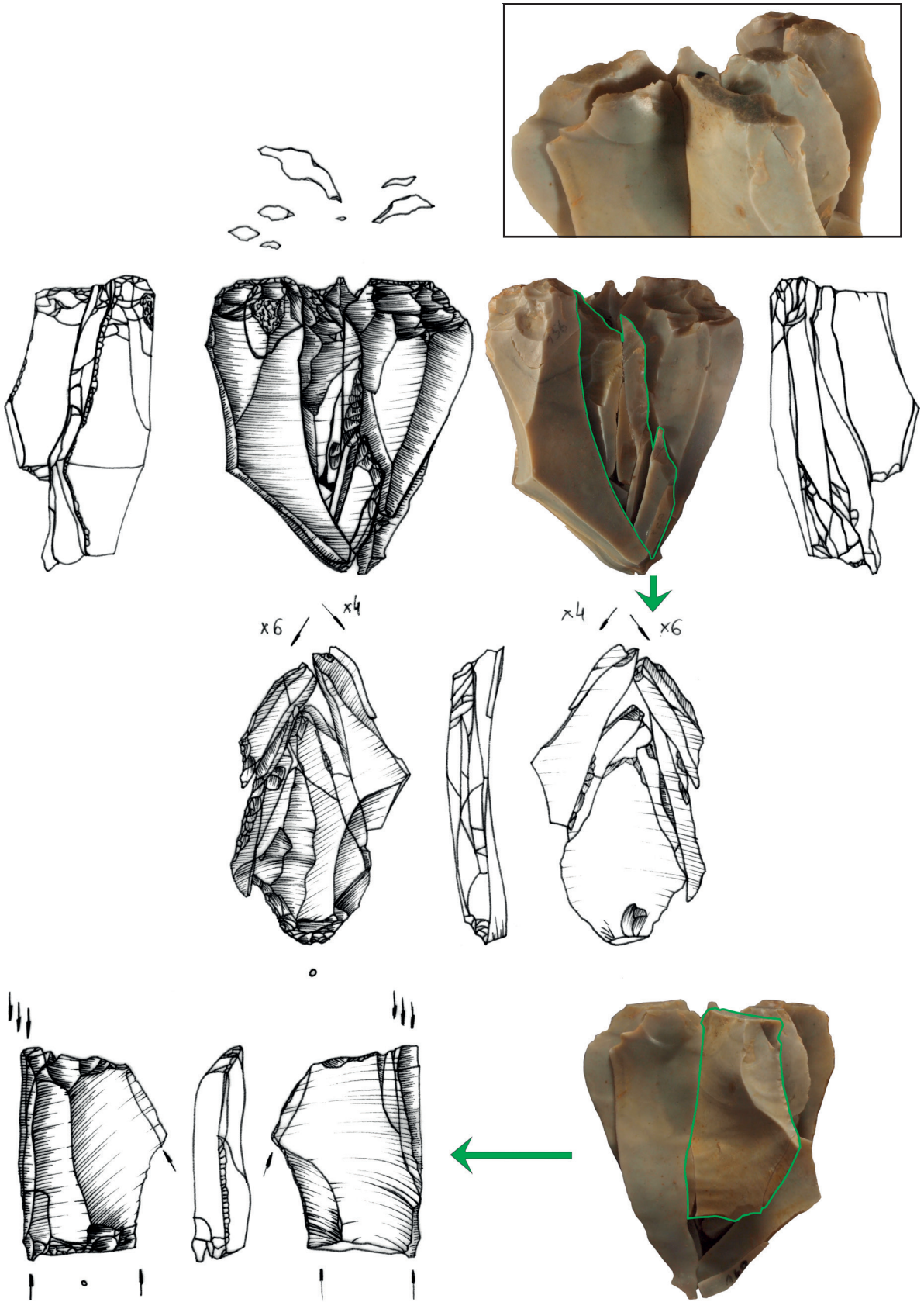


Fig. 3 Święty Wojciech 7. Refitted block, representing the first method of blade reduction (with plain butts). – (Drawings K. Pyżewicz, after P. Dmochowski; photos W. Gruzdź). – Scale 1:1.

