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M i c h a ł A d a m c z y k

Wołczkowo: The Federmesser Collection Reconsidered

Wołczkowo: badania wyrobów kultury Federmesser

Abstract: The article presents the Federmesser collection from Wołczkowo, Western Pomerania, in the context of the lithic technology. The technique and the method as well as the potential relations with other Late Palaeolithic units are highlighted in the discussion.
Keywords: Western Pomerania, Late Palaeolithic, Federmesser, lithic technology, old museum collection
Abstrakt: Artykuł prezentuje kolekcję zabytków kultury Federmesser znalezionych w Wołczkowie na Pomorzu Zachodnim pod względem technologii krzemieniarstwa. W pracy przedyskutowano technikę i metodę oraz potencjalne związki z innymi kulturami późnego paleolitu.
Słowa kluczowe: Pomorze Zachodnie, późny paleolit, Federmesser, technologia krzemieniarstwa, dawne zbiory muzealne

Introduction: The Site and the Collection

Late Palaeolithic site Wołczkowo 1 (Dobra commune, Police district, West Pomeranian Voivodeship/NW Poland; AZP 29-04/132) for a long time has been considered one of the oldest, if not the oldest, known site in Western Pomerania. It is also of high importance, as it triggered a half-century long discussion about early settlement and colonization of Pomerania in the postglacial period (e.g. Czarnecki 1983, 70; Galiński 2019, 198).

The site was discovered sometime in the late 19th or early 20th century in unknown circumstances, in the place called *Streitkamp* which means a "military training field" in German. Tadeusz Galiński (1997, 55–56; 2019, 30) hypothesised that the artefacts had been found during construction of a military shooting range in Wołczkowo, north-east of the village (Fig. 1). The range itself is

located on the border of a fluvioglacial terrace and the south-western edge of a Pleistocene tunnel valley (Fig. 2), nowadays mostly filled with Lake Głębokie in the north-western part of Szczecin (Piotrowski, Schiewe, Relisko-Rybak 2015, 7–8). The artefacts were originally part of the collection owned by Hugo Schumann, member of a medical council (German: *Sanitätsrat*) from Löcknitz. After his death in 1909, the collection came into Helmuth von Brüning's possession, district administrator (German: *Landrat*) of Kreis Randow, who in turn donated it to the *Gesellschaft für Pommersche Geschichte und Altertumskunde* (The Association for the Pomeranian History and Antiquities) in Szczecin, where later it was catalogued as number 7042:1–44 (present Cat. No.: MNS/A/5825). According to Hugo Lemcke's note published in *Baltische Studien*, at that time the Schumann's collection was the biggest and the most important collection of antiquities from Kreis Randow (Lemcke 1910, X). Unfortunately, both Schumann's original notes, his catalogue as well as part of a museum catalogue concerning the Wołczkowo site were long gone, thus the information on the site is limited to a brief mention in an archival record (ADA MNS 1743).

The Wołczkowo collection was introduced to the scientific discourse by Polish archaeologist Maciej Czarnecki who published its detailed description in two articles about Palaeolithic and Mesolithic sites in Western Pomerania (Czarnecki 1970; 1983). After the first publication, the site was mentioned several times, e.g. by Romuald Schild (1975), Tadeusz Galiński (1997; 2019), Michał Kobusiewicz (1999) and Iwona Sobkowiak-Tabaka (2011; 2017). However, it must be pointed out that all of the cited works focused only on a typological description, thus in many ways they contained the same data. There is a consensus among researchers that Wołczkowo is an assemblage of the Federmesser culture (or: *Federmesser-Gruppen*, FMG), also called the Arch-Backed Points Technocomplex (ABP), dated to the Allerød period, with possible cultural relations to the northern Germany area.

The collection contains only 44 artefacts (Figs 4–12), including two cores, 15 blades, one flake, one debitage fragment, eight arch backed points, one shouldered point (or unfinished backed point), 14 end scrapers and two burins. It is obvious that this set does not reflect a realistic composition of a typical Late Palaeolithic assemblage, mainly because of a high ratio of retouched tools in relation to blades and flakes which under normal circumstances should be the most numerous categories in an assemblage. It is very probable that the artefacts were selected upon discovery, and some were collected for aesthetic reasons with majority being rejected and left on the spot.

Goals and Aims

Because the typology of the tools from Wołczkowo has already been described several times, it will not be discussed here. Instead, the main focus of this paper is to reconsider the assemblage from Wołczkowo as seen in a different perspective. This is to be achieved through the technological analysis of the assemblage.

The most important aim here is the identification of a method and a technique used for lithic production. A related question is if the assemblage was made using a single method and a single technique or more than one. It is also important to find how in terms of technology this collection is related to the Federmesser; is it rather early or late phase of the culture and if there are any possible ties to other Late Palaeolithic cultures of Northern Europe.

An equally important goal of this paper is to refresh the knowledge of this collection and to present it to the scientific community in details and according to a modern methodology. Thus, all 44 lithics were documented and their images are an integral part of this article.

Methodology

The main objective of this paper is not as easy and straightforward as one might expect due to the nature of an old collection. What is more, it is a challenging one and requires a specific methodology of the analysis.

First of all, small collections, especially collected randomly from a surface of the ground or selected like in this case, are not fit for refittings. This method has been proven to be the most reliable if it comes to the technology, but it requires complete assemblages in order to be used most efficiently. Thus an ideal situation is a fully excavated site, which does not apply to the Wołczkowo collection.

There are two cores in the assemblage. Although it is possible to analyse cores with a scar pattern analysis, the method is better suited for research on large tools, such as bifaces or square axes (e.g. Migal, Urbanowski 2006; 2008). The reason is that in the case of cores the negatives of a last series of blade exploitation usually remove most (or even all) of negatives of initial preparation and repairs. The scar pattern analysis, in the case of blade cores, gives detailed information on the late stages, but not very much on the early ones.

The main analytical method used in this paper is the Dynamical Technological Classification (DTC), based on works of Bo Madsen (1992; 1996) and Mikkel Sørensen (2006), and later used with promising results (e.g. Berg-Hansen 2019). This approach was inspired and developed after Romuald Schild's Dynamical Classification (e.g. Schild, Marczak, Królik 1975),

although a substantial shift in philosophy occurred between the two research methods. While Schild, Marczak, Królik (1975) used the classification to qualify and quantify populations of tools in a purely typological manner, both Madsen (1992; 1996) and Sørensen (2006) used the same principles for separate technological elements derived mainly from a method (e.g. edge preparation) and a technique (e.g. form of a bulb; Tab. 1 and 2; Fig. 3). This approach was more suited for interpretation of data in the context of a *chaîne opératoire* and later to construct a *schema opératoire* (e.g. Inizian *et al*. 1999, 15–16).

One important remark about application of the DTC method is that it requires a knowledge of the *chaîne opératoire* concept and its stages. It is crucial to know how products of different stages may look like, because in many flintknapping traditions different techniques are used at different stages of core reduction, resulting in different sets of features. Thus it is helpful to separate debitage from technological waste and cores, and later compare these groups.

In its core, the DTC method was developed for quantifying large populations of lithics, allowing for clustering and subdividing them according to methods and techniques. However, in this paper, the analysed collection is definitely too small to fully use the potential of the method. Thus, it will only be adopted to describe different operations present in the collection and their technological context.

For comparison, some data on the Federmesser flintknapping were taken from the literature (e.g. Hartz 1987; Kabaciński, Sobkowiak-Tabaka 2010; Sobkowiak-Tabaka 2011; Kwiatkowski, Masojć 2011; Riede 2014; Kotthaus 2019; Sobkowiak-Tabaka, Okuniewska-Nowaczyk, Ratajczak-Szczerba 2019; Pyżewicz *et al*. 2020). However, the Federmesser lithic technology is still rather poorly described, especially when compared with other Late Palaeolithic units.

Raw material

The lithics from the Wołczkowo collection were made of variety of Cretaceous flints. Most of them represent high quality flints of different shades of grey, from milky white to almost black, of glassy and clear structure, making them very controllable during knapping. Among them there is a set of one core and four end scrapers (Figs 4:2; 9:6; 10:2,3 and 12:1) made of a very distinct striped flint. It seems very probable that all of them originate from the same pebble. The other notable raw material type is a semi-transparent flint containing numerous Bryozoa exoskeletons of the Middle Turonian Age (Czebreszuk, Kozłowska-Skoczka 2008, 18–19). The shouldered point, one arch backed point, one end scraper and two blades were made of this type of flint (Figs 5:4; 6:4; 8:8 and 9:1,4). Unsurprisingly, due to shared geological history, these

raw materials are typical of all of the Western Baltic zone, from southern Sweden and Denmark, through northern Germany to the north-western Poland.

All of the lithics from the Wołczkowo collection are patinated to some degree, from light white and bluish to heavy white patina (e.g. Figs 5 and 6). This kind of surface discoloration is typical of sites with slightly acidic soils and is common in Western Pomerania. Some flints have more or less pronounced red and light brown spots (e.g. Figs 5:3; 6:3 and 9:1), resulting from high content of iron oxides in soil.

Importantly, M. Czarnecki (1970, 37–38) in his description of the Wołczkowo collection in the case of 25 lithics described the raw material as a Jurassic flint. However, a closer examination does not allow to confirm this statement. All of the flint types present in the collection are of Cretaceous age and either of local or regional origin. Their presence was noted in other Western Pomeranian Late Palaeolithic assemblages, including other sites from the same area, like Tanowo 2 and 3 (e.g. Galiński 2015; 2019). Although we have no data about the rest of the original assemblage, it is possible that the main sources of flint for the site were located locally.

Technological Analysis

There are two cores in the Wołczkowo collection (Fig. 4). Both of them are single platform subconical blade cores, although one of them has a single blade negative of opposite direction, suggesting it may have been a two-platform core originally (Fig. 4:2). In the technological sense both of them are almost exactly the same, except for the platform curation process. While one of them has a negative suggesting a core tablet removal (Fig. 4:1), the other does not (Fig. 4:2). Both cores have their platforms formed with few large flakes. They also have flat frontal flaking surfaces and sides covered with blade negatives, as well as natural backs. Also their metrics are similar. It is noteworthy that both of them have been broken, thus they do not reflect a full length of possible blades. Flat bulb negatives on their flaking surfaces and rather deep ones on platforms suggest use of a soft hammer technique for blade detachment and hard hammer for maintenance. Both specimens have flaking angles around 80° and edge trimming was the only mode of edge preparation prior to blade detachment.

