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DOI: 10.15584/anarres.2021.16.3

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Early Neolithic Flint Assemblages from the Targowisko Settlement Region

Abstract

Wąs M., 2021. Early Neolithic Flint Assemblages from the Targowisko Settlement Region. *Analecta Archaeologica Resso-
viensia* 16, 43–62

The article presents flint materials obtained from domestic facilities from the late phase of *Linienbandkeramik* from the Brzezie 40 and Targowisko 16 sites and the classic phase of the Malice culture from the 14–15 Targowisko site. These complexes contain relatively few monuments. Their advantage, however, is that they belong to chronologically compact groups. Since the relics of the discovered houses are spatially isolated from other settlement structures, it can be assumed that the set of flint artifacts belonging to them is relatively homogeneous. Thanks to this, they can contribute considerably to the discussion on the processes of cultural heterogenization and the origin of post-LBK cultures, including the Malice culture.

Keywords: LBK, Malice culture, flint industry, early Neolithic, Targowisko region, SE Poland

Received: 01.10.2021; **Revised:** 14.10.2021; **Accepted:** 19.10.2021

Introduction

In the years 2002–2007, on the route of the A-4 motorway on the fields of the village of Targowisko, in the district of Wieliczka (approx. 30 km east of Kraków) and neighbouring villages, large-scale rescue excavations were carried out (cf. Golański *et al.* 2021 in this volume).

This settlement complex is located between the Vistula and Raba rivers (the so-called “Targowisko” region). In this zone traces of *Linienbandkeramik* (hereafter: LBK) settlement from the oldest (I) to the youngest (III) phases have been documented. Moreover, relics of the early and classical Malice culture (hereafter: MC) phases have been discovered there (cf. Golański *et al.* 2021, fig. 1).

In 2018–2019, test excavations were carried out on three selected sites from this region, the purpose of which was to achieve several goals (cf. Golański *et al.* 2019). As a result of a field survey conducted in 2017 by Martin Posselt, relics of three houses at three sites were selected for excavation tests: Brzezie 40 (LBK),

Targowisko 16 (LBK) and Targowisko 14–15 (MC) (cf. Golański *et al.* 2019, 9–15; 2021).

Flint materials of *Linienbandkeramik* from the Brzezie site 40, Kłaj commune, Małopolskie voivodeship

1. Introductory remarks

During the excavation work carried out at the site of Brzezie 40, a collection of 122 flint artifacts was obtained.

The dispersion of flint materials indicates that they are related to the relics of the LBK settlement. Their structure is made up of the remains of one house, mainly in the form of parallel long pits located along its walls (Kadrow *et al.* 2021, fig. 3). Since the relics of the discovered house are spatially isolated from other settlement structures, it can be assumed that the set of flint artefacts belonging to them is relatively homogeneous, as a remnant of the smallest settlement unit

which is a household cluster (a dwelling with a yard), compact in space and time (Golański *et al.* 2019, 8).

Almost the entire flint inventory from the Brzezie 40 site comes from the fills of 11 features. In total, 109 specimens were found in them, and only 13 specimens come from the exploration layers outside the features. It is worth emphasizing that there are clearly noticeable quantitative differences between the flint collections from the facilities located on the western and eastern side of the house. Features located on the W from the house (mainly 10, 10A and 11) contained a total of 20 flint remains, while features 1, 7, 13 and 14 located on the E from the house contained as many as 78 flint artefacts.

2. Raw material structure

Almost the entire raw material structure of the flint inventory from Brzezie 40 is made of local Jurassic Cracovian flint (Tab. 1; Fig. 1). The share of this raw material is almost 82% of the total material (100 pieces). Thermal transformations make it impossible to identify the raw material for 17 specimens (approx. 14% of the collection). Despite the changes in colour, they have features that suggest that they are probably made of Jurassic Cracovian flint, which increases its percentage in the entire inventory. There are no registered remains of other types of flint. Moreover, 5 products made of obsidian were distinguished, which constitutes over 4% of the raw material structure of the entire inventory.

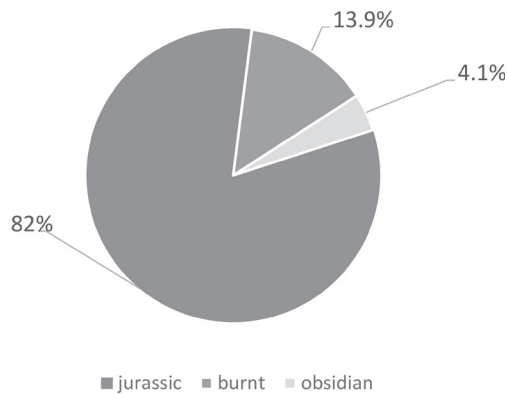


Fig. 1. Brzezie 40. Raw material frequency.

3. Technological and typological structure

The general structure of the inventory consists of products classified into 7 categories (Tab. 2; Fig. 2).

The most numerous group are products related to the flake exploitation (78 items in total). Flakes (64 items) and tools made on flakes (14 items, including one scraper) account for nearly 64% of the total inventory. The products associated with blade extraction (26 items) are slightly less numerous. The most numerous in this group are blades (10 pcs.). It also includes 1 rejuvenation flake probably from the exploitation of a blade core, and 15 tools made on blades. The rest of the inventory consists of specimens identified as chunks (9 items). Among them, 6 with negatives, 2 burnt and 1 natural specimen. A microdebitage in the form of 8 chips (smaller than 5 mm) was also identified.

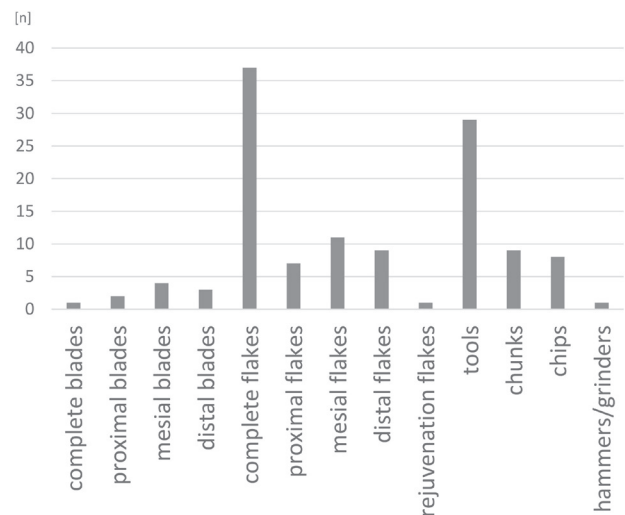


Fig. 2. Brzezie 40. Frequency of various types of flint products.

A tool group was also distinguished in the general structure of the flint inventory at Brzezie 40. A total of 29 tools (approx. 24% of the whole inventory) were identified and classified into 7 categories. Based on the degree of shape by retouching, two groups of tools can be distinguished. The first and most numerous group

Table 1. Brzezie 40. Raw material structure.

Raw material	Features											Outside features	=
	1	2	4	6	7	8	10	10a	11	13	14		
Jurassic Cracovian	25	1	4		38	1	5	6	5	4	1	10	100
burnt			5	1	4		1	2			3	1	17
obsidian			1		1		1					2	5
=	25	1	10	1	43	1	7	8	5	4	4	13	122

Table 2. Brzezcie 40. Qualitative and quantitative structure of the flint inventory.

	Feature 1	Feature 2	Feature 4	Feature 6	Feature 7	Feature 8	Feature 10	Feature 10a	Feature 11	Feature 13	Feature 14	Outside features	SUM
BLADES			2		6		1					1	10
complete												1	1
proximal			1		1								2
mesial			1		3								4
distal					2		1						3
FLAKES	18		5	1	21		4	6		2	4	3	64
complete	11		2		11		2	5		1	3	2	37
proximal	2			1	4								7
mesial	2		1		3		1	1		1	1	1	11
distal	3		2		3		1						9
REJUVENATION FLAKES												1	1
TOOLS	6				10	1	2	1	2	1		6	29
end-scrapers					5		1	1		1			8
truncated blades	1						1						2
perforators					1								1
micro-retouched blades	2								1			1	4
blades with polish												1	1
retouched flakes	2				2				1			2	7
flakes with use retouch	1				2	1						2	6
CHUNKS		1	1		1			1	2	1		2	9
with negatives					1				2	1		2	6
burnt			1					1					2
natural		1											1
CHIPS	1		2		4				1				8
HAMMERS/GRINDERS					1								1
SUM	25	1	10	1	43	1	7	8	5	4	4	13	122

are typological (conventional) tools. In total, 22 re-touched specimens were distinguished, among which blade forms predominate quantitatively: end-scrapers (8), truncated blades (2), micro-retouched blades (4) and a perforator (1). The flake forms are represented by 7 amorphous retouched specimens. The second group of tools are the so-called utility forms, i.e. flakes and blades with traces of their use in the form of the so-called utility retouching and utility displays (7 items in total). The most numerous of them are flakes with utility retouching (6 items). In this group, 1 blade with polish was also distinguished. Apart from the tool group, 1 flint hammer/grinder was separated in the inventory.

4. Characteristics of the collections

As previously noted, the collections of remains from individual features differ in terms of quantity, and thus in terms of quality and raw materials. In terms of saturation with finds, features 7 and 1 can be distinguished. In the remaining ones, less than 10 were discovered. In turn, in features 2, 6 and 8, single specimens were found, therefore they will be omitted in the following characteristics of the materials.

