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# ANALYSIS OF CHIPPED INDUSTRY FROM THE SETTLEMENT OF THE ŽELIEZOVCE GROUP IN BAJČ[1]

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Abstract: A rich collection of chipped stone industry, chronologically falling to the final stage of the Želiezovce group, was obtained from the area of the settlement in Bajč. Two aspects were taken into consideration when analysing the assemblage of finds – typological-technological point of view and proportion of knappable raw materials at the site. The assemblage of chipped industry from Bajč comprises of items representing all phases of production process. The initial phase of raw silicite modification (including obsidian) is indicated by primary blades and flakes. The following stage, a primary exploitation, is documented by the presence of crest and subcrest blades. The final phase of the production process is represented mainly by the finished artefacts. Even though the collection contains also production waste, such as blades and their fragments, it mainly comprises tools – the final products of the knapping process. The analysed collection comprises of a wide range of various kinds of silicites and volcanic glass. It is currently the most diverse assemblage of knappable material obtained from the settlements of the Želiezovce group in Southwestern Slovakia. Local silicite raw material – limnosilicite – clearly prevails in the assemblage, but obsidian was also common. Radiolarite of the Szentgál type, chalk flint of the Tevel type, radiolarites of the Bakonycsernye, Gercse and Hárskút types were also identified, although they were fewer. The least frequent raw materials include felsitic porphyry, Volhynian flint, radiolarite from the Klippen Belt of the White Carpathians, silicite of the Kraków-Częstochowa Jurassic period, erratic flint, wood opal and nummulite silicite. A new, previously undescribed raw material has been recorded. It was identified as a siliceous substance of volcanic origin whose primary sources are located within the territory of neovolcanites in central Slovakia.

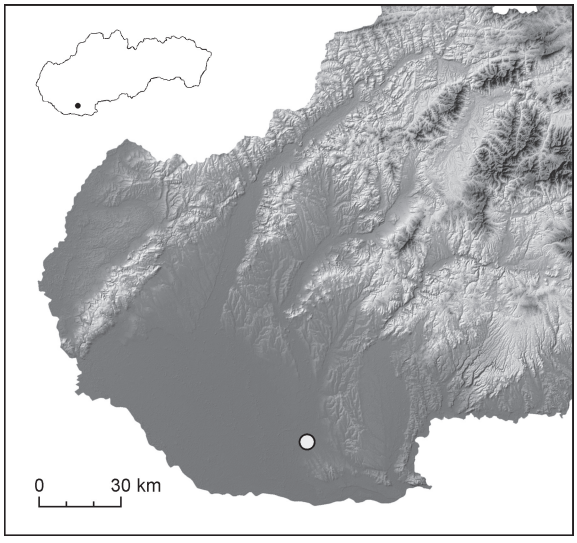


Fig. 1. Location of Želiezovce group settlement in Bajč-Medzi kanálmi.

## THE SETTLEMENT AREA

During several seasons (1987–1990 and 1992–1993), a large settlement area was excavated in the cadastral area of the village of Bajč (Komárno dist.), located on a sand dune, at the Medzi kanálmi site (Fig. 1). Several chronological horizons were detected. The site was most intensely settled in the end of the cultural development of the Želiezovce group, especially in its third development stage. The site was not re-settled until as late as the Early Middle Ages, since when it was again intensely occupied. Only few traces of occupancy of the sand dune have been documented within the excavated area, for instance, an object containing pottery of the Kosihy-Čaka culture (*Cheben I. 1998*, fig. 4). Traces of habitation in the late Hallstatt and the LaTène periods were also detected (*Čaplovič/Cheben I./Ruttkay 1988*; *1990*; *Cheben I./Ruttkay 1991*; *1992*; *1993*; *1995*).

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Numerous and typologically diverse finds were obtained from more than 500 settlement features and four inhumation burials (*Cheben I. 2000*, appendix 1) related to the Želiezovce group. Pottery represented the most numerous group of finds. Based on a detailed analysis of pottery, development of the Želiezovce group in its final stage was outlined (*Cheben I. 2000*). In comparison to other artefacts found within the settlement, polished and chipped lithic industry were extremely frequent. Such a numerous collection of stone industry has not been obtained from any other settlement of the Linear Pottery culture and the Želiezovce group in Southwestern Slovakia. The collection of polished lithic industry (*Méres/Hovorka/Cheben I. 2001*) consisting of more than 200 artefacts was processed from the aspects of raw materials as well as typology.

Chipped industry, represented by 734 specimens from the settlement at Bajč, remains unpublished. From the typological-technological point of view, as well as from the aspect of representations of knappable raw materials, the assemblage had been processed as a part of a dissertation dealing with chipped lithic industry from the Early Neolithic in the territory of Southwestern Slovakia (*Cheben M. 2020*). The presented article thus provides a more complex view on this type of material culture. The results of typological and technological analyses, as well as the diversity of raw materials, are presented in this paper. However, what needs to be considered is that it is a closed complex, culturally associated with a relatively short stage of the Želiezovce group (stage III).

## RAW MATERIAL COMPOSITION AND TYPOLOGICAL-TECHNOLOGICAL EVALUATION OF ARTEFACTS

The collection of chipped industry from the investigated settlement contains a wide range of various types of silicites and volcanic glass. It is currently the most numerous and most diverse collection of knappable raw materials obtained from a settlement of the Želiezovce group in Southwestern Slovakia.

Local silicite – limnosilicite – is clearly predominant in the collection; it is represented by 308 specimens (Fig. 2). One artefact was probably also made of limnosilicite, however, determination of this type of silicite raw material was very difficult. The second widely used silicite is radiolarite of Szentgál type, imported from Hungary (188 specimens). In addition, more silicites imported from the territory of Hunary occurred at the site, chalk flint of the Tevel type being the most frequently represented type (55 specimens). Also, Bakonycsernye, Gerecse, and Hárskút types of radiolarite were detected (Fig. 2). Two specimens of felsitic porphyry, whose sources are located in Northeastern Hungary, was represented in the assemblage as well. This type of raw material was used e.g. during the Early Upper Palaeolithic at the Moravany nad Váhom-Dlhá site (*Nemergut/Cheben M./Gregor 2012*). Another rather frequent raw material from the category of volcanic glass, detected in the collection, was obsidian (73 specimens). Volhynian flint (4 specimens) was probably brought to the settlement together with obsidian. The source of this type of flint is situated in the territory of Western Ukraine. The collection also contained 41 specimens of radiolarite. Its origin can be sought in the Klippen Belt, in the area of the White Carpathians in Western Slovakia. A raw material imported from the territory of Poland – silicite of the Kraków-Częstochowa Jurassic period – was also represented in the collection, represented by 25 specimens. In one case, its G variety was identified. Finding of four artefacts made of erratic flint was an important discovery, because this type of silicite occurs only exceptionally in the collections of chipped industry of the Želiezovce group. The collection from Bajč comprised of three artefacts containing a new, previously undescribed type of raw material, identified as a "siliceous substance of volcanic origin". It has not yet been identified in any of the previously analysed collections obtained from Neolithic or Eneolithic sites or in any Palaeolithic collections. It is a silicite whose primary sources are located in the territory of the neovolcanites in central Slovakia, where it is found together with rhyolites (*Cheben M. 2020*). In the case of rhyolites, it creates several-centimetres thick layers which can be several meters long. During an intense survey, the authors identified one of the primary sources of this raw material near Hliník nad Hronom. As for other knappable raw materials, wood opal occurred (2 specimens) and one artefact was made of nummulite silicite whose sources are the gravels of the Ipeľ River. In one case, it was not possible to identify the raw material. Fourteen artefacts bore traces of intense burning, making the identification of the exact type of silicite impossible. The same applies to four specimens whose surface was covered with patina.

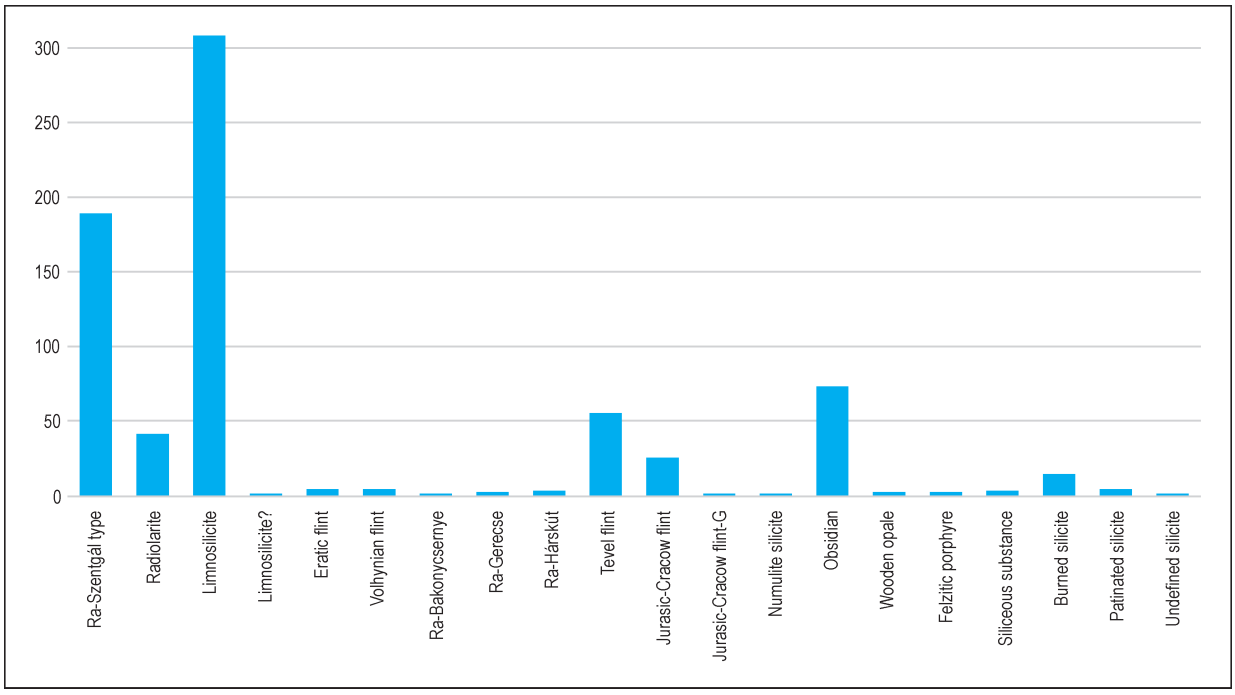



Fig. 2. Bajč-Medzi kanálmi. Proportion of individual types of raw materials present on the settlement.

Petrographic analysis of material composition of the chipped industry obtained from the settlements of the Želiezovce group clearly suggests that a wide range of used knappable raw materials from different areas of Slovakia or its neighbouring countries – Poland, Bohemia, Hungary, or Ukraine were used.

Petrographic determination of silicite used for the production of chipped tools definitely revealed important findings about the chipped industry from Bajč. It also conributed to identification of primary or secondary sources from which the material was transported to the settlement. This type of analysis also provides important information on the contacts of contemporary cultures, indicating the existence of trade routes in the territory of central Europe in the Neolithic and Eneolithic. The detailed analysis determining proportions of raw materials documented at individual sites can, similarly to the settlement in Bajč, suggest whether a similar trend could have been present also at other settlements in Southwestern Slovakia.

