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THE TECHNIQUES OF OBSIDIAN TREATMENT ON THE MALICE CULTURE SETTLEMENT OF TARGOWISKO 11, LESSER POLAND

This article is devoted to the obsidian inventory from Targowisko 11 site associated with the Malice settlement. The years of research on this site resulted in the discovery of a very rich complex of obsidian debitage, consisting of several dozen examples of cores and several hundred blade and flake fragments. Such a large number of artifacts made it possible to reconstruct the process of obsidian treatment carried out on this site.

KEY WORDS: Neolithic, Malice culture, obsidian, technology

INTRODUCTION

The multi-culture site Targowisko 11 in comm. Kłaj, Lesser Poland, was discovered during the surface research carried out on the planned route of A-4 motorway linking Kraków and Tarnów. The research was funded from the state budget, and the issues connected with archaeological work were handled by the newly-appointed Krakow Team for Motorway Survey. The systematic archaeological rescue research started in 2000 under the direction of B. Konieczny and B. Grabowska.

The site Targowisko 11 is located on a loess terrace, about a dozen meters above the current level of the Raba river – the right-bank tributary of the Vistula (203 meters above sea level), and about 30 km east from Kraków (Fig. 1). It lies on the joint of two geographical units, which are part of the largest macroregion of the Northern Subcarpathia – the Sandomierz Basin. The first unit is the Nadwiślań-

ska Lowland encompassing the vast Vistula valley, including the mouth segments and alluvial cones of three Carpathian rivers: Raba, Dunajec and Wisłoka (Kondracki 2002, 306). The second geographical unit is the Bochnia Foothills, on the edge of which the site is located. It is part of the near-Carpathian fragment of the Sandomierz Basin, adjacent on the south to the edge of the Wieliczka Foothills and Wiśnicz Foothills. In terms of geology it is a folded saliferous Miocene, leveled to the height of 260-300 m and partially covered by the Quaternary deposits, including loess. The geographical conditions were probably the main reasons for establishing a camp on this site by the representatives of the Malice culture. This fact is proved by the rich and diverse relic material obtained from this site, signifying the recurring occupation of this place starting from the Upper Paleolithic, through Neolithic and Bronze



Fig 1. Location of the site Targowisko 11

Age, the Roman times, up to the Middle Ages (Górski J. et al. 2006).

The archaeological work of the area of over 2 hectares was finished in 2005, and resulted in the discoveries of many objects and layers containing rich and diverse relic material. Most of the remains are associated with the Neolithic settlements – mainly of the Linear Pottery Culture and Malice culture. Most of the Malice culture objects on this site occurred in complexes located about several dozen meters from each other (Fig. 2). Each of these complexes consisted of 2 to 6 objects, which in turn com-

prised of one larger and several smaller hollows. Apart from these hollows, which are the remains of the ground structures, the researchers discovered also the remains of two skeletal burials (Czekaj-Zastawny et al. 2004). The rich Malice material was discovered also within other culture layers all over the site's area. The pottery found on the site is typical of this culture unit. There are many examples of pear-shaped cups, bowls, hollow-stand bowls, dishes, pitchers, as well as spherical and biconical pottery. The stone inventory of the site mostly consists of debitage made on Jurassic flint, chocolate flint and obsidian.

STATE OF RESEARCH ON THE OBSIDIAN ASSEMBLAGES FROM POLAND

The oldest recorded obsidian artifacts found in Poland come from the Paleolithic Age. These are mostly individual findings, mainly flakes, blades or

even small chips, sometimes single instances of cores or retouched tools. The more numerous complexes, consisting of several to dozen obsidian arti-