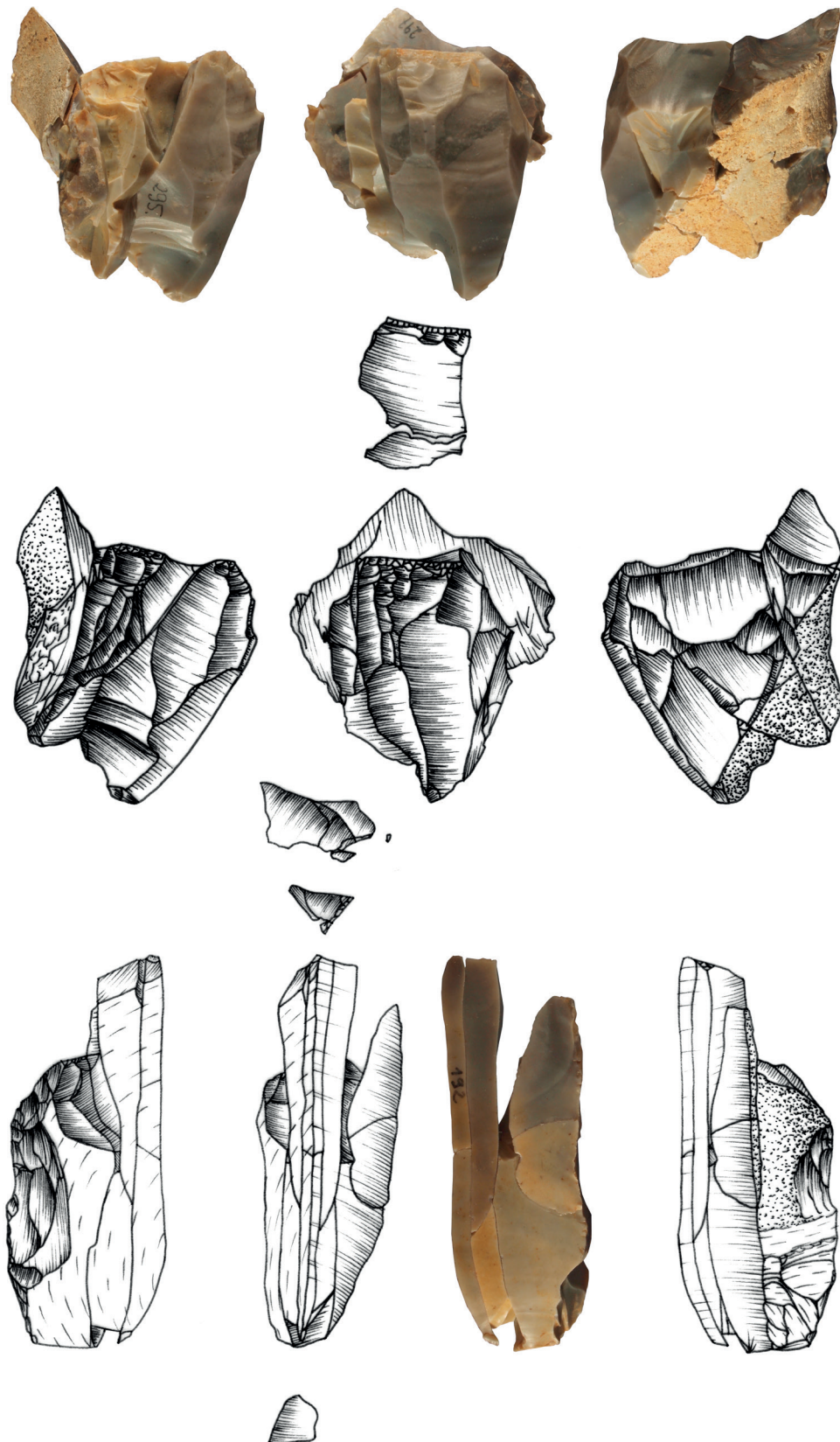


Fig. 4 Święty Wojciech 7. Refitted block, representing the first method of blade reduction (with plain butts). – (Drawings K. Pyżewicz, after P. Dmochowski; photos W. Gruzdź). – Scale 1:1.

