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LITHIC IMPLEMENTS AT ARIUŞD (ERŐSD) A PRELIMINARY REPORT[1]

Ariuşd (Erősd) is the eponym site of the Copper Age Ariuşd group. The systematic investigation of the site has begun over a hundred years ago. Recent archaeological studies could clarify the layer sequence and the artefacts of the site, especially the pottery finds. Our current paper is aiming at presenting the chipped lithic industry, the largest of its kind within the Ariuşd group. Though this study is a work in progress with several open questions, we hope to contribute to a more profound knowledge on the material culture of the Ariuşd group.

Erősd (Ariuşd) a rézkori Erősdi csoport névadó lelőhelye. Régészeti kutatása több mint száz éve vette kezdetét. A közelmúltban megtörtént a lelőhely rétegtani adatainak kritikai értékelése és a leletanyag egy részének, elsősorban a kerámiának a feldolgozása. Az alábbi tanulmány a pattintott kőanyaggal foglalkozik, amely az egész Erősdi csoport legjelentősebb ilyen leletegyüttese. Noha dolgozatunk még számos nyitott kérdést hagy maga után, remélhetőleg hozzájárul majd az Erősdi csoport anyagi kultúrájának alaposabb megismeréséhez.

Keywords: *Ariuşd (Erősd), Copper Age, Ariuşd-Cucuteni-Tripolye Cultural Complex, stone tools, macroscopic petroarchaeological analysis*

Kulcsszavak: *Erősd (Ariuşd), Rézkor, Erősd-Cucuteni-Tripolye kulturálkör, kőeszközök, makroszkópos petroarcheológiai elemzés*

The Ariuşd group (previously known as Ariuşd culture) is one of the most characteristic and renowned units of Transylvanian prehistory. In a wider context, it is the westernmost branch of the great Eastern European Ariuşd-Cucuteni-Tripolye cultural complex (for a general overview see Marinescu-Bîlcu 1993; Monah–Monah 1997; László 2008). Its evolution within Transylvania embraced nearly the entire period of the Early and Middle Copper Age (cca. 4500–3800 BC).

The distribution area of the Ariuşd group comprises the eastern part of Transylvania, the interior basins of the Eastern Carpathians and the Sub-Carpathian Hills (Fig. 1) For the time being, about 90 Ariuşd sites are known from the region. Among them, however, only a few has been investigated systematically, i.e. Ariuşd (Erősd)-Tyiszk-hegy, Boroşneu Mic (Kisborosnyó)-Borzvára, Leţ (Lécfalva)-Várhegy, Malnaş Băi (Málnásfürdő)-Füvenyestető, Olteni (Oltszem)-Vármege, Păuleni (Csíkpálfalva)-Várdomb. The eponym site stands out among them both in respect of the extent of excavations and the quantity and quality of the resulting archaeological finds and features. For all of them, it is unfortunately typical that the results of the excavations have only been partially published. Consequently, for the investigation of the chipped stone artefacts of the Ariuşd group mainly the above sites can offer significant information.

Preliminary studies have already been made on the lithic industry of this group, mainly by researchers of the Cucuteni assemblages (Maxim–Săsăran 2000; Boghian 2008), but on the whole we can say that till recently no detailed reports or reviews have been made on the lithic assemblages of the Ariuşd group and very few of the stone artefacts were actually published (see e.g. Teutsch 1900, Abb. 173–185; László 1911, 222, Fig. 87–89; Kovács 1915, Fig. 5, 2, 3, 5–8; Schroller 1933, 59–60, Taf. 41, 9, 11, Taf. 42, 1–24, Taf. 43, 1–6; Székely 1951, Fig. 17, 18–20, 23; Sztáncsuj 2003, 59, Fig. 8). More recently, a detailed petroarchaeological investigation was started in collaboration of the Székely National Museum (Sfântu Gheorghe/Sepsiszentgyörgy) and

the Hungarian National Museum (Budapest), in order to process and publish the entire lithic assemblage of the eponym settlement. The aim of this paper is to sum up the main results achieved so far.