As revealed by the petrographic analysis, one of the most frequently used silicites in the collection was the local silicite – limnosilicite. One of the important primary sources of this raw material is in the Žiarska dolina basin (Fig. 3), in the region of neovulcanites located in central Slovakia. Besides limnosilicite, other silicites represented in Bajč chipped industry collection can also be found in this territory, even though the intensity of their use varied, as confirmed by the analysed collection. They include, for instance, chalcedonies (jasper), opals (wood opal), silicified tuff and the siliceous mineral of volcanic origin. The sources of these silicites are approx. 80 km far from the settlement. However, as shown by the analysis of the chipped industry, their secondary sources, the gravels of the Hron River, were also intensely used. In this case, the distance between the source of the raw material and the settlement is significantly shorter, being only a few tens of km. Another local raw material richly represented in the collection is radiolarite from the Klippen Belt (Fig. 4). The transportation route from the primary and secondary sources (the gravels of the Váh River) to the settlement was approx. 130 km long. The assumed secondary sources are 60–80 km far from the settlement. Volcanic glass – obsidian (Fig. 3), whose sources are located in Southeastern Slovakia (Zemplínske vrchy Hills) and Northeastern Hungary (Tokaj-Zemplén Hills), had to be brought to the site from the distance of more than 250 km. An important raw material – the silicite of the Kraków-Częstochowa Jurassic period – was imported from the territory of Southern Poland, from the Kraków-Częstochowa Upland 350 km far (Fig. 3). Volhynian flint was imported from the region of the Dnieper River (Ukraine), from a distance of 800 km (Fig. 3). As suggested by the analysis, important raw materials used in Southwestern Slovakia included Hungarian

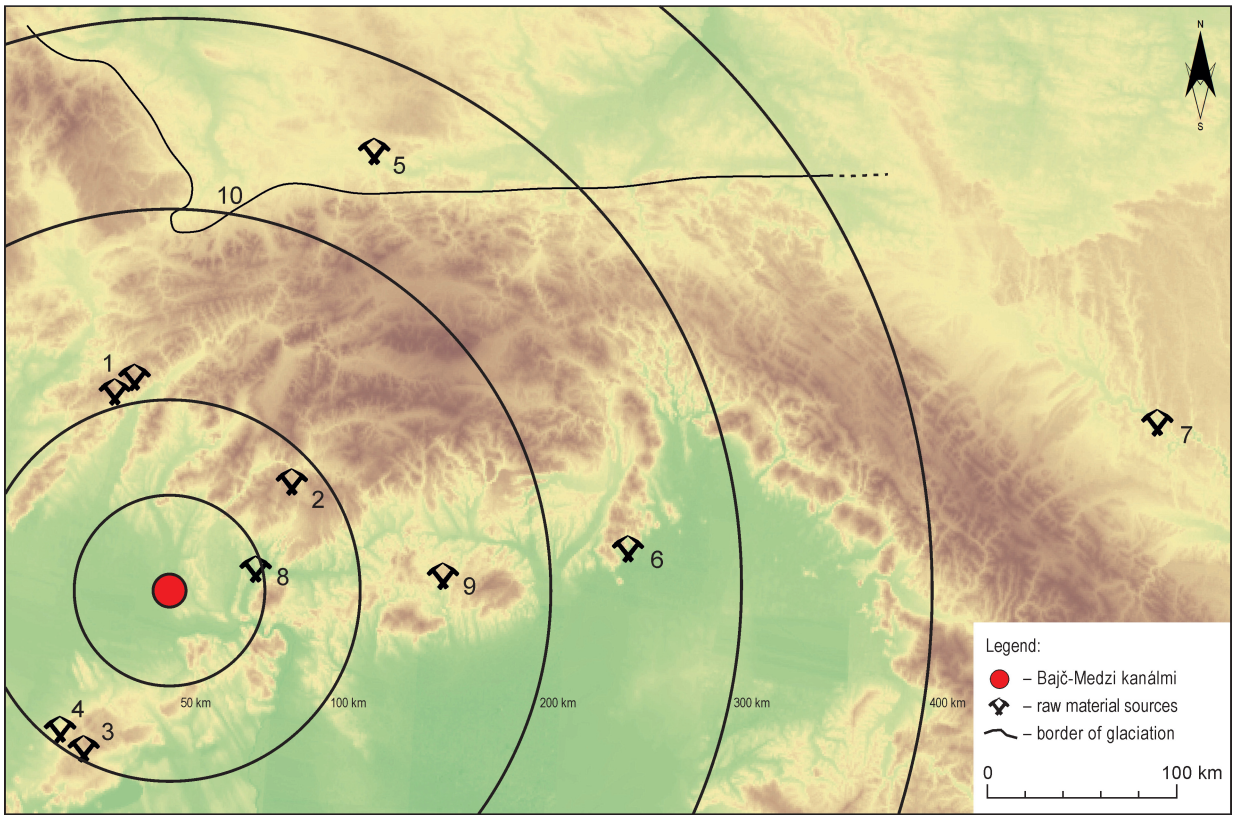



Fig. 3. Map of sources of the siliceous raw materials and volcanic glass, and their distance to the analysed settlement. 1 – radiolarite (Pieniny Klippen Belt); 2 – limnosilicite; 3 – Szentgál-type radiolarite; 4 – Tevel flint; 5 – Jurasic flint, Kraków-Częstochowa Upland; 6 – obsidian; 7 – Volhynian flint; 8 – numulite silicite; 9 – limnosilicite (N Hungary); 10 – erratic flint.

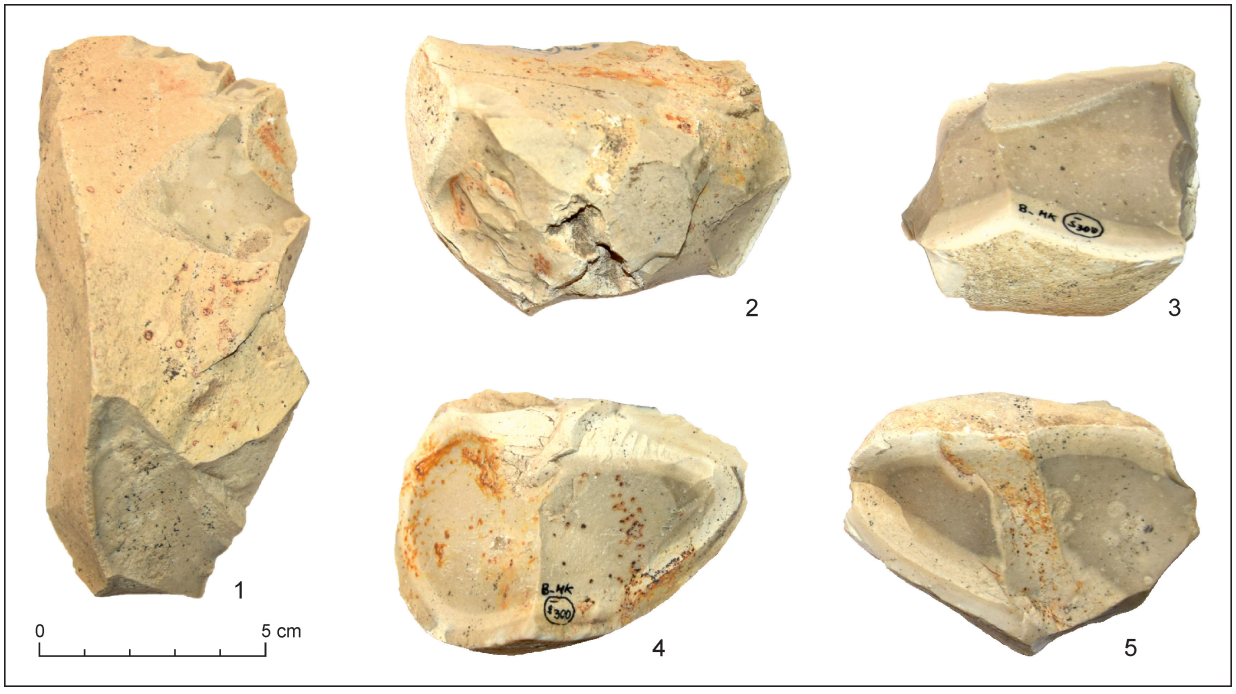



Fig. 4. Bajč-Medzi kanálmi. Hoard of silicite raw material from the pit 550 (Tevel flint).

Table 1. Bajč-Medzi kanálmi. Level of preservation of the original surface on blades and flakes.

| Surface | Ra-Szentgál | Radiolarite | Limnosilicite | SGS | Volhynian flint | Ra-Bakonycsernye | Ra-Gerecse | Ra-Hárskút | Flint-Tevel | SKCJ | SKCJ-G | Nummulite silicite | Obsidian | Siliceous substance | In total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blade with original surface | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Blade with partial cotex | – | – | 3 | – | – | – | 2 | – | 6 | 2 | 1 | – | 4 | – | 18 |
| Blade with negative | 96 | 9 | 112 | 1 | 4 | – | – | 1 | 32 | 14 | – | – | 32 | 3 | 312 |
| Flake with original surface | – | 2 | 3 | – | – | – | – | – | 2 | – | – | – | – | – | 7 |
| Flake with partial cortex | 2 | 1 | 2 | 2 | – | – | – | – | 2 | 3 | – | – | 2 | – | 14 |
| Flake with negative | 48 | 10 | 130 | 1 | – | 1 | – | 1 | 5 | 4 | – | – | 26 | – | 230 |
| Total | 146 | 22 | 250 | 4 | 4 | 1 | 2 | 2 | 47 | 23 | 1 | 0 | 64 | 3 | 581 |

silicites, especially radiolarite of the Szentgál type and chalk flint of the Tevel type, whose primary sources are located in the Bakony Mountains. The transportation route was approx. 130 km (Fig. 3). In the collection, erratic flint was represented by several specimens. This material was most probably imported from a distance of 200 km, from the region of Northern Moravia and Silesia (Fig. 3).

Analysis of the surface of the silicites and obsidian can determine whether individual raw materials were transported to individual settlements from primary/secondary sources and in what state. For such a numerous collection as the one obtained from the settlement in Bajč, it is rather surprising that the blades with preserved original surface (cortex) are absolutely absent. Similar situation was observed when it comes to flakes, with only seven specimen present (Table 1). Considering blades and flakes with partly preserved cortex (Table 1), similar trend can be observed when in case of specimen made of limnosilicite, flint of the Tevel type, silicite of the Kraków-Częstochowa Jurassic period, and obsidian. In case of flakes with partly preserved cortex, silicites such as radiolarite of the Szentgál type, radiolarite from the Klippen Belt, and erratic flint occurred together with the above mentioned silicite raw materials (Table 1). In the whole assemblage, several pieces of silicite raw material with original surface and traces of manipulation occurred, represented mainly by the Tevel type flint, radiolarite, limnosilicite, and nummilite silicite.

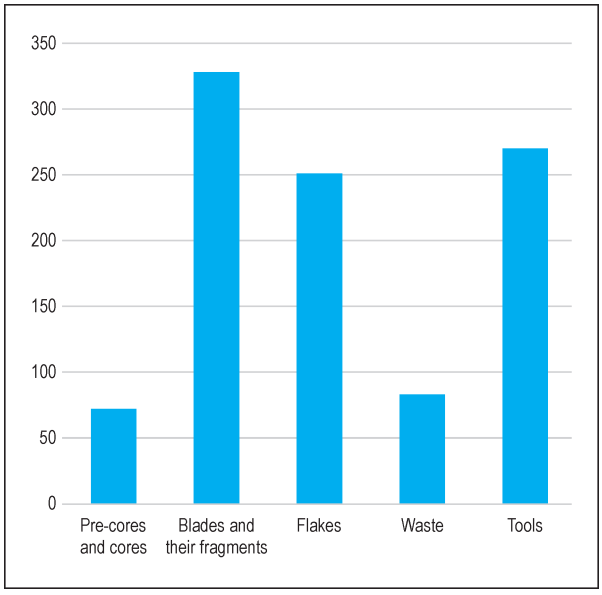



Fig. 5. Bajč-Medzi kanálmi. Quantity of chipped industry in the main groups.

The minimum number of artefacts with the original surface (cortex) might suggest that the silicites, such as the Szentgál type radiolarite, erratic flint, Volhynian flint, silicite of the Kraków-Częstochowa Jurassic period, siliceous substance of volcanic origin, and felsitic porphyry, were most probably imported to the settlement in the form of modified cores, possibily with the remnants of cortex. Raw materials such as obsidian, the Tevel type flint, radiolarite, nummulite silicite and limnosilicite were transported to the settlement in Bajč in their unmodified or only roughly processed form. The finds with the preserved pebble surface indicate that the gravels of the Hron River were the secondary source of limnosilicite material. Two types of original surface were detected on the radiolarites (from the Klippen Belt). In one case, a radiolarite layer with chert cortex was detected, the second specimen was

a radiolarite pebble. These finds suggest that radiolarite was obtained not only from its primary sources located in the Klippen Belt, but also from secondary sources – the gravels of the Váh River.

The analysed chipped industry comprises of the elements of all phases of the production process. Initial phase of silicite raw material modification (including obsidian) is represented by the presence of primary blades and flakes. Material exploitation phase is represented by crest and sub-crest blades. The assemblage contains predominantly the artefacts from the final phase. Cores amended because of improper exploitation or damaged raw material (cracks, hollows) are represented by a numerous reparation blades and flakes, indicating rejuvenation of the striking or exploited surface of the core. The assemblage also contains numerous exemplars of waste as well as final products – tools (Fig. 5). The most dominant in the collection are blades and their fragments, followed by flakes. Tools represent another considerable part of the inventory (Fig. 5).

**Pre-cores and cores**

72 artefacts have been evaluated within this group (Table 2; Pl. I). Thirteen specimens were identified as raw material without any traces of manipulation. On the same number of artefacts in this category, traces of manipulation have been found. These were mainly nodules or pebbles with preserved negatives of several debitages which may have been a result of testing of the quality of raw material.

As many as 45 individuals identified as cores in various stages of exploitation were identified in the analysed collection. Three massive rejuvenation flakes (removed by a direct strike with a hard hammering tool) were secondarily used for core production. One of such cores was identified as a single-platform disc-shaped core with a platform trimmed by several blows. The edge of the core between the platform and the reduced surface bore traces of dorsal preparation. According to the preserved negatives on the reduced surface of the core, we can say that only flakes were removed. The second core was identified as a fragment from which blades were obtained. Third specimen is a flat single-platform core with the striking surface modified by several blows. The edge was modified by removing the overhangs. Blades and flakes were being chipped off from the core. In the collection, one flake used as a double-platform flat microcore was detected. The platforms were made up by lines with dorsal preparation identified on their edges. The microcore was rejected probably due to a technical fault. It was used only for chipping off flakes.