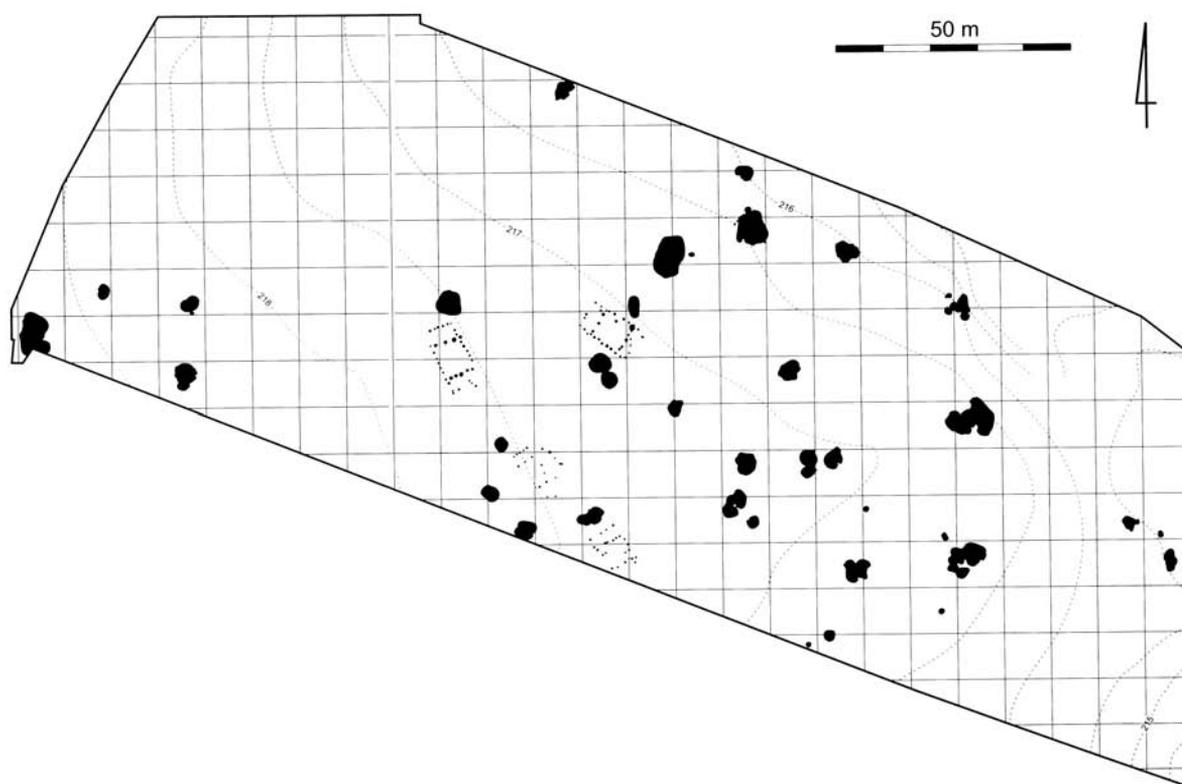


Fig 2. Scatter pattern of the Malice culture objects at Targowisko 11 (after Czekaj-Zastawny A. *et al.*, 2005)

facts, were found in the inventories of such sites as Obłazowa Cave (Valde-Nowak P. *et al.* 2003), Kraków Zwierzyniec (Sawicki 1949), or Kraków Spadzista Street (Sobczyk 1995). The obsidian finds, consisting of several dozen artifacts and dated on 15 thousand BP, was also present at the recently discovered Targowisko 10 site (Wilczyński 2009). The more numerous finds made of obsidian appears in the inventories of the Late Paleolithic and Mesolithic Ages – especially in the materials associated with its late period – the Janisławice culture (Szeli-ga 2002). In this regard the sites of Grzybowa Góra “Rydno” (Schild *et al.* 1975; Schild, Królik 1981) and Tylicz (Tunia 1977) are particularly interesting. Unfortunately, the number of obsidian finds is too small to properly illustrate the methods of distribution and treatment of these materials during the older and middle parts of the Stone Age.

A large amount of obsidian artifacts comes from southern Poland Neolithic sites. Unfortunately studying the Neolithic stone assemblages we come with some difficulties, which are result of very similar

technique used by different early farming societies (Kulczycka-Leciejewiczowa 1979). Very often those materials (Linear Pottery Culture and Malice culture) are founding together on sites, what makes almost impossible to separate them if they an example comes from multicultural layer. Comprehensive lists of this sites was presented by M. Szeli-ga (2007), so in this part of article I will only mention some important examples.

A several number of obsidian artifacts comes from the Neolithic sites associated with the Linear Pottery Culture, located near Kraków and Rzeszów. Most of these inventories consist of over several dozens of items, as e.g. on the Komarnice site (Aksamit 1971) or Piastów estate in Rzeszów (Kadrow 1990). Only the material from the settlement in Ol-szanica provided us with nearly 200 obsidian finds (Milisaukas 1976). In addition, some Linear Pottery Culture – related obsidian materials, were also obtained during the research on the planned route of A-4 motorway linking Kraków and Tarnów. These materials include the currently studied inventory of

Brzezie 17 (oral information by A. Czekał-Zastawny) or Targowisko 3, 12-15, 34 sites (Czerniak L. *et al.* 2006).

Numerous obsidian finds are also well known from sites associated with the Middle and Late Neolithic – settlement of Lengyel-Polgar Pleszów Group and Malice culture. One of the example is the inventory from single object from Nowa Huta-Pleszów (Cabalska, 1964) which contains 214 finds made on obsidian: cores (7 items), flakes (133 items), chunks (25 items) and 49 retouched tools – mainly microliths. Presence of so many retouched tools and lack of blades in this inventory is surprising. Another site, which contains numerous obsidian artifacts,

is Piastów estate in Rzeszów from where we know 5 cores made on obsidian (Kadrow, 1990).

All of these Neolithic collections are relatively small (apart from the material of Olszanica settlement and Nowa Huta-Pleszów), and even if they are much larger, they contains only single cores what makes detailed technological study difficult. The material obtained during the research carried out on the planned route of A-4 motorway linking Kraków and Tarnów may be a good opportunity to better understand this issue, as the obsidian material is relatively rich (comparing to other sites in Poland). This article is one of the first such attempts, and hopefully more will follow.

OBSIDIAN INVENTORY – ANALYSIS

The inventory consists of 530 obsidian artifacts found around the discovered Malice culture objects and within the multicultural layers (Tab. 1, 2). In total there are 60 examples of cores (12.2%), 188 examples of flakes and their fragments (38.2%), 242 blades and their fragments (49.2%) and 2 retouched tools (0.4%). In addition, this inventory consists also of 38 chips and other debris, which were not included in the further analysis (Fig. 3). Number of obsidian artifacts, which were to the author disposal, is very high and equivalent to the others Neolithic materials known from Slovakia sites, which are placed nearly the obsidian deposit (Kaczanowska, Kozłowski 1997).

Raw material

The items in the analyzed inventory were made of small nodules of obsidian, not exceeding 5 cm in size, mainly spherical, sometimes cubic in shape. The cortex on the surface of cores, blades and flakes is rough (similar to pumice), often forming a porous outer layer on a concretion. In addition, the size of the nodules is generally typical for this material. This fact signifies that these people obtained the obsidian directly from the volcanic extraction points located on the territory of the present-day Slovakia and Hungary. The small number and weight of the whole obsidian collection from this site (less than 1 kilogram) indicates that this material was

obtained probably through the means of trade. It is unlikely that any direct expeditions were being organized in order to extract and transport this material to the site, as it would require an excessive amount of work disproportionate to the benefit. Such expeditions could have been possible only if we assume that this material was one of the desirable goods and was traded with the inhabitants of other settlements in the nearest area. Only 1 flake from this inventory, found in the subsoil layer, has a strongly rounded cortex, indicating a long time of transport by the river, what may suggest its different origin. Therefore, it is also possible that this individual artifact may be associated with some other, chronologically different, settlement of Targowisko 11 site.