Previous research

The eponym site, Ariuşd-Tyiszk-hegy (Dealul Tyiszk/Tyiszk-Hill) is one of the earliest discovered and systematically excavated settlements of the Ariuşd-Cucuteni-Tripolye Civilisation (László 1987; László 2009). It is located on a small hilltop near the valley of Olt River in South-East Transylvania. First mentioned by Balázs Orbán in 1869, the settlement has become known scientifically in the late 19th century. At the beginning of the 20th century, Julius Teutsch and Zsigmond Csulak performed several small surveys on the north side of the settlement (Teutsch 1904; László 1914, 283–284). The larger scale, systematical investigation of the Ariuşd site was carried out between 1907 and 1913 and later in 1925, by Ferenc László, the ward-archaeologist of the Székely National Museum from Sfântu Gheorghe (László 1911; László 1914; László 1927; László 1980).

László's work was continued later, in the second half of the 20th century by Zoltán Székely, professor Ion Nestor and Eugenia Zaharia, as a result of collaboration between the Romanian Academy of Sciences and the Székely National Museum between 1968 and 1986 (Zaharia 1973; Zaharia–Székely 1988). Most of the discoveries are kept in the Székely National Museum, but important assemblages also enriched the collections of Hungarian National Museum and National Museum of Transylvanian History (Muzeul Naţional de Istorie a Transilvaniei, Cluj-Napoca).

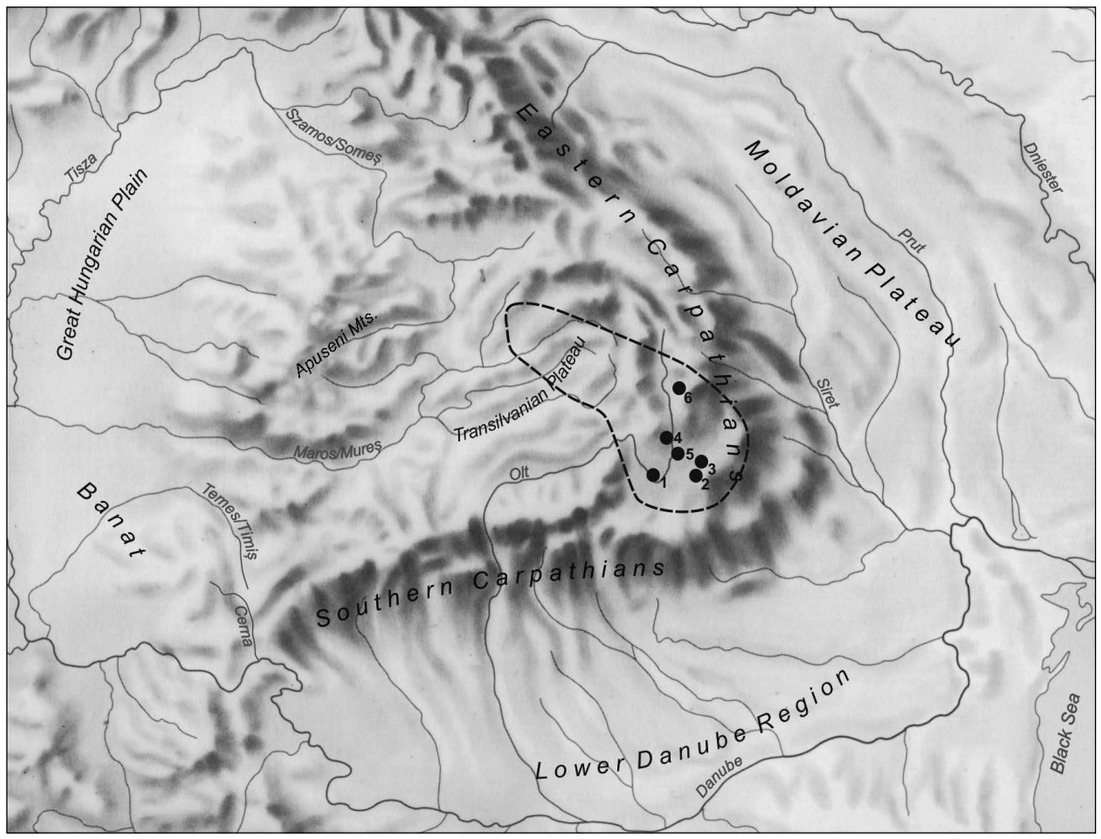

Fig. 1 The distribution area of the Ariuşd group in Transylvania with the major settlements mentioned in the text. 1: Ariuşd-Tyiszk-hegy; 2: Boroşneu Mic-Borzvára; 3: Leţ-Várhegy; 4: Malnaş Băi-Füvenyestető; 5. Olteni-Vármege; 6: Păuleni-Várdomb
1. kép Az Erősdi csoport elterjedése Erdélyben, a szövegben említett jelentősebb lelőhelyek megjelölésével. 1: Erősd-Tyiszk-hegy; 2: Kisborosnyó-Borzvára; 3: Lécfalva-Várhegy; 4: Málnásfürdő-Füvenyestető; 5. Oltszem-Vármege; 6: Csíkpálfalva-Várdomb