Our technological studies (**tab. 1**) have identified two methods of blade reduction in the analysed lithic assemblages. The strategies were based on direct percussion techniques with a soft or hard hammer stone and blade detachment from single platform cores or cores with changed orientation.

The first method is represented by lithics from Świąty Wojciech 7 (**figs 3-4**). Characteristic features here include amorphous and massive cores and debitage products, but no advanced core preparation – this is mostly limited to the preparation of one or two striking platforms, with traces of reorientation. Occasionally, the core platform was isolated by facetting. Most of the blades' butts are plain, and striking platforms are covered by negatives of one or two flakes – facetting scars were rarely observed. Usually big butts, well pronounced bulbs with a frequent appearance of bulbar scars, lips, »esquillements du bulbe«, and radial striations demonstrate a preference for direct percussion with a hammer stone. The features mentioned above, especially the frequency of blades with »esquillements du bulbe« and lip, may also suggest use of a soft stone hammer. What seems also to be characteristic of this method is obtaining blades by applying a flaking angle of 80° or even c. 90°. These types of products were removed in both the early and advanced phases of debitage.

The method of blade production employed at Świąty Wojciech can be considered as relatively simple, i. e. undemanding in terms of a high level of knapping skills and know-how. The first flakes detached from the nodules were massive and formed a platform with an acute flaking angle. Next, the cortex blades were removed from the working face of the core. There are some crested blades in the materials, albeit not many; it therefore seems reasonable to conjecture that the cresting procedure was not frequently used. Most of the blades from the advanced stage of debitage were massive and thick. We refitted some of the blades with blanks from the Świąty Wojciech site that were reshaped into burins. These burins were probably extensively used at the campsite, a lot of them having been reshaped on site. In the last stage of detachment, blade cores were typically turned into flake cores.

The second method was aimed at producing blanks by soft stone percussion. Lithic artefacts indicating the use of this method were noticed in the inventory of Rogalinek 1 (**figs 5-6**). The blades from this assemblage are more regular and slender in comparison with the artefacts from Świąty Wojciech. Typical for the analysed blades is the frequent occurrence of the facetting procedure. The traces of this special isolation of a platform can be noticed in both the initial and advanced stages of reduction. However, single pieces show no traces of this procedure (natural, punctiform, or linear butts). Bulbs of the analysed blanks are not as well pronounced as in the case of the assemblage from Świąty Wojciech 7. We have also noticed a higher frequency of more pronounced lips and a more acute flaking angle. At the same time the presence of bulb scars, »esquillements du bulbe«, and radial striations may indicate the same type of toolkit as in the production of blanks at the Świąty Wojciech 7 site.

Based on the refitted blocks from Rogalinek 1, we can conclude that the first stage of the »chaîne opératoire« was heavily dependent on the natural shape of the nodule. We have not noticed any special procedures related to cresting. Only in some cases was a rejuvenation of striking platforms carried out. It should be noted that the frequently applied facetting procedure resulted in a precise application of force. Thereby the obtained products of debitage from Rogalinek are slender and not as massive as blanks from the Świąty Wojciech 7 assemblage. Although the first cortex blades in the analysed assemblage are massive and frequently exhibit a plunging termination, we believe it to have been a possibly intentional procedure applied in order to cope with a nodule's natural irregularity and at the same time aimed at shaping a more acute angle between the negative of a plunging blade and the core platform. On the level of advanced blade detachment, the blanks removed were sometimes similar to flakes – their morphology was still determined by the shape of the individual nodules. The last stages of the »chaîne opératoire« could have ended with the change of core orientation, once further detachment from one striking platform became impossible.