Feature 1

This provided the second largest collection of flint relics at the site. From its fill there are 25 speci-

mens made of Jurassic Cracovian flint (Fig. 3: 1–5). Most (18 pieces) are flakes, of which 11 are complete specimens and the remaining 7 are proximal, mesial and distal fragments. Apart from 1 chip, the remaining items were classified as tools. Among them, only one specimen is typologically defined – truncated blade (Fig. 3: 4). The remaining forms are typologically indefinite: 2 micro-retouched blades (Fig. 3: 1,

5), 2 retouched flakes (Fig. 3: 2, 3) and 1 flake with utility retouch.

Feature 4

Half of the 10 specimens discovered in the refill are burned out. There are almost exclusively half-products here. 5 flakes were distinguished (2 complete and 3 fragmentary) and 2 fragments of blades, includ-

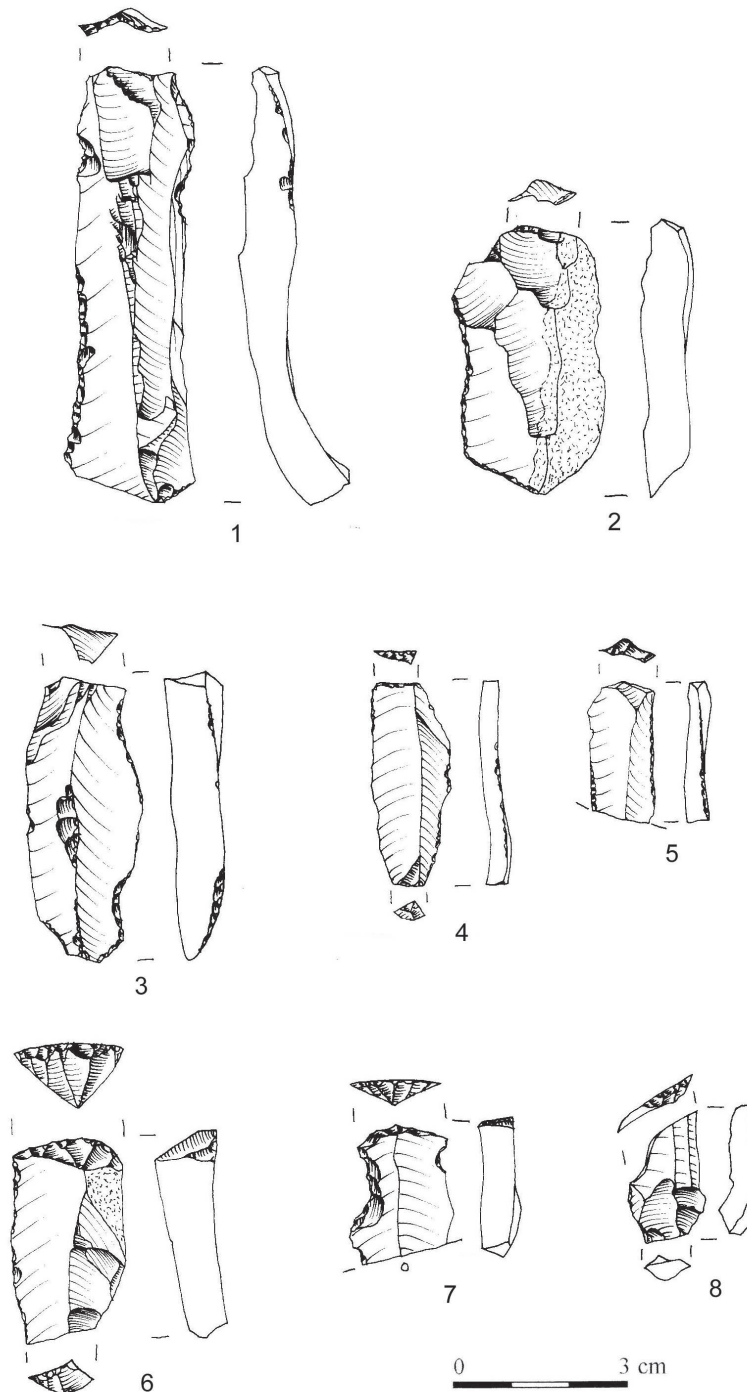


Fig. 3. Brzezie 40. LBK flint materials from features: 1 (1–5), 10 (6, 8) and 10A (7). 1–7 – Jurassic Cracovian flint; 8 – obsidian (drawn by M. Wąs).

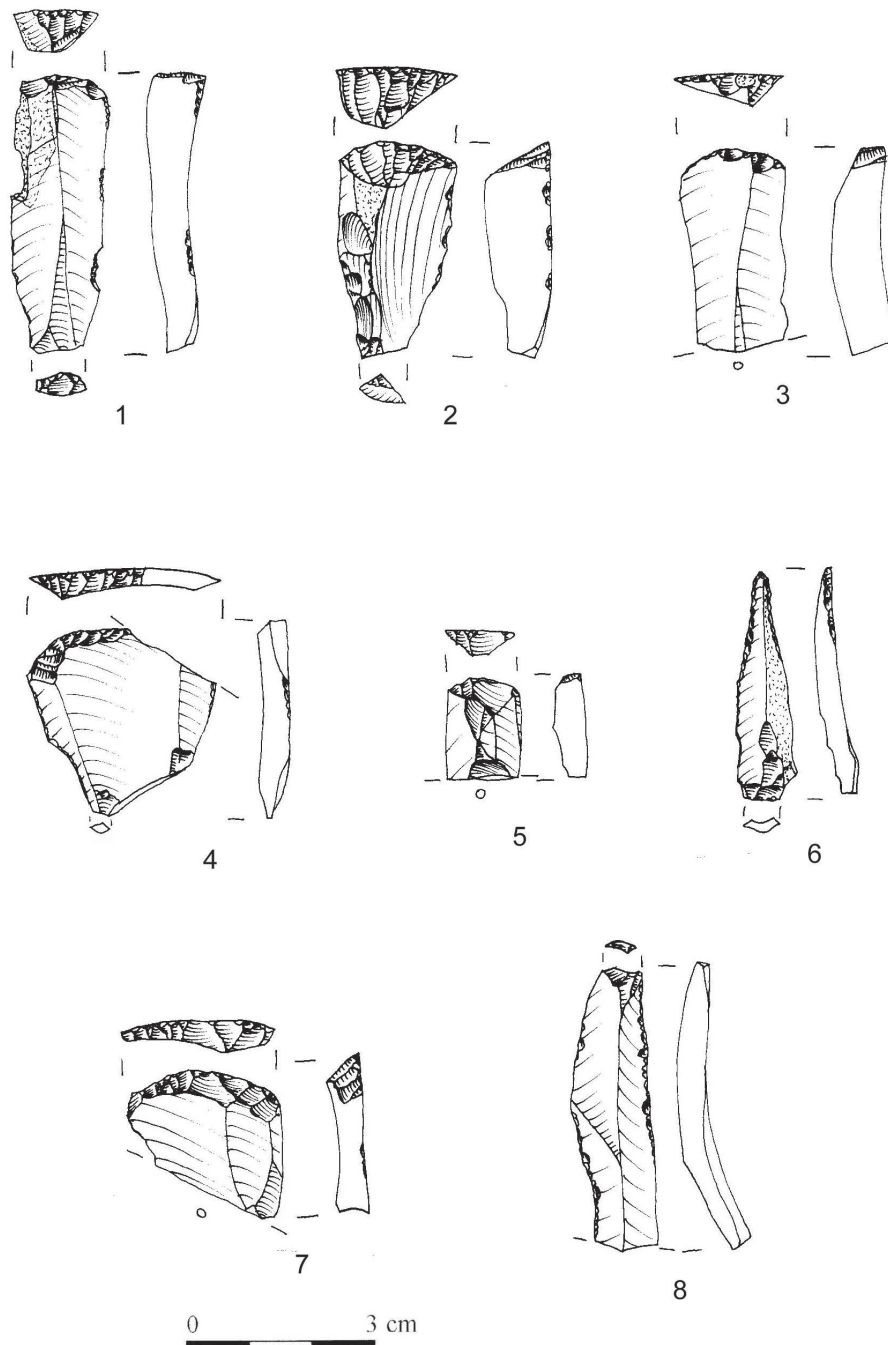


Fig. 4. Brzezie 40. LBK flint materials from features: 7 (1-6), 11 (8) and 13 (7). 1-8 – Jurassic Cracovian flint (drawn by M. Wąs).

ing 1 mesial fragment of obsidian blade. Moreover, with feature 4 come 2 chips and 1 burnt chunk.

Feature 7

This is the source of the largest collection of flint products on the site (43 items) (Fig. 4: 1-6). Among them, 1 specimen is made of obsidian, and 4 others are burned items. The quantitatively dominant group of artefacts from this feature are half-products (27

items). Flakes (21 pieces) predominate, while blades were distinguished only in 6 specimens. One of them is an obsidian distal fragment. Moreover, 10 tools were identified, most of which are typological specimens represented by 5 end-scrapers (Fig. 4: 1-5) and 1 perforator (Fig. 4: 6). The remaining ones are flake forms, both atypical retouched (2 items) and functional (2 items). The feature also contained 1 hammer/grinder, 4 chips and 1 negative chunk.

Feature 10

7 products come from this feature, of which 5 belong to the group of half-products. It is dominated by flakes over the one distal blade fragment. The remaining specimens are conventional tools: 1 end-scrapers (Fig. 3: 6) and a truncated blade made of obsidian (Fig. 3: 8).