One specimen indicating initial phase of exploitation also occurred in the collection. It was a single-platform prismatic core with the platform modified by several blows. The reason for rejection was impossible to define.

As for the core shapes, the collection contained mostly prismatic (7 specimens), conical (6 specimens), pyramidal (5 specimens) and boat-shaped (4 specimens) cores. Among the prismatic shapes, double platform cores with striking surfaces modified by multiple blows were predominant. Only one core had both platforms modified by a single blow. Changed orientation was detected on two cores. The edge between the reduced and striking surfaces on two specimens bore traces of overhangs removal. Mainly blades and flakes were made from the cores, however, there are unique documents of bladelets reduction. Conical cores had – except of one specimen – platforms modified by multiple blows. On their edges, between the striking and reduced surfaces, exclusively traces of removed overhangs were identified. It was mainly blades and bladelets that were reduced from the conical cores. Other frequently occurring shapes of cores in the collections were pyramids. Three of them had changed orientation and there was also one single-platform and one double-platform core. All striking surfaces were modified by multiple blows. The edge of one specimen was modified by means of dorsal preparation. Mainly flakes were made of these cores, in one case it was also blades. Only bladelets were chipped off of another specimen. Boat-shaped, single-platform cores occurred in the collection as well. Changed orientation was detected in one of them. Striking surfaces on all individuals were modified by multiple blows. Edges of two cores were modified by removal of overhangs. The analysed cores were rejected mostly due to technological fault. From the boat-shaped cores, mostly blades and bladelets were removed, sometimes it was blades and flakes. Three specimens represent irregular cores with changed orientation. Their striking surfaces were modified either by single or multiple blows. On one specimen, traces of removal of the overhangs from the core's edge were detected. Irregular cores were probably used for reduction of flakes only. The collection of cores also includes one disc-shaped core and one flat core. The double-platform flat core had its platforms modified by single blows. The single-platform disc-shaped core had its striking surfaces modified by multiple blows. Only flakes were reduced from both cores.

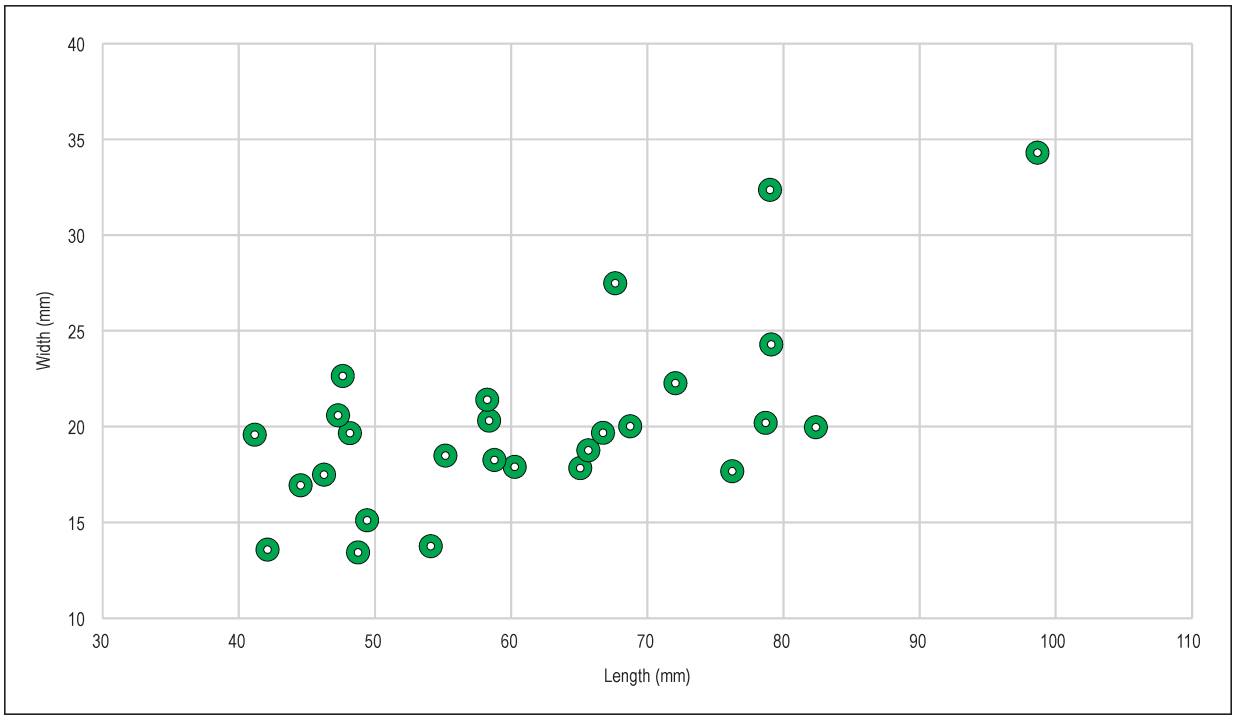



Fig. 6. Bajč-Medzi kanálmi. The width-to-lenght ratio of the whole target blades.

Eleven residues of cores (exploited) from which only flakes were reduced in the final phase were detected in the inventory of the chipped industry. They were mainly cores with changed orientation, but single-platform and double-platform cores occurred as well. Their striking areas were mainly modified by multiple blows and only several specimens were modified by single blows.

Three specimens were identified as core fragments. They all came from single-platform cores whose striking areas were modified either by single or multiple blows. On the edge of one core fragment, removal of the overhangs was detected. Blades, bladelets and flakes were made from the cores. One fragment came from a thin single-platform pyramidal core with the platform modified by a single blow. Blades were made only from a part of the core. The reduced surface was U-shaped. The platform and the striking area were in an acute angle. Identical or very similar cores (shape, modification and reduction method) were discovered also at a polycultural site of Sedmerovec, at the Podjamie site (*Cheben I./Cheben M./Nemergut 2017*).

A hoard of chipped industry was discovered at the settlement in Bajč, in feature 550. It is currently the second such find from the territory of Southwestern Slovakia. The other hoard of chipped industry comes from the settlement of Želiezovce group in Borovce, Staré hliníky site, discovered in 1950's (*Kolník/Paulík 1957*). At the studied settlement, five pieces of raw material with traces of manipulation were found in the above-mentioned feature. They were nodules of chalk flint of the Tevel type, on which original surface was partly preserved (Fig. 4). The nodules' lengths varied between 6.0 and 12.7 cm. Their widths reached 4.7–6.64 cm, and their thicknesses was between 3.3 and 5.9 cm.

## Blades and their fragments

328 artefacts were classified as blades and/or their fragments (Fig. 6; Table 2; Pl. II; III). 68 complete final blades occurred in the inventory. They included one complete blade with core pole in its distal portion – so called *outrepassé*. Only eight complete blades were detected in the collection. A cosiderable part of the collection was fragmentary; proximal-mesial and mesial portions of blades were clearly predominant (Table 3). Mesial-distal fragments of blades were represented by 26 specimens. Seventeen specimens from proximal parts of blades were identified, as for distal portions, nine specimens were found. Similar trend can be observed also in blades (Table 3), among which mesial (8 specimens) and proximal-mesial portions (7 specimens) prevail. The collection also includes two examples of mesial-distal portions of bladelets.

Table 2. Bajč-Medzi kanálmi. Representation of individual raw materials in individual groups.

| | Ra-Szentgál | Radiolarite | Limnosilicite | Limnosilicite? | SGS | Volhynian flint | Ra-Gerecse | Ra-Bakonycsernye | Ra-Hárskút | Flint-Tevel | SKCJ | SKCJ-G | Obsidian | Siliceous substance | Nummulite silicite | Wood opal | Felsitic porphyry | Burned silicite | Patinated silicite | Undetermined silicite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pre-cores and cores | 17 | 9 | 28 | – | – | – | – | 1 | 1 | 9 | 1 | – | – | – | 1 | 1 | – | 1 | – | 1 |
| Blades and their fragments | 96 | 9 | 114 | – | 1 | 4 | 2 | – | 1 | 37 | 16 | 1 | 36 | 3 | – | – | – | 6 | 2 | – |
| Flakes | 51 | 13 | 134 | 1 | 3 | – | – | – | 1 | 9 | – | – | 28 | – | – | – | – | 3 | 1 | – |
| Waste | 25 | 10 | 32 | – | – | – | – | – | – | – | 1 | – | 7 | – | – | 1 | 2 | 4 | 1 | – |
| Tools | 84 | 10 | 95 | – | 2 | 3 | 1 | – | 1 | 31 | 18 | 1 | 14 | 3 | – | – | – | 5 | 1 | – |
| Total | 273 | 51 | 403 | 1 | 6 | 7 | 3 | 1 | 4 | 86 | 43 | 2 | 87 | 6 | 1 | 2 | 2 | 19 | 5 | 1 |

Fifteen blades from the preparation phase, suggesting primary processing of transported raw materials, were discovered in the collection from the settlement in Bajč. On preparation blades, plain butts were predominant, found on five specimens. Presence of lips was detected on two specimens. Other two had two poles on their edges (bipoled). As for other types of butts, one punctiform and one faceted butt (two poles found on the edge – bipoled) occurred. Specimens from the final exploitation phase are most frequently represented in the assemblage (295 specimens). From the initial phase of exploitation, one crest and eleven subcrest blades occurred. Several types of butts have been recorded on the final blades and bladelets.

Table 3. Bajč-Medzi kanálmi. Fragmentary state of final blades and bladelets in the inventory.

| | Blades | % | Bladelets | % |
|---|---|---|---|---|
| Complete | 68 | 25 | 8 | 32 |
| Proximal part | 17 | 6 | – | 0 |
| Proximal-mesial part | 81 | 30 | 7 | 28 |
| Mesial part | 68 | 25 | 8 | 32 |
| Mesial-distal part | 26 | 10 | 2 | 8 |
| Distal part | 9 | 4 | – | 0 |
| Total | 269 | 100 | 25 | 100 |

Faceted and plain butts are predominant. 60 faceted and 58 plain butts were identified. Lips were recognized on 23 faceted and 21 plain butts. Two poles on edges (bipoled) were preserved on twelve faceted and eight plain butts. As for other frequently occurring types of butts, 26 dihedral butts were found; fifteen of them had lips, and on four edges two poles occurred (bipoled). Five specimens represented linear (with lips on two of them) and three punctiform butts. As for cortical (with lip) and winged faceted butts, one specimen of each was present. Fifteen butts were modified by secondary retouch. Rejuvenation of cores due to technological faults is documented by rejuvenating blades and bladelets (15 specimens) which were reduced mainly to repair the reduction surface. In three cases, blades reduced from core edges occurred (in dorsal portion, a part of the striking and reduction areas were preserved). Plain (5 specimens) and punctiform butts prevailed among the butt types. On two plain butts, lips were recognized, and two poles on the edge of one but was found (bipoled). As for other types, there were two linear and faceted (one with a present lip) butts. The collection also included a dihedral butt with two poles on its edge (bipoled).

On fifteen blades, modification of the core edge, between the platform and the reduced surface by means of dorsal preparation, has been documented. In as many as 60 specimens in the collection, modification of core edges by removal of overhangs was identified. Two specimens from the preparation phase were reduced by a direct blow of a soft anorganic as well as organic percussors. Indirect reduction, using a punch, was identified in one case. On another blade, use of the same technique can only be assumed. Another specimen was probably also reduced indirectly (by a punch) or directly by a soft organic percussor. Specimens from the final reduction phase were reduced mainly from single-platform cores. Only two blades were reduced from double-platform cores. To reduce

final blades and bladelets, direct blow using an organic percussor was most frequently used (54 specimens). On three others, it is only assumed. As for the soft techniques, indirect reduction, by means of a punch, was used in 34 specimens. It was impossible to decide exactly whether indirect (a punch) or direct reduction by an antler/bone was used in the case of 23 blades. On eleven blades, possible indirect reduction by a punch was detected. Apart from soft unaggressive techniques, hard aggressive reductions occurred on final items. In eighteen cases, direct reduction by a soft percussor and five cases of the use of hard anorganic percussor were identified. On other eight specimens, use of direct blows by a soft stone is assumed. When reducing rejuvenating flakes, mainly hard techniques were used. On seven individuals, direct blows by a hard anorganic hammer were detected. In one case, a direct blow of a soft hammerstone was used. Three rejuvenating blades were reduced directly using an organic hammer and one was removed inderectly by a punch. On one specimen, it was impossible to determine whether there was a direct (by an organic hammer) or indirect (by a punch) blow.