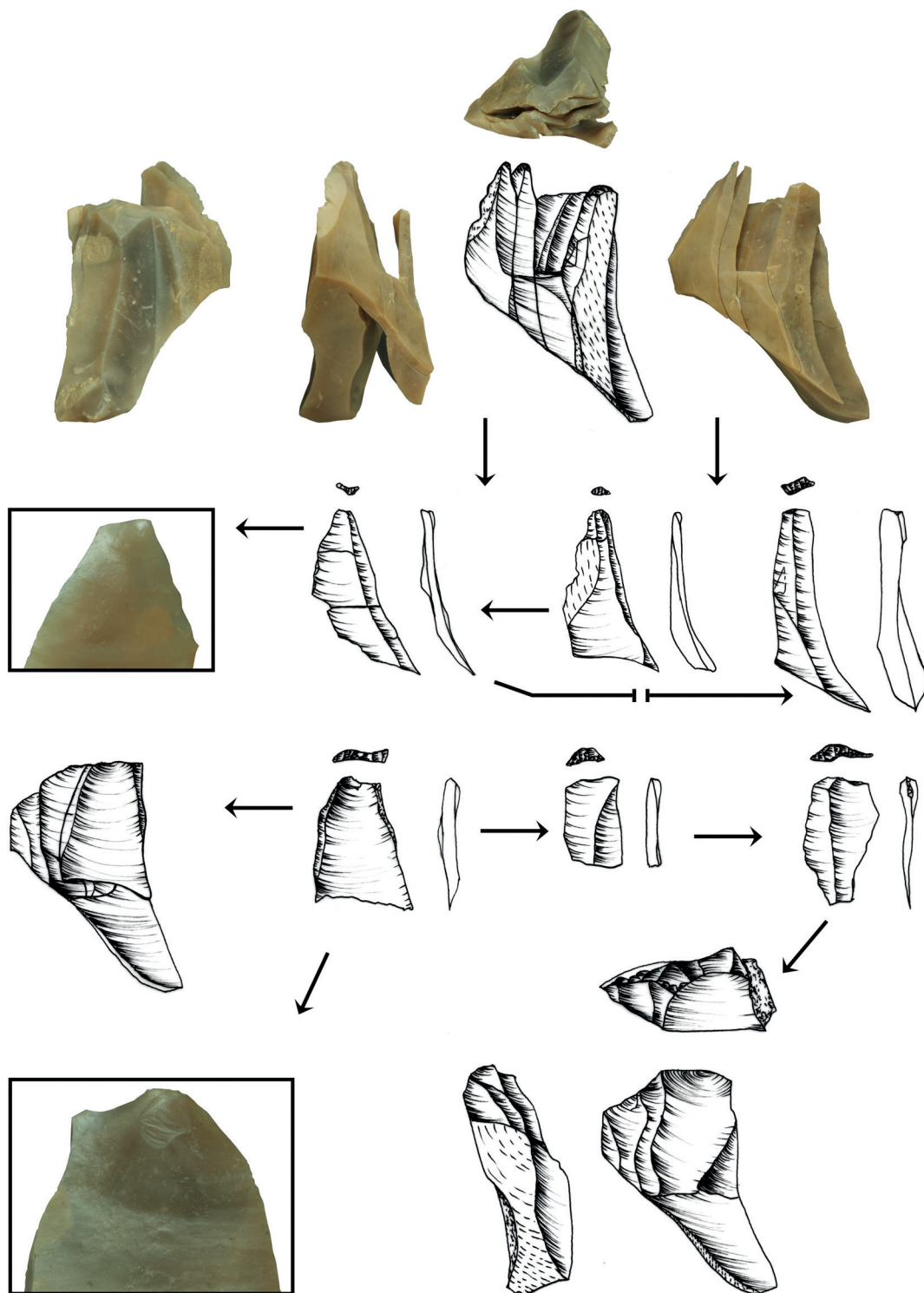


Fig. 5 Rogalinek 1. Refitted block, representing the second method of blade reduction (with faceted butts). – (Drawings A. Rakoca; photos W. Grużdź). – Scale 1:2.