Feature 10A

The materials from this facility (8 items) are mainly flakes (6 items). Apart from them, only 1 tool was distinguished – an end-scrapers with a retouched niche in one of the side edges (Fig. 3: 7). In addition, 1 burned chunk was found.

Feature 11

The collection from this feature is one of the smallest in the scale of the entire inventory. Of only 5 that belong to it, only 2 are atypical tools – 1 retouched flake and 1 micro-retouched blade (Fig. 4: 8). The remaining flints are 2 negative chunks and 1 chip.

Feature 13

Only 4 specimens were found there: 2 flakes, 1 negative chunk and 1 scraper-like tool that stands out typologically (Fig. 4: 7).

Feature 14

All the specimens found in this feature (4 pieces) are flakes – including 3 complete and one mesial fragment.

In addition to the above-mentioned collections from the ground features located in the vicinity of the LBK house, 13 artefacts were discovered in the exploration layer outside the features. Among them, 2 specimens are made of obsidian (flake and probably rejuvenation flake), 1 was thermally transformed, and the remaining 10 were made of Jurassic Cracovian flint. Almost half of them (6 items) are tools classified as atypical and utilitarian forms made on blades (2 items) or flakes (4 items). The remaining products are 3 flakes and 1 blade, and 2 negative chunks.

5. General characteristics of LBK flint industry from Brzezie 40

5.1. Technological aspects

Despite the quantitative differences between the individual features from Brzezie 40, no differences were noticed in the general level of technology used to process flints.

In the light of the available data, it is difficult to confirm unequivocally the production of half-products by the LBK communities inhabiting the site. Although there are few blades here, there are no stronger premises for establishing local flint production in the field of blade technology. Blades from Brzezie 40 have quite similar morpho-stylistic features. There were no specimens that would technically deviate from the canon of LBK blades.

Although flakes are the dominant product category in this inventory, not all of them can be considered as the result of deliberate production of flake half-products. Thus, the flake processing trend cannot be treated as the leading trend in the entire flint production at the discussed site.

Considering the flake material in general, it can be assumed that it has a varied technological origin. Thus, flakes are the result of variously targeted production activities. There are specimens that were produced as deliberate flakes or flake half-products, but there are also those that can be genetically related to the exploitation of blade, preparation and shaping of the striking platform, transformation of large flake tools, etc.

5.2. A set of flint tools

Specimens classified as tools form two groups differing in the degree and standardization of transformations that comprise their morphology and working edges.

The first one consists of typological tools, mainly such as end-scrapers, as well as truncated blades (sickles) and perforators. The second group is the utility tools. In other words, they are atypical forms of tools that cannot be categorized under any of the categories of typological tools. They are either flakes and blades with retouching modifying the edge (or edges) in an atypical manner, or “raw” blades and flakes with retouching termed utilitarian.

In total, 11 utility tools were distinguished, which is a slight minority in the entire tool inventory, but taking into account amorphous retouched flakes, they constitute a dominant group over conventional forms. The morphological diversity of products from this group shows that it is not possible to do complete, proximal, mesial and distal a half-product with specific morphometric properties, which was selected as appropriate for a given category of tools. Products from this group are probably *ad hoc* selected flakes and blades, which ensured the implementation of specific tooling tasks.

This category of tools is opposed to conventional (typological) tools (11 items). These are standardized

forms shaped by intentional retouching, whose morphology and traces of wear often correlate with one specific activity. A classic example in the LBK inventory are truncated blades (sickles, sickle inserts) related to cutting cereals and end-scrapers (e.g. Małecka-Kukawka 2001).

In the inventory from the Brzezcie 40 site, the most numerous category of typological tools are end-scrapers (8 items). They are mainly made of blades, but also of flakes (1 item). The selected blade half-products transformed into scrapers came from various phases of exploitation, as evidenced by the fact that some of them have partially cortical surfaces. These are only scrapers with one scrap-edge, usually located in the distal part of the blade half-product.

The second largest typological tool in the inventory from the site in question are truncated blades (2 items). It seems that this group of tools is much more closely related to the blade half-product than it was in the case of scrapers. Moreover, negative blades were clearly preferred. The truncated edge was formed in the distal part, which is clearly visible in the case of both truncated blades, despite the differences in raw materials (flint and obsidian).

6. Characteristics of the LBK flint industry from Brzezcie 40 against the background of settlement in Małopolska

The LBK flint inventory from Brzezcie 40 should be described as small, especially in comparison with the previously identified sites of this unit in Małopolska. This applies in particular to inventories from other LBK settlements explored as part of rescue research in Małopolska, such as, for example, Modlnica 5. In this context, a large collection of 16 houses in the southern part of the site studied in 2002–2007 should be highlighted (Wąs 2012). This inventory, however, has some cognitive values, enriching the knowledge of LBK flint-processing. This is due to the fact that it is a fairly homogeneous collection attributed to the functioning of a single house, the relics of which and the immediate surroundings have been recognized almost entirely (Golański *et al.* 2019, 15). This situation allows the discussed inventory to be considered against the background of other LBK sites, however, it should be noted that the comparative characteristics of the flint-making industry from Brzezcie 40 are only general at the present stage, showing its potential position in relation to other LBK inventories from Małopolska. An in-depth comparative analysis requires not only the most detailed description of the flint-making dynam-

ics from the discussed site, but especially a uniform analytical apparatus used for the comparative characteristics of many Małopolska inventories. The above reasons and the fact that the chronologically analogous collections come from studies that differ not only in the scale of relic recognition, but also in a different scope of publication of their results, limit the possibility of a detailed comparison.

Significant for the comparative analysis of the materials from Brzezcie 40 are the results of the research at the LBK sites in the Nowa Huta region (Kaczanowska 1971; Kaczanowska *et al.* 1987). First of all, the sites Nowa Huta-Mogiła 62 and Bieńczyce 12 and 15 and from Pleszów (sites 17–20) should be mentioned. In general, these sites contain flint materials typical for the Lesser Poland LBK, related to the production of half-products and the use of tools.

However, while in terms of typology, the Brzezcie 40 inventory has numerous analogies, some differences are visible in terms of production. This is mainly related to the relatively poorly readable local production in Brzezcie, especially in the field of blade technology. The lack of cores should not only be emphasized, but most of all the characteristic production waste, such as rejuvenation flakes, etc.

In general, the inventory from Brzezcie 40 contains mostly elements typical for many sites of this unit in Małopolska. The percentage of individual categories within it allows to place it in the group of standard LBK inventories in southern Poland.

The raw material homogeneity of the inventory from Brzezcie 40 is also typical for the LBK sites from Małopolska, located relatively close to the Jurassic Cracovian flint outcrops. The low percentage of exotic raw materials (obsidian) is part of the standard of resource management in the unit in question (cf. Milisauskas 1976; Szeliga 2007, 297).

7. Conclusions

The research carried out at the Brzezcie 40 site provided a sparse flint collection related to the settlement of the LBK. It contains elements typical of the flint-making of that period and is characterized by a full cross-section of the technological and typological structure of early Neolithic flint inventories (Kozłowski 1970; Balcer 1983; 1987, 332–335).

The analysis of the inventory composition revealed a far-reaching standardization of flint-making in the discussed site, both in terms of production and use. The raw material structure with the quantitatively and technologically dominant Jurassic Craco-

vian flint, with a small amount of obsidian, alludes to analogous Małopolska inventories, especially located near the Jurassic Cracovian flint deposits (Lech 1981; Balcer 1983).

Taking into account the qualitative structure of the Neolithic inventory from Brzezcie 40, its similarity to the sites referred to as “user settlements” (Lech 1981) can be noticed. The spatial context – the relationship with the residential building (the house and its surroundings) harmonizes with the settlement character. In addition, the structure of the tool group is characteristic of the so-called “home” inventories. In particular, stand out blades and flakes from the so-called utilitarian re-touch category that do not show formal standardization features and metric preferences.

Although semi-raw forms dominate here in terms of numbers (with a predominance of flakes over blades), the scope and place of their production is undefined in the space of the site. It is highly probable that at least some of the finished semi-raw material (especially blades) was imported from the workshops near flint mines of the Saspów type (Dzieduszycka-Machnikowa and Lech 1976; Lech 1987) or from other settlements where production activities were identified (e.g. Olszanica, Nowa Huta-Pleszów) (Kruk and Milisauskas 1999, 52–54). The most likely is a connection between the discovered relics and the LBK flint processing identified as a result of the exploration of the site during the wide-ranging rescue research of Brzezcie 40 in the collision zone with the A-4 motorway (cf. Wąs 2012).

Flint materials of Linienbandkeramik culture from the Targowisko site 16, Kłaj commune, Małopolskie voivodeship.

1. Introductory remarks

During the excavations carried out at the Targowisko 16 site, a collection of 64 flint artefacts was obtained.

The dispersion of flint materials indicates that they are related to the relics of the LBK settlement. Their structure is made up of structural remains of one house and the aboveground features around it: pits and ditches. Since the relics of the discovered house are spatially isolated from other settlement structures, it can be assumed that the set of flint artefacts belonging to them is relatively homogeneous, as a remnant of the smallest settlement unit, which is household cluster, compact in space and time (Golański *et al.* 2019, 8).

The entire flint inventory at Targowisko 16 comes from the fillings of 4 features. It is worth emphasizing that there are clearly noticeable quantitative differences between the flint collections from the features located at the western and eastern walls. Features 3 and 8 located on the W from the house contained a total of 8 flint objects, while features 44 and 45 located on the E from the house contained as many as 53 flint objects.