Material structure of the inventory

Unfortunately, it is impossible to appropriately estimate the percentage of the obsidian in the structure of the Malice stone inventory. The reason is that the obsidian artifacts were found not only around the Malice-related objects, but also within layers of both Malice material and the material of Linear Pottery culture (Tab. 1, 2). We can only assume that the whole obsidian material can be associated with the Malice culture, basing on the fact that it mainly appears in “purely” Malice-related objects (only 11 obsidian finds, constituting 2% of the whole inventory, were found around the Linear Pottery Culture

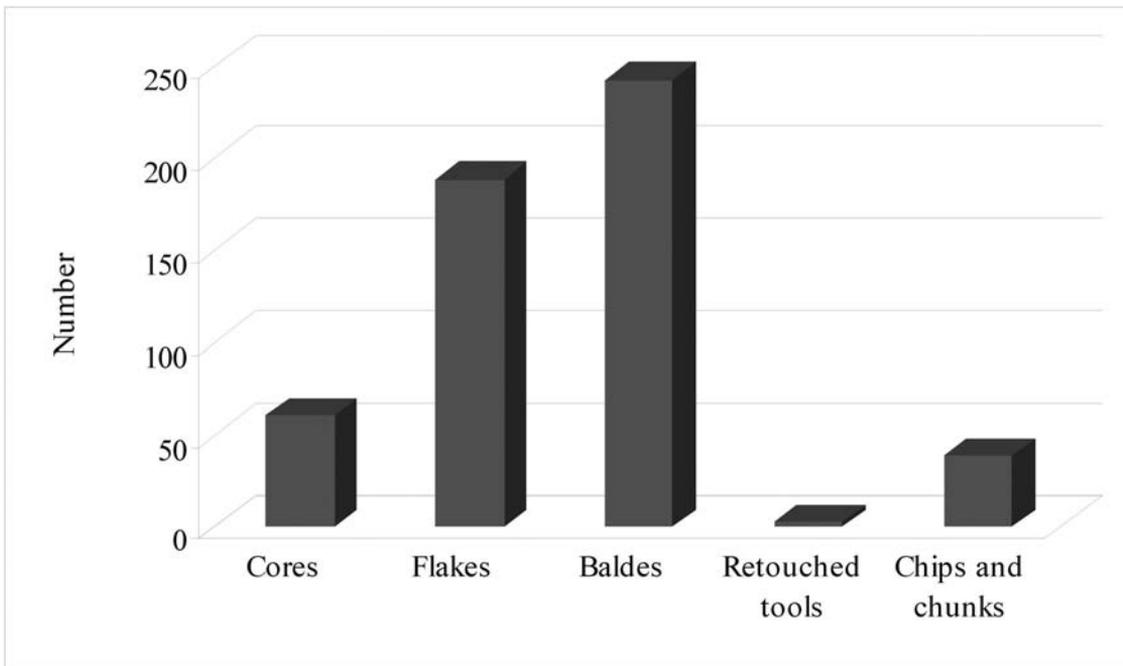


Fig. 3. Targowisko 11 site, structure of major technological groups in obsidian inventory

and Early Bronze Age culture objects, with no examples of cores whatsoever). We can not, however, specify the percentage of obsidian artifacts in relation to all of the stone finds. It results from the fact that it is impossible to determine the size of Malice flint inventory from this site, as the flint items found both around the objects and within the layers associated with Malice culture, as well as those related to Linear Pottery Culture were of the same Jurassic flint type.

Such comparison of the percentages of raw materials can only be illustrated with the “purely” Malice-related objects (not the whole site), and only those with appropriate and statistically representative number of obsidian and flint artifacts. Object 2925 seems to be the best for this purpose, containing a very rich stone (flint and obsidian) material, originating from the small domestic workshop. 371 flint and 106 obsidian artifacts were found there, what illustrates how large is the percentage of this unique material, reaching even 1/5 of the whole inventory. Of course, we should bear in mind that the items found around this object are not too reliable, as the average size of flakes does not exceed 2 cm. Such a large number of finds made of this unique mate-

rial (mostly in the form of small blades) signifies that the people of that time used it for strictly utilitarian purposes (at least to a larger extent than was previously thought), rather than as the prestige or religious objects (what is not, however, mutually exclusive).

Cores

Among the 60 core forms, there are 4 examples of natural concretions (Fig. 4.1,2), 5 examples of nodules with marks of single strikes (Fig. 4.4,5), 10 initial cores (Fig. 4.3,6-10) and 41 examples of cores in advanced state of exploitation (Fig. 4.11-15, Fig. 5.1-21). The category of residual cores is purposefully excluded, due to the very small sizes of the processed nodules, which do not exceed 2 cm.

Only one core was formed on a massive flake. The rest of the examples were made on natural nodules, mostly spherical in shape.

The cores with single strikes (5 items) are natural nodules with marks of one to several flake negatives (Fig. 3.4,5). Unfortunately, as in the case of obsidian found on the site, it was impossible to de-

termine why these particular examples had been discarded.