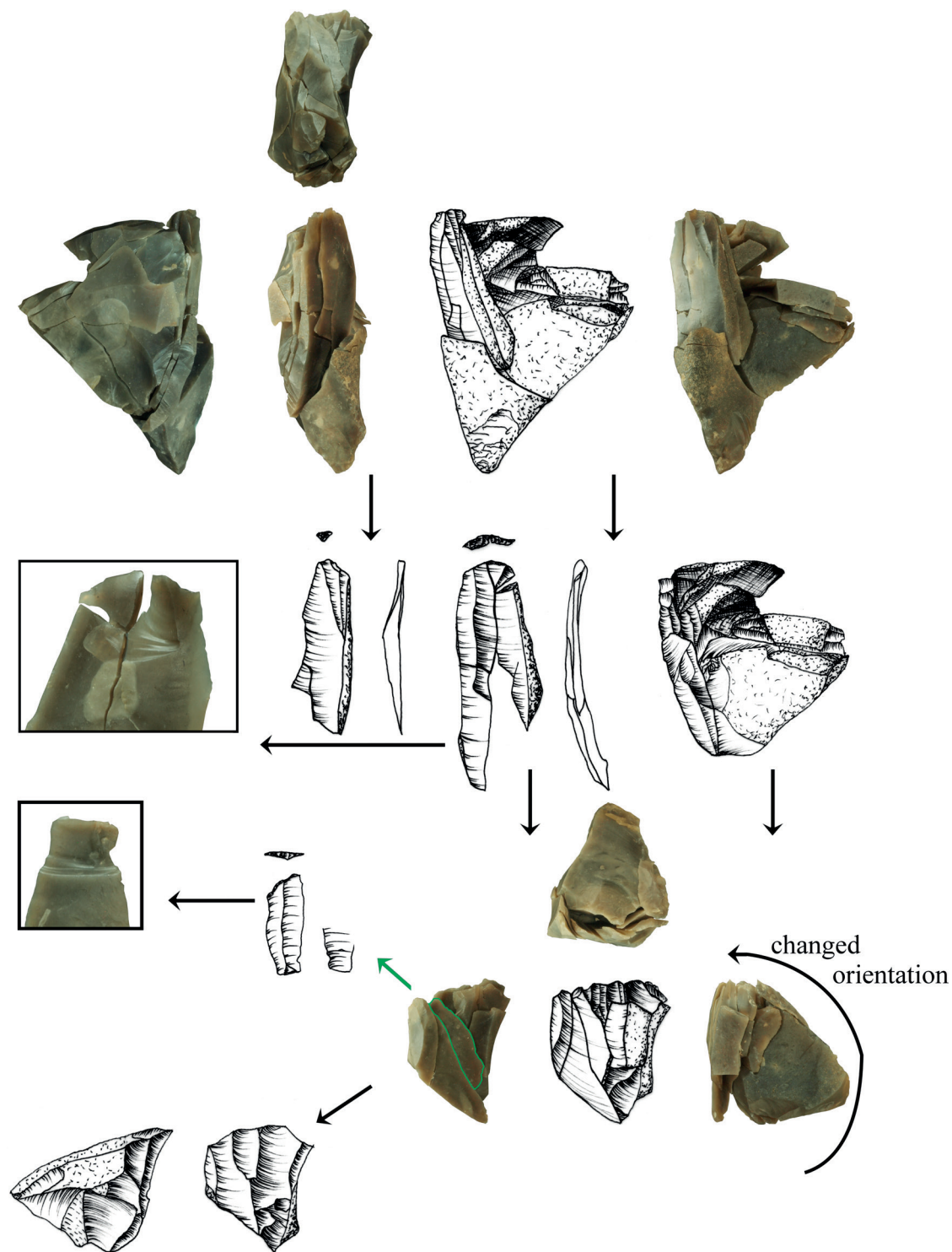


Fig. 6 Rogalinek 1. Refitted block, representing the second method of blade reduction (with faceted butts). – (Drawings A. Rakoca; photos W. Grużdź). – Scale 1:2.

DISCUSSION

The issue of the lithic technology used by groups with arch-backed points from the Polish Lowland is still not well recognised and requires further study. Thus far, the data presented in the literature regarding the methods of lithic treatment is usually limited to a few basic statements. The characteristics of this method (as presented by other researchers) include amorphous and massive cores and debitage products, a simple initial preparation mainly limited to the preparation of a striking platform by detaching one or a few flakes, the presence of single platform cores or cores with changed orientation, and the occurrence of facetting in some cases. The authors emphasise the use of a technique of direct percussion, usually with a hard hammer (i. e. Kabaciński/Sobkowiak-Tabaka 2010; Kwiatkowski/Masojć 2011; Migal 2007; Sobkowiak-Tabaka 2011, 86).

At the same time, a duality in the approach to the lithic treatment has been recently noted among the groups with arch-backed points (i. e. Pyżewicz et al. 2008). The blanks are obtained in both cases mainly from blade and flake cores with simple core preparation or the lack thereof. The recorded reorientation procedure noted in both assemblages may be interpreted in two ways – as a planned stage of the reduction, or the result of core maintenance by the reorientation of the flaking surface to the most optimal side of the nodule. The differences are visible in the preparation of core platforms. This is reflected in the morphology of blanks, which are characterised by »hard« or »soft« features of