Among 29 blades and tools on blades (Figs 5–9) 20 have their proximal ends intact, making it possible to identify a technique. They are rather slender and thin, with angles between surfaces and butts around 70–80°, and only a single blade having a more acute 60° angle. The blades are regular, with predominant proximal curvature, with 10 of them being twisted.

All of the blades were detached using soft hammer direct percussion, possibly a mineral one striking at the edge, as suggested by rather flat or even absent

ripples, in some cases more pronounced at distal ends, predominantly present lips and flat and spread bulbs. In 10 cases a bulbar scar is present, which also occur often in soft hammer debitage. Only two of them have a conus.

There is a variety of butt forms (Figs 13–15), with predominant small and punctiform butts, although oval, either relatively large and small, are also present. The same is observed in terms of butt preparation, with 10 having a flat butt, one with two negatives and eight with more than two negatives present.

The blades have mostly two negatives present on their dorsal sides (14 cases), with three and more than three being less frequent (eight and four specimens respectively). Also one crested blade and two blades with cortex and single negative are present. Interestingly, while 17 blades have unidirectional negatives, seven specimens have negatives of blades struck from opposite directions, suggesting they have been detached from double platform cores.

A variety of edge preparation types is registered, with nine blades being prepared with trimming (Fig. 13), six blades prepared with faceting (Fig. 14) and three prepared with a combination of both trimming and faceting (Fig. 15). There seems to be no correlation between a type of edge preparation and a core type, although with such small analysed population this impression might be false.

Almost all (11 of 13) flakes and flake fragments in the Wołczkowo collection are end scrapers (Figs 10–12). Only seven of them have their proximal parts. They are rather thick, much more than blades, and short, although this results from retouching. The angles between platforms and surfaces are all around 70–80°, which is similar to blade population. They seem to be mostly regular, with a slight curve, mostly in a proximal part and without a twist.

Contrary to blades, all of the flakes were struck at platform, 2–3 mm behind the edge. As a result, their features resemble more hard hammer direct percussion technique, although the hammer was probably some kind of soft rock, such as sandstone. The bulbs are rather flat. Similarly to blades, the ventral sides of flakes are mostly flat, with three flakes having more pronounced ripples. Except for one example all of the flakes with proximal parts preserved have some form of a weak lip, four of seven have a bulbar scar, and a conus is largely absent. These traits are also similar to attributes observed on blades.

Flakes from the Wołczkowo collection in comparison with blades have bigger and more robust butts, mostly large oval and small but thick, in relation to their overall size (Fig. 16). In terms of butt preparation three specimens have flat butts, while four have more than two negatives. This proportion is different than in the case of blades where mostly flat butts occurred.

Most flakes have two (three cases) or three (six cases) negatives visible on their dorsal sides. Additionally, three flakes have at least some cortex on their

dorsal sides. Flakes are also more diverse in terms of direction of negatives on dorsal sides, with almost equal proportions of dorsal sides with one, two and more than two directions, as well as dorsal sides fully covered by cortex.

The same type of equal proportions is observed in the case of edge preparation. Preparation by trimming was used three times (Fig. 16:1–3) and preparation by faceting two times (Fig. 16:4,5), while further two flakes were prepared by combination of both modes (Fig. 16:6,7). Just like with blades, there is no correlation between preparation and number and direction of negatives.

Technique and Method

As stated above, it seems very probable that both blades and flakes at different stages of production (preparation, repairs, exploitation) were made with the same mineral soft hammers (e.g. sandstones), with angles mainly around 70–80° and rather careful edge preparation, although blades were mostly struck at an edge, while flakes were struck behind an edge. This resulted in notable differences in debitage features, such as small, well-prepared butts and precise execution of blades versus relatively big butts and less careful strike in the case of flakes. Thus blades have mostly features typical of soft hammer percussion and features of flakes reflect hard hammer percussion.

Although in the Wołczkowo collection there are only single platform cores, there is evidence of double platform cores being in use, as suggested by presence of negatives struck from opposite directions on dorsal sides of some blades (e.g. Figs 5:7; 7:1,4; 8:1,7 and 9:3). At this point it is still unclear if this results from using at least two different methods (single and double platform cores respectively), or if the same cores were initially used as double platform cores and reworked into single platform cores when initially exploited. The latter seems probable, as one of the cores has a single negative of a blade struck in an opposite direction in relation to the platform (Fig. 4:2).

It appears that some tools from the Wołczkowo collection, notably end scrapers, were fabricated on flakes from core preparation and repairs (Figs 10–12). This may suggest that waste management was an integral part of the *chaîne opératoire* and a method of a dedicated flake core was not used. However, because of a small and incomplete collection, this is a suggestion, rather than a solid conclusion.

Discussion

During the technological analysis some issues worth of discussion have been noted. While the typology of this collection is rather straightforward and there is a consensus about its Federmesser origin, it is more complicated in

terms of technology. This is mostly due to some technological similarities of the Wołczkowo collection to the Hamburg culture. A similar phenomenon was earlier described by Julia Kotthaus (2019, 199) in her analysis of the Borneck-Ost site of the Federmesser culture, where she described a case of one core being similar to a Hamburgian one.

A number of features of the Wołczkowo collection, such as soft hammer blade detachment, a combination of trimming and faceting in the case of some blades (none of these are *en éperon*, though) or intense trimming with plain butts, as well as the presence of a single shouldered point (Fig. 9:1) are part of the standard technological package of the Hamburgian (Madsen 1996, 64), although it must be mentioned that the shouldered point may in fact be an unfinished backed point. On the other hand, flaking angles are different in both flintknapping traditions, in Federmesser assemblages from Borneck-Ost and Wołczkowo being around 70–80°, while typical Hamburgian flintknapping represents more acute 70° or less, although in some Havelte phase assemblages, e.g. in Jels, the majority of blades had angles around 80–85° (Madsen 1992, 108; 1996, 64). Furthermore, backed points are also present in Hamburgian assemblages (Burdukiewicz 1987, 196–197; Kobusiewicz 1999, 28–29; Riede 2014, 38; Kotthaus 2019, 196). In Wołczkowo, there are three small points that may be interpreted as micro-truncations (*Mikroformen*; Fig. 8:1–3). There are also five long end scrapers with retouched sides (although four of them are broken and were counted as flakes; Figs 9:6 and 12), which together with micro-truncations are generally considered to be associated with the Hamburgian (e.g. Sobkowiak-Tabaka 2011, 65). Noteworthy *Zinkens*, widely associated with the Hamburgian, are in fact present in different Late Palaeolithic cultural contexts in Western Pomerania, including Federmesser, although they are absent in the Wołczkowo collection. This, however, suggests that cross-cultural contacts, transmission of knowledge, tradition and cultural ancestry of Late Palaeolithic groups are more complicated than it is usually considered.

The similarity between Hamburgian and Federmesser technologies suggested above is understandable when origins of both cultures and their ties to the Magdalenian are taken into account. This is due to the fact that Hamburgian stems from the Middle and Late Magdalenian, while Federmesser is a continuation of the Late Magdalenian and Azilian (Riede 2014, 35–39). Hence the possible similarities might be remnants of the older tradition and while both cultures adapted different environmental and economic strategies, some common technological aspects were present in both. This is more evident in the case of the Hamburgian, because both the classic phase and the Havelte phase were identical with a sole exception of the main projectile point type, a shouldered point and a Havelte point respectively (Riede 2014, 38), but overall

technology was similar to the Magdalenian. In Federmesser, these similarities are not as obvious. One must ask a question though, whether or not in the case of Wołczkowo this similarity is a result of the selection of artefacts on the basis of appearance and would or would not these results be different if the complete assemblage was considered?

Another important issue is a diversity of the Federmesser lithic technology. Katarzyna Pyżewicz *et al*. (2020) in their case study of sites Święty Wojciech 7 and Rogalinek 1 described two different methods used in the Federmesser. The first one (Święty Wojciech 7) was production of robust debitage pieces detached from amorphous cores, mostly lacking any advanced preparation. The other method (Rogalinek 1) was more advanced in terms of preparation and repairs, with careful edge preparation and slender blade production (Pyżewicz *et al*. 2020, 97), the features which in many ways are represented in the Wołczkowo collection. In Authors' opinion, the differences might be a result of individual knappers' preferences, but on the other hand, they might also reflect cultural differences and traditions (Pyżewicz *et al*. 2020, 100).

Technologically, the Wołczkowo collection seems to be similar to sites with a primarily soft hammer blade detachment method, such as aforementioned Rogalinek 1 (Pyżewicz *et al*. 2020) and possibly Borneck-Ost (Kotthaus 2019). A typical trait of the Federmesser flintknapping is shortening of a *chaîne opératoire*, more technological flexibility and overall simplification of technology in relation to both Magdalenian and Hamburgian (Riede 2014, 36; Kotthaus 2019, 194–196). It is unclear if this is true for the Wołczkowo collection, although the possible use of preparation and repair waste as tool blanks might suggest following this strategy.

A separate question is the use of double platform cores suggested by opposite directions of negatives of some blades and one core. The number of these blades is actually around 25%, far too much to be a coincidence. These opposite negatives are also a very clear result of a serial blade detachment, meaning they are not merely negatives of repairs. While single platform cores are usually the type associated with the Federmesser, double platform cores are in general present in other assemblages, including in Western Pomerania, and may in fact be a dominating type of core in some cases. This was suggested for the Federmesser assemblage from Rotnowo 18 (Galiński 2007; 2019, 36–39), although the Ahrensburgian settlement was also present at the site. These conclusions must therefore be treated carefully.

Dating of the Wołczkowo collection is a very hard task due to its incomplete nature and absence of any organic materials. The aforementioned possible similarities to the Hamburgian technology might suggest rather early dating of this collection, however, when examined closely this claim is impossible to verify.