The cores from the initial stage of exploitation are characterized by several to dozen negatives, signifying the start of proper treatment (10 items). In this group there are 7 examples of single platform cores, one single platform item with two flaking faces and 2 examples of double platform cores with a common debitage surface (Fig. 4.9,10). Among the single platform items the most common are those used to produce blades (4 items), with smaller number of the flake cores (2 items) and flake/blade cores (2 items). The striking platforms of the initial cores, is often covered by cortex (4 items), with equal number of the platforms formed by several strikes. Only in the case of 2 examples the striking platforms were formed by a single strike. The flaking surface is mostly flat (5 items), sometimes slightly convex (4 items), in most cases rectangular in shape (9 items). Among the 10 initial cores, the most common are those with sides covered by cortex – without any signs of preparation. Only one item bears marks of the preparation of a flaking surface, resulting from the attempts to form a crest on the surface of a core (Fig. 4.6). Half of the initial cores (5 items) bear marks of rejuvenation, resulting from the preparation of the surface of a striking platform.

As many as 41 cores are in advanced stage of exploitation. They were used to produce a series of blades. Most of these cores (39 items) are single-platform cores, and in this group there are 2 cores with two debitage surfaces. In addition, there is one core with changed orientation and one double-platform core with a twisted flaking face (Fig. 4.12). Single platform cores were used mainly to produce blades (37 items). In this group are present cores with two debitage surfaces. Rest of cores bear marks of flake or flake and blade negatives on their flaking surfaces. The double platform core was used to produce blades. Most of the cores' striking platforms were formed by several strikes (38 items), occasionally with one strike (2 items). Flaking angle of this cores almost in all cases are almost 90°. Most of the debitage surfaces are slightly convex (18 items), less often flat (14 items). On 8 examples we can observe an "angular" flaking surface (Fig. 4.11, Fig. 5.14,18). These are characterized by the presence of two flat surfaces used to produce blades (like separate flaking surfaces), and the joint between them forming

a sharp edge. Unfortunately, due to the lack of refittings, it is impossible to determine whether it was really a separate method of treatment or just one of the stages (e.g. connected with the process of widening the flaking surface during the treatment of a core, changing it from flat to convex). The debitage surfaces are mostly rectangular in shape (31 items), occasionally triangular or similar (9 items). Only few of the cores in advanced stage of exploitation bear marks of preparation of the flaking surface. Two cores bear marks of probably 1-sided preparation on both sides (Fig. 4.7,8), one core has such marks on one side (Fig. 5.18). There are also very few cases of the repair of a debitage surface. Only on 2 cores we can find marks resulting from the formation of a secondary crest – the first one-sided and the second two-sided (Fig. 5.7). On almost every core we can find marks of rejuvenation (38 items). The average size of negatives on blade cores is 20 mm and it mostly corresponds to the size of cores themselves.

Flakes

There are 188 examples of flakes, which is 38.2% of the whole inventory. Most are complete flakes (141 items), with much smaller percentage of distal (36 items) and proximal fragments (11 items).

We can find many examples of the primary decortication flakes – the items completely or in most part covered by cortex, constituting 40% of all flakes (Fig. 6.1-12). Flakes of this type are often massive, measuring over 4 cm in length. These flakes (as can be deduced from the initial cores) formed the surface of a striking platform, and also were used to create a flaking surface.

Most of the flakes bear on their dorsal surfaces marks of negatives corresponding with the strike axis – 88 items, less often marks of transverse negatives – 41 items. There are only 14 crested flakes (Fig. 6.13-17). Most of them are one-sided – 11 items. This number indicates that the preparation of a flaking surface by forming a crest was performed only to a limited extent. The main reason must have been the small size of nodules brought to the site. Despite the identification of only 4 evident items of debris resulting from the process of repair of a striking surface (3 rejuvenation flakes and 1 rejuvenation core tablet), we can assume that most of the n cortical