direct percussion (according to Odell 2004, 59). At the present stage of research we believe that the mentioned duality does not stem from the use of different stone hammers, but results from the application of the facetting procedure, marked by a more precise point of impact located near the edge of the core and the special kind of gesture. The detached blanks are accordingly characterised by »soft« features.

The underlying reasons for this kind of duality might include the characteristics of individual preferences of flintknappers, coupled with their experience. Alternatively, the duality might reflect two different traditions. During the studies of Late Palaeolithic flint artefacts, we noticed that the Witovian assemblages (Całowanie, lev. III and IV [Karczew commune], Witów 1 [Piątek commune], Katarzynów 1 [Zgierz commune]: Chmielewska 1978; Schild 1975; Schild et al. 2014) are typified by a less advanced lithic technology. The lithic strategy there used mainly the simplest modes of detachment; no sophisticated and well planned technological procedures were employed, and the applied technique was hard hammer direct percussion. The result of such a technology is the production of short arch-backed pieces, which are linked by some researchers to the Witovian industry situated between the Rivers Vistula and Oder. These tools are classified as curve-backed points of class II according to S. K. Kozłowski (1987). Some researchers treat Witovian assemblages as a separate cultural unit, which originated from the South European Epigravettian (Kozłowski 1987; Szymczak 2000). This interpretation could be linked to a different tradition in lithic production. It seems that the lithic materials from Święty Wojciech 7 appear to be similar to the Witovian assemblages.