Following a promising start, the research of the Ariuşd settlement was delayed by several factors. The results of the excavations remained mainly unpublished until very recently, in spite of their great importance for the whole group, especially concerning its internal development, cultural and chronological relations, subsistence system and economy (see Niţu 1973, 59–97; Zaharia 1973, 30–31; László 1993, 64–65; László–Sztáncsuj 2013, 588–592).

Fortunately, the stratigraphical relations of the Ariuşd site can be adequately reconstructed on the basis of the published evidence and the preserved archaeological documentations. The stratigraphy of the settlement comprises sections of nearly 4 meters. Remains of two archaeological cultures, the Copper Age Ariuşd group and the Early Bronze Age Schneckenberg culture were found. These can be divided into 6 habitation levels, 5 belonging to the Ariuşd group and one to the Bronze Age (László 1914, 291–386, Fig. 78; Zaharia–Székely 1988, 103–104, Fig. 2–4; Sztáncsuj 2009). Several *in situ* archaeological features like remains of houses, open-air fireplaces, pottery kilns (including an entire pottery workshop), ritual and refuse pits were unearthed, all belonging to the Copper Age horizon. The excavations provided also very rich assemblages of ceramics, stone and bone tools, metal objects (copper and gold) and a significant amount of archaeozoological material.

According to the currently available data, based mainly on the formal and stylistic features of the pottery, the Copper Age habitation levels can be dated in at least three periods of evolution of the Ariuşd group.

In respect of the lithic material, the Ariuşd assemblage is also remarkable with more than thousand implements preserved in the museum collections. One of the find assemblages of outstanding importance however was only partially preserved. The so-called *Ariuşd hoard*, discovered by F. László in 1910 (László 1911, 224–225; Sztáncsuj 2005), comprised more than 2000 various prestige items, acquired typically from distant regions as a product of long distance trade (trinkets of gold, copper, marble, *Spondylus gaederopus*, deer canine teeth and wild boar tusk), deposited in two vessels, among them, 15 large and long blades made of, most probably, Prut or Volhynian flint according to the archive photo (Fig. 2; see also Sztáncsuj 2005, Fig. 2). A very similar hoard is known and displayed in the Hungarian National Museum from Kálló-Bikázó-dűlő (Patay 1960). Unfortunately, a large part of the Ariuşd hoard had been destroyed during the Second World War. Parallels and analogies of the find have been collected for a recent publication on the hoard (Sztáncsuj 2005). It is enough to mention here that the depot find heralded the importance of the Ariuşd lithics in the evaluation of the contacts of the site.

Fig. 2 Archive photo of the lithic implements from the inventory of the Ariuşd hoard (courtesy of the Székely National Museum)
2. kép Az erősdi kincs kőeszközei archív felvételen (a Székely Nemzeti Múzeum archívumából)

As we mentioned above, only small parts of the entire lithic material have been published over the years (László 1911, 222, 245, Fig. 87; Zaharia–Székely 1988, Fig. 6–10; Sztáncsuj 2003, 59, Fig. 8; Boghian 2008, Fig. 9–10). The first general overview of the lithic implements of the Ariuşd group (including the lithic assemblages of the eponym settlement) was made by S. J. Sztáncsuj for his PhD (Sztáncsuj 2011). The systematisation performed by that time is used as a basis for the current work as well.

Current work

The aim of this work, started in 2013, is the comprehensive study and publication of the entire Ariuşd lithic material.

In the first step, a macroscopic survey of the stone artefacts was made with an eye on further petrographical and geochemical studies. From the site 778 lithics have been analysed so far, mainly with macroscopic methods. Of these, 24 from the collection of the Hungarian National Museum and 754 from the collection of the Székely National Museum. Typological and macroscopic petroarchaeological

data were registered.