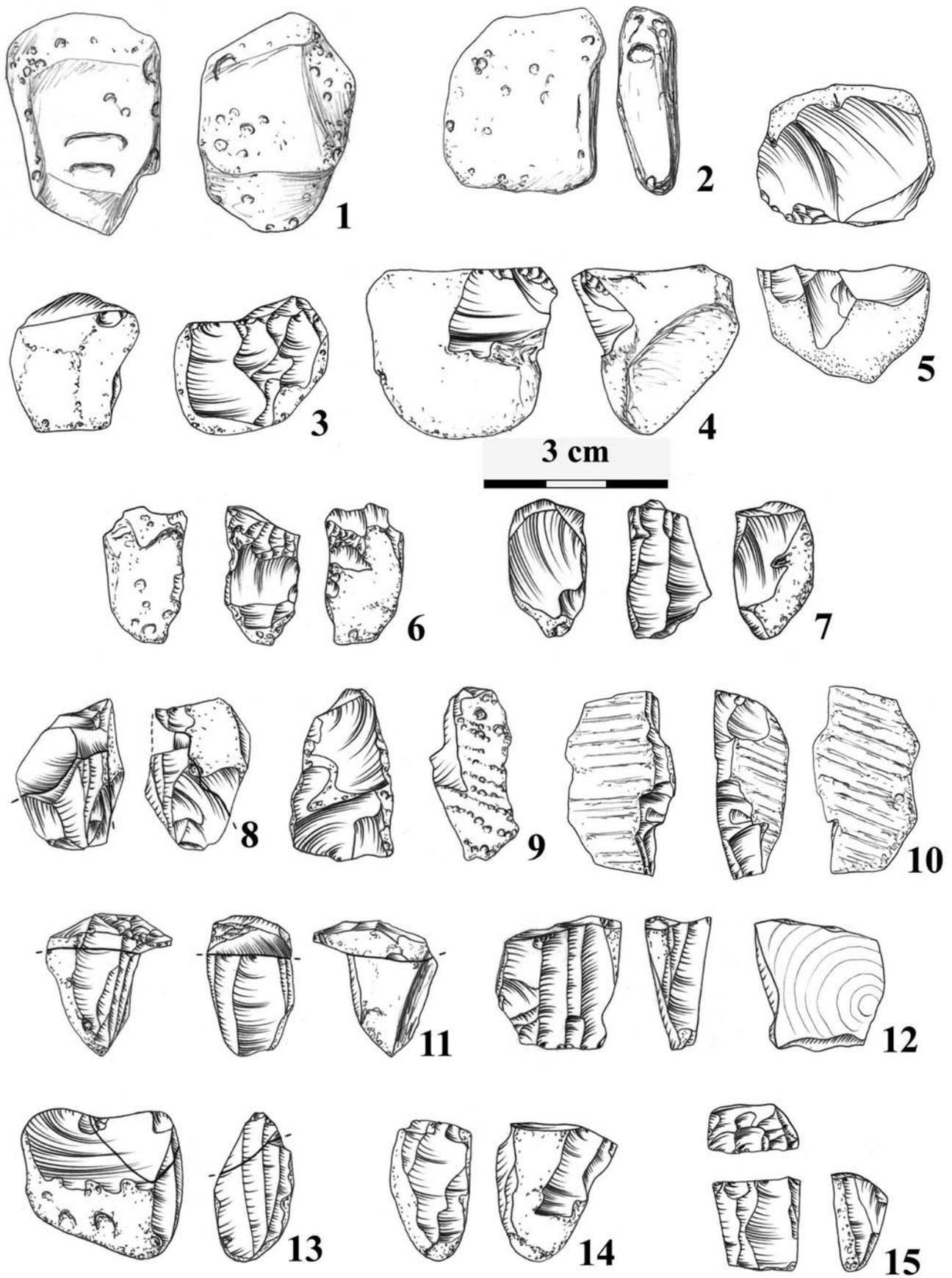


Fig 4. 1-2 – natural lumps of obsidian; 3-15 – obsidian cores

flakes with transverse negatives on their dorsal surfaces come from this stage of treatment. This fact is connected with the intensity of rejuvenation, which can be observed on individual cores.

The butts of 46% of flakes are covered by cortex. In case of only 25% of items we can observe a butt formed by one or several strikes. This is completely different from the case of blades. On most items the bulb is clearly visible (78% of items).

The average size of complete flakes is 19 x 18 x 5 mm.

Blades

There were 242 blades and their related fragments on the Targowisko 11 site, which is 49% of the whole inventory (Fig. 7.1-33). The further subdivision of this category into blades and bladelets would only obscure the overall image of the methods used in the material treatment by the inhabitants of this settlement. The materials used for this type of debitage were in form of very small nodules, from which the maximum possible number of blades/bladelets was produced (meeting the specific requirements physically determined by the small size of concretion). The larger and more massive products must come from a larger nodule or from the preparatory treatment of relatively large cores. Taking this into consideration, distinguishing between blades and bladelets in this inventory would be only a mechanical subdivision, having nothing in common with a separate method of treatment.

The items in his category are in the form of complete blades (72 items), proximal (70 items) and distal parts (64 items), occasionally central fragments (36 items).

Most of the blades lack cortex (113 items), but there is also a large group of items completely or in most part covered by it (45 items), constituting almost 20% of all examples.

In most cases blades were produced out of a single platform cores, and bear on their dorsal faces negatives corresponding with the direction of the strike – 255 items – which is 93% of all blades. There are only 3 examples of crested blades, what indicates (as in the case of flakes) that the preparation of a flaking surface was carried out only to a limited extent. The same applies to the secondary crested blades produced during the repair of a flaking sur-

face – 2 items. This data indicates that (apart from the rejuvenation of a striking platform) there were practically no repair operations performed. This fact directly results from the size of raw material brought to the site. In case of a damaged core or flaking surface, the next appropriate surface was used (change of orientation), very often with a previously used striking platform – (forming a single platform core with two debitage surfaces). This operation, however, was performed very rarely, mostly during a preparatory stage of a core treatment, what is illustrated by a relatively small number of cores with changed orientation (comparing to the cores made of flint).

The butts of 81 items bear on their surfaces marks of several strikes, whereas on 28 items we can find marks of one strike. The cortical butt is very rare (5 items), occasionally we can observe an edge butt (12 items) or a punctiform (8 items). It indicates a very careful preparation of a striking platform, as can be seen in both core and blade inventories.

In most cases the bulb is clearly visible (67% of items), a lip can be found in 4% of examples.

The produced blades are relatively small, but mostly very slender with very straight and regular parallel arises. The average size of complete examples is 23x8x3 mm. About 1/3 of all blades are curved, in addition there are also 22 examples of plunging blades.

Retouched tools

Answering on question what this material was used for is difficult when we take into consideration, that almost all of the several hundred retouched tools found on this site were made of flint. There are only 2 examples of obsidian retouched tools in this inventory. These are single retouched blade and flake.