There is a suggestion of a little to none chronological diversity of the Federmesser, both in technological (Riede 2014, 36) and typological terms (Sobkowiak-Tabaka 2017, 319). On the other hand, there is definitely some technological diversity within the Federmesser, as evidenced by Pyżewicz *et al*. (2020), and two methods might as well be markers of chronological variety, although it is impossible to verify this claim. Therefore while Sobkowiak-Tabaka (2017) in her monograph on the Federmesser divided the culture into five chronological ranges based on modelled radiocarbon dates, our knowledge on the possible relations between the Federmesser technology and chronology is still seriously limited.

Conclusions

The technological analysis presented in this paper allowed to look on the Wołczkowo collection with a new perspective. However, as stated many times, caution is required and the conclusions should be taken with a grain of salt.

It is possible that the method was identified, and it is the method present in other Federmesser assemblages, as suggested by results of Pyżewicz *et al*. (2020). As the directions noted on the dorsal sides of some blades may indicate double platform cores may have been used at some point, even though both cores associated with the Wołczkowo collection are single platform cores. However, due to a low number and generally an incomplete set of finds, the results must be taken carefully. A use of mineral soft hammers on all stages of the reduction, differentiated by striking either on an edge (blades) or behind it (flakes), seems probable.

There is still much to say about Wołczkowo. Despite many years of efforts by T. Galiński (1997, 55–56) the site was never found. It is possible, that it was completely destroyed and the Schumann's collection is all that is left. Also exact chronology of these artefacts is unknown and a chance to narrow it is very low.

As to some common technological features of the Hamburgian and Federmesser flintknapping noted in this research, we may expect more assemblages showing some degree of similarities. The Federmesser lithic technology is a fascinating research field due to its flexibility, shared Magdalenian ancestry with the Hamburgian and generally different way of solving problems than two previous cultures. Despite some technological analysis and especially refittings have been published in recent years (e.g. Kwiatkowski, Masojć 2011; Kotthaus 2019; Pyżewicz *et al*. 2020), there are still many uncertainties and much to discuss in the future.

Table 1. List of features described in the Dynamical Technological Classification (DTC) method used in the study. Colours mark different sets of data: grey – site and artefact number; red – basic classification; yellow – measurements; blue – debitage features; orange – edge and preparation features; green – core features
Tabela 1. Lista cech opisywanych metodą Dynamicznej Klasyfikacji Technologicznej (DTC). Kolory odpowiadają różnym zestawom danych: szary – nazwa stanowiska i numer zabytku; czerwony – podstawowa klasyfikacja; żółty – wymiary; niebieski – cechy debitażu; pomarańczowy – cechy krawędzi i jej przygotowania; zielony – cechy rdzeni

Code Kod	Feature Cecha	Attribute Właściwość
–	Site	–
–	Artefact number	–
X1	Type	Description
X2	Subtype	Description
X3	Blank type	Description
X4	Raw material	Description
M1	Length	Measurement
M2	Width	Measurement
M3	Thickness	Measurement
A1	Dorsal debitage face	1. Cortex/natural surface; 2. Cortex + negative; 3. Cortex + 2 or more negatives; 4. 2 negatives; 5. 3 negatives (prismatic); 6. 4 or more negatives; 7. Unifacial crested blade; 8. Bifacial crested blade
A2	Dorsal negative direction	0. Cortex; 1. Unidirectional; 2. 2 directions (or different than on ventral side); 3. More than 2 directions
B	Debitage termination	1. Ideal; 2. Feathered; 3. Plunging; 4. Hinged
C1	Debitage curvature	1. Straight; 2. Distal curvature; 3. Even curvature; 4. Proximal curvature; 5. Curvature with belly
C2	Twist	0. No twist; 1. Right-hand twist; 2. Left-hand twist
D	Regularity	1. Irregular; 2. Mostly regular; 3. Extremely regular
E	Ventral ripples	0. Smooth ventral face; 1. Distal end ripple; 2. Flat ripple; 3. Pronounced ripple
F1	Lip	0. No lip; 1. Weak lip (felt under a finger); 2. Medium lip (visible); 3. Pronounced lip
F2	Bulb morphology	0. No bulb; 1. Flat and spread bulb; 2. Round bulb; 3. Pronounced bulb; 4. Multiple bulbs
G	Bulbar scar	0. No scar; 1. Small scar; 2. Large scar; 3. Split bulb
H	Conus formation	0. No conus; 1. Ring crack; 2. Ring crack + conus; 3. Detached bulb
I	Butt morphology	1. Large thick butt; 2. Large oval butt; 3. Thin oval butt; 4. Small thick butt; 5. Small butt; 6. Punctiform butt; 7. Broken butt
J	Butt preparation	0. No preparation; 1. 2 negatives; 2. More than 2 negatives
K	Debitage preparation	0. No preparation; 1. Light preparation; 2. Intense preparation; 3. Point isolation
L	Debitage fragmentation	1. Complete debitage; 2. Distal end; 3. No distal end; 4. Proximal end; 5. No proximal end; 6. Medial fragment; 7. Split debitage
Q1	Angle	Description

Q2	Edge trimming	0. No trimming; 1. Light trimming; 2. Intense trimming; 3. Point isolation
Q3	Edge faceting	0. No faceting; 1. Light faceting; 2. Intense faceting; 3. Point isolation
N1	Number of platforms	1. 1 platform; 2. 2 platforms; 3. 3 or more platforms
N2	Platform preparation	1. Single flake; 2. Few large flakes; 3. Many small flakes
O1	Core morphology	1. Single platform subconical; 2. Single platform conical; 3. Dual platform cylindrical; 4. Dual platform prismatic; 5. Multiplatform; 6. Discoidal
O2	Front morphology	1. Cortex/natural; 2. Unifacial crest; 3. Bifacial crest; 4. Flat surface (1 negative); 5. Flat surface (2 or more negatives); 6. Blade negatives
O3	Back morphology	1. Cortex/natural; 2. Unifacial crest; 3. Bifacial crest; 4. Flat surface (1 negative); 5. Flat surface (2 or more negatives); 6. Blade negatives
O4	Sides morphology	1. Cortex/natural; 2. Crest formation negatives; 3. Preparation from platform; 4. Other preparation; 5. Blade negatives
P	Core front exploitation	1. Circular exploitation; 2. Up to ¾ exploitation; 3. Single front exploitation
R	Platform rejuvenation	1. Full rejuvenation (core tablet removal); 2. Partial rejuvenation (rejuvenation flake removal)
S	Core rejuvenation	1. Front rejuvenation flake; 2. Distal blade rejuvenation flake; 3. Side rejuvenation flake

Table 2. Technological features of the debitage from Wołczkowo 1
Tabela 2. Cechy technologiczne debitażu z Wołczkowa 1

Code Kod	Feature Cecha	Attribute Właściwość	Blades Wióry	Flakes Odłupki
A1	Dorsal debitage face	1. Cortex/natural surface	0	2
		2. Cortex + negative	2	0
		3. Cortex + 2 or more negatives	0	1
		4. 2 negatives	14	3
		5. 3 negatives (prismatic)	8	5
		6. 4 or more negatives	4	0
		7. Unifacial crested blade	1	0
		8. Bifacial crested blade	0	0
A2	Dorsal negative direction	0. Cortex	1	2
		1. Unidirectional	17	3
		2. 2 directions (or different than on ventral side)	7	4
		3. More than 2 directions	4	3
B	Debitage termination	1. Ideal	12	1
		2. Feathered	4	0
		3. Plunging	0	0
		4. Hinged	3	0
C1	Debitage curvature	1. Straight	3	1
		2. Distal curvature	3	0
		3. Even curvature	2	1
		4. Proximal curvature	15	3
		5. Curvature with belly	0	0
C2	Twist	0. No twist	11	6
		1. Right-hand twist	6	0
		2. Left-hand twist	4	0
D	Regularity	1. Irregular	0	1
		2. Mostly regular	24	6
		3. Extremely regular	0	0
E	Ventral ripples	0. Smooth ventral face	10	9
		1. Distal end ripple	10	0
		2. Flat ripple	9	2
		3. Pronounced ripple	0	1
F1	Lip	0. No lip	3	1
		1. Weak lip (felt under a finger)	15	5
		2. Medium lip (visible)	2	1
		3. Pronounced lip	0	0
F2	Bulb morphology	0. No bulb	0	0
		1. Flat and spread bulb	20	7
		2. Round bulb	0	0
		3. Pronounced bulb	0	0
		4. Multiple bulbs	0	0

G	Bulbar scar	0. No scar	10	3
		1. Small scar	8	4
		2. Large scar	2	0
		3. Split bulb	0	0
H	Conus formation	0. No conus	18	5
		1. Ring crack	2	2
		2. Ring crack + conus	0	0
		3. Detached bulb	0	0
I	Butt morphology	1. Large thick butt	0	0
		2. Large oval butt	2	3
		3. Thin oval butt	2	0
		4. Small thick butt	2	2
		5. Small butt	4	0
		6. Punctiform butt	7	1
		7. Broken butt	3	1
J	Butt preparation	0. No preparation	10	3
		1. 2 negatives	1	0
		2. More than 2 negatives	8	4
K	Debitage preparation	0. No preparation	6	2
		1. Light preparation	1	0
		2. Intense preparation	1	4
		3. Point isolation	12	1
L	Debitage fragmentation	1. Complete debitage	16	4
		2. Distal end	2	0
		3. No distal end	3	3
		4. Proximal end	1	0
		5. No proximal end	4	0
		6. Medial fragment	3	5
		7. Split blade	0	0
Q1	Angle	80	11	3
		70	8	4
		60	1	0
Q2	Edge trimming	0. No trimming	6	2
		1. Light trimming	1	0
		2. Intense trimming	1	4
		3. Point isolation	12	1
Q3	Edge faceting	0. No faceting	10	3
		1. Light faceting	0	1
		2. Intense faceting	0	1
		3. Point isolation	9	2
Q2+Q3	Edge trimming + Edge faceting	1. Preparation by trimming	9	3
		2. Preparation by faceting	6	2
		3. Preparation by both trimming and faceting	3	2