2. Raw material structure

Almost the entire raw material structure of the flint inventory at Targowisko 16 is made of local Jurassic Cracovian flint (Tab. 3; Fig. 5). The share of this raw material is almost 78% of the total material (50 pieces). Thermal transformations prevent the raw material identification of three specimens (approx. 5% of the collection). Despite the changes in colour, they have features that suggest that they are probably made of Jurassic Cracovian flint, which increases its percentage in the entire inventory. There are no registered remains of other types of flint. Moreover, 11 products made of obsidian were distinguished, which constitutes about 17% of the raw material structure of the entire inventory.

Table 3. Targowisko 16. Raw material structure.

Raw material	Feature 31	Feature 44	Feature 45	Feature 63	=
Jurassic Cracovian	4	20	23	3	50
burned	1	1	1		3
obsidian	3	2	6		11
=	8	23	30	3	64

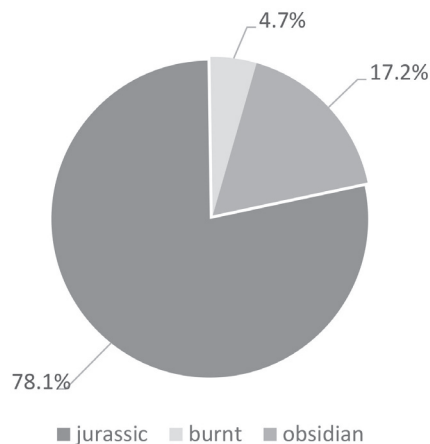


Fig. 5. Targowisko 16. Percentage share of individual varieties of raw material.

3. Technological and typological structure

The general structure of the inventory consists of products classified into 8 categories (Tab. 4; Fig. 6). The most numerous group are the products related to flake exploitation (a total of 30 items). Flakes (19 items) and the technologically related flaking core (1 item) as well as tools made of flake half-products (10 items) constitute nearly half of the entire inventory. The products associated with blade extraction (26 items) are slightly less numerous. The most numerous in this group are blades (10 items). It also includes the blade core (1 piece) and 15 tools made of blade half-products. The rest of the inventory consists of specimens identified as chunks (3 items). All of them are negative specimens. A microdebitage in the form of a single chip (smaller than 5 mm) has also been identified. A single specimen remained indefinite in terms of technology and typology.

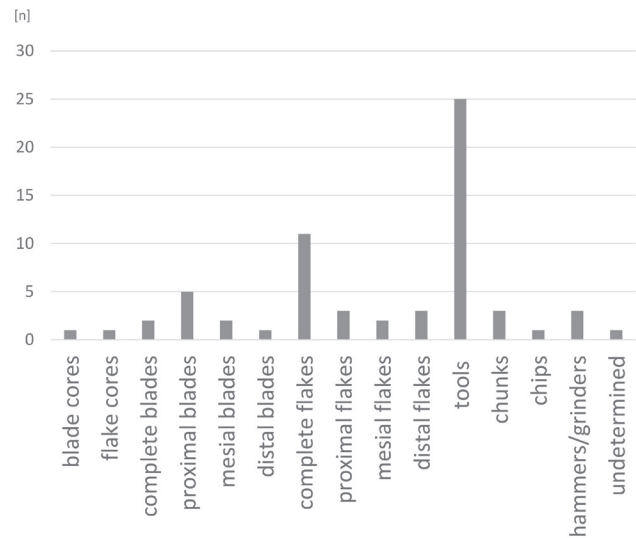


Fig. 6. Targowisko 16. The frequency of types of flint products.

Table 4. Targowisko 16. Qualitative and quantitative structure of the flint inventory.

	Feature 31	Feature 44	Feature 45	Feature 63	SUM
CORES			2		2
blade			1		1
flake			1		1
BLADES	3	4	2	1	10
complete	1		1		2
proximal	2	2	1		5
mesial		1		1	2
distal		1			1
FLAKES		7	12		19
complete		4	7		11
proximal		2	1		3
mesial			2		2
distal		1	2		3
TOOLS	5	8	11	1	25
truncated blades	2	1	3	1	7
perforators		1			1
micro-retouched blades	1	1	1		3
blades with polish			1		1
blades with use retouch			3		3
retouched flakes	1	3	1		5
flakes with use retouch	1	2	2		5
CHUNKS		2	1		3
with negatives		2	1		3
CHIPS		1			1
HAMMERS/GRINDERS			2	1	3
UNDETERMINED		1			1
SUM	8	23	30	3	64

A tool group was also distinguished in the general structure of the flint inventory at Targowisko 16. A total of 25 tools were identified and classified under 7 categories. Based on the degree of shape by retouching, two groups of tools can be distinguished. The first and most numerous group are typological (conventional) tools. In total, 16 retouched specimens were identified, among which blade forms predominate quantitatively: truncated blades (7 items), micro-retouched blades (3 items) and a perforator (1 item). Flake forms are represented by 5 retouched amorphous ones. The second group of tools are the so-called utility forms, i.e. flakes and blades with traces of their use in the form of the so-called utility retouch and utility displays (9 items in total). The most numerous of them are flakes with utility retouching (5 items). In this group, there were also distinguished 3 blades with utility retouch and 1 blade with polish. Apart from the tool group, the inventory includes 3 flint hammers/grinders, most of which are probably functionally transformed cores of various types.

4. Characteristics of collections from features

As previously noted, the collections of artefacts from individual features differ in terms of quantity, and thus in terms of quality and raw materials.

Feature 31

From its fill there are 8 specimens, 3 of which are made of obsidian (Fig. 7: 6–8). Most (5 items) are tools: 2 truncated blades (Fig. 7: 4, 5) and 3 typologically undefined forms. Moreover, 3 blades (1 whole and 2 proximal) were distinguished, bearing the characteristics of LBK blade debitage.

Feature 44

This provided the second largest collection of flint relics at the site. Among 23 specimens, 11 are half-products: 4 blades and 7 flakes. Eight tools were distinguished, among which 3 blade forms are distinguished: truncated blade (Fig. 7: 2), a perforator (Fig. 7: 3) and micro-retouched blade (Fig. 7: 1). Moreover, feature 44 came with 3 undefined forms and 1 chip.

Feature 45

This is the source of the largest collection of flint products on the site (30 items). Among them, 6 specimens are made of obsidian (Fig. 8: 2, 3, 7). In addition to the half-products and tools, two specimens of used cores were also distinguished: blade and flake cores. In the group of half-products, flakes (12 pieces)

clearly dominate (Fig. 8: 3), while blades were distinguished only in 2 specimens (Fig. 8: 1). Moreover, 11 tools were identified, of which only 3 are typological specimens represented by 3 truncated blades (Fig. 8: 4–6). The others are atypical and functional forms, such as obsidian blade with micro-retouch (Fig. 8: 7). Two hammers/grinders were also found at this facility.

Feature 63

Only 3 products come from this feature: a fragment of a blade, a truncated blade (Fig. 8: 8) and 1 hammer/grinder.

5. Characteristics of the LBK flint industry from Targowisko 16 on the background of Małopolska

The LBK flint inventory from Targowisko 16 should be described as small, especially in comparison with the previously identified sites of this unit in Małopolska. This applies in particular to inventories from other LBK settlements explored as part of rescue research in Małopolska, such as, for example, Modlnica 5, Brzezie 40. However, this inventory has some cognitive values, enriching the knowledge of LBK flint-making. This is due to the fact that it is a fairly homogeneous collection attributed to the functioning of a single house, the relics of which and the immediate surroundings have been recognized almost entirely (Golański *et al.* 2019, 8). This situation makes it possible to consider the inventory in question against the background of other LBK sites, but it should be noted that the comparative characteristics of the flint-making industry from Targowisko 16 are only general at the present stage, showing its potential position in relation to other LBK inventories from Małopolska. An in-depth comparative analysis not only requires the most detailed description of the flint-making dynamics from the discussed site, but especially a uniform analytical apparatus used for the comparative characteristics of many Małopolska inventories. The above reasons and the fact that the chronologically analogous collections come from studies that differ not only in the scale of relic recognition, but also in a different scope of publication of their results, limit the possibility of a detailed comparison.

Significant for the comparative analysis of the materials from Targowisko 16 are the results of the research carried out at the LBK sites in the Nowa Huta region (Kaczanowska 1971; Kaczanowska *et al.* 1987). First of all, the sites of Nowa Huta-Mogiła 62 and Bieńczyce 12 and 15 and from Pleszów (sites 17–20) should be mentioned. In general, these sites