Additionally, there are 16 examples of blades with marks of a slight retouch near the edges, located mostly on the dorsal surfaces of bladelets. It may indicate that this semi-material might have been used in some form of cutting activity. Further conclusions can be drawn after performing a series of experiments and research, which would make it possible to answer the above question. Undoubtedly, such a rich obsidian material, with a large number of

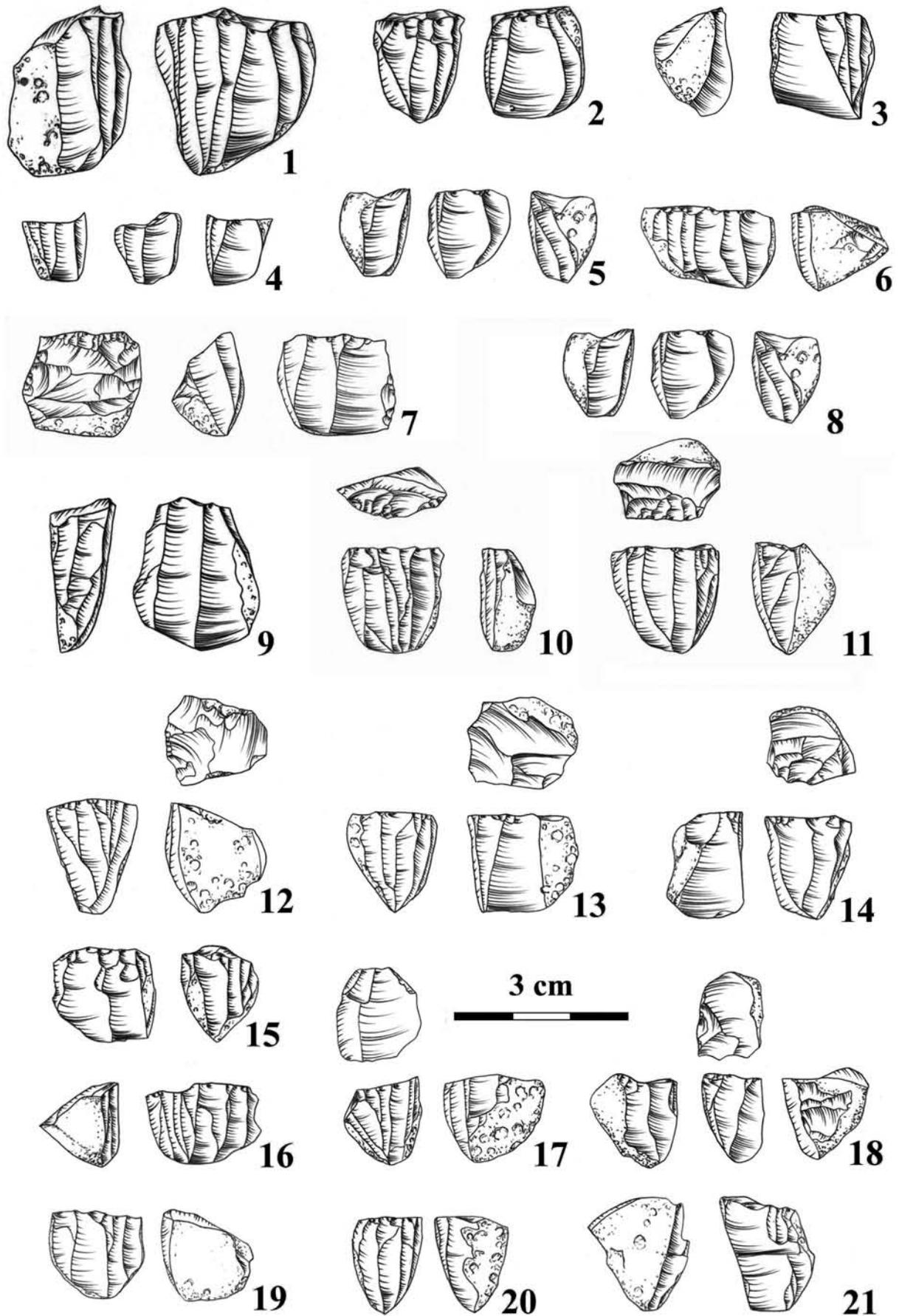