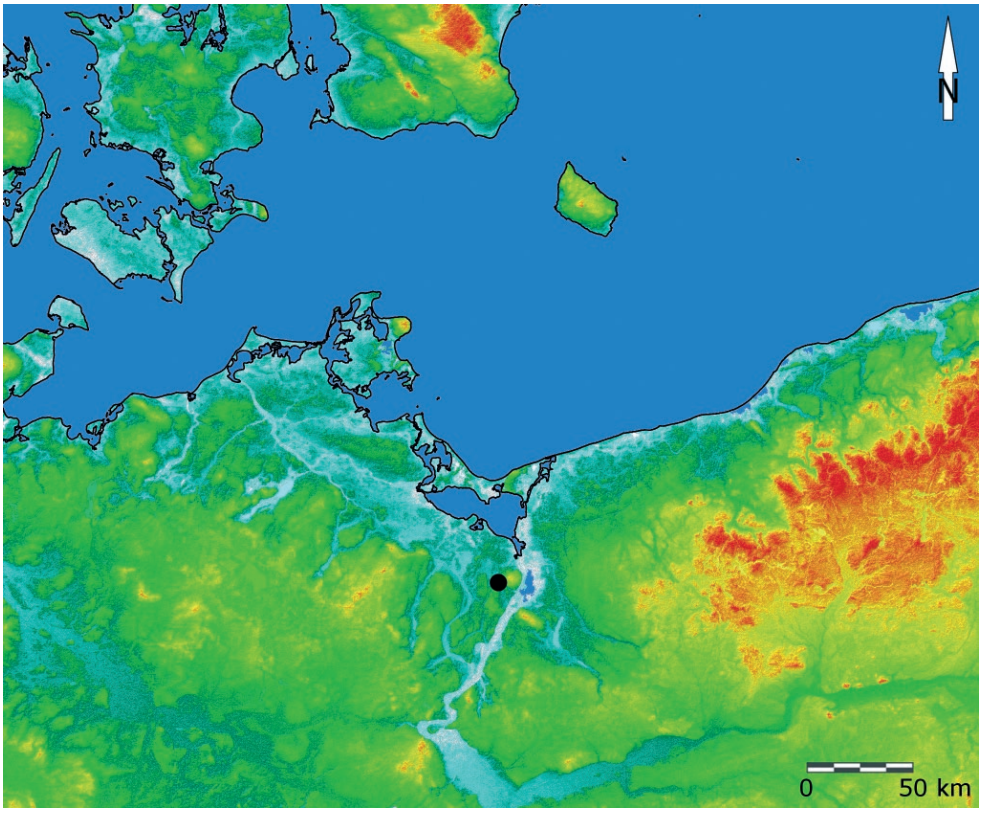

Fig. 1. Probable location of Wołczkowo 1 (black dot) in the south-western Baltic region. Prepared by M. Adamczyk
Ryc. 1. Prawdopodobna lokalizacja stanowiska Wołczkowo 1 (czarny punkt) w regionie południowo-zachodniego Bałtyku. Oprac. M. Adamczyk

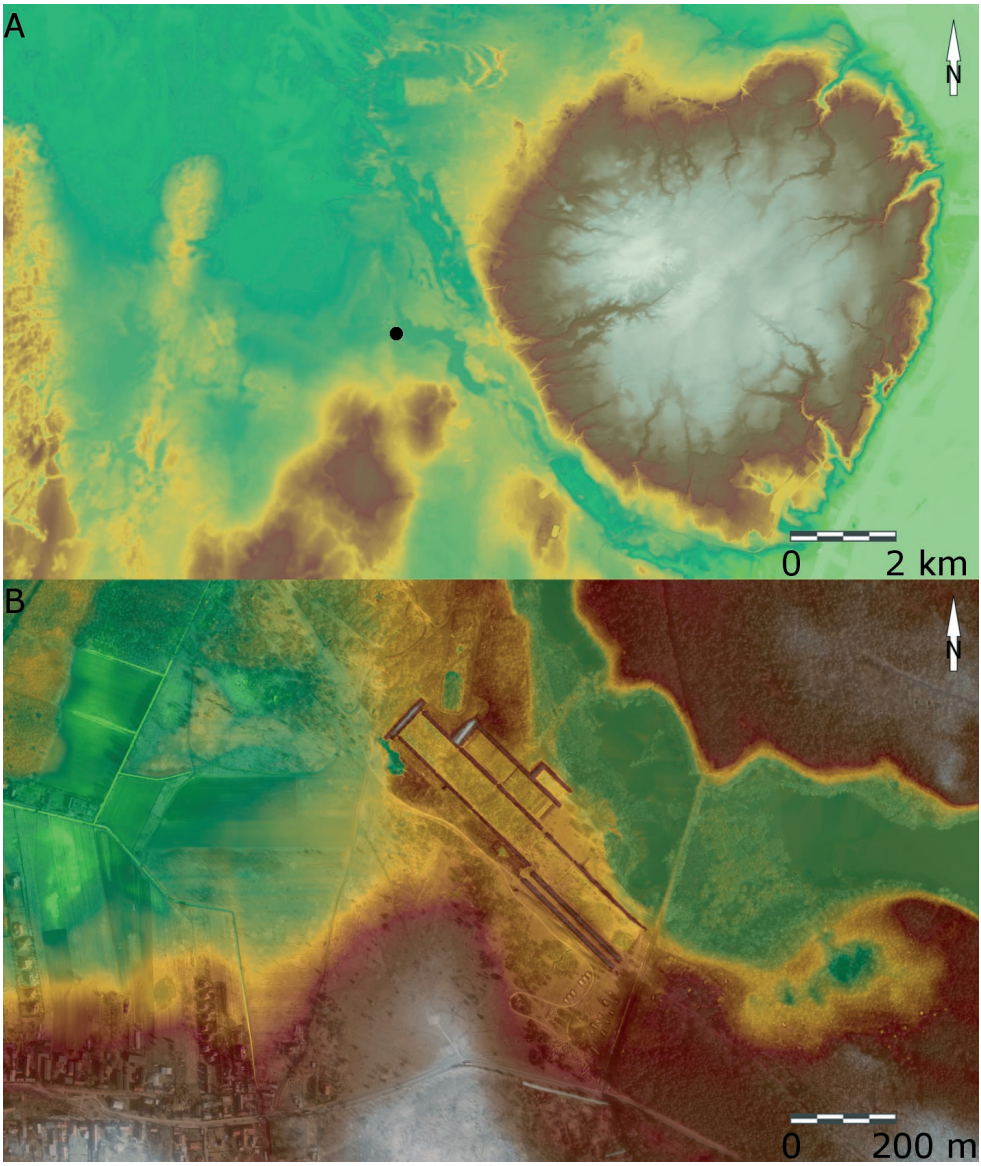

Fig. 2. Most probable location of site Wołczkowo 1: A – LIDAR ALS image of the NW part of Szczecin and adjusting Ueckermünder Heide (the black dot marks the shooting range in Wołczkowo); B – detailed view of the shooting range in Wołczkowo and its surroundings. ALS images after: <geoportal.gov.pl> [accessed: 19 IV 2022]. Prepared by M. Adamczyk

Ryc. 2. Najbardziej prawdopodobna lokalizacja stanowiska Wołczkowo 1: A – zobrazowanie LIDAR ALS obejmujące północno-zachodnią część Szczecina i przyległą Puszczę Wkrzańską (czarnym punktem oznaczono lokalizację strzelnicy w Wołczkowie); B – szczegółowe zobrazowanie strzelnicy w Wołczkowie i jej otoczenia. Zobrazowanie ALS pobrane ze strony <geoportal.gov.pl> [dostęp: 19 IV 2022]. Oprac. M. Adamczyk

No.	X1 Type	X2 Subtype	M1 Length	M2 Width	M3 Thickness	A1 Dorsal blade face	A2 Dorsal Neg dir	B Blade termination1	C1 Blade curvature	C2 Twist	D Regularity	E Ventral ripples	F1 Lip	F2 Bulb morphology	G Bulbar scar	H Conus formation	I Butt morhpology	J Butt preparation	K Blade preparation	L Blade fragmentation	Q1 Angle	Q2 Edge_trimm	Q3 Edge_Facett
	X1	X2	M1	M2	M3	A1	A2	B	C1	C2	D	E	F1	F2	G	H	I	J	K	L	Q1	Q2	Q3
37	blade	serial	53,92	17,13	5,01	4	3		4	1	2	1	2	1	0	0	2	2	0	3	80	0	3
40	blade	correction	53,65	25,67	6,65	6	2	2	4	0	2	1	1	1	2	1	6	1	0	1	80	0	3
36	blade	serial	47,24	17,01	2,95	5	2	1	3	2	2	1								5			
32	blade	serial	43,21	18,27	4,67	6	1	2	2	0	2	2	1	1	0	0	6	0	3	1	80	3	0
33	blade	serial	41,19	13,23	2,97	4	2	1	4	0	2	0	2	1	1	0	5	0	3	1	60	3	0
9	blade	serial	38,58	13,21	2,86	5	1	1	4	0	2	1	1	1	2	0	7		3	1	80	3	
6	blade	serial	32,61	12,23	3,17	5	1	2	4	0	2	1	1	1	1	0	5	0	3	1	70	3	0
39	burin		57,34	14,91	5,07	4	2		4	1	2	0	1	1	1	0	3	0	3	1	80	3	0
41	burin		56,43	23,3	8,15	6	1		1	1	2	1	1	1	1	0	6	2	0	1	70	0	3
42	blade	crested bl	80,79	25,61	17,24	7	3	1	4	1	2	1	1	1	0	0	7	2	3	1	70	3	3
38	point	shouldere	58,57	19,63	6,02	5	1	2	1	0	2	1	0	1	0	0	3	2	0	1	80	0	3
35	point	arched ba	49,39	15,31	4,28	5	2	1	4	0	2	2	0	1	1	0	4	2	1	1	80	1	3
7	point	arched ba	40,67	14,53	4,41	4	1	1	4	2	2	2	0	1	1	0	5	0	3	1	80	3	0
8	point	arched ba	40,37	11,54	4,97	4	1	1	2		2	2								5			
11	point	arched ba	44,1	12,87	4,2	4	1	1	4		2	2								5			
34	blade	serial	45,24	17,78	5,47	5	1	1			2	2								5			
30	blade	serial	31	18,21	3,47	4	1	4	4	0	2	2	1	1	1	1	2	0	3	1	70	3	0
28	blade	serial	40,43	13,84	6,63	6	2	1	1	2	2	0	1	1	0	0	6	2	2	1	70	2	3
31	blade	serial	34,39	19,36	5,53	4	1		4	1	2	0	1	1	0	0	7	2	0	4	70	0	3
10	blade	2nd creste	46,84	9,9	4,06	4	3	1	4	1	2	2	1	1	0	0	6	0	3	1	70	3	0
27	blade	serial	32,09	12,95	5,75	5	1		4	0	2	0	1	1	0	0	6	0	3	3	70	3	0
29	point	arched ba	31,42	16,44	3,31	5	1		4	0	2	1	1	1	0	0	5	0	3	3	80	3	0
2	blade	correction	22,97	9,47	3,05	4	1	1	2	0	2	0	1	1	0	0	6	0	3	1	80	3	0
3	point	arched ba	23,13	10,98	3,75	4	2	4				2								2			
5	point	arched ba	23,79	9,12	4,39	2	1					1								6			
4	point	arched ba	28,74	10,88	3,44	4	1	4				0								2			
26	end scraper		28,28	13,85	7,26	2	0					0								6			
18	end scraper		39,71	18,39	6,9	4	3		3	2	2	0	1	1	1	0	4	2	0	1	80	0	3
15	end scraper		36,6	17,9	5,44	4	1					0								6			
22	end scraper		30,66	21,25	6,2	1	0					0	1	1	1	0	4	2	0	3	80	0	3
21	end scraper		35,36	25,45	5,24	5	1		4	0	2	2	2	1	1	0	2	2	2	3	80	2	1
17	end scraper		27,46	17,4	6,11	1	0			0	2	0	1	1	0	0	2	2	0	3	80	0	3
25	end scraper		21,04	18,65	7,1	5	2				2	0								6			
14	flake	preparatic	36,88	23,89	10,46	5	2	1	3	0	2	3	1	1	1	1	2	2	2	1	70	2	2
13	end scraper		39,21	21,74	12,02	5	3					0								6			
16	end scraper		28,29	19,03	6,96	5	3					0								6			
23	end scraper		25,62	22,97	4,89	4	1					0								6			
19	end scraper		33,44	19,41	7,08	3	3					0								6			
12	end scraper		34,68	21,28	6,3	5	1		1	0	1	2	0	1	0	0	7	0	2	1	70	2	0
24	end scraper		31,02	21,52	7,65	4	2		4	0	2	0	1	1	1	1	4	0	2	1	70	2	0
20	end scraper		32,21	21,84	8,39	4	2		4	0	2	0	1	1	0	0	6	0	3	1	70	3	0
1	fragment		8,23	22,32	1,93																		