**Flakes**

251 specimens of the chipped industry were flakes (Table 2). 21 cases with partly preserved original surface of the silicite were detected in the assemblage. Rejuventaing flakes, as well as rejuvenating blades document primary processing of transported raw materials at the settlement. Among them, four spherical segments (one probably chipped off a hammer) and three massive flakes with cortex were detected. Plain butts dominated on these flakes (9 specimens). On three of them, lip was detected, and on as many as five edges of butts two poles occurred (bipoled). As for other types, there were three punctiform and two dihedral butts. In one case, a combination of cortical and linear butt was found. One flake had a secondarily retouched butt. Flakes of specimens from the rejuvenating phase were most numerous in this group. In the collection, flakes were identified in 115 cases. Five of them were massive flakes on which two plain, one punctiform, and one secondarily retouched butt were detected. On the plain butt, a lip was present, and on the edge of another one, two poles occurred (bipoled). Plain butts clearly dominated on the flakes. On eleven specimens, lips were found, and five edges had two preserved poles (bipoled). Six linear (edges on three butts had two poles – bipoled) and five punctiform butts were detected on flakes. Two butts were secondarily retouched. On some flakes, combinations of two different butts were detected. In two cases, a winged faceted (one with a lip) and a winged dihedral butt with a lip were found. One combination of plain and linear butts and one combination of plain and cortical butts occurred. Two poles (bipoled) were detected on the edges of both of these butts. As stated above, the individuals from the rejuvenating phase also represented a numerous group (115 specimens). In the collection, flakes rejuvenating the striking surface were represented by 19 specimens, and flakes rejuvenating the reduction surface of the core were represented by 96 specimens. One massive flake created from a core platform – a core tablet with a plain butt – was detected in the collection. On other core tablets, five plain (three with lips and three edges with two poles – bipoled), four punctiform and one dihedral butt with bi-polar edge were determined. A combination of two butts – a plain and a linear with two poles on one edge (bipoled) – occurred on one core tablet. Sixteen massive rejuvenating flakes were included in the inventory. Plain (6 specimens) and linear (5 specimens) butts dominated. Two poles (bipoled) were found on two edges of linear butts. As for other butt types, there were three punctiform butts and one dihedral specimens. Plain butts were the most frequent (23 specimens) on rejuvenating flakes, 80 of which were identified in the inventory. Lips occurred on five of them and two poles were detected on eight edges (bipoled). As for other types, thirteen punctiform (one butt edge had two poles – bipoled), eleven linear (four butt edges had two poles – bipoled), nine faceted (three butt edges had two poles – bipoled) and eight dihedral (two butt edges had two poles – bipoled) butts were identified. Lips were discovered in five cases of faceted and in two dihedral butts. Faulty first blows were detected on several rejuvenating flakes. Two striking points were found on four such flakes. The first blow (direct, with a hard stone) did not remove the flake, so the core was then turned either by 90 degrees (in three cases) or by only a few degrees (one case), so that the second blow could remove the desired flake. Softer unaggressive techniques were used for second attempts – either an indirect blow (by a punch) or a direct blow by a soft stone – probably to have more control over the reduction process.

Dorsal preparation was used to modify core edges between the platforms and the reduced surfaces of twelve flakes. Removal of overhangs, used for modifying core edges, was detected on fifteen specimen.

Mainly hard aggressive techniques were used for reduction of preparation flakes. Direct blow using a hard anorganic hammer was predominant; it was detected in seven cases. Four flakes were reduced by direct blow using a soft anorganic hammerstone. All spherical segments were removed by direct blow using either a hard or a soft hammer. On two flakes, direct blows by a soft organic percussor occurred, on other two, indirect blows by a punch were probably used. Two massive flakes were reduced by a direct blow with a hard anorganic hammer. On one flake, direct reduction with a use of an organic material was applied. Flakes were most often reduced using soft unaggressive techniques. In seventeen cases, indirect blows by a punch were detected, and they can be expected to have been used on other eight individuals. Fourteen flakes were removed by using organic hammers. The same can be assumed in the case of two other specimens. The use of either indirect blows with a punch or direct blows with organic materials are assumed to have been used on six specimens. To remove the flakes in the collection, harder techniques were used as well. The use of direct blows was detected on 21 specimens, eleven of which were chipped off by a soft and ten by a hard percussor. In five cases, we can estimate reduction by anorganic percussors.

## Waste

83 specimens of chipped industry obtained from the settlement in Bajč were identified as waste (Table 2). These were mainly small flakes, fragments of blades and flakes as well as fragments of tools.

## Tools

The group of tools contains 270 items (Table 2). Besides the retouched specimens, artefacts with sickle gloss and those with traces of a use-wear (so-called use-wear retouch) were classified as tools. Especially blades, and bladelets and their fragments were used for tool production (177 specimens). Flakes were used in 53 cases. Together with final blanks, specimens from core preparation and rejuvenation phases were used for tool production (25 specimens).

Retouched blades and bladelets and their fragments – 38 specimens in total – were prevailing types of tools in the collection (Fig. 7; Table 4). Apart from them, fourteen pieces of flakes, modified by retouch, were detected in the collection. The most common types of retouched blades and bladelets in the inventory were the blades with distal end truncation. There were eight such specimen, including one bladelet. A notch was recorded on the distal end of one blade. Another specimen with bilateral retouch also had a truncation on the body. Three specimens were the blades with diagonal distal-end retouch. Diagonal retouch was slightly arcuate on one blade. Another blade was probably made from what had originally been a sickle blade. Two blades had their distal ends modified by means of convex retouch. One of the above-mentioned specimens also had diagonal corner retouch at its distal part. One more blade with a corner retouch of the distal end occurred in the collection. Only three specimens had both ends (proximal and distal) or lateral edges modified by retouch. One of them was a blade with proximal and distal truncation. The second blade had its proximal part modified by truncation and its distal part was modified by diagonal convex retouch. Another specimen had steep bilateral retouch, its distal portion modified by arcuate retouch, and its proximal portion trimmed by diagonal convex retouch.

The collection of such modified blades and bladelets is complemented with specimens with lateral (2 specimens) and bilateral (5 specimens) retouch. On three bilaterally retouched blades (one with truncated distal end) and on one bladelet, retouch of single lateral edge on the dorsal and another lateral edge of the ventral side was detected. Such modified blades are rather frequent in the inventories of Neolithic chipped industry.

Besides complete or semi-complete blades (their proximal-mesial and mesial-distal portions), the group of tools included eight specimens representing mesial portions of blades modified by retouch. In four cases, modification of distal portion (no specimens with trimmed proximal portion) were detected – either with diagonal-corner (2 specimens), diagonal (1 specimen) or convex (1 specimen) retouch. On one of the mesial portions with distal end corner retouch, a burin blow leading from the side of the artefact (distal portion) occurred. Lateral (2 specimens) and bilateral (2 specimens) retouch was detected on other four mesial portions of the blades. Steep retouch occurred on one lateral and one bilateral blade with such modification.

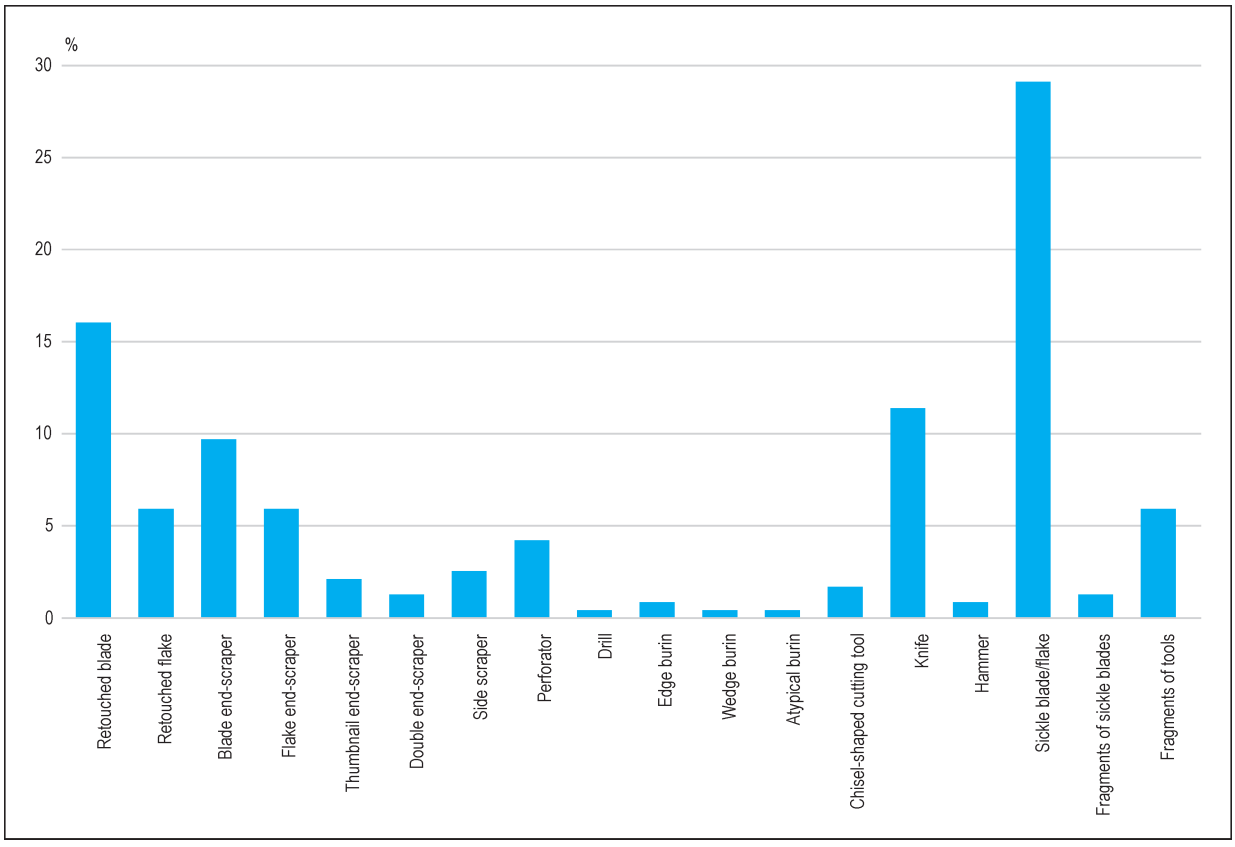



Fig. 7. Bajč-Medzi kanálmi. Quantity of individual tools.

Five blades and one bladelet with notches were detected in the assemblage. One blade had a notch created on the proximal end. The specimen whose both lateral edges bore traces of use-wear was interesting. On the right edge, there were traces on the dorsal side, on the left edge, the traces were on its ventral side (as far as one edge was blunted, the blade must have been turned by 180 degrees along its longer axis and further used).

As for the retouched flakes, fourteen specimens were recorded in the collection (Fig. 7; Table 4). Besides final flakes, specimens from the preparation as well as rejuvenation phases were used for tool production. Lateral edges (both edges in one case) were retouched – either on the dorsal or ventral sides – on eight specimens. The retouch was usually transverse, on two flakes convex retouch was detected. Two specimens had their lateral edges modified by steep retouch – looking like having a blunted side. Modified distal-end portions with diagonal (3 specimens), straight (2 specimens), and convex (1 specimen) retouch were recorded on six other flakes.

Endscrapers represent second dominant group of tools in the collection (Fig. 7; Table 4; Pl. IV). From typological point of view, several types of endscrapers occurred. The most numerous type, counting 23 specimens, is blade endscraper (Table 4). Massive endscrapers were represented by one specimen. Several specimens were modified by lateral convex retouch, proximal end truncation, and diagonal corner retouch. One blade had a notch on its lateral edge. The notch might have been associated with being attached to a shaft. Five blade endscrapers were secondarily made from blades originally used as sickles. This phenomenon occurs very frequently in the collections of Neolithic chipped industry. Fourteen specimens of flake endscrapers, including one massive specimen, were recorded (Table 4). Lateral (on the ventral side) and bilateral retouch (right edge retouched on the ventral, left edge retouched on the dorsal side) was identified on two specimens. Diagonal corner retouch was detected in one endscraper's proximal portion. Thumbnail endscrapers, represented by five specimens, are another type of endscrapers identified in the collection (Table 4). Distal as well as proximal portion of one of the specimens (double thumbnail endscraper) were retouched. Three specimens of double endscrapers were also present in the assemblage (Table 4).

Table 4. Bajč-Medzi kanálmi. Numbers of individual types of tools and raw materials they were made of.

| | RaSzentgál | Radiolarite | Limnosilicite | SGS | Volhynian flint | Ra-Gerecse | Ra-Hárskút | Tevel flint | SKCJ | SKCJ-G | Obsidian | Siliceous substance | Burned silicite | Patinated silicite | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Retouched blade | 13 | 2 | 9 | – | 1 | 1 | – | 3 | – | – | 6 | 1 | 1 | 1 | 38 |
| Retouched flake | 2 | 2 | 7 | 1 | – | – | – | 1 | – | – | 1 | – | – | – | 14 |
| Blade end-scraper | 9 | – | 4 | – | – | – | – | 7 | 3 | – | – | – | – | – | 23 |
| Flake end-scraper | 7 | – | 3 | 1 | – | – | – | – | 3 | – | – | – | – | – | 14 |
| Thumbnail end-scraper | 3 | – | 1 | – | – | – | – | – | 1 | – | – | – | – | – | 5 |
| Double end-scraper | 1 | – | 2 | – | – | – | – | – | – | – | – | – | – | – | 3 |
| Side scraper | – | – | 5 | – | – | – | – | – | – | – | – | – | – | – | 5 |
| Perforator | 4 | – | 5 | – | 1 | – | – | – | – | – | – | – | – | – | 10 |
| Drill | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 |
| Edge burin | 1 | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 2 |
| Wedge burin | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 |
| Atypical burin | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 |
| Chisel-shaped cutting tool | 3 | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 4 |
| Knife | 5 | – | 11 | – | – | – | – | 6 | 3 | – | 1 | 1 | – | – | 27 |
| Hammer | – | – | 2 | – | – | – | – | – | – | – | – | – | – | – | 2 |
| Sickle blade/flake | 12 | 2 | 33 | – | – | – | 1 | 12 | 4 | 1 | – | 1 | 3 | – | 69 |
| Fragments of sickle blades | – | – | 2 | – | – | – | – | – | 1 | – | – | – | – | – | 3 |
| Fragments of tools | 7 | 1 | 3 | – | – | – | – | – | 2 | – | – | – | 1 | – | 14 |
| Total | 69 | 7 | 87 | 2 | 2 | 1 | 1 | 29 | 18 | 1 | 10 | 3 | 5 | 1 | 236 |

The set of tools contained also six side scrapers (Fig. 7; Table 4). All of them were made from flakes. In two cases, rejuvenating flakes – tablets – were used for their production. Distal-end portion of three specimen – besides arcuately retouched lateral edge – was also retouched. One massive flake with slightly arcuate lateral retouch was present in the collection.