Among the assemblages from Święty Wojciech 7 and Rogalinek 1 we also registered more slender and longer forms, with slightly arched backs, formed by abrupt retouch. This type of backed points is classified by S. K. Kozłowski as class I – Federmesser-type backed points, related to the local Federmesser-Gruppen (Tarnovian assemblages) in the Polish Lowland (Kozłowski 1987). These backed pieces are known mainly in the Oder Basin and only rarely in the Vistula Basin. However, the oldest analogies can be found among Magdalenian assemblages. Most researchers see the origins of the local Federmesser-Gruppen (on Polish territories) in this unit (Kobusiewicz 1999, 51; Kozłowski 1987; Schild 2014; Szymczak 2000). Usually, the presence of slender backed pieces is coupled with the occurrence of a more advanced lithic technology, associated with e. g. a facetting procedure, a phenomenon also registered in the western part of the distribution area of the Federmesser-Gruppen (e. g. De Bie/Caspar 2000; Hartz 1987; Vollbrecht 2005).

It is worth noting another ABP assemblage from Pawłów 4 (Zawichost commune), where two techniques of lithic detachment were noted on the basis of the refitting method. The site is located in the Sandomierz Upland in eastern Poland (Libera/Wąs/Zakościelna 2008). This region is characterised by the presence of rich high quality lithic raw materials derived from primary and secondary deposits, which probably, among others, affected the lithic strategy recorded at Pawłów. Almost all artefacts were made of chocolate flint. These materials are somewhat similar to those recovered from Święty Wojciech 7. However, the applied refitting method indicates a much more intense core preparation than the one registered in the assemblages from the Polish Lowland, which is perhaps related to the availability and quality of the lithic raw material. The process of blade detachment, including toolkits, and a lack of facetting to isolate the striking platform, was similar to features of the analysed materials from Święty Wojciech 7. It is worth noting that the authors of the article also recorded numerous examples of »esquillements du bulbe«, which they nevertheless interpreted as resulting from direct percussion with a hard hammer stone (Libera/Wąs/Zakościelna 2008), while we believe that a soft stone hammer was used (cf. Pelegrin 2000; Weber 2012, 39-40). Additionally, some other researchers interpret knapping characteristics of lithic materials from Pawłów 4 as an effect of direct percussion with an antler hammer applied for obtaining the blades (Migal 2007).

As we mentioned above, most of the sites located in the Polish Lowland, including those presented in this paper, are marked by a lack of preserved stratigraphy. Hence, the assemblages of ABP groups usually overlap with other settlement episodes. The identification of their lithic technology is therefore beset with difficulties. In the case of coexistence with various Late Palaeolithic lithic scatters – related to Swiderian or Hamburgian settlement – it is possible to distinguish the remains of particular lithic technologies, because the applied methods of core preparation, the techniques of blade detachment, or the use of additional procedures differ from one another (see Dziewanowski 2006; Fiedorczuk 1992; Gruzdź et al. 2012; Klimek 2006; Migal 2007; Przeździecki 2006; Schild 1969; Sobkowiak-Tabaka 2011, 64. 86. 110-111; Weber 2012). However, as is for example the case with flint materials from Święty Wojciech 7, the coexistence of Mesolithic artefacts (especially those associated with the Komornica Culture) renders it difficult to identify and analyse the Late Palaeolithic blade production. The Early Holocene technology was observed in some Komornica assemblages recovered from the western Polish Lowland, i. e. sites Żuławka 13 (Wyrzysk commune), Pięczkowo 3 (Krzykosy commune), Borowo 2 (Krzykosy commune), Młodzikowo 1 (Krzykosy commune; Dmochowski 2002; 2005), Rosko 4 (Wieleń commune; Jankowska/Pyżewicz 2006), or Santocko 54 (Kłodawa commune; Pyżewicz/Rejchert/Rozbiegalski 2010). Blade production was based on single platform cores or – less frequently – on cores with changed orientation or double platform cores. The technique applied was identified as direct percussion with a stone hammer. The debitage is also marked by a not very advanced core preparation, limited mainly to the preparation of the striking platform, formed by detaching one or few flakes. This brief description indicates that in many cases the elements of both technologies can overlap. Therefore, we decided to find some differentiating characteristics of both groups (apart from the obvious differences in the typology of backed pieces and microliths). Without doubt, one of the differences is the facetting procedure, which also results in a different morphology of butts. Mesolithic blanks are typified by small, punctiform, or linear butts. We think that traces of other procedures, such as cresting and trimming, should also be taken into account while distinguishing these two chronological groups. In both analysed assemblages with arch-backed points these procedures were only marginally used, and they were not as common as in case of Mesolithic inventories. In addition, the Mesolithic artefacts are not so massive, which is evident when we have the whole series of blanks and cores from the lithic assemblage.