Fig. 3. Datasheet with DTC data, cores are not included. Prepared by M. Adamczyk
Ryc. 3. Tabela zawierająca dane z DTC, nie uwzględniono rdzeni. Oprac. M. Adamczyk

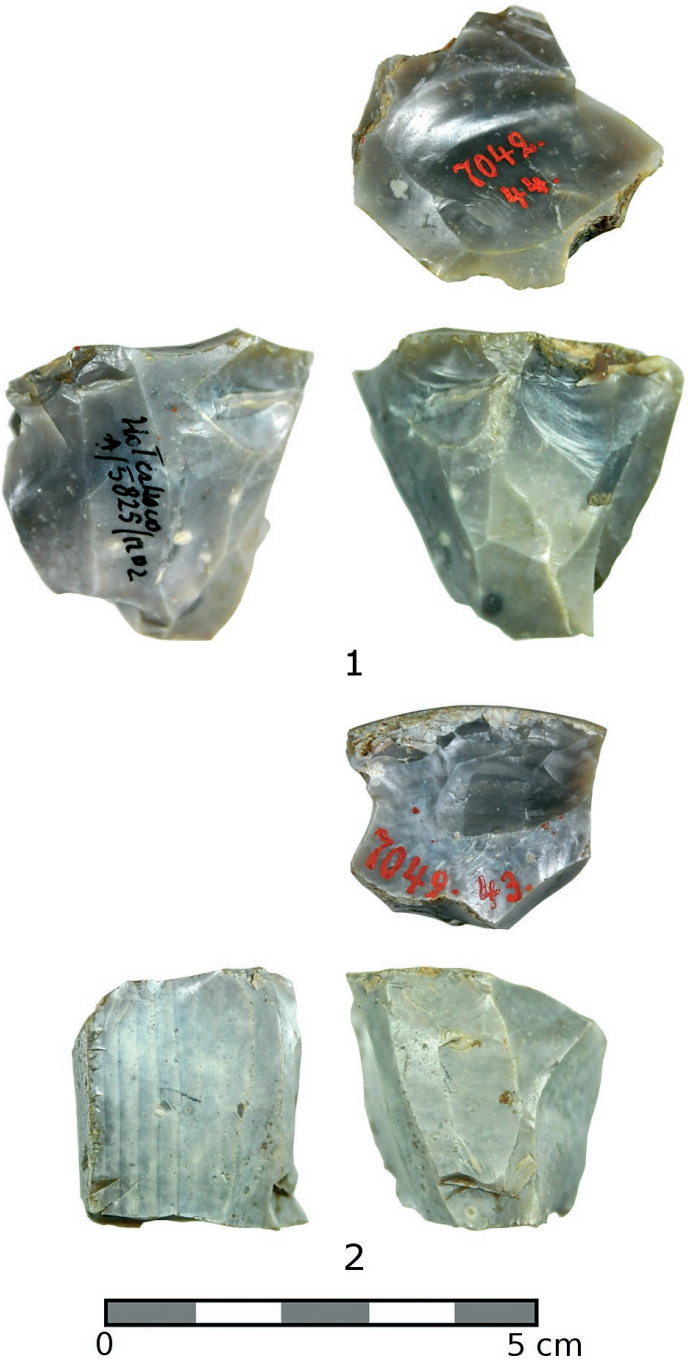

Fig. 4. Cores. Photograph by M. Adamczyk
Ryc. 4. Rdzenie. Fot. M. Adamczyk

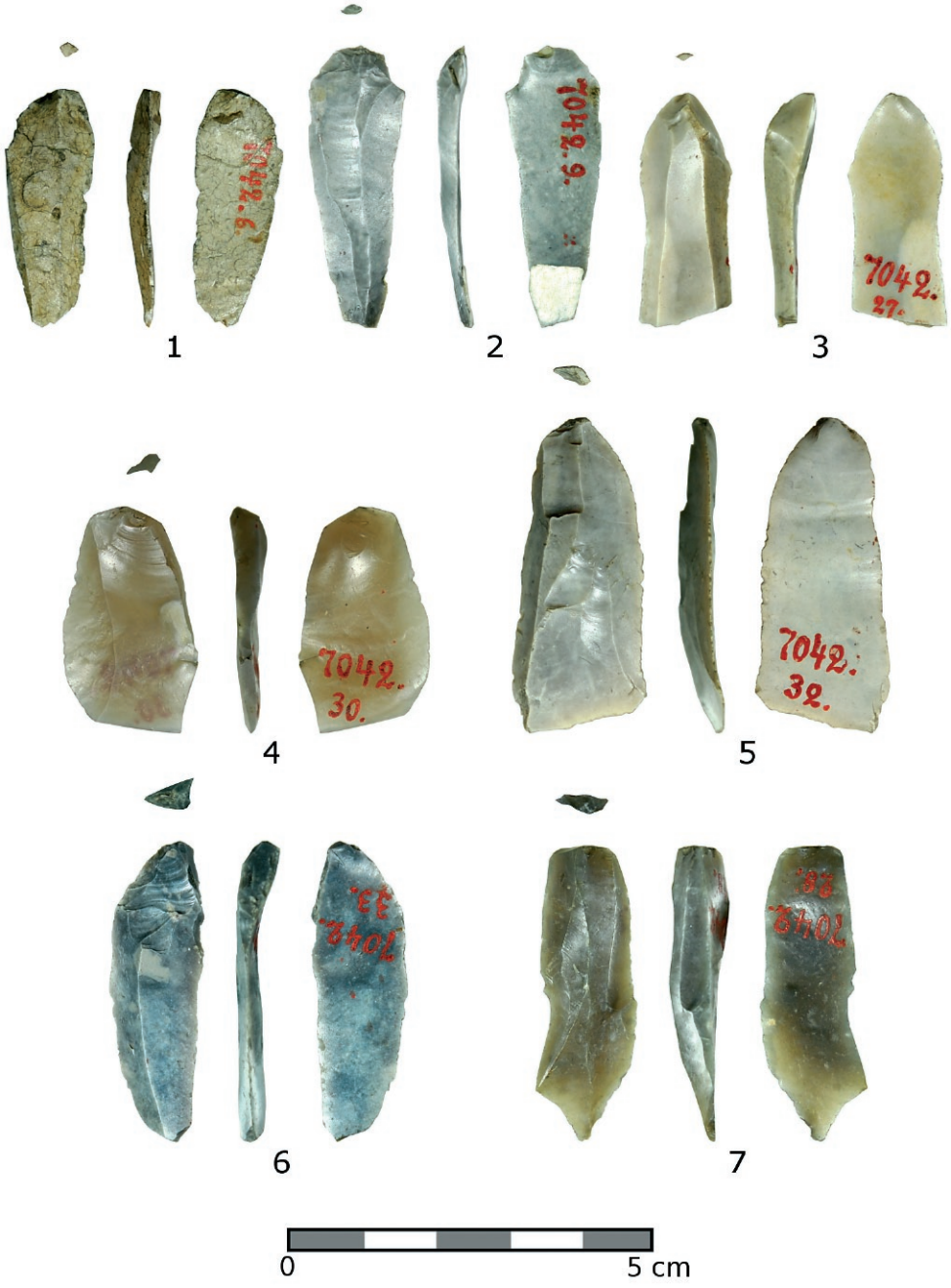

Fig. 5. Serial blades and fragments. Photograph by M. Adamczyk
Ryc. 5. Wióry seryjne i ich fragmenty. Fot. M. Adamczyk

Fig. 6. Serial blades and fragments. Photograph by M. Adamczyk
Ryc. 6. Wióry seryjne i ich fragmenty. Fot. M. Adamczyk

Fig. 7. Non-serial blades: 1 – crested blade; 2 – correction blade; 3 – 2nd crested blade; 4 – correction blade. Photograph by M. Adamczyk
Ryc. 7. Wióry niebędące efektem produkcji seryjnej: 1 – zatępiec; 2 – wiór korekcyjny; 3 – podtępiec; 4 – wiór korekcyjny. Fot. M. Adamczyk