The set of perforators comprised of ten specimen (Fig. 7; Table 4; Pl. VI: 1–3; 5; 6) among which slender perforators with non-offset basal portions dominated. There were six specimens. One of them had its proximal portion removed by a side blow. One wide perforator with non-offset basal portion also occurred. Two massive and one slender perforator had slightly offset basal portions.

One artefact, identified as a drill, was reported in the inventory (Pl. VI: 4). It was a wide tool with slightly offset basal portion made of radiolarite of the Szentgál type.

As for other tools, the collection contained several types of burins (Fig. 7; Table 4). Two specimens represent edge burins (Pl. VI: 7). Distal portion of one of them was truncated. One lateral wedge-shaped burin was also present. Atypical burin blow was detected on the proximal-mesial portion of a blade. From the distal portion of the blade, the blow was aimed at its edge and it probably went wrong, which is why the debited burin splinter slipped to the dorsal side.

Four specimens of chisel-shaped cutting tools made from two flakes and blades were recorded in the group of tools. As for raw materials, only radiolarite of the Szentgál type and obsidian were used.

27 blades were detected in the collection of chipped industry from the settlement in Bajč (Fig. 7; Table 4). They were interpreted as knives made either from complete blades or their proximal-mesial portions. The proportion of the blades' lengths and widths is shown in Graph 3. We can see from the graph that mainly complete blades longer than 5 cm were used as knives. Nine blades classified into this group are between 4 and 5 cm long. They are mainly proximal-mesial portions of blades. We can ask whether they were broken on purpose (better attachment to a shaft) or while being used. Traces of work-wear (use-wear retouch) were observed on the edges of almost all specimens. A traseological analysis would confirm whether they are really knives. Retouch occurred on two blades identified as knives. One with distal truncation and the second massive blade which was bilaterally retouched.

Two pieces of limnosilicite were used as hammers. One of them was a pebble, from the second one only a fragment was preserved.

Fourteen damaged (broken) tools were identified in the analysed collection (Fig. 7; Table 4). Fragments of the retouched blades and flakes, as well as fragments of endscrapers and perforators, prevailed.

Artefacts with sickle gloss represent numerous set of tools within the whole analysed assemblage (Fig. 7; Table 4; Pl. V). Not only blades, bladelets and their fragments were used as sickle tools, there were also flakes. Seven specimen with sickle gloss were classified as flakes. Two specimens were modified by retouch, one with truncated distal portion, the second with retouched lateral edge in the proximal portion. As many as 62 artefacts with sickle gloss were made from blades, bladelets and their fragments. Most often, complete blades or their proximal-mesial and mesial portions were used. 41 sickle blades unmodified by additional retouch were detected in the collection. In one case, a blade endscraper was used as a sickle blade. In two cases, sickle blades had their proximal portions modified by series of blows on the ventral sides. Several sickle blades were modified by retouch. Individuals with distal truncation (nine cases) were predominant. Distal portions of other three specimens were modified by arcuate retouch, one was modified by partial diagonal retouch. Only two specimens with detected corner retouch were with modified proximal portions. Besides modified end portions, lateral retouch also occurred. It was observed on four specimens – two of which were the bladelets with steep retouch (backed). Two specimens represented segments made from mesial portions of blades. Both ends (proximal and distal) of one specimen were modified by irregular diagonal retouch. An interesting fact about this specimen is that it was rejuvenated. Originally, it might have been a complete blade used as sickle (gloss on its right side). Probably after it had been broken or damaged, its proximal and distal portions were broken off and its mesial portion was modified by retouch on both ends. There is no sickle gloss on the retouched surfaces; on the left side, it is visible along the whole length (on retouched surfaces as well). We can deduce that first the right edge was used as a sickle, and later, after the specimen's modification, its left edge was used. It is also suggested by the traces of use-wear on both edges. Both ends (proximal as well as distal) of the second specimen were also diagonally retouched. Sickle gloss was detected on both its edges. Besides modified end portions, the segments were also laterally retouched.

The set of tools also included 33 specimens with traces of the so-called use-wear retouch on their lateral edges.

## ANALYSIS OF CHIPPED INDUSTRY FROM BURIAL COMPLEXES

Besides numerous archaeological features, four inhumation burials were uncovered in the settlement area of Želiezovce group in Bajč. Together with pottery, they yielded artefacts made of bones, antlers, stone and gastropod shells (*Cheben I. 2000*, fig. 13). Chipped industry used as grave goods (offerings) occurred only in graves 1/88 and 3/90, dated to the very end of stage III of Želiezovce group or to the beginning of the Pre-Lengyel horizon.

### Grave 1/88

In this burial complex with rich grave goods, one specimen of chipped industry was arranged next to the skeleton's hands (Fig. 8), together with eight vessels, polished industry, antler and bone artefacts and a stone mat. The artefact was made of limnosilicite. It is the proximal-mesial portion of a blade (Pl. VI: 8) with diagonal retouch of the distal end. Traces of intense use (so-called use-wear retouch – tiny

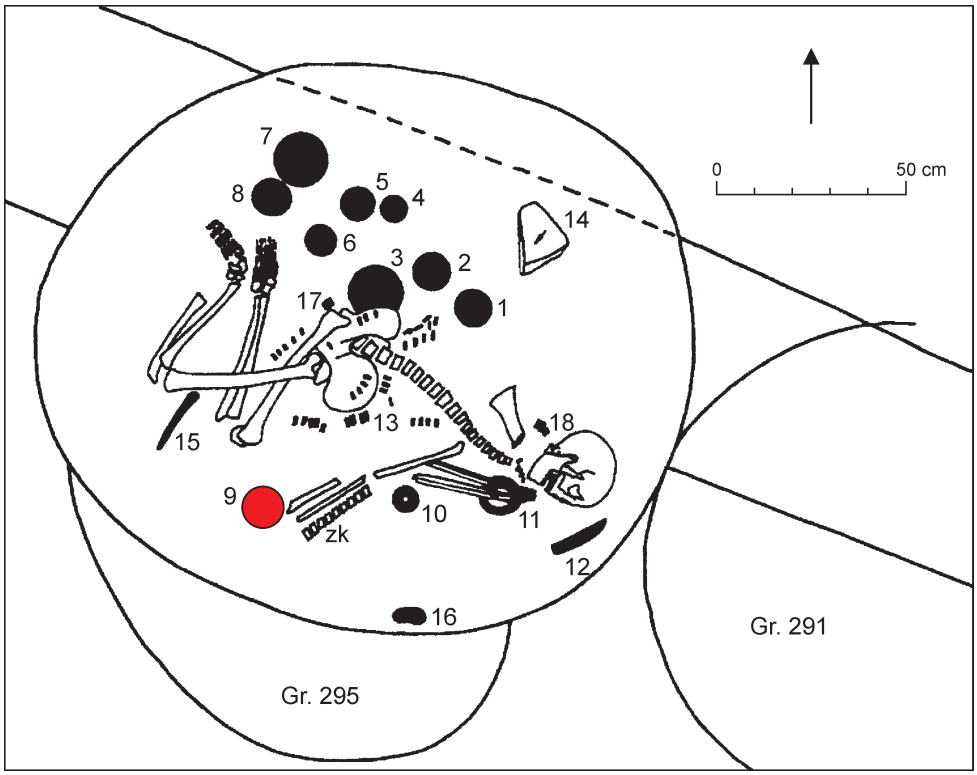



Fig. 8. Bajč-Medzi kanálmi. Plan of the grave 1/88 with the location of the stone chipped industry (modified after *Cheben I. 2000*).

incontinuous retouch visible with a naked eye, caused by the use of the artefact) are visible on both edges of the tool.

From the aspect of technology, the artefact was removed from a single-platform core, either indirectly with a punch, or by a direct blow using an organic percussor (probably an antler). A faceted butt with a lip was found on the blade. Traces of modification of the reduced core edge, caused by a removal of an overhang, were detected on the blade.

**Grave 3/90**

One specimen was found in the grave pit. The artefact was made of chalk flint of the Tevel type. It is a complete preparation blade with partly preserved original surface (Pl. VI: 9). The blade was used for production of a sickle blade with lateral retouch. Sickle gloss occurred on the left edge of the blade.

From the aspect of technology, the artefact was made from a single-platform core, probably indirectly with a punch. A plain butt was detected on the blade.

Only four burial complexes of the Želiezovce group containing grave goods made of some type of knappable raw material are known from the territory of Southwestern Slovakia. There were two specimens of chipped industry in a grave at the settlement in Bajč, and two come from the settlement in Vráble. They are the above-described graves – 1/88 with a retouched blade located on the fingers of an adult woman, and 3/90, where a preparation blade was deposited. In the enclosed settlement area I in Vráble–Veľké Lehenby, three artefacts were found in two graves of adult men (a sickle blade, a comb blade and a complete blade). They were placed in the chest area (*Furholt et al. 2020*, fig. 3.2.9; 3.2.13). Chipped industry was also discovered in grave pits in other settlements of the Želiezovce group, for instance Patince, Blatné and Štúrovo. Even though we cannot say that they were grave goods, the chipped industry was found in the fill of the pits.

A totally opposite trend can be observed in the countries of Western Europe. At the studied burial grounds and in burials deposited in settlement features in the Czech Republic (Vedrovice), Austria (Kleinhadersdorf) or Germany (Müddersheim, Schwanfeld), chipped industry is much more frequently represented.

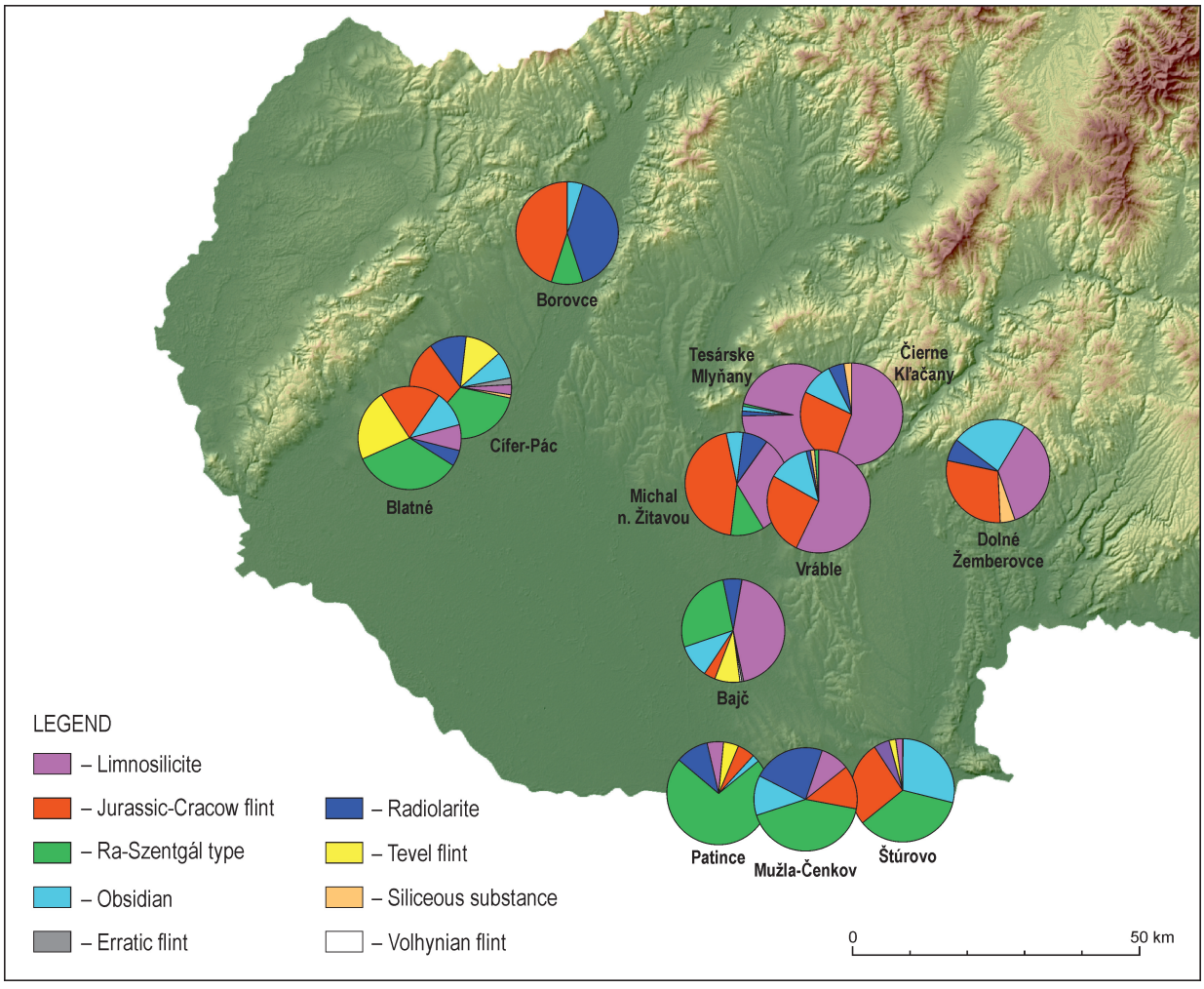



Fig. 9. Representation of main raw materials found on settlements of the Želiezovce group in Southwestern Slovakia (*Cheben M. 2020*).