A selection of characteristic raw materials was made and suggested for further analysis. As we want to spare the museum-based historical collections we have selected analogies from a contemporary and neighbouring site, Boroşneu Mic-Borzvára and 3 characteristic items from uninventorised stray finds from the site proper, Ariuşd. Altogether 18 samples were selected for primary analysis. The selected samples were subjected to non-destructive geochemical analysis by Prompt Gamma Activation Analysis (PGAA). The facility is operated by the Centre for Energy Research, Hungarian Academy of Sciences at the Budapest Neutron Center. Additional petrographical thin section studies were made at Eötvös Loránd University, Budapest.

Summary of typological analysis

The lithic assemblage is seemingly unevenly preserved. We can suspect that from the old excavations a selected set of typical tools were inventorised. The situation is similar to our experiences on the Lengyel eponym site (Bácskay–Biró 1984; Bácskay 1989; Biró 1989) where, according to the original observations of Mór Wosinszky thousands of lithic artefacts were collected, however, by the time of our analysis, only 600 pieces were available for study. The 778 pieces of stone tools are not the complete set of information for us (it is work in progress) but still one of the largest sets of lithics from South-East Transylvania in the Copper Age. The analysis was also biased in the sense that chipped stone artefacts were preferentially selected for study. We plan to complete it later on by polished stone tools and other tool categories.

The assemblage is very rich in tools and characteristic artefacts – probably it was depleted in chips and technological pieces. Even though, the richness of form and type and the quality of finish is exceptional (Fig. 3–4). Of the 512 pieces analysed, 507 belong to the class of chipped stone tools; of these, 228 (44,5 %) is typical retouched tool (Fig. 5). As the usual ratio of retouched tools on a habitation site is typically around 10 %, we can be sure that only part of the lithic evidence was observed and preserved in the collection. Characteristic tool types include projectile points, bifacial scraping knifes and more simple forms of classical scrapers, truncated pieces, borers and burins (Fig. 6). The retouched artefacts are typically of excellent workmanship and characteristic form. This is partly due to the selection of raw materials (high quality Prut flint preferred). The retouch is often not simple marginal retouch but bifacial surface retouch or high relief of convex character. Sickle polish is frequent and often very intensive. Typologically, the assemblage fits well within the image of Copper Age lithic industries related to Precucuteni and Cucuteni forms and also similar to known Tiszapolgár and Bodrogkeresztúr culture lithics (see e.g. Biró 1998; Bognár-Kutzián 1963; Bognár-Kutzián 1972; Marinescu-Bîlcu 1981; Boghian 2008; Ţurcanu 2012).

Metric character of the lithic industry was also studied (Fig. 7–8). The tools and blanks (mainly blades) of the Ariuşd industry are relatively large and slender. Most of the tools were made on blade or blade-like base form. This is indicating a blade-based blank form for the industry and this approach is independent of the effect of selecting the „nice" tools.

Summary of macroscopic petroarchaeological analysis

Petroarchaeological analysis in Romania has established, from the side of the archaeologists, macroscopically distinguishable raw material type groups in the 60's of the last century already (see Comşa 1967; Comşa 1976; Păunescu 1970). More recent research has contributed substantially to identify and locate the main raw material types within the area of the Ariuşd-Cucuteni-Tripolye cultural complex, the Eastern Carpathian Mountains and Moldavia (Cotoi 2009; Crandell 2012, with further references; Crandell–Diaconu 2012). From the most important and best quality raw material types the comparative raw material collection of the Hungarian National Museum (Lithotheca of the HNM, Biró–Dobosi 1991, Biró et al. 2000 and more recent fieldwork) has suitable comparative raw materials we could efficiently use in the current analysis.

The Ariuşd lithic assemblage comprises mainly high quality flint varieties of „Long distance" origin. This can be related to the fact that typical tools were preferentially selected, but the top quality flint types can be equally observed in the preserved flakes and chips, too.

The most frequent type is Prut flint and its varieties. It is sometimes difficult to separate the brown, translucent smoky tint Prut flint from Volhynian flint (striped translucent or non transparent, grey to light grey). As we know, the sources can yield fairly variable material, so the category „others" can quite often comprise flint of Transcarpathian (North-Eastern) origin, not adequately specified.