Fig. 8. Blade tools, arch backed points: 1–3 – possible micro-truncations; 4–8 – Federmessers. Photograph by M. Adamczyk
Ryc. 8. Narzędzia wiórowe, tylczaki łukowe: 1–3 – możliwe mikropółtylczaki; 4–8 – tylczaki Federmesser. Fot. M. Adamczyk

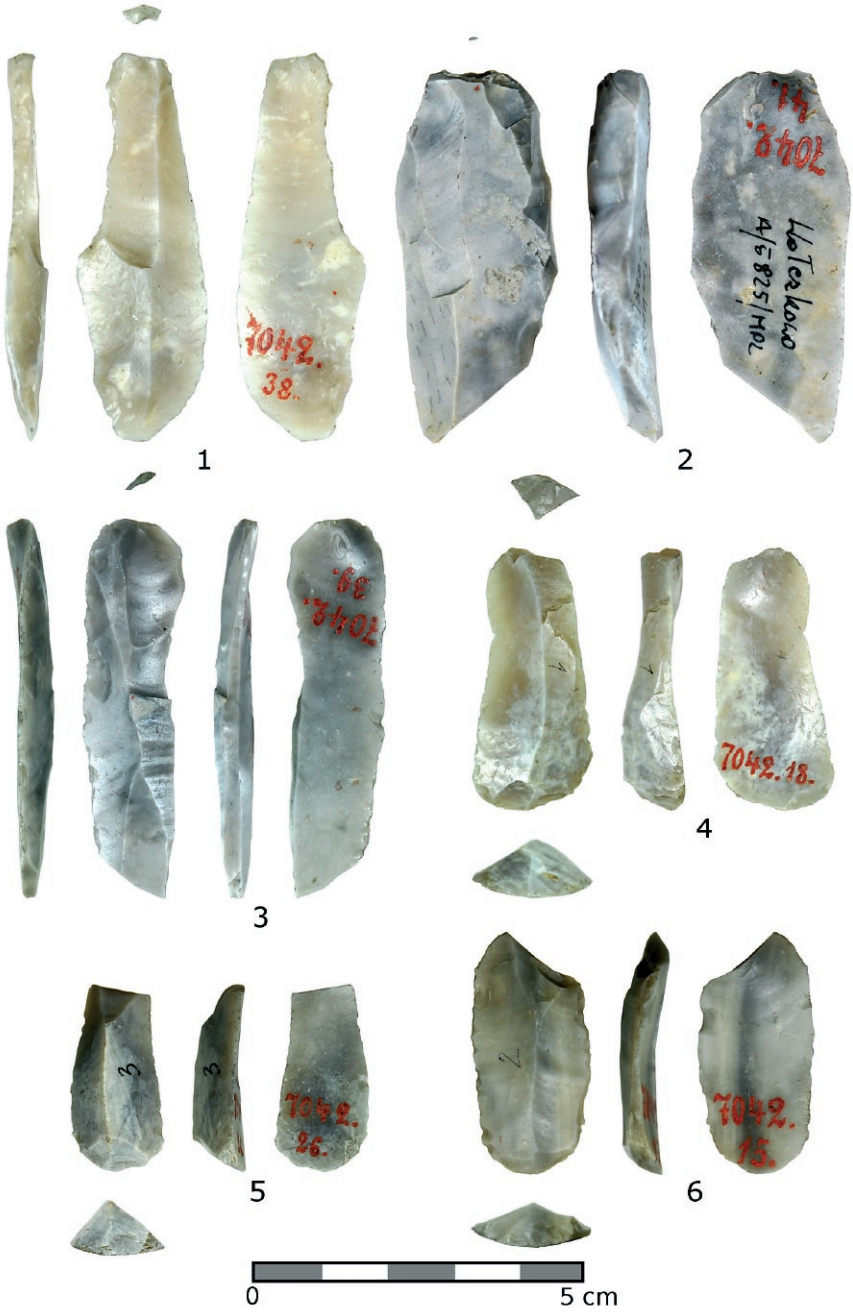

Fig. 9. Other blade tools: 1 – shouldered point (or unfinished backed point); 2 and 3 – burins; 4–6 – end scrapers. Photograph by M. Adamczyk
Ryc. 9. Inne narzędzia wiórowe: 1 – jednozadziorzec (lub niedokończony tylczak); 2 i 3 – rylce; 4–6 – drapacze. Fot. M. Adamczyk

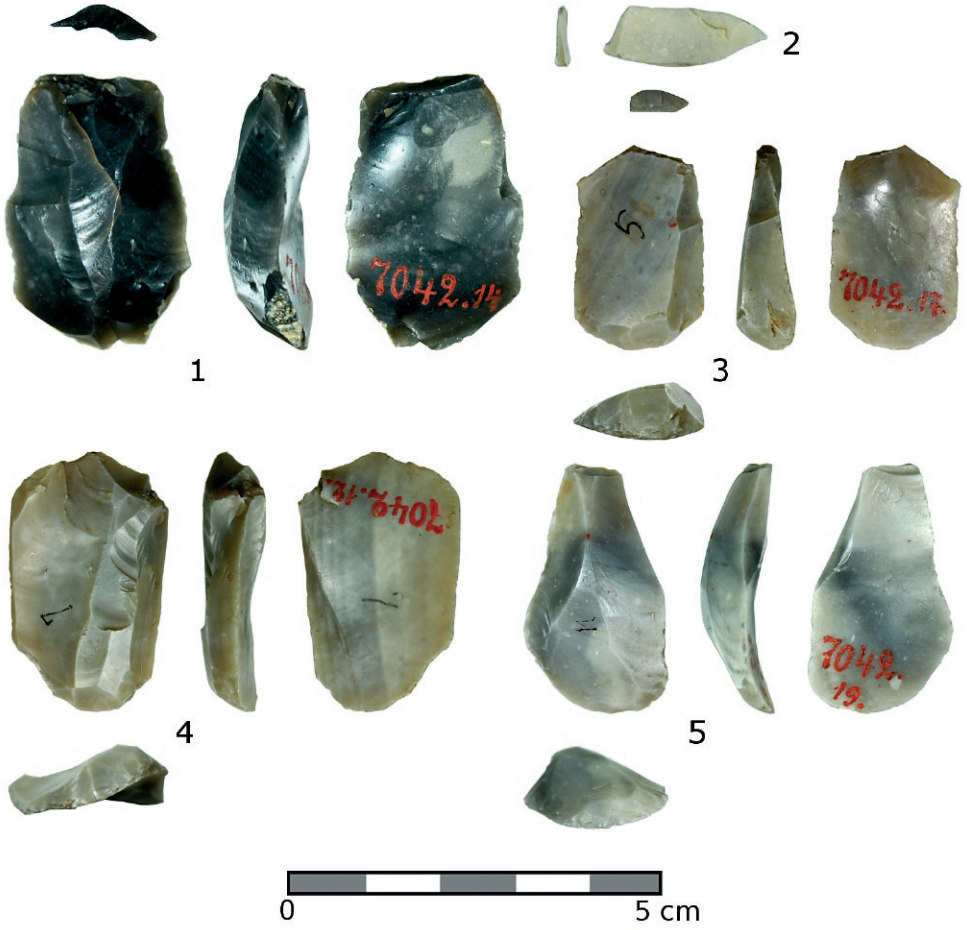

Fig. 10. Flakes and flake tools: 1 – complete flake; 2 – flake fragment; 3–5 – end scrapers. Photograph by M. Adamczyk
Ryc. 10. Odłupki i narzędzia odłupkowe: 1 – kompletny odłupek; 2 – fragment odłupka; 3–5 – drapacze. Fot. M. Adamczyk

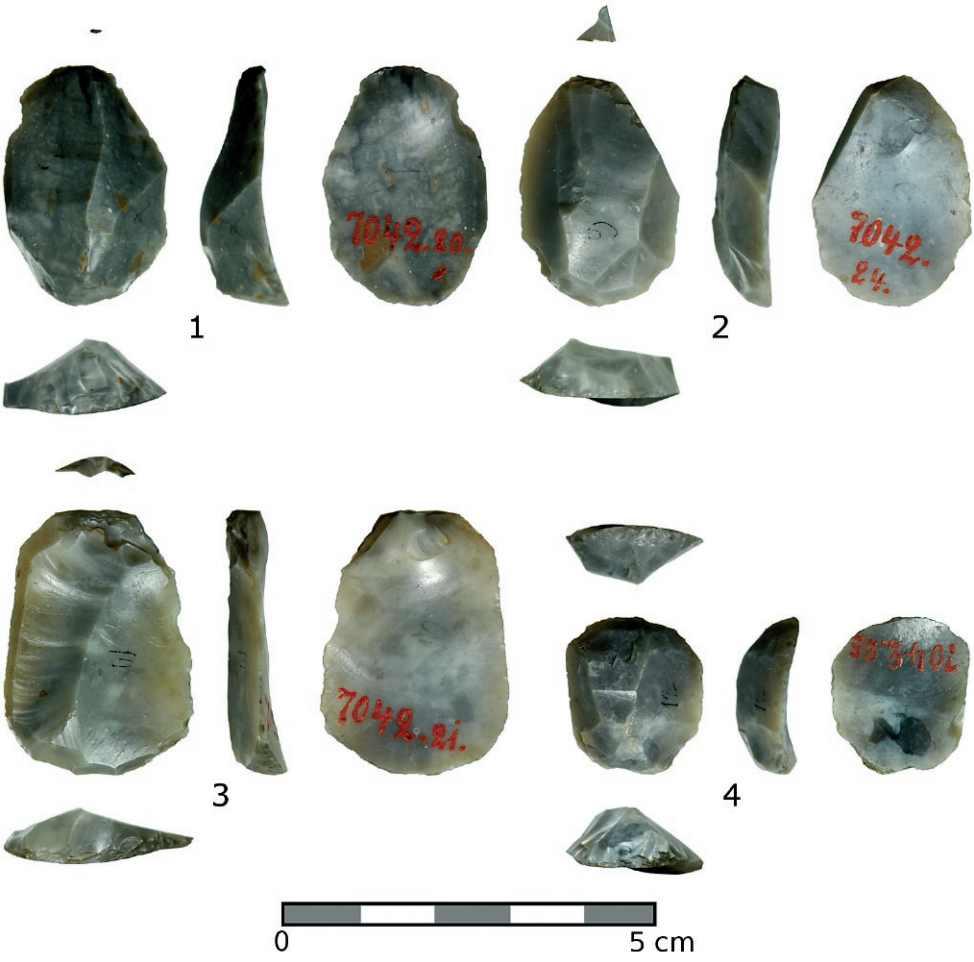

Fig. 11. Flake tools, short end scrapers. Photograph by M. Adamczyk
Ryc. 11. Narzędzia odłupkowe, krótkie drapacze. Fot. M. Adamczyk