From small amount of data obtained so far, we can hardly guess the reason why chipped industry was added to children's, male or female burials. We cannot say either whether a specific type of tool was added to male or female graves only. It seems that this kind of material culture was added to male graves more often. However, male graves did not contain artefacts which could be interpreted as exclusively male attributes (e.g. weapon, arrowhead, etc.).

## CONCLUSION

A wide range of silicite, including volcanic glass, was used in Southwestern Slovakia in Želiezovce group period. Among the used raw materials, in addition to traditionally dominant silicites such as various types of radiolarites and flints, limnosilicites or obsidian occur as well. Rare or even exotic silicite is represented as well – opal, jasper, streaky silicite, felsitic porphyry or siliceous substance of volcanic origin. Individual raw materials detected in assemblages come from various orographic as well as geological territories of central Europe. Their occurrence at the settlements of the Želiezovce group gives us some idea of their transportation (in what form they might have been imported to the settlement) as well as possible communication routes.

The silicite of the Kraków-Częstochowa Jurassic, imported from Poland, was very important in this period. It is documented by its presence in several collections of chipped industry (Fig. 9). However,

compared to previous periods, a considerable decrease can be observed. It was caused by its replacement by Hungarian raw materials, mainly the Szentgál radiolarite and the Tevel flint (Fig. 9). Besides these, other Hungarian types of radiolarite occur less frequently (Gerecse, Hárskút, Tata and Bakonysernye). In the period of the Želiezovce group in Southwestern Slovakia, a considerable increase in use of local raw materials – limnosilicte and obsidian – is visible (Fig. 9). This increasing trend is observable as early as the Late Linear Pottery culture. The occurrence of radiolarite (originally from the Klippen Belt) at the settlements of the Želiezovce group is poorer compared to earlier Neolithic periods. Nevertheless, it still maintains its irreplaceable role in the assemblages of chipped industry.

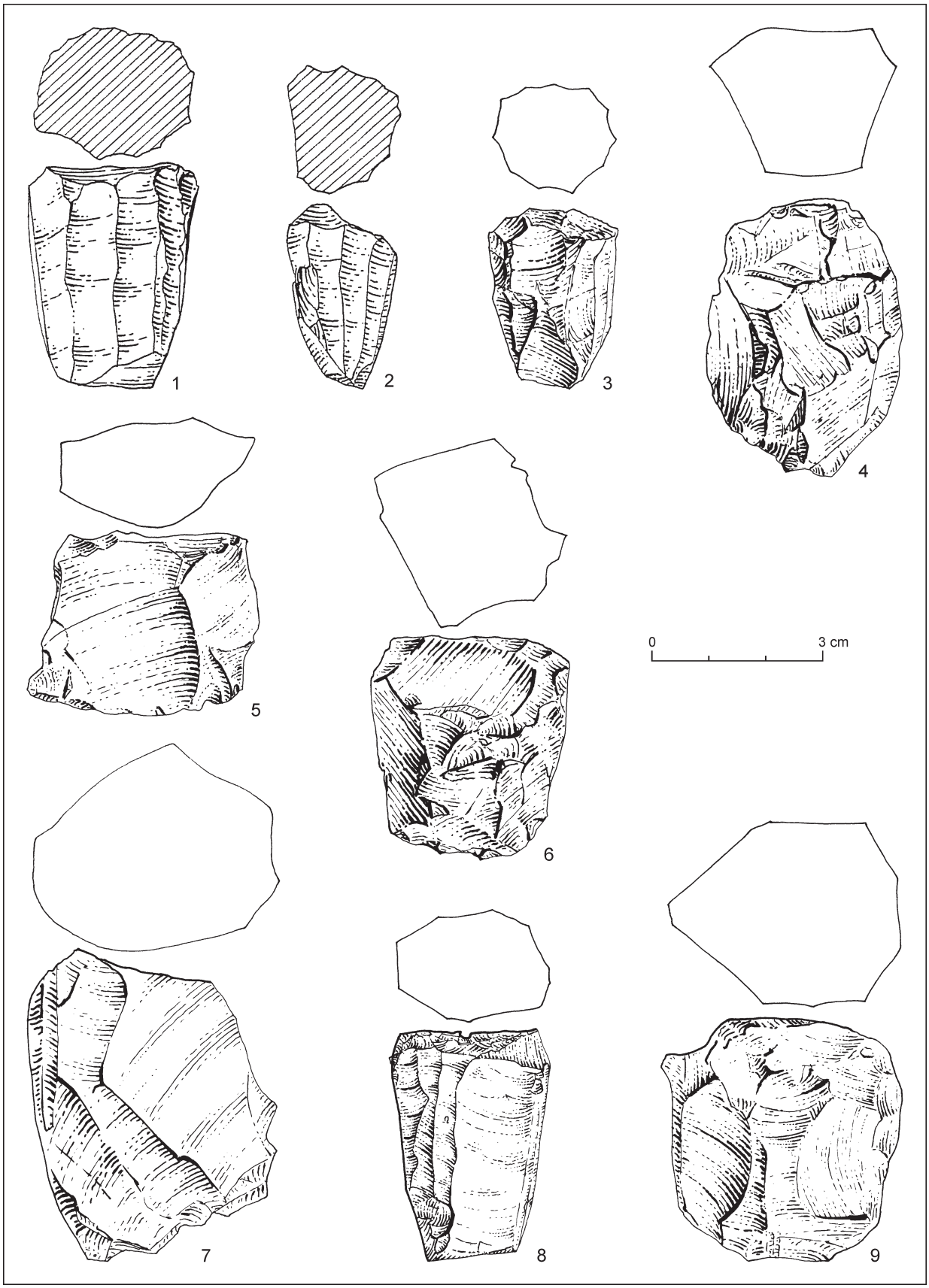
Double-platform prismatic and single-platform pyramidal, conical and boat-shaped cores are most frequent in the collections of chipped industry obtained from the settlements of the Želiezovce group. The same trend is observed in the analysed assemblage from the settlement in Bajč. Cores' platforms of almost all specimens were modified by multiple blows. Cores with striking surfaces modified by single blows are rare. Modification of core edges by removing the overhangs is a frequent phenomenon. The use of massive preparation or rejuvenating flakes in order to prepare cores is a typical phenomenon in the collections of the Želiezovce group, compared to earlier Neolithic periods.

Blades, and bladelets and their fragments are undoubtedly the most frequently represented items of Želiezovce group lithic collections. In the assemblages, including the analysed site, complete, proximal-mesial and mesial portions of blades are predominant. If we look at the numbers of butt types in individual phases of exploitation, plain and faceted butts on blades from the preparation phase prevail. On final blades, mainly faceted, plain and dihedral butts were detected. Plain and punctiform butts are most commonly seen on the blades from the rejuvenating phase. For reduction of blades within the preparation phase, soft techniques were most commonly used – indirect blows and direct blows with organic percussors. A few specimens bore traces of direct blows with hard or soft hammerstones. Debitage of final blades was carried out mainly by using indirect blows with a punch and direct blows with organic percussors. As for rejuvenating blades, aggressive reduction techniques using direct blows with hard and soft hammerstones were applied.

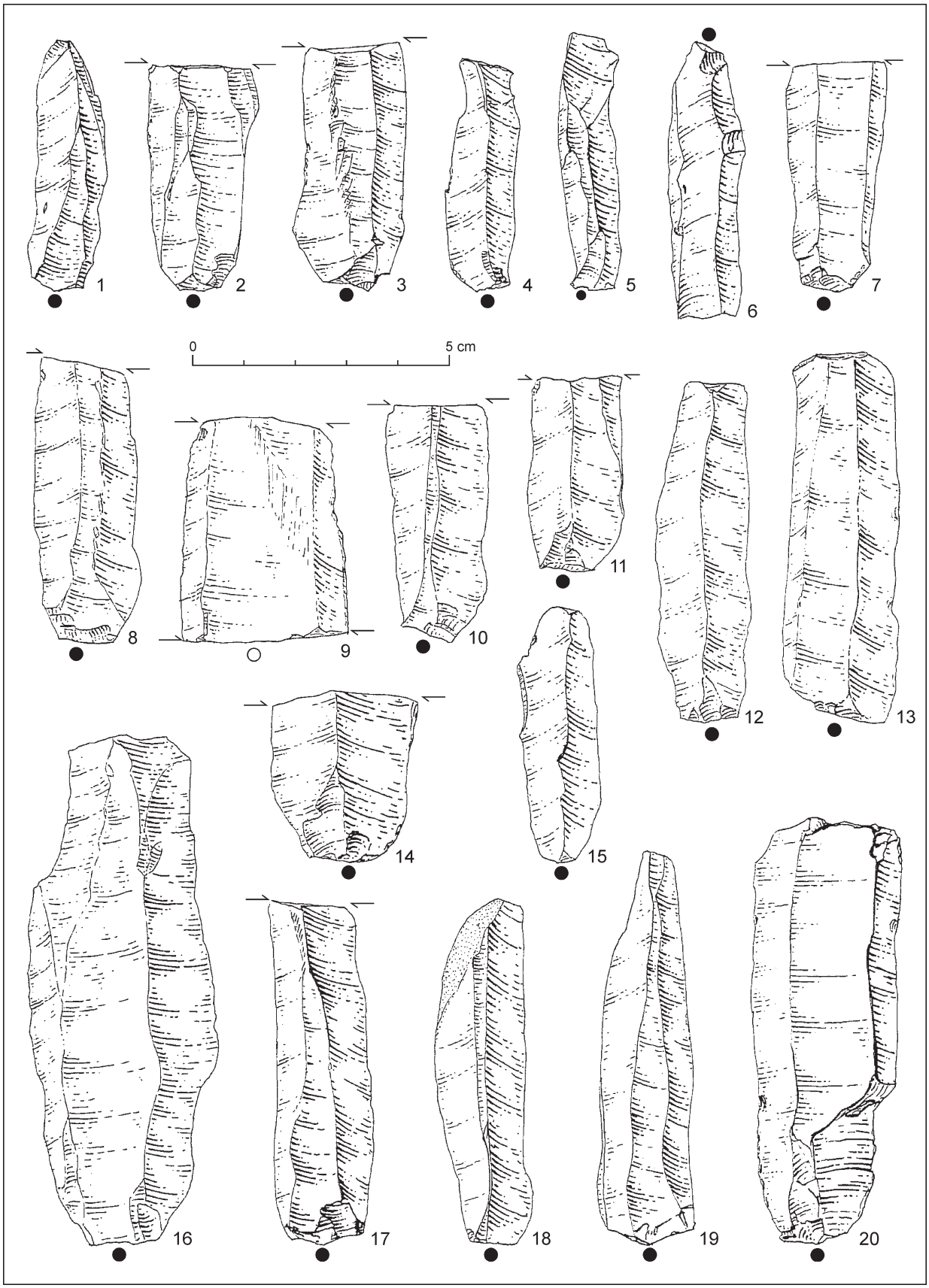
As many as 270 individuals identified as tools were found in the analysed assemblage. As for the typological composition, the analysed collection is no different from other collections of chipped industry from the Želiezovce group settlements. Mainly retouched blades and bladelets as well as flakes are predominant there as well. Other groups of frequently occurring tools include various types of endscrapers, chisel-like cutting tools, knives, drills and perforators. The number of artefacts with sickle gloss is also high. The discovery of five side scrapers at the settlement in Bajč is interesting, since the number is double compared to all other settlements.

Based on the analysis of the chipped industry from the settlement of the final stage of the Želiezovce group in Bajč, we can assume that it was one of the processing areas (in the modern world it would be an industrial park) of the Želiezovce group in the Žitava River Basin. It is indirectly also suggested by the absence of groundplans of any stake-indicating structures, but also by abundant polished industry, as well as artefacts made of clay, bones and antlers that come from the settlement pits. Compared to other studied sites of the Linear Pottery culture and Želiezovce group from Southwestern Slovakia, where structures with stake construction were documented, in Bajč there are extremely high numbers of all types of artefacts.