CONCLUSIONS

In our studies we sought to identify the characteristics of the ABP lithic technology, which differentiate this method of debitage from those used among other Late Palaeolithic and Early Mesolithic societies in the western Polish Lowland. We should note that various Late Palaeolithic and Early Mesolithic groups differed both in terms of the technology and the structure of production and distribution of blade debitage. This comment applies, *inter alia*, to the Swiderian and ABP groups, settlement remains of which usually overlap. We can observe that Swiderian flint workshops contain retouched forms and debitage products made of different types of raw materials. The group of tools includes some examples of tanged points and burins made on blanks probably produced at other sites. This is in contrast to the debitage products – these types of artefacts, even if they were deposited in the same place as the tools, were derived from another production sequence, and probably were used as replacements for a worn-out toolkit. In this case, the model of the »chaîne opératoire« involves taking lithic blades out of a workshop and using them in another place, which is confirmed by numerous refittings, i.e. from Całowanie (Karczew commune; Fiedorczuk 2006; 2014), Rydno (Skarżysko-Kamienna commune; Fiedorczuk 1992; 2006; Schild et al. 2011), Suchodółka (Ożarów commune; Gruzdź et al. 2012), Kijewo (Środa Wielkopolska commune; Rakoca 2013). Tools were not usually associated with the debitage sequences and were often made from different lithic raw material. The presented strategy involves the use of the toolkit, which was supplemented in the case of a lack of blades and retouched forms. Among the ABP groups the structure of production and distribution of blanks was quite different, typically based on the exploitation of the local raw material (i.e. Sulgostowska 2005, 57-63). More frequently we could record used tools within refitted blocks, e.g. from Rogalinek and Święty Wojciech, or from other sites located further away (e.g. Rydno: Fiedorczuk 1992; Schild et al. 2011; Tomaszewski et al. 2008), and it seems that the debitage was an effect of the strategy that focused on *ad hoc* production (in the case of burins and end-scrapers; backed blades were probably taken out from the site). We can assume that these groups either occupied one place for a longer time, or, alternatively, that they produced blanks and formed tools each time right before a given activity. Both strategies of Swiderian and ABP groups represent two totally different models of the »chaîne opératoire« and can be related to different adaptations of these societies in the Pleistocene (such as the environment, tradition, different levels of skills and knowledge, etc.). Last but not least, we should also refer to the issues of the Early Mesolithic groups. The structure of production and distribution of blank debitage in the Early Mesolithic could have been to some extent similar to that of the ABP groups, and therefore we observe similar lithic scatters. There are nevertheless differences between them as regards some elements of the applied technology and the morphology of retouched forms.

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Summary

This paper seeks to characterise the technological processes of lithic production of Arch-Backed Point (ABP) groups. The studied Late Palaeolithic inventories come from two sites, i.e. Święty Wojciech 7 and Rogalinek 1 (western part of the Polish Lowland). During the detailed interpretation of particular stages of the »chaîne opératoire« we applied a combination of refitting method and morphological analysis of flint materials. Special attention was paid to the aspect of duality in the approach to the lithic technology, as noted in the preparation of cores as well as blade production and the toolkit used for debitage. Our studies have allowed us to characterise the ABP groups' lithic technology, which makes it possible to differentiate this method of debitage from others used among other Late Palaeolithic and Early Mesolithic societies in the western Polish Lowland.

Keywords

Lithic technology, refitting method, Polish Lowland, Arch-Backed Point groups