Fig. 5. Obsidian cores

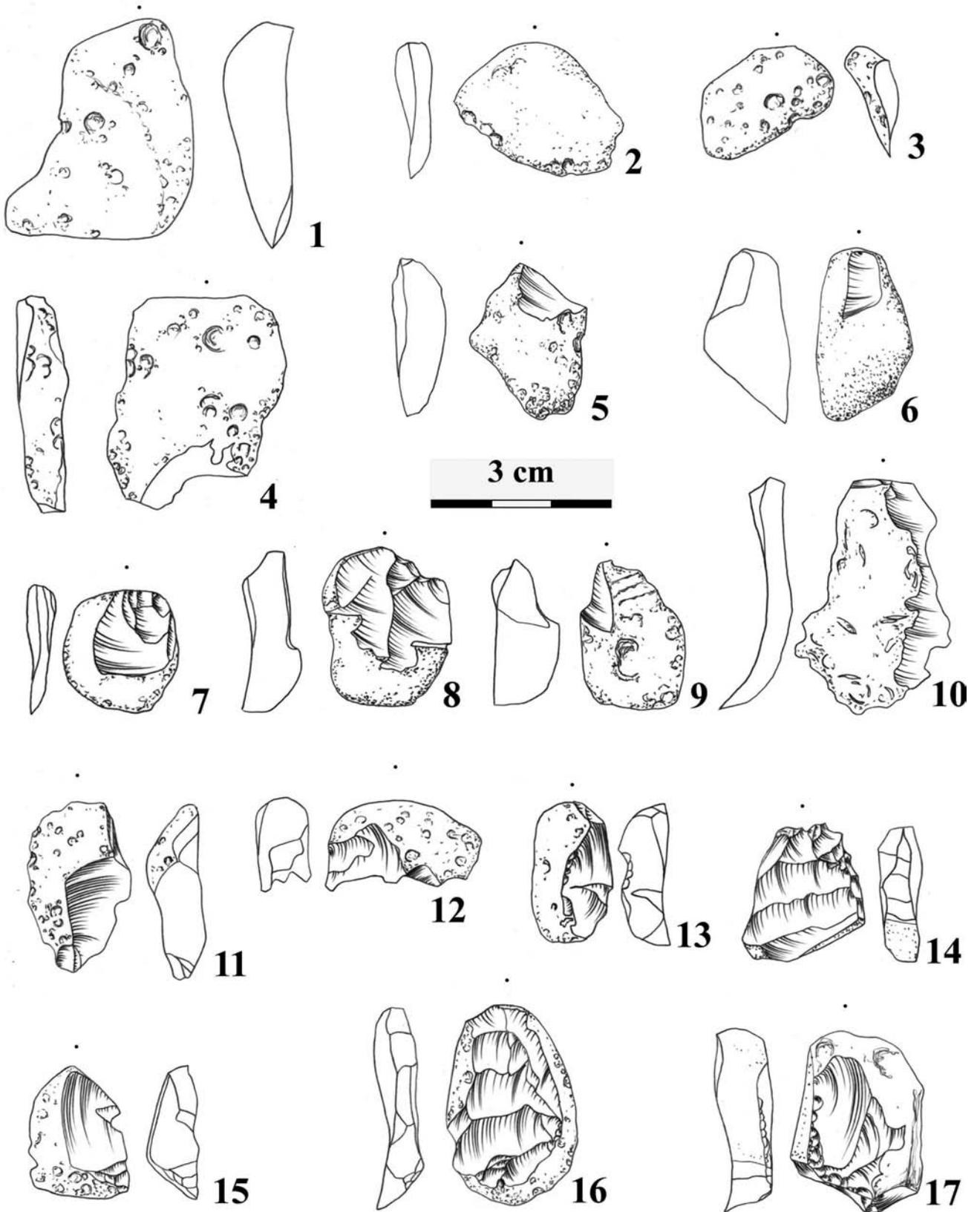


Fig. 6. Obsidian flakes

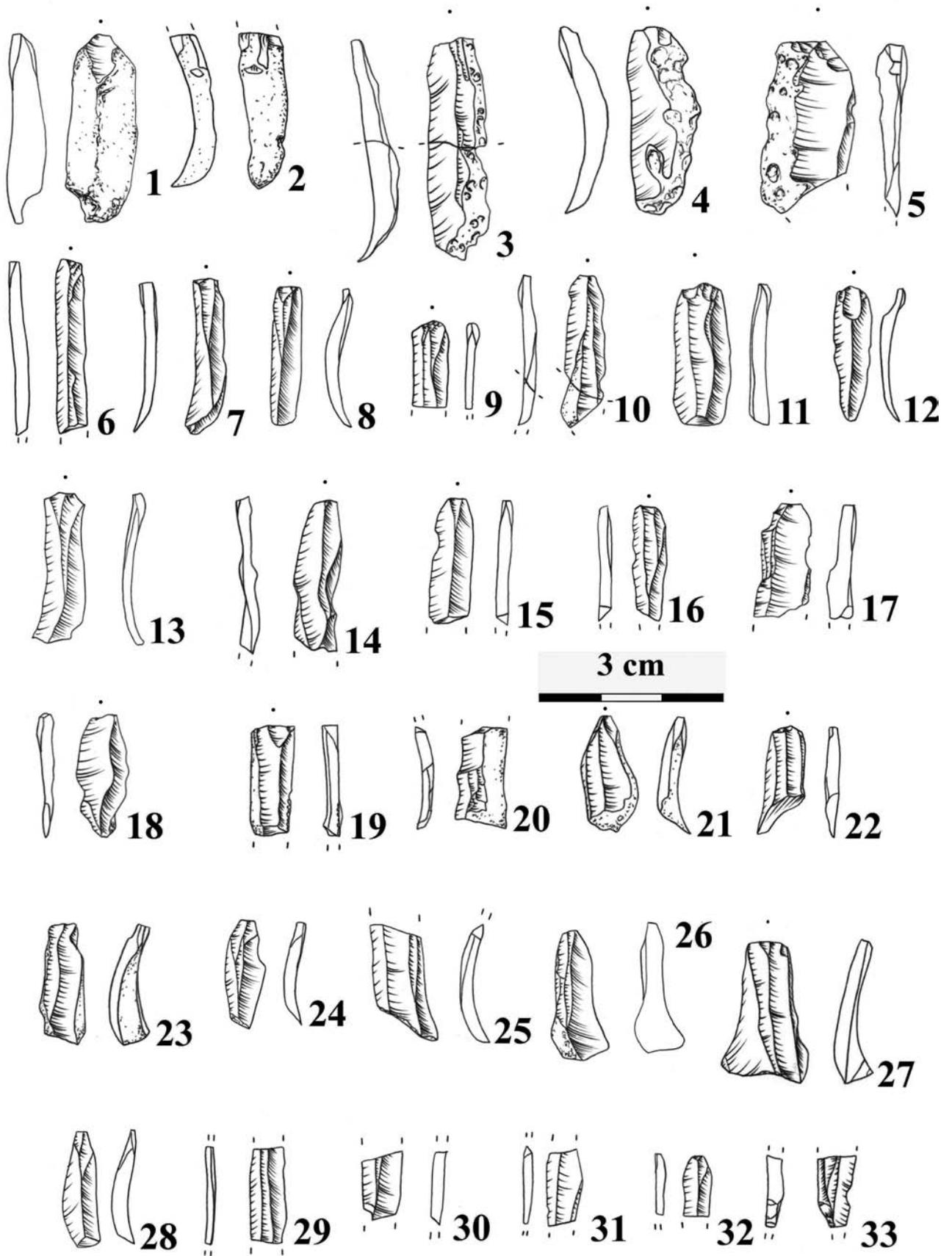


Fig. 7. Obsidian blades

blades, performed strictly utilitarian functions. This is illustrated by the standardization of blades, which, due to small sizes, could not be used as separate

working tools (e.g. scrapers) but must have been used as parts of more complex tools, such as sickles, or as points of throwing weapons.