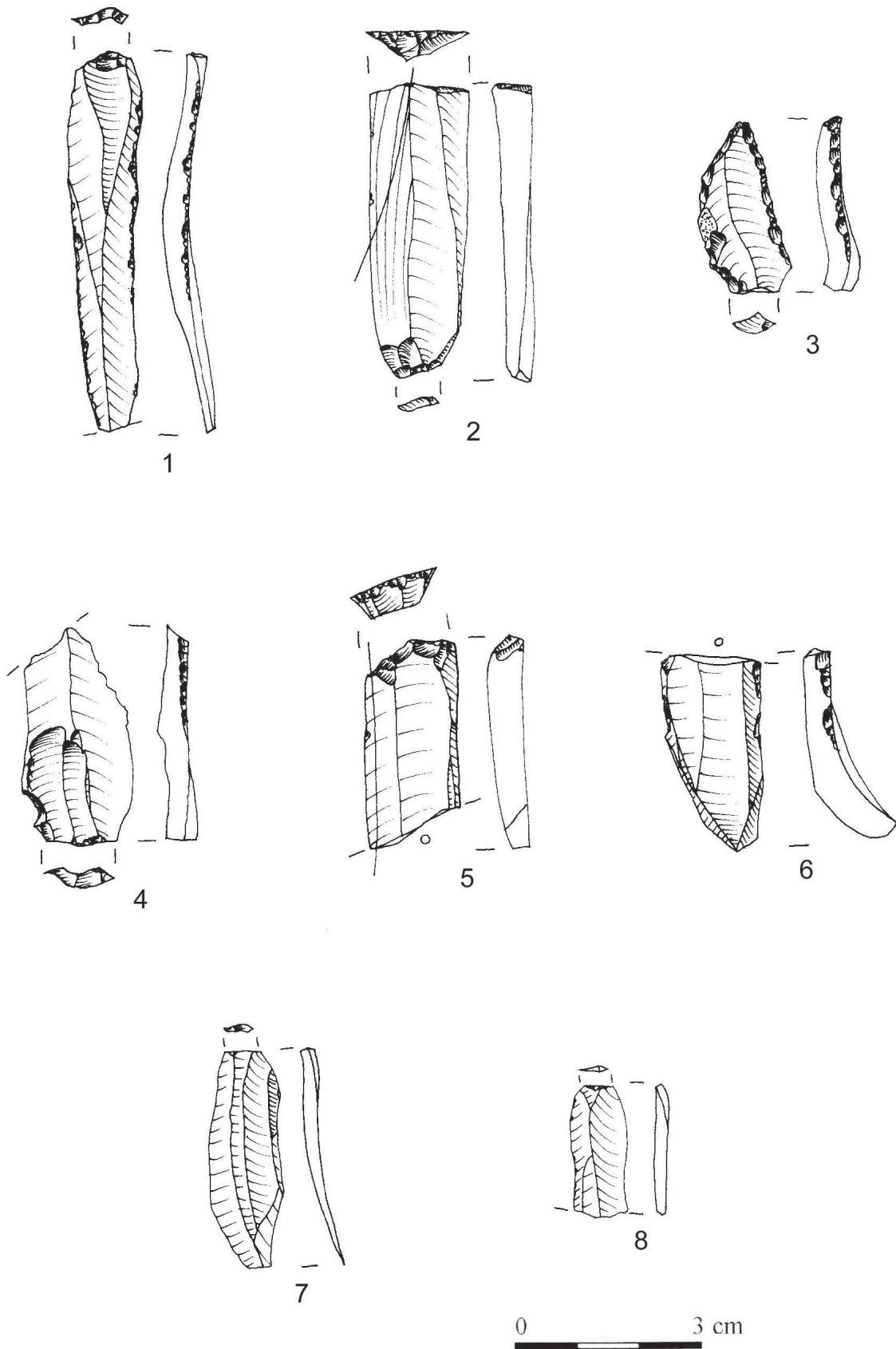


Fig. 7. Targowisko 16. LBK flint materials from features: 44 (1-3, 8) and 31 (4-7).
1-5 - Jurassic Cracovian flint; 6-8 - obsidian (drawn by M. Wąs).

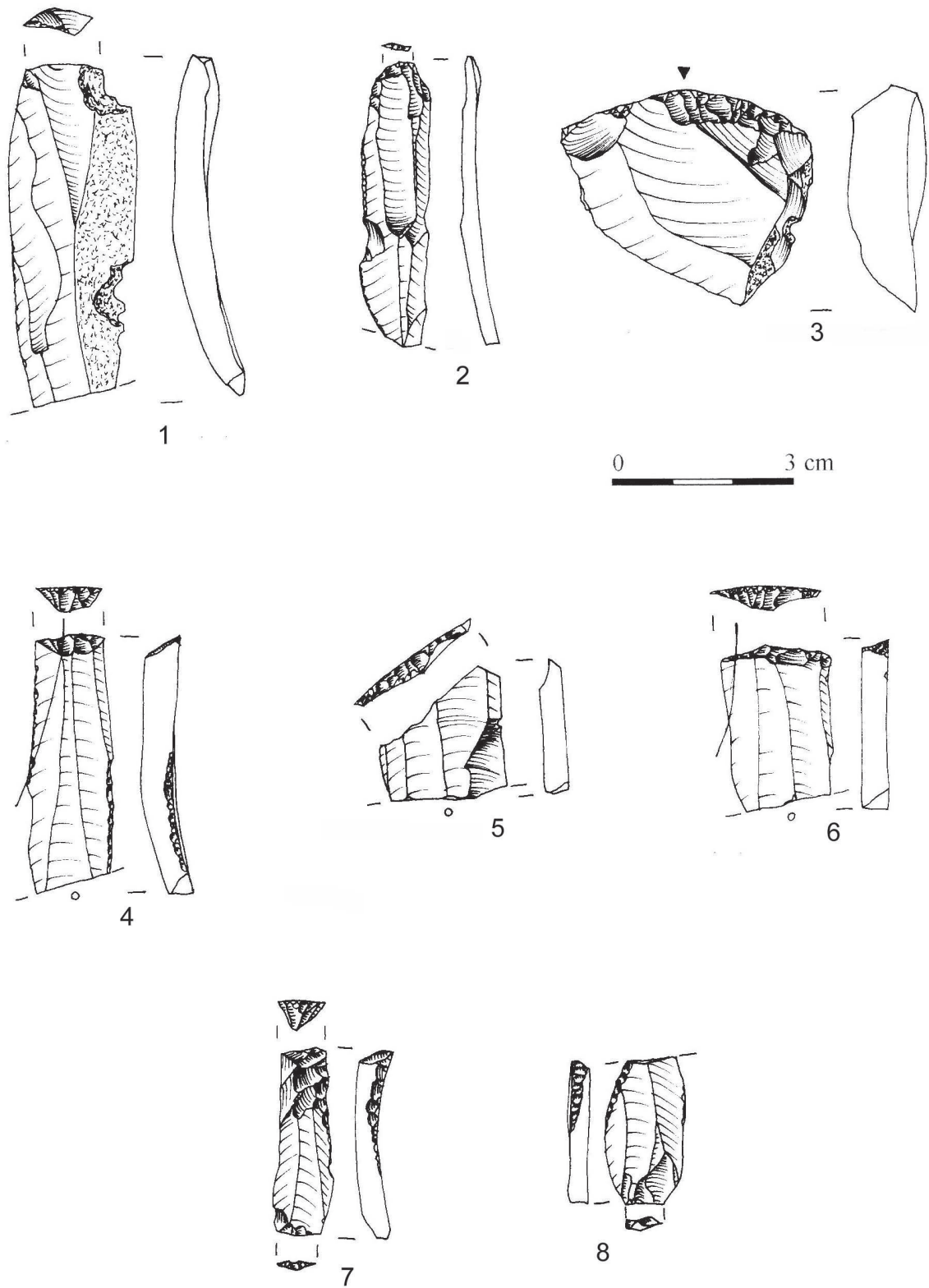


Fig. 8. Targowisko 16. LBK flint materials from features 45 (1-7) and 63 (8).
1, 4-6, 8 - Jurassic Cracovian flint; 2, 3, 7 - obsidian (drawn by M. Wąs).

contain flint materials typical for the Małopolska LBK, related to the production of half-products and the use of tools. It is worth noting that, similarly to Targowisko 16, the domination of truncated blades in the group of conventional tools is clear (Kaczanowska *et al.* 1987, 113).

However, while the Targowisko 16 inventory has numerous analogies in terms of typology, some differences are visible in terms of production. This is mainly related to the relatively poorly readable local production in Targowisko 16, especially in the field of blade technology. It should be emphasized not only the lack of cores, but most of all the characteristic production waste, such as rejuvenation flakes, etc.

In general, the inventory from Targowisko 16 mostly contains elements typical for many sites of this unit in Małopolska. The percentage of individual categories within it allows to be placed in the group of standard LBK inventories in southern Poland.

The raw material homogeneity of the inventory from Targowisko 16 is also typical of the LBK sites from Małopolska, located relatively close to the Jurassic Cracovian flint outcrops. The low percentage of exotic raw materials (obsidian) is part of the standard of resource management in the unit in question (cf. Milisauskas 1976; Szeliga 2007, 297).

6. Conclusions

The research carried out at Targowisko 16 provided a sparse flint collection related to the LBK. It contains elements typical of the flint-making of that period and is characterized by a full cross-section of the technological and typological structure of early Neolithic flint inventories (Kozłowski 1970; Balcer 1983; 1987, 332–335).

The analysis of the inventory composition revealed a far-reaching standardization of flint-making in the discussed site, both in terms of production and use. The raw material structure with the quantitatively and technologically dominant Jurassic Cracovian flint, with a small amount of obsidian, alludes to analogous Małopolska inventories, especially those located near the Jurassic Cracovian flint deposits (Lech 1981; Balcer 1983).

Taking into account the qualitative structure of the Neolithic inventory at Targowisko 16, its similarity to the sites referred to as “user settlements” (Lech 1981) can be noticed. The spatial context – the relationship with the residential building (the house and its surroundings) harmonizes with the settlement character. In addition, the structure of the tool group

is characteristic of the so-called “home” inventories. In particular, chips and flakes stand out from the so-called utilitarian retouching that do not show formal standardization features and metric preferences.

Although semi-raw forms dominate here in numbers (with a predominance of flakes over blades), the scope and place of their production is undefined in the space of the site. It is highly probable that at least some of the finished semi-raw material (especially blades) was imported from the workshops near flint mines of the Sąspów type (Dzieduszycka-Machnikowa and Lech 1976; Lech 1987) or from other settlements where production activities were identified (e.g. Olszanica, Nowa Huta-Pleszów) (Kruk and Milisauskas 1999, 52–54). The most likely connection between the discovered relics and the LBK flint processing identified as a result of the exploration of the site during the wide-ranging rescue research of Brzezie 40 in the collision zone with the A-4 motorway (cf. Wąs 2012).