The other important constituent in good quality „Long distance" silices is Banat and/or Balkan flint. The two types are macroscopically distinct (yellow translucent with small white dots vs. light white

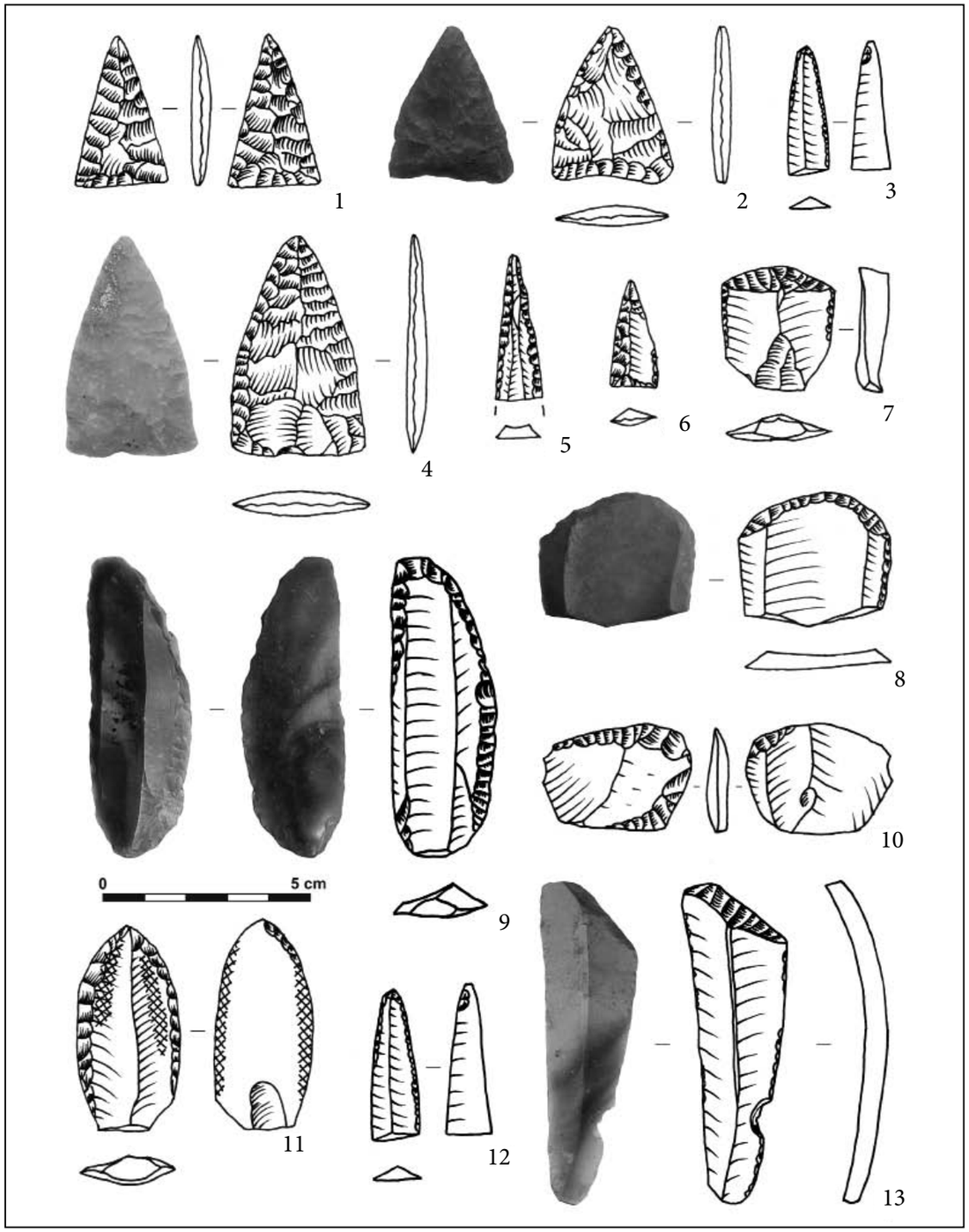

Fig. 3 Ariuşd-Tyiszk-hegy. Lithic implements
3. kép Erősd-Tyiszk-hegy, kőeszközök