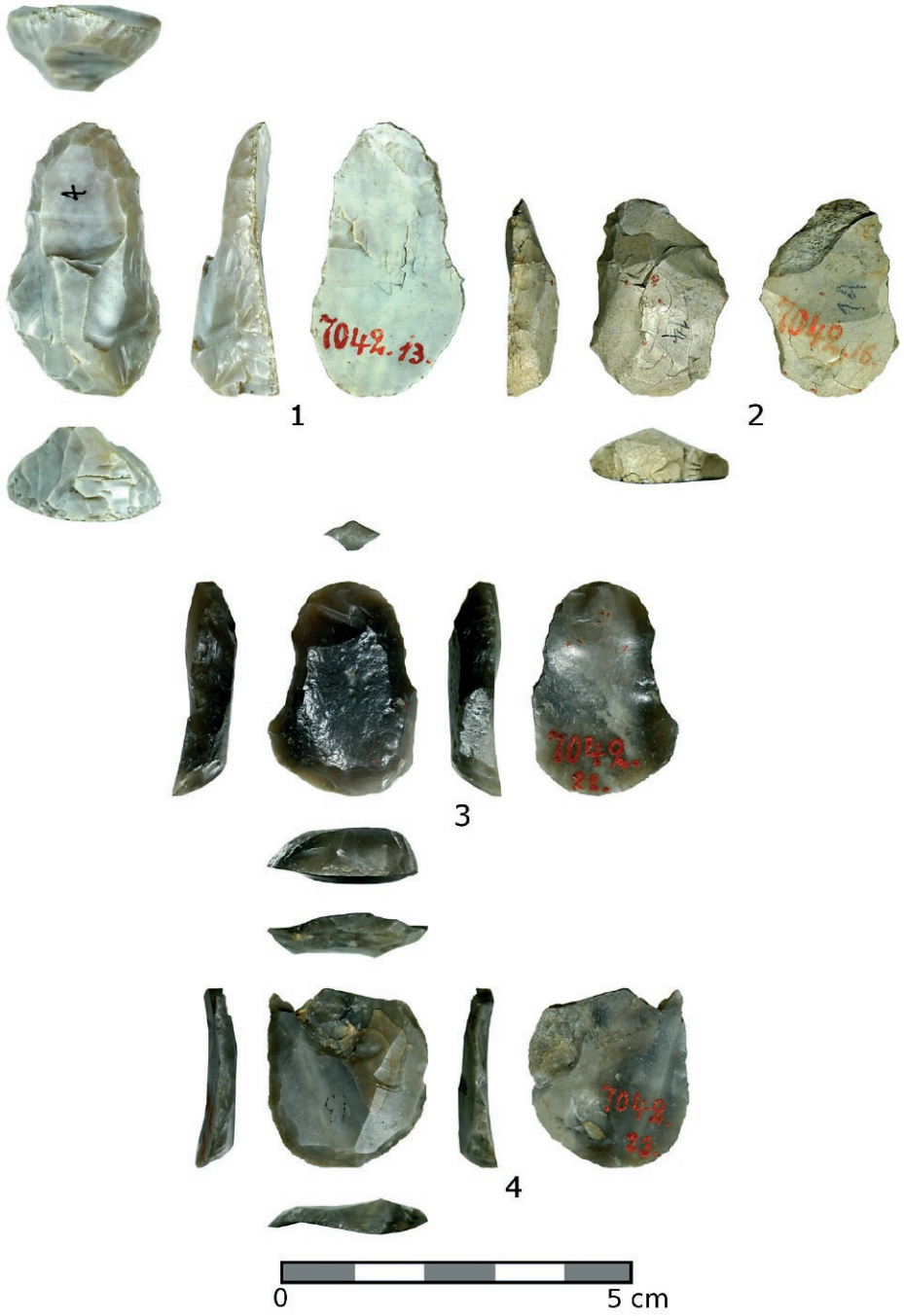

Fig. 12. Flake (?) tools, long end scrapers with retouched sides. Photograph by M. Adamczyk
Ryc. 12. Narzędzia odłupkowe (?), długie drapacze z retuszowanymi bokami. Fot. M. Adamczyk

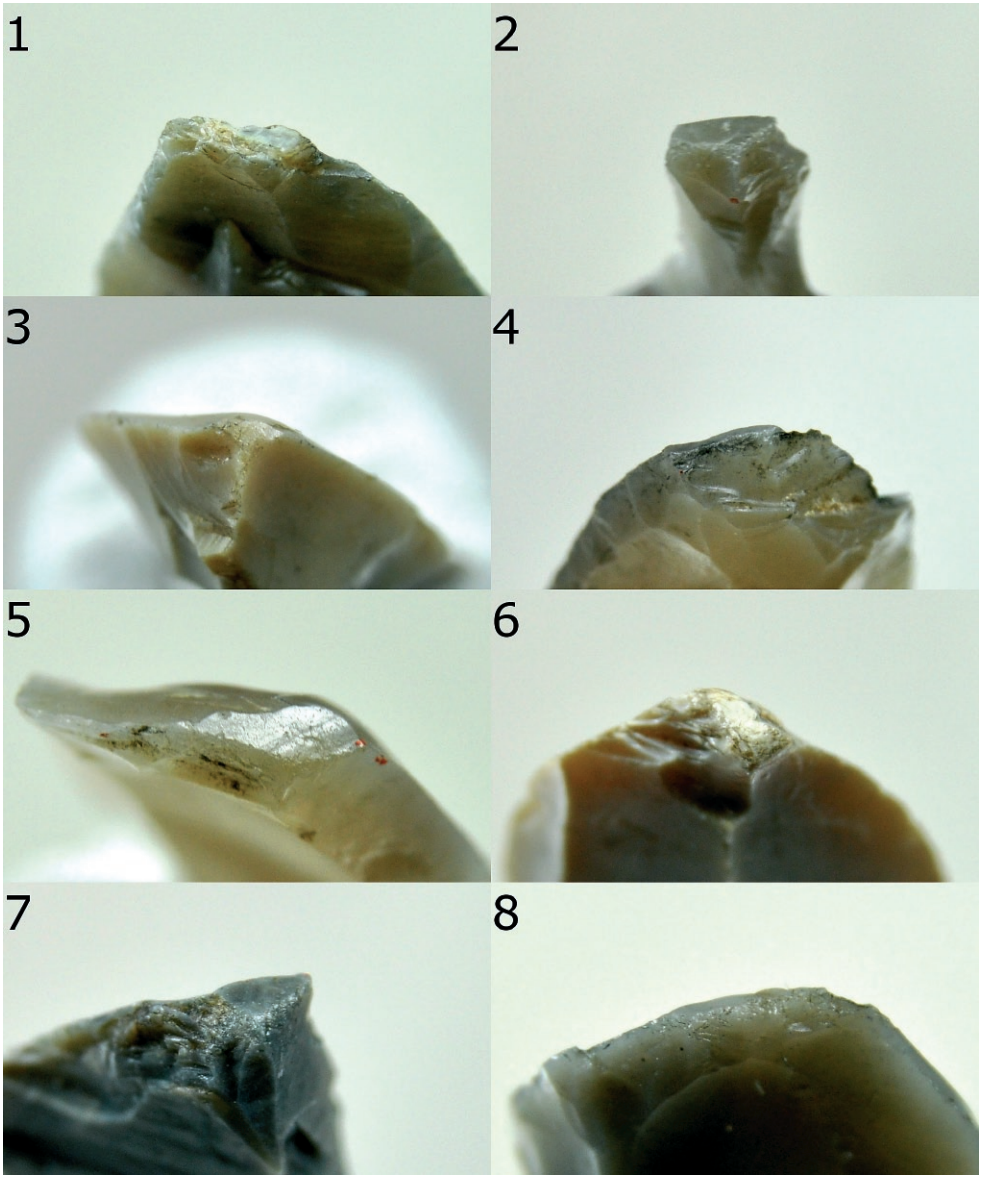

Fig. 13. Blade butts and edges, preparation by trimming. Photograph by M. Adamczyk
Ryc. 13. Piętki i krawędzie wiórów, przygotowane za pomocą prawcowania. Fot. M. Adamczyk