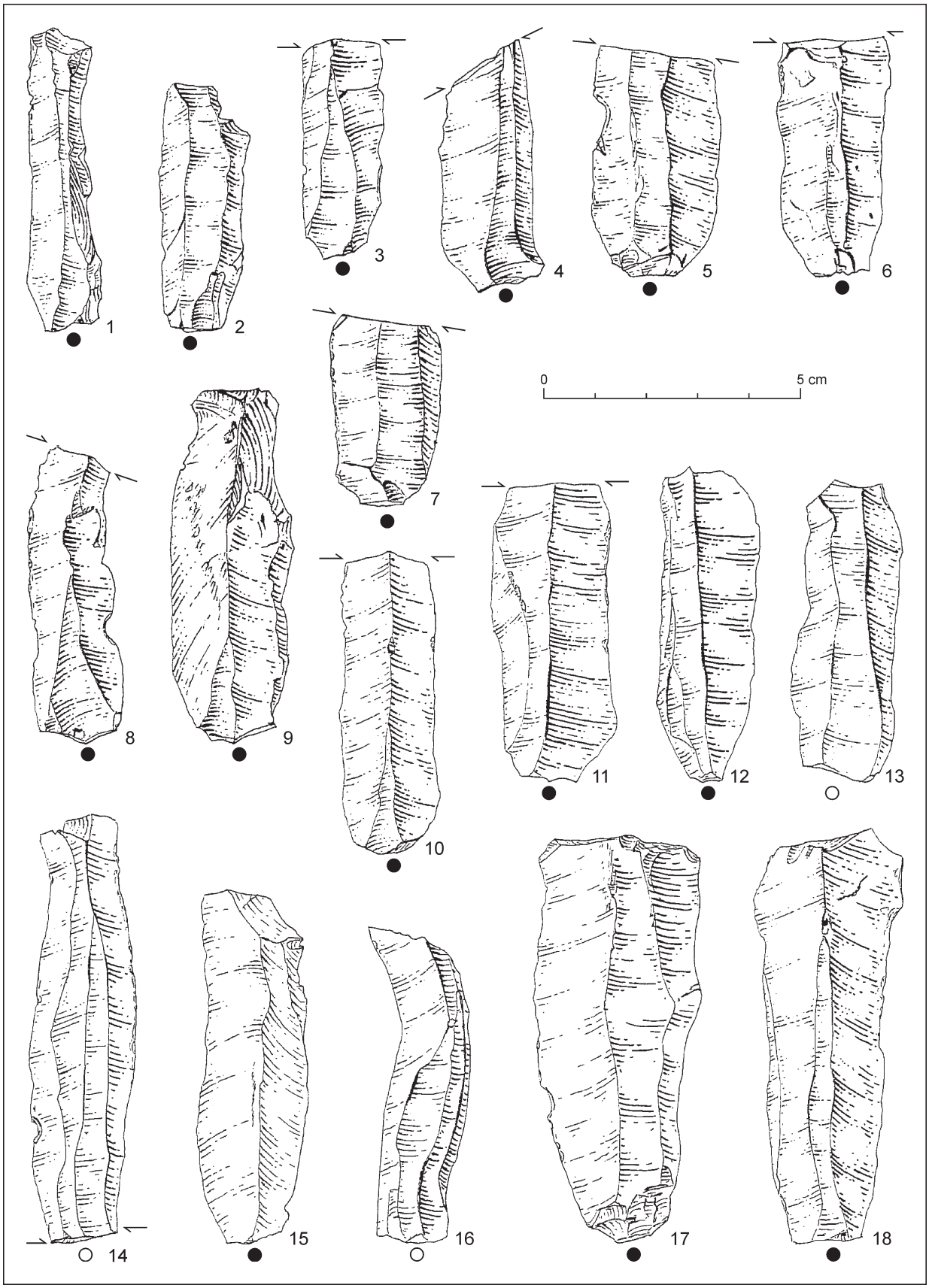
*Translated by Viera Tejbusová*



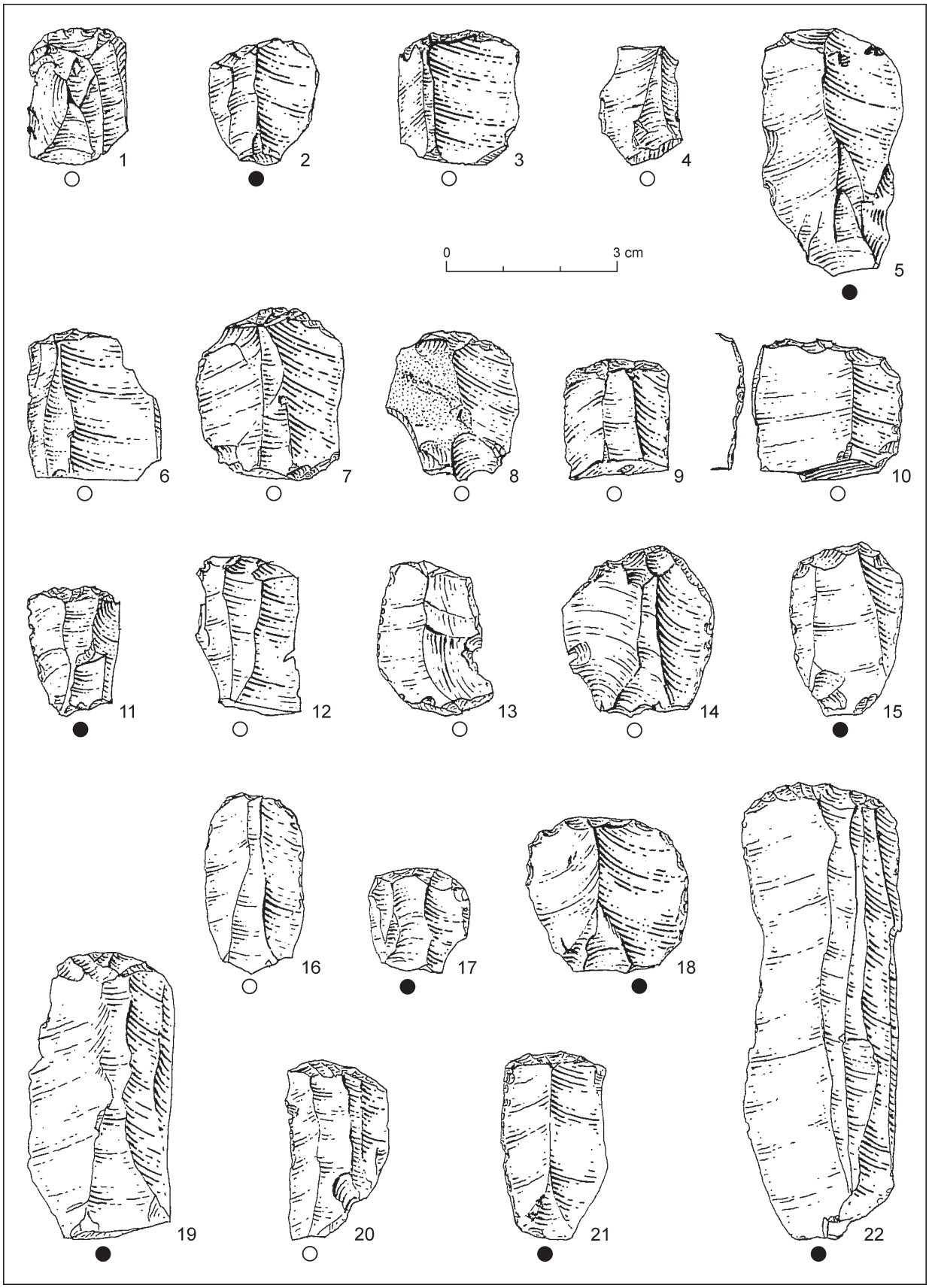

Pl. I. Bajč-Medzi kanálmi. Selection of cores.



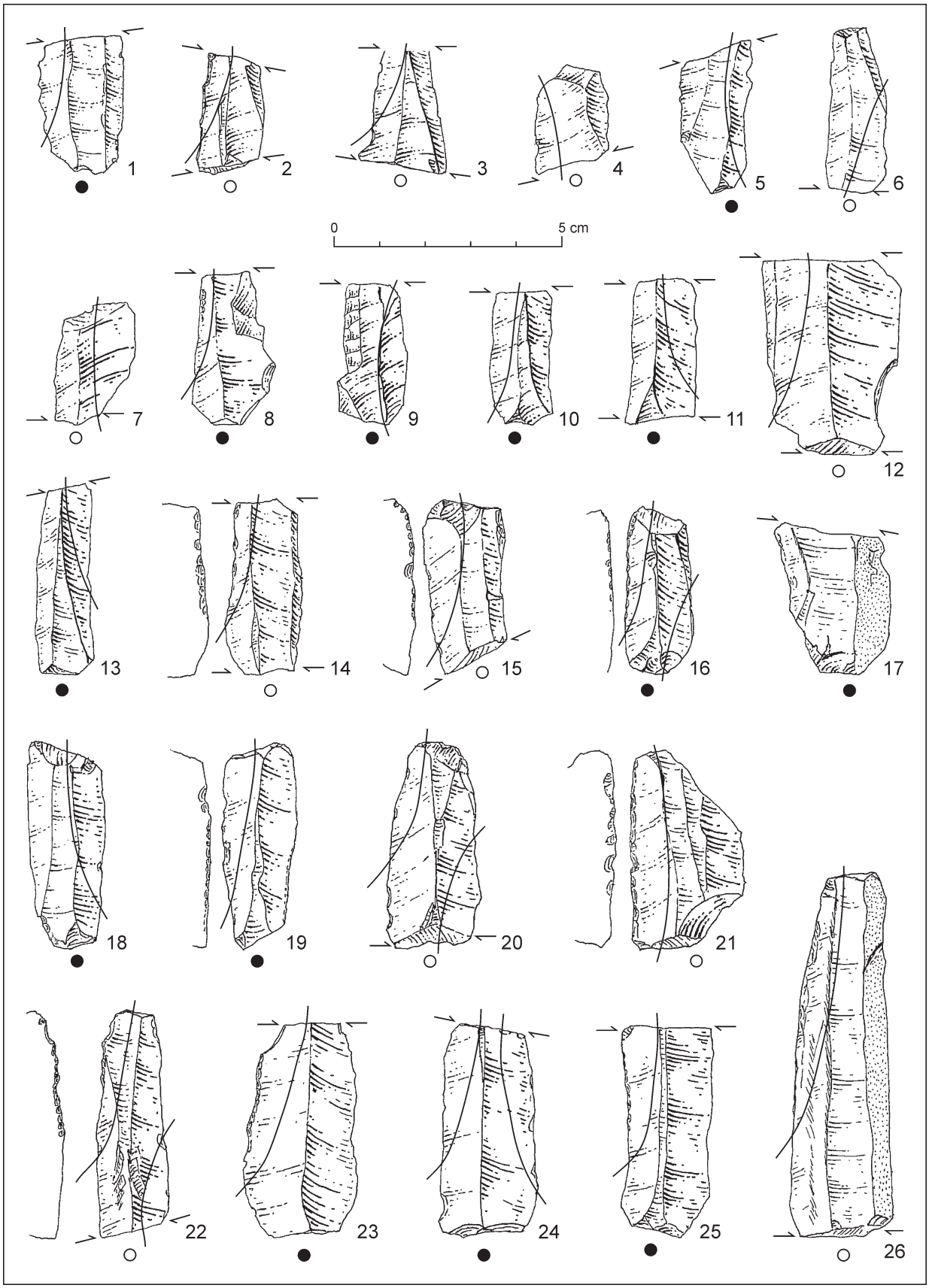

Pl. II. Bajč-Medzi kanálmi. Selection of chipped stone industry, blades and their fragments.