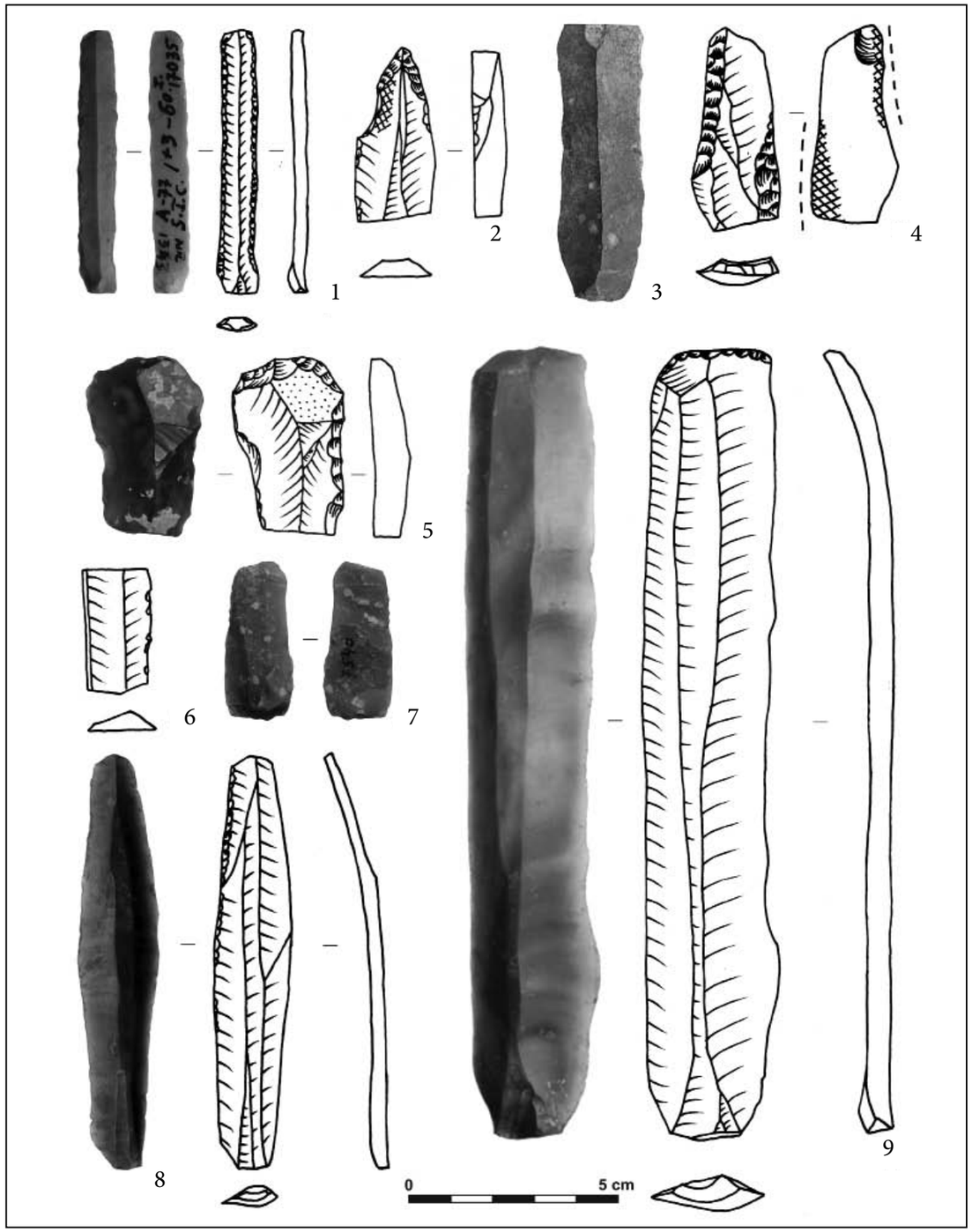

Fig. 4 Ariuşd-Tyiszk-hegy. Lithic implements
4. kép Erősd-Tyiszk-hegy, kőeszközök