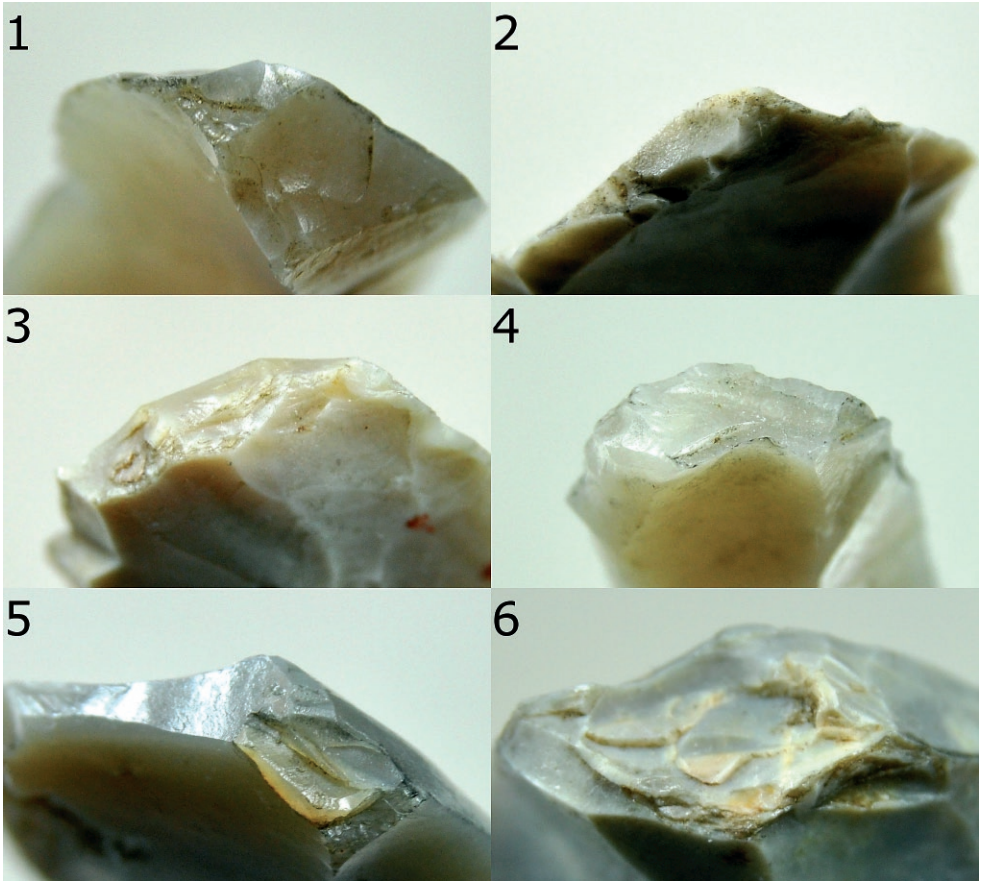

Fig. 14. Blade butts and edges, preparation by faceting. Photograph by M. Adamczyk
Ryc. 14. Piętki i krawędzie wiórów, przygotowane za pomocą fasetowania. Fot. M. Adamczyk

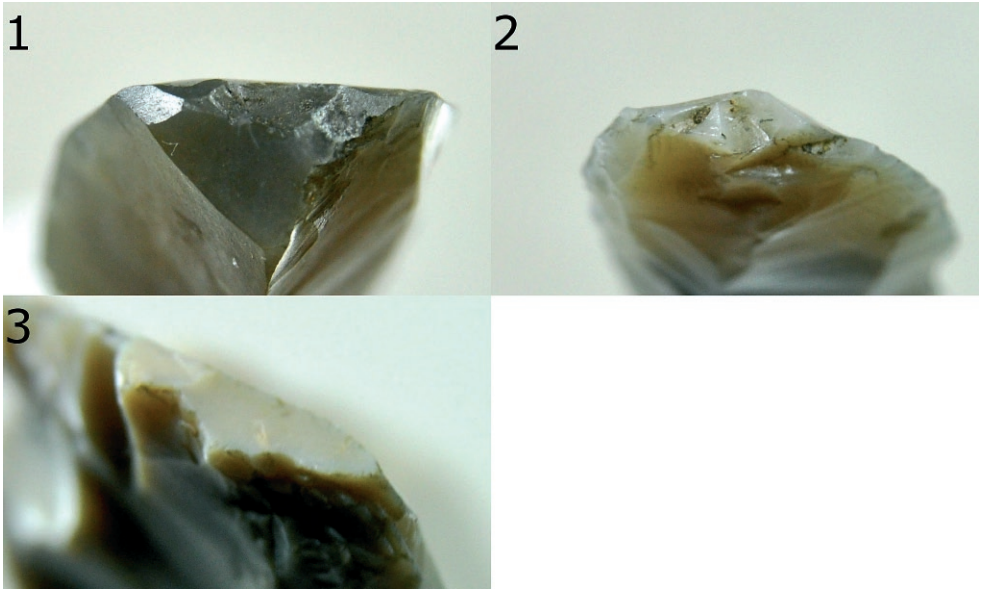

Fig. 15. Blade butts and edges, preparation by both trimming and faceting. Photograph by M. Adamczyk
Ryc. 15. Piętki i krawędzie wiórów, przygotowane za pomocą kombinacji prawcowania i fasetowania. Fot. M. Adamczyk

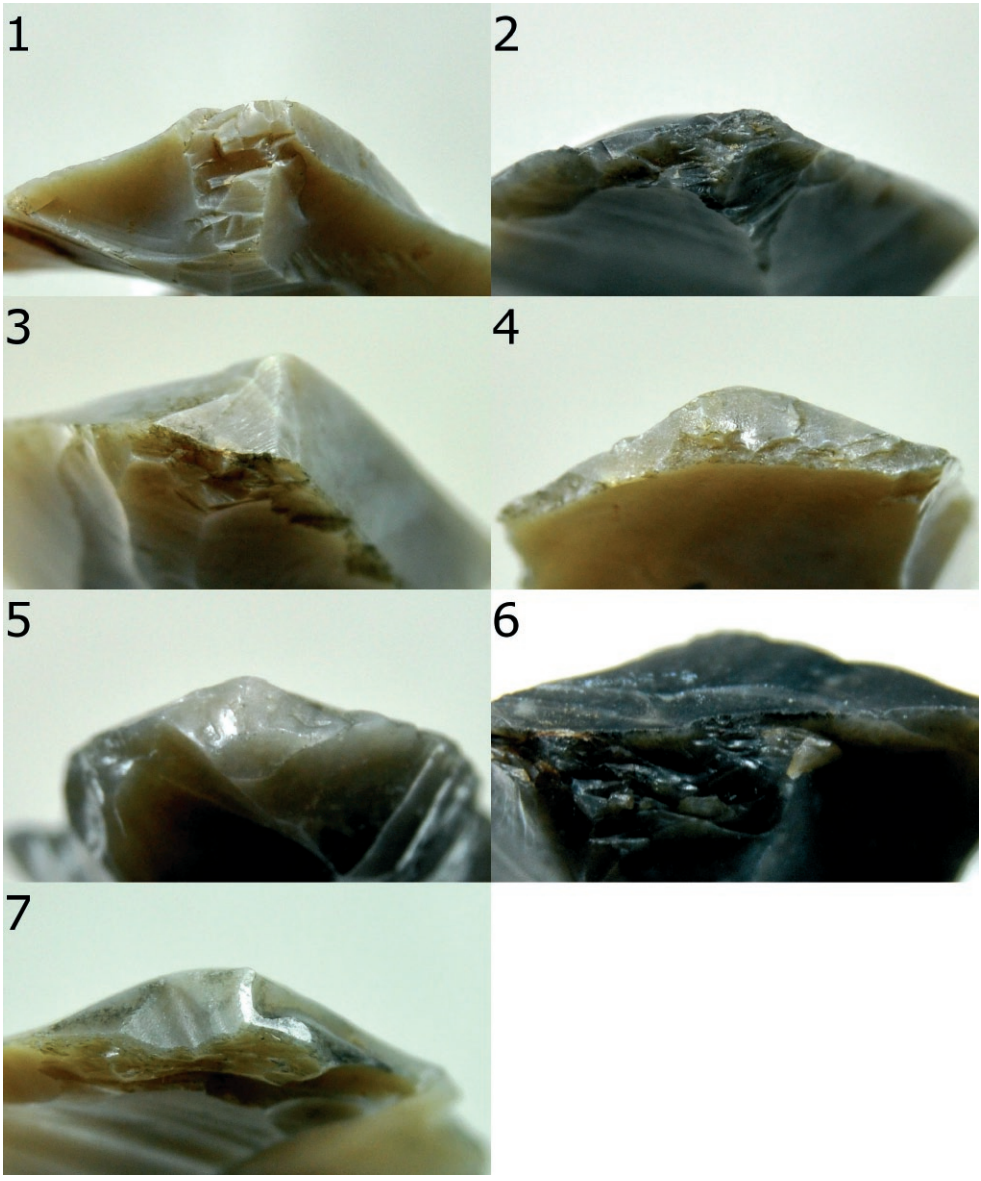

Fig. 16. Flake butts and edges: 1–3 – preparation by trimming; 4 and 5 – preparation by faceting. 6 and 7 – preparation by both trimming and faceting. Photograph by M. Adamczyk
Ryc. 16. Piętki i krawędzie odłupków: 1–3 – przygotowane za pomocą prawcowania; 4 i 5 – przygotowane za pomocą fasetowania; 6 i 7 – przygotowane za pomocą kombinacji prawcowania i fasetowania. Fot. M. Adamczyk

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Summary

The article presents the Federmesser collection from Wołczkowo, one of the oldest assemblages in the Western Pomerania, in the context of the lithic technology. The additional goal is to present the classic collection in details and according to a modern methodology. The main analytical method used in this paper is the Dynamical Technological Classification, based on quantifying of technological features and their interpretation in the context of a *chaîne opératoire* and later to construct a *schema opératoire*.

The results suggest that the main method used here was the single platform subconical cores exploited with mineral soft hammers, e.g. sandstones, with a different striking angle and placement for blades and flakes. Possible use of double platform cores is also suggested.

The technology used in Wołczkowo 1 strongly resembles other Federmesser assemblages with predominantly soft hammer blade detachment. However, some features, both technological and typological, are similar to Hamburgian flintknapping.

Streszczenie

Artykuł prezentuje kolekcję zabytków kultury Federmesser pod względem technologii krzemieniarstwa. Zespół ten, odkryty w miejscowości Wołczkowo (stan. 1), należy do najstarszych źródeł archeologicznych na Pomorzu Zachodnim. Analiza tej klasycznej kolekcji wykonana została zgodnie z nowoczesnymi standardami metodycznymi. Jako podstawową metodę badawczą zastosowano Dynamiczną Klasyfikację Technologiczną, opartą na katalogowaniu cech technologicznych, ich interpretacji w łańcuchu operacji oraz konstruowaniu schematu operacji.

Wyniki badań sugerują, że w Wołczkowie dominowała eksploatacja jednopiętowych rdzeni podstożkowych przy użyciu mineralnych miękkich tłuków (np. z piaskowca), w połączeniu z różnymi sposobami uderzenia w przypadku produkcji wiórów i odłupków. Możliwe także było korzystanie z rdzeni dwupiętowych.

Pod względem technologii krzemieniarstwa stanowisko 1 w Wołczkowie jest silnie związane z innymi stanowiskami z Polski i Niemiec, na których miała miejsce produkcja wiórów przy pomocy miękkiego tłuka. Niektóre cechy technologiczne i typologiczne nawiązują do krzemieniarstwa hamburskiego.

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