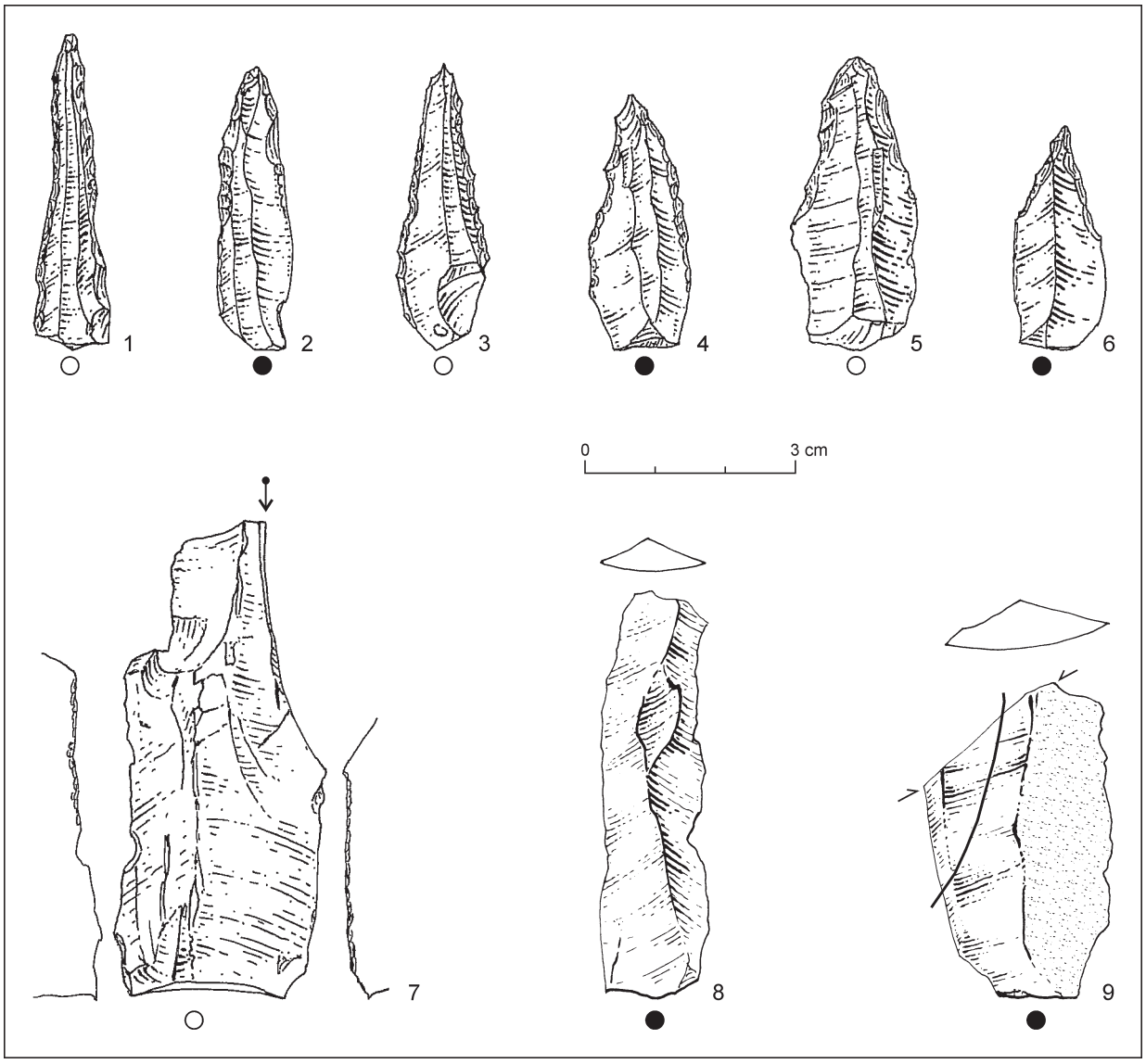

Pl. III. Bajč-Medzi kanálmi. Selection of chipped stone industry, blades and their fragments.




Pl. IV. Bajč-Medzi kanálmi. Selection of chipped stone industry, blades and flakes scrapers.




Pl. V. Bajč-Medzi kanálmi. Selection of chipped stone industry, artefacts with sickle gloss.




Pl. VI. Bajč-Medzi kanálmi. Selection of chipped stone industry. 1–3, 5, 6 – perforators; 4 – drill; 7 – edge burin; 8 – retouched blade (Grave 1/88); 9 – sickle blade (Grave 3/90).

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# Analýza štiepanej kamennej industrie z lokality želiezovskej skupiny v Bajči

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## Súhrn

V priebehu viacerých výskumných sezón v rokoch 1987–1990 a 1992–1993 sa v katastri obce Bajč (okr. Komárno), na pieskovej dune v polohe Medzi kanálmi, preskúmal rozsiahly sídliskový areál, na ktorom sa našlo osídlenie z viacerých časových horizontov. Najintenzívnejšie bola poloha osídlená v závere kultúrneho vývoja želiezovskej skupiny, a to v jej III. vývojovom stupni (*Čaplovič/Cheben I./Ruttkay 1988*; *1990*; *Cheben I./Ruttkay 1991*; *1992*; *1993*; *1995*). Z viac ako 500 sídliskových objektov a štyroch kostrových hrobov (*Cheben I. 2000*, príloha 1), prislúchajúcich želiezovskej skupine, sa získal početný a typologicky rôznorodý nálezový inventár. Okrem objavených početných nálezov keramického materiálu je dôležité zdôrazniť, že v porovnaní s inými inventármi, získanými na sídliskách želiezovskej skupiny, patrila kamenná brúsená a štiepaná industria k mimoriadne frekventovaným nálezom. V takom obrovskom množstve sa doposiaľ nezískala zo žiadneho sídliska kultúry lineárnej a želiezovskej skupiny skúmaného na juhozápadnom Slovensku.

Doteraz nepublikovaným nálezovým súborom zostáva štiepaná industria, ktorá je na sídlisku v Bajči zastúpená 734 exemplármi. Po stránke typologicko-technologickej, ako i v rámci zastúpenia štiepateľných surovín, bol nálezový celok spracovaný v dizertačnej práci, ktorá bola zameraná na kamennú štiepanú industriu z obdobia staršieho neolitu z územia juhozápadného Slovenska (*Cheben M. 2020*). Predložený príspevok vypĺňa biele miesto a dopĺňa komplexnejší pohľad na hmotnú kultúru. Pri tomto súbore je potrebné uvedomiť si skutočnosť, že ide o uzatvorený celok, ktorý kultúrne patrí relatívne krátkemu vývojovému stupňu želiezovskej skupiny (stupeň III).

V období želiezovskej skupiny na juhozápadnom Slovensku sa využívalo široké spektrum silicitových surovín, vrátane vulkanického skla. Z použitých surovín sa neobjavujú len tradičné dominantne zastúpené silicity, akými sú rôzne typy rádiolaritov a pazúrikov, limnosilicity alebo obsidián, ale aj ojedinelo zastúpené, môžeme povedať až exotické silicity, napríklad opál, jaspis, žilný kremeň, felzitický porfýr alebo kremičitá hmota vulkanického pôvodu. Jednotlivé suroviny v súboroch pochádzajú z rôznych orografických a geologických oblastí strednej Európy. Ich výskyt na sídliskách želiezovskej skupiny nám podáva určitý pohľad o ich transporte (v akej forme mohli byť na sídlisko donášané), ako aj o ich prípadných komunikačných cestách.

Z Poľska importovaný silicit krakovsko-čenstochovskej jury mal aj v tomto období pre spoločnosť veľký význam. Dokladá to jeho zastúpenie vo viacerých kolekciách štiepanej industrie. Avšak je tu badať výrazný pokles oproti starším obdobiam, spôsobený vytláčaním a nahradením za maďarské suroviny, predovšetkým rádiolaritom typu Szentgál a pazúrikom typu Tevel. Okrem nich sa v menšej miere objavujú aj ďalšie maďarské typy rádiolaritov (Gerecse, Hárskút, Tata a Bakonysernye). V období želiezovskej skupiny na juhozápadnom Slovensku je v kolekciách štiepanej industrie výrazný nárast využívania lokálnej miestnej suroviny, limnosilicitu a obsidiánu. Tento narastajúci trend je patrný už v období mladšej kultúry lineárnej. Výskyt rádiolaritu (pôvodom z bradlového pásma) na sídliskách

železiezovskej skupiny je oproti starším obdobiam neolitu menej početný, avšak stále si udržal svoje nenahraditeľné zastúpenie v súboroch štiepanej industrie.

Najčastejšie sa v kolekciách štiepanej industrie, získaných na sídliskách železiezovskej skupiny, objavujú dvojpodstavové hranolové a jednopodstavové ihlanové, kužeľové a loďkovité jadrá. Tento trend je rovnaký aj na analyzovanom sídlisku v Bajči. Podstava jadier bola skoro u všetkých jedincov upravená viacerými údermi. V malej miere sa objavili jadrá s úderovou plochou, ktorá bola upravená jedným úderom. Častým javom je úprava hrany jadier odstránením previsov. Typickým javom v kolekciách železiezovskej skupiny oproti starším obdobiam neolitu je, že na prípravu jadier boli využívané masívne preparačné alebo reparačné úštepy.

K najpočetnejšie zastúpenému inventáru železiezovskej skupiny patria čepele, čepieľky a ich fragmenty. V kolekciách, nevynímajúc analyzovanú lokalitu, dominujú celé proximálno-meziálne a meziálne časti čepelí. Ak by sme sa pozreli na zastúpenie typov pätiek v jednotlivých fázach ťažby, tak na čepeliach z preparačnej fázy dominujú hladké a facetované pätky. Na cieľových čepeliach sa zistili hlavne facetované, hladké a strieškovité pätky. U čepeliach z reparačnej fázy dominujú pätky hladké a bodové. Na odbíjanie čepelí z preparačnej fázy sa najčastejšie využili mäkké techniky, a to nepriamy úder a priamy úder organickým otĺkačom. Pár kusov malo stopy po použití priameho úderu tvrdým alebo aj mäkkým kameňom. Odbíjanie cieľových čepelí prebiehalo predovšetkým za využitia nepriameho úderu prostredníkom a priamym úderom organickým otĺkačom. U reparačných čepelí bolo zachytené použitie techník za využitia priameho úderu tvrdým a mäkkým kameňom.

V analyzovanom súbore sa identifikovalo až 270 jedincov určených ako nástroje. Z typologickej skladby sa analyzovaný súbor výrazne nelíši od iných kolekcií štiepanej industrie zo sídlisk železiezovskej skupiny. Aj tu dominujú predovšetkým retušou modifikované čepele a čepieľky, ale aj úštepy. Ďalšími skupinami často sa objavujúcich nástrojov sú rôzne typy škrabadiel, dlátovitých pretínacích nástrojov, nožíkov, vrtákov a dierkovačov. Početne zastúpené sú aj artefakty s kosákovým leskom. Zaujímavým zistením bolo, že na sídlisku v Bajči sa našlo až päť kusov driapadiel, čo je dvojnásobne viac ako v kolekcii zo všetkých ostatných sídlisk.

Z analýzy štiepanej industrie môžeme skonštatovať, že ako sídlisko v Bajči, tak aj ostatné sídliská železiezovskej skupiny na juhozápadnom Slovensku boli výlučne spracovateľské.

Obr. 1. Situovanie železiezovského sídliska v Bajči-Medzi kanálmi.
Obr. 2. Bajč-Medzi kanálmi. Podiel jednotlivých druhov surovín zastúpených na sídlisku.
Obr. 3. Mapa so zdrojmi silicitových surovín a vulkanického skla a ich vzdialenosti na analyzované sídlisko. 1 – rádiolarity (bradlové pásmo); 2 – limnosilicity; 3 – rádiolarit typu Szentgál; 4 – pazúrik typu Tevel; 5 – silicit krakovsko-čenstochovskej jury; 6 – obsidián; 7 – Volýnsky pazúrik; 8 – numulitový silicit; 9 – limnosilicity (S Maďarsko); 10 – silicit z glacigénnych sedimentov.
Obr. 4. Bajč-Medzi kanálmi. Hromadný nález suroviny z objektu 550 (pazúrik typu Tevel).
Obr. 5. Bajč-Medzi kanálmi. Podiel industrie v hlavných skupinách.
Obr. 6. Bajč-Medzi kanálmi. Pomer šírky a dĺžky celých cieľových čepelí.
Obr. 7. Bajč-Medzi kanálmi. Percentuálne zastúpenie typov nástrojov.
Obr. 8. Bajč-Medzi kanálmi. Plán hrobu 1/88 s umiestnením kamennej štiepanej industrie (upravené podľa *Cheben I. 2000*).
Obr. 9. Zastúpenie hlavných surovín na sídliskách železiezovskej skupiny na juhozápadnom Slovensku (*Cheben M. 2020*).

Tabela 1. Bajč-Medzi kanálmi. Zachovanie pôvodného povrchu na čepeliach a úštepoch.
Tabela 2. Bajč-Medzi kanálmi. Zastúpenie surovín v jednotlivých skupinách.
Tabela 3. Bajč-Medzi kanálmi. Fragmentácia čepelí a čepieľok.
Tabela 4. Bajč-Medzi kanálmi. Zastúpenie nástrojov a surovín, z ktorých boli vyrobené.

Tab. I. Bajč-Medzi kanálmi. Výber jadier.
Tab. II. Bajč-Medzi kanálmi. Výber štiepanej industrie, čepelí a ich fragmentov.
Tab. III. Bajč-Medzi kanálmi. Výber štiepanej industrie, čepelí a ich fragmentov.
Tab. IV. Bajč-Medzi kanálmi. Výber štiepanej industrie, čepeľových a úštepových škrabadiel.
Tab. V. Bajč-Medzi kanálmi. Výber štiepanej industrie, artefakty s kosákovým leskom.
Tab. VI. Bajč-Medzi kanálmi. Výber štiepanej industrie. 1–3, 5, 6 – dierkovače; 4 – vrták; 7 – hranové rydlo; 8 – retušovaná čepeľ (hrob 1/88); 9 – kosáková čepeľ (hrob 3/90).

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