Flint materials of Malice culture from the Targowisko site 14–15, Kłaj commune, Małopolskie voivodeship.

1. Introductory remarks

As a result of the excavations carried out at the Targowisko 14–15 site, a collection of 97 flint artefacts related to the relics of the Malice culture settlement were discovered.

They are the remains of one house, together with large ground feature adjacent to the north-west. Since the relics of the discovered house are spatially isolated from other settlement structures, it can be assumed that the set of flint artefacts belonging to them is relatively homogeneous, as a remnant of the smallest settlement unit, which is a household cluster, compact in space and time (Golański *et al.* 2019, 8).

Almost the entire flint inventory from the Targowisko 14–15 site comes from the fills of 3 features. A total of 97 items were found in them, and only 2 specimens come from the exploration layers outside the features.

2. Raw material structure

The raw material structure of the inventory from Targowisko 14–15 consists of a similar number of Jurassic Cracovian and chocolate flint. The first one represents the local raw material resources dominated

by Jurassic Cracovian (Tab. 5; Fig. 9). Its share is 43% of the total material (41 pieces). A similar percentage (43%) includes products made of chocolate flint (42 items). From the perspective of the examined site, these specimens can be described as imported. Apart from the above-mentioned flint species, also 3 specimens of obsidian were found at the site. On the other hand, about 11% are remains, the degree of thermal transformation of which makes it impossible to indicate the type of flint raw material. They were classified as burned specimens, although it is highly probable that most of the 11 such specimens were made of Jurassic Cracovian flint.

Table 5. Targowisko 14–15. Raw material structure of the inventory.

Raw material	Feature 1	Feature 2	Feature 22	Outside features	=
Jurassic Cracovian	31	3	5	2	41
chocolate	41	1			42
burned	11				11
obsidian	3				3
=	86	4	5	2	97

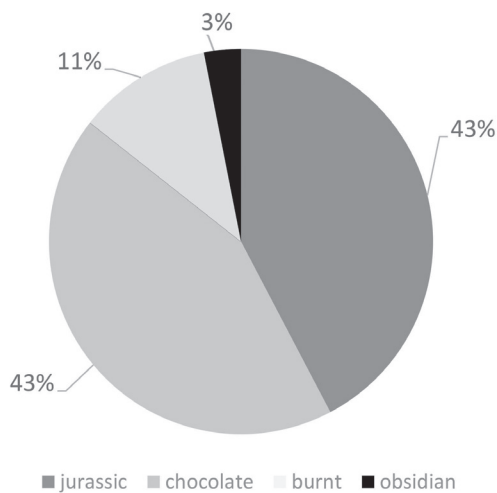


Fig. 9. Targowisko 14–15. Raw material structure of the inventory.

The technological origin of the specimens from obsidian, and especially from chocolate flint, is impossible to define. There are definitely no premises for local (within the range of the site) processing of

both raw materials. It is possible that the interpretation of the presence of the above-mentioned raw materials should be sought on the functional level (e.g. Małecka-Kukawka 2001).

The raw material structure outlined above, containing three components: local raw material (Jurassic Cracovian flint), quantitatively distinguished imported raw material (“chocolate”) and exotic (obsidian), is typical for many other MC inventories in Małopolska (e.g. Szeliga 2007; Wilczyński 2010).

3. Technological and typological structure

The general structure of the inventory consists of products classified into 7 categories (Tab. 6; Fig. 10). The most numerous group are products related to the flake exploitation (55 items in total). The flakes (39 items), the flake core and the tools made of the flake half-products (16 items) account for over 72% of the total inventory. The products associated with blade exploitation (35 items) are slightly less numerous. Blades are the most numerous in this group (16 items). It also includes 1 blade core, 2 rejuvenation flakes from the exploitation, probably the blade core, 1 flake from the reduction of the blade core tip and 15 tools made of blade half-products. The rest of the inventory consists of specimens identified as chunks (5 items). Among them, 3 are negative and 2 are burned ones. A micro-debitage in the form of two chips (smaller than 5 mm) has also been identified.

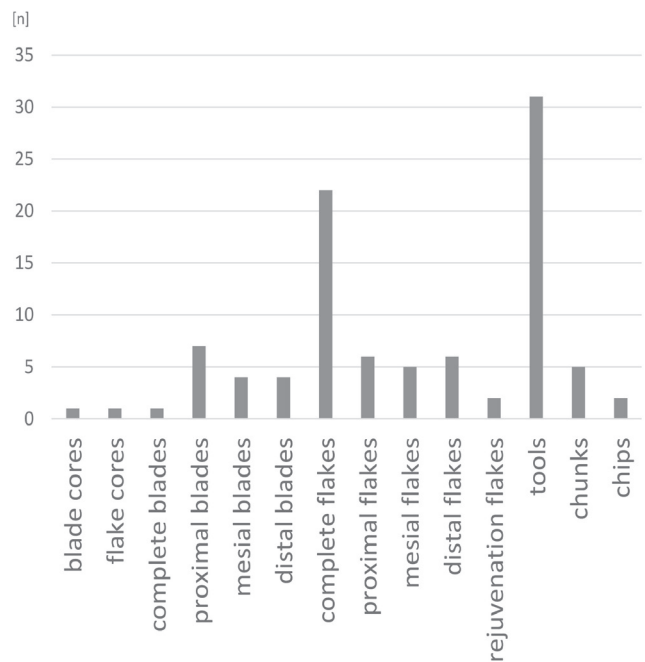


Fig. 10. Targowisko 14–15. Frequency of product types in the entire inventory.

Table 6. Targowisko 14–15. Qualitative and quantitative structure of the entire flint inventory.

	Feature 1	Feature 2	Feature 22	Outside features	SUM
CORES	2				2
blade	1				1
flake	1				1
BLADES	13	1	2		16
complete			1		1
proximal	6	1			7
mesial	4				4
distal	3		1		4
FLAKES	36	1	2		39
complete	20	1	1		22
proximal	5		1		6
mesial	5				5
distal	6				6
REJUVENATION FLAKES	2				2
TOOLS	27	1	1	2	31
end-scrapers	2				2
truncated blades	2				2
double-truncated blades	4				4
micro-retouched blades	6				6
blades with use retouch		1			1
retouched flakes	2				2
flakes with use retouch	11		1	2	14
CHUNKS	4	1			5
with negatives	2	1			3
burnt	2				2
CHIPS	2				2
SUM	86	4	5	2	97

In addition to the above-mentioned categories, a tool group was distinguished in the general inventory structure from the discussed site. 31 tools were identified which account for over 30% of the total inventory. They are classified into 7 types. Based on the degree of shape by retouching, two groups of tools can be distinguished.

The first numerous group are typological (conventional) tools. In total, 16 retouched specimens were identified, among which chip forms quantitatively predominate: truncations (6 pcs., including 2 single and 4 doubled ones), scrapers (2 pcs.), Micro-

retouched shavings (6 pcs.). The splintered forms are represented by 2 amorphous retouched specimens. In total, 16 retouched specimens were identified, among which blade forms quantitatively predominate: truncated blades (6 items), including 2 single and 4 doubled ones), end-scrapers (2 items), micro-retouched blades (6 pcs.). The flake forms are represented by 2 amorphous retouched specimens.

The second group of tools are the so-called utility forms, i.e. flakes and blades with traces of their use in the form of the so-called utility retouch and polishing (15 items in total). The most numerous of

them are flakes with utility retouching (14 items). 1 blade with utility retouch was also distinguished in this group.

4. Characteristics of collections from features

The collections of remains from individual features discovered at the Targowisko 14–15 site differ in terms of quantity, and thus in terms of quality and raw materials. In terms of saturation with finds, they are distinguished by Feature 1. In the remaining ones (features 2 and 22), several pieces of flint relics were

discovered, while feature 22 is in a strict stratigraphic relation with feature 1.

Feature 1

This is the source of the most numerous collection of flint products on the site (86 items) (Fig. 11, 12). Among them, products made of chocolate flint dominate quantitatively (41 items). Slightly fewer products made of Jurassic Cracovian flint were distinguished (31 pieces). Moreover, 3 specimens are made of obsidian, and 11 others are burned artefacts (probably both flint species present in this collection).