SUMMARY

When summarizing this article it is important to note that the described material made it possible to carry out a detailed analysis, which may be used as a basis for the reconstruction of the obsidian treatment techniques used on the Malice culture settlement at Targowisko 11 site. Additionally, we can draw some general conclusions concerning the means of distribution of this material.

Studying the issues connected with obtaining the obsidian by the agricultural societies of that time, we need to consider the effort made by these settlers in order to get the flint material, much more numerous and massive, from the area of Kraków-Częstochowa Upland.

Basing on the performed analysis we can assume that the whole technological process connected with obsidian treatment was carried out on the settlement. The large numbers of cortical flakes indicate that the whole concretions were brought to the site, and only then the proper treatment began. The first stage consisted in the preparation of concretion, flakes comes from this stage of exploitation are relatively large (exceeding 4 cm in length). This method of treatment was dictated by the small sizes of nodules, and helped minimizing the losses and maximizing the effectiveness of material use. Among the initial cores there are many examples of cortical striking platforms, what may indicate that these large cortical flakes were not only used as flakes for a striking platform formation, but also could have been chipped off during the decortications of a flaking surface (mostly by the means of a single strike).

The cores in the initial stage of exploitation were used to produce blades and flakes, and those in ad-

vanced stage – mostly to produce blades. The presence of relatively large examples of blade/flake cores from the first stage probably results from the fact, that inappropriately exploited items were discarded in the course of treatment without any alteration. This would be a surprising fact, as it would mean that the people inhabiting this site did not hesitate to “waste” part of the obsidian material by discarding unsatisfactory examples of cores, which were still fit for further exploitation. This situation is completely different from that of the sites, which lacked appropriate material, where every concretion was used to maximum. The assumption that some examples might have been lost on the site may be another explanation, but this would contradict the argument of the worth of obsidian material. In the analyzed inventory there is only one example of a core with changed orientation and one double platform core with a twisted flaking surface. Most of the cores, however, have only one striking platform, and were used in the production of blades. Small size of cores with flaking angle almost 90° and very straight and regular parallel arises visible on them indicate debitage processing by indirect percussion (Inizan et al. 1992).

The final result of the whole process of obsidian treatment was a series of small blades without any natural surfaces. Probably they were used as parts of more complex tools, such as sickles, or as points of throwing weapons.

All obsidian artifacts create a uniform collection, what (along with the presence of a small domestic workshop of flint and obsidian) may indicate some sort of specialization developed by the society inhabiting this settlement.

Tab. 1. Targowisko 11 site, composition of obsidian finds discover in archaeological objects

Object	Cores	Chips	Flakes	Blades	Tools	TOTAL	Chronology
2001				2		2	Malice culture
2006				1		1	Malice culture
2007				1		1	Malice culture
2008	1		3	4		8	Malice culture
2074			1	2		3	Malice culture
2075	1	1	10	11		23	Malice culture
2088			2			2	Malice culture
2130	1			2		3	Malice culture
2177				1		1	Linear Pottery culture
2198				3		3	Łużycka culture
2202	2		1	3		6	Malice culture
2208			1			1	Linear Pottery culture
2225			1	3		4	Malice culture
2250			1	1		2	Linear Pottery culture
2251		1	4	5		10	Malice culture
2251/2252	1		1	2		4	Malice culture
2252		1	6	7		14	Malice culture
2257	1	1	3	3		8	Malice culture
2268	2		4	6		12	Malice culture
2271	2	3	3	6		14	Malice culture
2275	1					1	Łużycka culture
2286			1			1	Mierzanowicka culture
2314			1	2	1	4	Malice culture
2315	3		3	6		12	Malice culture
2315/2341	4	1	3	7		15	Malice culture
2328			1			1	Linear Pottery culture
2341			6	2		8	Malice culture
2380			2	14		16	Malice culture
2468				1		1	Linear Pottery culture
2629				2		2	Malice culture
2756			4	1		5	Malice culture
2823			1	3		4	Malice culture
2838			1			1	Malice culture
2851			1			1	?
2906				1		1	Malice culture
2924			1	1		2	Malice culture
2925	15	15	27	49		106	Malice culture
3080			2			2	?
3177			1			1	?
3422			1	1		2	Malice culture
3498			3	2		5	Malice culture
3503				1		1	Malice culture
TOTAL	34	23	100	156	1	314	

Tab. 2. Targowisko 11 site, composition of obsidian finds discover in multicultural layer

Leyer	Cores	Chips	Flakes	Blades	Tools	TOTAL
2b	3		15	10		28
2025	4	1	4	4		13
2035			1	3		4
2124			1	1		2
2193	1		1			2
2198	3		4	4		11
2198/2403		3	10	6		19
2403	7	11	31	38		87
2475/2476			1			1
2507			1			1
2508	3		18	12		33
2813	2					2
2982					1	1
3081	2			4		6
4134	1			3		4
4222			1	1		2
TOTAL	26	15	88	86	1	216

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