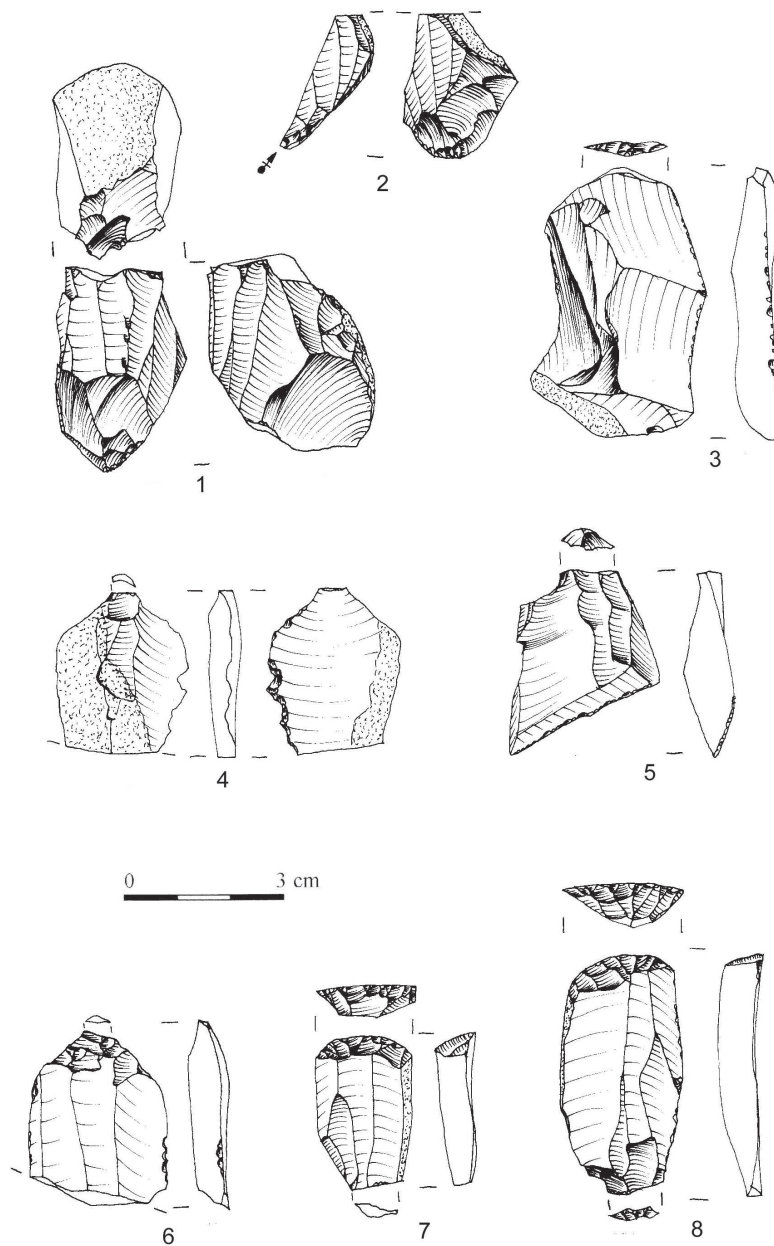


Fig. 11. Targowisko 14–15. MC flint materials from feature 1 (1–8). 1, 3–5, 7 – Jurassic Cracovian flint; 2, 6, 8 – “chocolate” flint (drawn by M. Wąs).

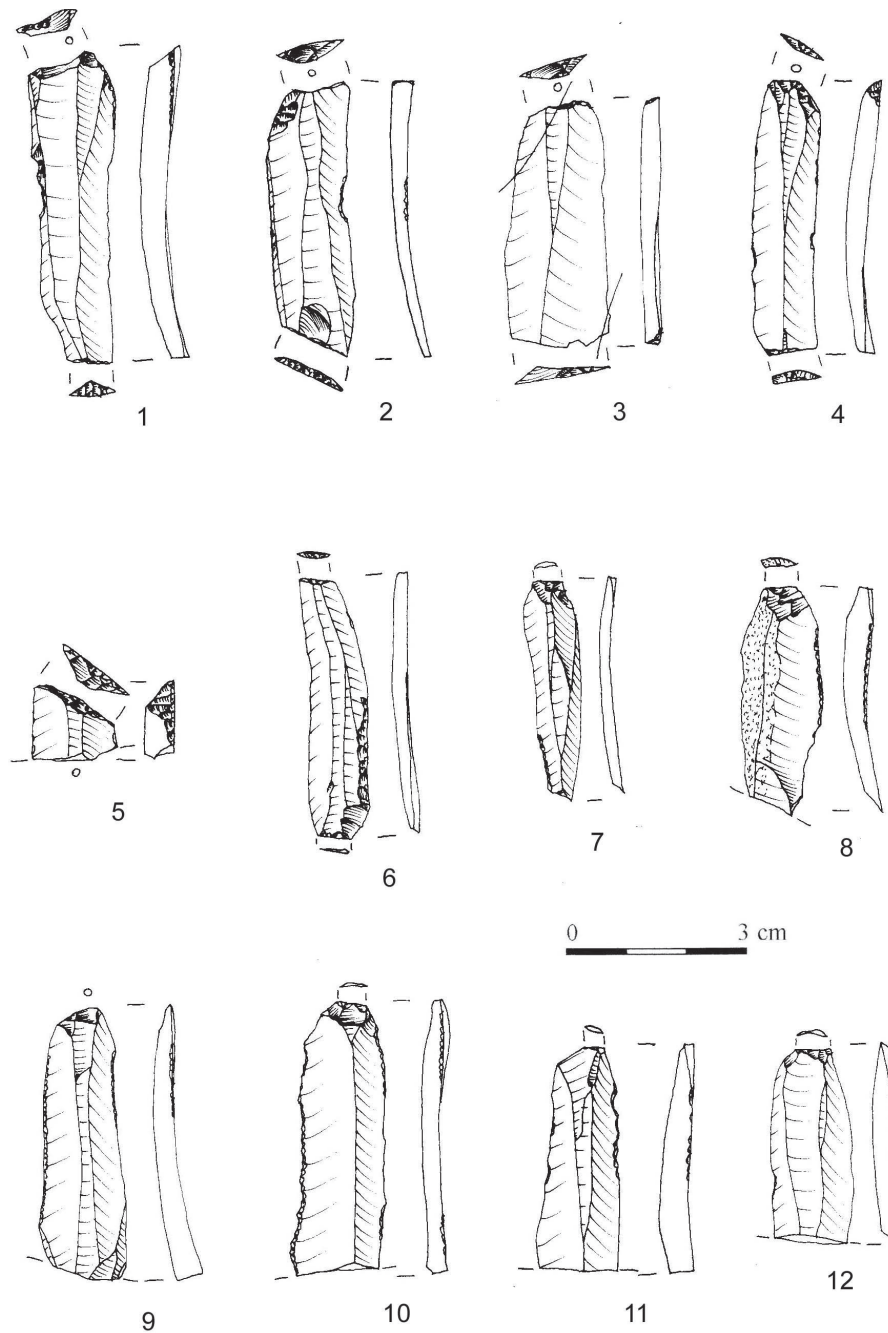


Fig. 12. Targowisko 14-15. MC flint materials from feature 1 (1-12). 1, 3, 6, 8, 10-12 – Jurassic Cracovian flint; 2, 4, 7, 9 – “chocolate” flint; 5 – burnt flint (drawn by M. Wąs).

Most of the products (36 pieces) are flakes, of which 20 are complete specimens, and the remaining 16 are proximal (5 items), mesial (5 items) and distal (6 items) fragments. A residual fragment of core is technologically related to them. The blade extraction products also stand out quantitatively (17 items). Among them, attention is drawn to 1 blade core with a strongly shortened striking platform (Fig. 11: 1). One of the flakes of chocolate flint exploited from the top of the core with distinct chip negatives is probably

related to such actions (Fig. 11: 2). In addition, 2 rejuvenation flakes are technologically related to them. The most characteristic in this technological group, however, are the blades represented by 13 fragments (6 proximal, 4 mesial and 3 distal) (Fig. 12: 12).

Apart from two chips and four chunks, the remaining items were classified as tools (27 items). Among them, 8 specimens are typologically defined. There are truncated blades – doubled and single – both types made of both types of flint (Fig. 12: 1-6).

Apart from them, conventional tools are represented by 2 end-scrapers (Fig. 11: 7, 8). The remaining forms are not typologically defined: 6 micro-retouched blades (Fig. 12: 7–11), 2 retouched flakes (Fig. 11: 4, 5) and 2 flakes with utility retouching (Fig. 11: 3, 6).

Feature 2

Only 4 products were found: 1 flake, 1 proximal part of the blade, 1 fragment of the blade with utility retouching and 1 negative flake.

Feature 22

Among the 5 specimens discovered in its fill, almost all are exclusively half-products. There were 2 flakes (1 complete and 1 proximal) and 2 blades (including 1 complete and 1 distal fragment). Moreover, with feature 22 comes from the flake with functional retouching.

In addition to the above-mentioned collections from the ground features located in the vicinity of the MC house, 2 flint products were discovered in the exploration layer outside the features. Both are flakes with utility retouching.

5. General characteristics of the Malice culture flint industry from Targowisko 14–15

The source base for the characteristics of MC flint-making at the Targowisko 14–15 site are products found in stratigraphic contexts related to the relics of a single house. It should be noted that the spatial organization of the stratigraphic systems within the MC settlement unit, which is a household cluster, is different than in the case of LBK settlements. The best example of this is the lack of groups of features surrounding the house (Golański *et al.* 2019, fig. 16–17), in favour of the functioning of single large cavities located mainly north and west of the MC houses. This scheme is also clear in the case of the relics of MC in Targowisko 14–15 (Golański *et al.* 2019, fig. 18).

The collection of flint products related to the functioning of a single MC house should be assessed as small. Nevertheless, it is important for the possibility of characterizing all issues related to the MC flint-making. It should be emphasized first of all that the inventory is quite homogeneous. The first distinguishing feature is the raw material structure, in which the non-local chocolate flint has a significant share.

The second aspect that needs to be highlighted is the noticeable specificity of the stylistics of chip materials, especially those made of chocolate flint. At the present stage of research, it can be assumed that part

of the MC half-products from Targowisko 14–15 is related to a different technology of exploitation and perhaps also to the use of different techniques of blade production known, for example, in LBK.

However, due to the lack of appropriate source data in the MC inventory, the problem of blade half-products production cannot be characterized in detail. It can only be assumed that such activities took place at a different site or were spatially located outside the zones identified as settlements.

5.1. Technological aspect

The basic category related to the flint production in Targowisko 14–15 is a sparse half-product material (and indirectly also blade tools). In a group of 16 specimens, there is only 1 complete blade. Only this specimen and 7 fragments of proximal blades have clear morpho-stylistic features of diagnostic proximal parts for the identification of the exploitation technique (Inizan *et al.* 1992). Most of them have features referring to analogous forms known from LBK. Such a conclusion applies especially to chips made of Jurassic Cracovian flint. This issue is slightly different in the case of the “chocolate” blades, whose morphology differs in macroscopic assessment from the canon of LBK blades. These are mainly specimens that are characterized by extraordinary regularity of edges and interneegative ridges. Partially raw material used for the production of truncated blades refers to them. The blade debitage group at Targowisko 14–15 also includes the Jurassic flint blade core, which in turn has features referring to analogous products from LBK inventories.

In comparison with not very numerous blades, flakes stand out quantitatively in the MC inventory. It is probably not a homogeneous set and individual specimens may have different technological origins. However, there are no broader data to characterize this issue. Perhaps a single flake core may be a relic of local semi-raw material production.

5.2. An assortment of flint tools

The characteristics of the MC flint working in Targowisko 14–15 are based on not very numerous sources in the form of about 30 relics. In this context, the primary issue is the qualitative structure of the group of typological tools similar to the LBK inventories. Actually, it is composed of two quantitatively dominant types: truncated blades and end-scrapers. However, similarly to LBK, typological tools constitute a distinct minority here in relation to utility tools and amorphous retouched flakes.

6. Characteristics of flint-making of MC from Targowisko 14–15 against the background of settlement in Małopolska

The attempt to embed MC flint materials from Targowisko 14–15 against a broader comparative background encounters significant and objective limitations. First of all, attention should be paid to the highly unsatisfactory state of diagnosis of flint-making in this unit (see Kadrow 1990; 2009; Kozłowski 1996; Michalak-Ścibior 1996). In this context, the collection of MC flints from Targowisko 14–15 has great cognitive value as one of the few relatively fully recognized and at the same time homogeneous settlement inventories. Undoubtedly, the entire MC collection together with the analogous inventory from the southern part of the site (explored several years ago, but still unpublished results), is a more important part of the source base for MC flint-making in Małopolska, which will allow for the development of appropriately targeted analytical and comparative studies aimed at identification of its characteristic features (Wąs 2012).

7. Conclusion

The tests carried out at the Targowisko 14–15 provided small flint material related to the settlement of MC. It contains elements typical of the flint-making of that period and is characterized by a full cross-section of the technological, typological and raw material structure of the MC inventories.

From a technological point of view, the entire collection identified with the settlement of MC in Targowisko 14–15 is a conglomerate of many production episodes. Although the number of half-products materials is dominant here (with a predominance of flakes over blades), the scope and place of their production are unspecified in the structure of the settlement. This applies to both the local Jurassic Cracovian flint and the imported chocolate variety.

In general, MC's inventory of flint products from Targowisko 14–15 is "home" in character (associated with the use of flint tools), and to a much lesser extent, a workshop, the scope of which is difficult to unequivocally define. Therefore, it can be assumed that the flint collection associated with the MC house reflects the general character of the settlement, with an indication of the settlement of tool users rather than tool manufacturers. However, this aspect requires properly targeted studies.

Acknowledgements

The work was created as a result of the research project NCN No. 2016/21/B/HS3/03137 financed by the National Science Centre.

References

- Balcer B. 1983. *Wytwórczość narzędzi w neolicie ziem Polski*. Wrocław: Zakład Narodowy im. Ossolińskich.
- Balcer B. 1987. Die Feuersteinindustrien der frühneolithischen "Keramik"-Kulturen in der Polnischen Tiefebene. In J. K. Kozłowski and S. K. Kozłowski (eds.), *Chipped Stone Industries of the early Farming Cultures in Europe (= Archaeologia Interregionalis 9)*. Warszawa: Wydawnictwa Uniwersytetu Warszawskiego, 331–350.
- Dzieduszycka-Machnikowa A. and Lech J. 1976. *Neolityczne zespoły pracowniane z kopalni krzemienia w Sąspowie (= Polskie Badania Archeologiczne 19)*. Wrocław: Zakład Narodowy im. Ossolińskich.
- Golański A., Kadrow S. and Krzywda A. 2021. Field Research in the Targowisko Region in 2018–2019. *Analecta Archaeologica Ressoiviensia* 16, 19–41.
- Golański A., Kadrow S. and Posselt M. 2019. Prospekcja geomagnetyczna wczesnoneolitycznego kompleksu osadniczego w Targowisku, woj. małopolskie. *Raport* 14, 7–20.
- Inizan M. L., Roche H. and Tixier J. 1992. *Technology of Knapped Stone*. Meudon: CREP.
- Kaczanowska M. 1971. Krzemienne materiały kultur neolitycznych pochodzenia południowego z terenu Nowej Huty. In J. K. Kozłowski (ed.), *Z badań nad krzemieniarstwem neolitycznym i eneolitycznym: referaty i komunikaty przedstawione na sympozjum w Nowej Hucie dn. 10, 11 maja 1971*. Kraków: Polskie Towarzystwo Archeologiczne, 10–24.
- Kaczanowska M., Kozłowski J. K. and Zakościelna A. 1987. Chipped stone industries of the Linear Band Pottery Culture settlements in the Nowa Huta region. *Przegląd Archeologiczny* 34, 93–132.
- Kadrow S. 1990. Obiekt kultury malickiej na stanowisku nr 20 w Rzeszowie. *Sprawozdania Archeologiczne* 42, 95–104.
- Kadrow S. 2009. Obrządek pogrzebowy kultury malickiej. In A. Czekaj-Zastawny (ed.), *Obrządek pogrzebowy kultur pochodzenia naddunajskiego w neolicie Polski południowo-wschodniej (5600/5500–2900 BC)*. Kraków: Instytut Archeologii i Etnologii Polskiej Akademii Nauk, 53–66.
- Kadrow S., Posselt M., Saile T., Wąs M., Abramów J. and Golański A. 2021. Culture transformation in the Targowisko microregion. Trends of changes among Danubian farmers. *Sprawozdania Archeologiczne* 73/1, 153–176.
- Kozłowski J. K. 1970. Z badań nad wytwórczością krzemieniarską w kulturze ceramiki wstęgowej rytej. In J. K. Kozłowski (ed.), *Z badań nad kulturą ceramiki wstęgowej*

- rytej. Kraków: Polskie Towarzystwo Archeologiczne. Oddział w Nowej Hucie, 73–94.
- Kozłowski J. K. 1996. Kultura malicka. In J. K. Kozłowski (ed.), *Kultura malicka. Drugi etap adaptacji naddunajskich wzorców kulturowych w neolicie północnej części Środkowej Europy* (= *Rozprawy Wydziału Historyczno-Filozoficznego PAU 80*). Kraków: Polska Akademia Umiejętności, 153–158.
- Kruk J. and Milisauskas S. 1999. *Rozkwit i upadek społeczeństw rolniczych neolitu*. Kraków: Instytut Archeologii i Etnologii Polskiej Akademii Nauk.
- Lech J. 1981. *Górnictwo krzemienia społeczności wczesnorolniczych na Wyżynie Krakowskiej. Koniec VI tysiąclecia – I połowa IV tysiąclecia p.n.e.* Wrocław: Zakład Narodowy im. Ossolińskich.
- Lech J. 1987. Z badań nad górnictwem krzemienia społeczności rolniczych Europy Środkowej. Relacje przestrzenne kopalń i osad. *Acta Archaeologica Carpathica* 26, 93–137.
- Małecka-Kukawka J. 2001. *Między formą a funkcją. Traseologia neolitycznych zabytków krzemiennych z ziemi chełmińskiej*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.
- Michalak-Ścibior J. 1996. Zagadnienie chronologii i periodyzacji kultury malickiej w świetle nowych źródeł z Wyżyny Sandomierskiej. In J. K. Kozłowski (ed.), *Kultura malicka. Drugi etap adaptacji naddunajskich wzorców kulturowych w neolicie północnej części Środkowej Europy* (= *Rozprawy Wydziału Historyczno-Filozoficznego PAU 80*). Kraków: Polska Akademia Umiejętności, 35–30.
- Milisauskas S. 1976. *Archaeological Investigations on the Linear Culture Village of Olszanica*. Wrocław: Zakład Narodowy im. Ossolińskich.
- Szeliga M. 2007. Der Zufluss und die Bedeutung des Karpatenobsidians in der Rohstoffwirtschaft der post-linearen Donaugemeinschaften auf der polnischen Gebieten. In J. K. Kozłowski and P. Raczky (eds.), *The Lengyel, Polgar and related cultures in the Middle/Late Neolithic in Central Europe*. Kraków: Polska Akademia Umiejętności, 295–308.
- Wąs M. 2012. Materiały krzemienne kultury ceramiki wstęgowej rytej ze stanowiska Brzezcie 40. In L. Czerniak, J. Pyzel, A. Badtke, K. Michalak and Ł. Połczyński, *Osada kultury ceramiki wstęgowej rytej w Brzeziu, stan. 40*. Kraków (unpublished manuscript in the archive of the Krakowski Zespół do Badań Autostrad).
- Wilczyński J. 2010. The Techniques of Obsidian Treatment on the Malice Culture Settlement of Targowisko 11, Lesser Poland. *Przegląd Archeologiczny* 58, 23–38.