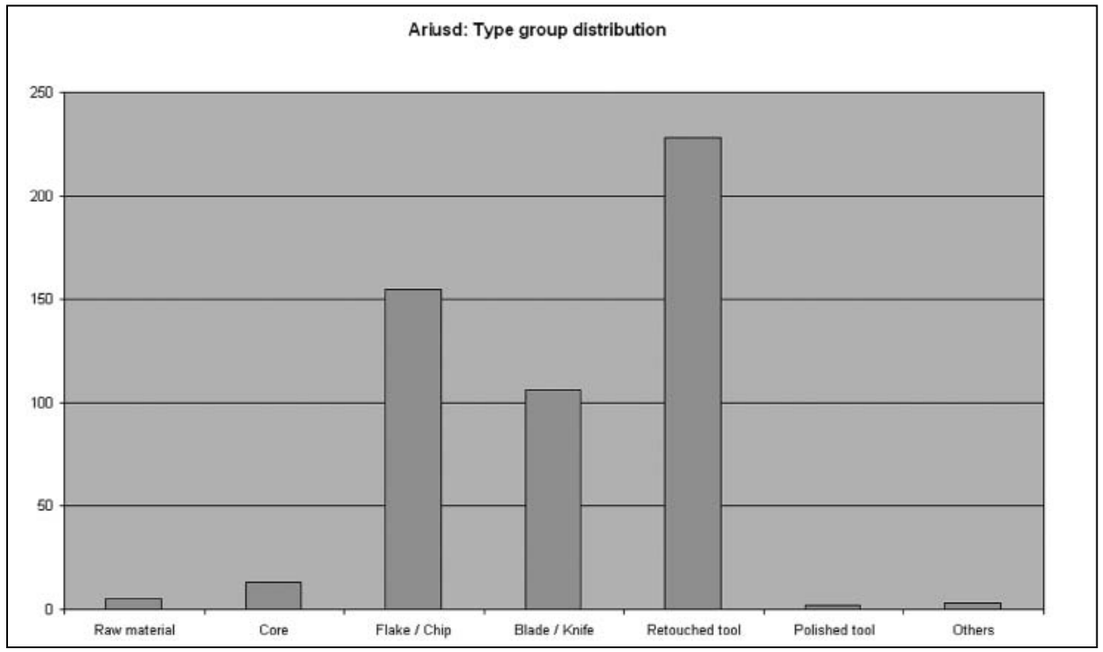

Fig. 5 Ariuşd-Tyiszk-hegy. Main type group distribution of the lithic implements
5. kép Erősd-Tyiszk-hegy, a kőeszközök típuscsoportok szerinti megoszlása

and beige patinated „honey coloured" silica rock, respectively) but recent results in sourcing raised the possibility that we have to consider two phenotypes from the same source region (see Biagi–Starnini 2013). This and the objective separation of Prut vs. Volhynian flint is one of the tasks to be clarified in further studies.

Obsidian is present in very low number at Ariuşd (in fact, so far only two pieces; see Roska 1934, 152, nr. 22; Sztáncsuj 2003) but contemporary sites in South-East Transylvania (e.g. Bixad-Vápa-vára; Bod-Priesterhügel, Boroşneu Mic-Borzvára, Malnaş Băi-Füvenyestető or Târgu Mureş-Tornakert) contain it in slightly higher quantities (Schroller 1933, 59; Roska 1934, 153, nr. 17, 47, 48, 75; Kovács 1915, 234–235, Fig. 5–6). The obsidian probably came from the Carpathian 1 (Slovakian) sources; detailed analysis by non-destructive geochemical methods is planned in the near future.

There are important local and regional raw materials located nearby in the Eastern Carpathian region as well. Two of them seems to be important constituent of the Ariuşd lithics, described as a "basaltoid" (Bányai 1957, 21) and various colour variants of radiolarites, probably from the environs of Sita Buzăului (Szitabodza).

Analytical approach to the Ariuşd lithic assemblage

Macroscopic analysis of the raw materials can be very successful on areas where the basic raw material stock is well known and petroarchaeological cognizance of the region is advanced. For regions with few or no petroarchaeological information, however, careful sampling coupled with intensive fieldwork is necessary. In the case of the eastern part of Transylvania, the distribution area of the Ariuşd group, we have to follow basic research on both geological and archaeological samples. As the inventorised Ariuşd lithics are of special historical and museographic value, we could not start our work directly on the best pieces of the lithic collection, but selected chips and flakes from Ariuşd proper from recent excavations and corresponding raw material types from a neighbouring and contemporary site, Boroşneu Mic-Borzvára from the excavations of S. J. Sztáncsuj (2011). For a start, geochemical analysis by non-destructive Prompt Gamma Activation Analysis (PGAA) was selected together with petrographic thin section studies on the same samples. This way we could cover main raw material type groups, both the well-known long distance types and the seemingly local raw materi-

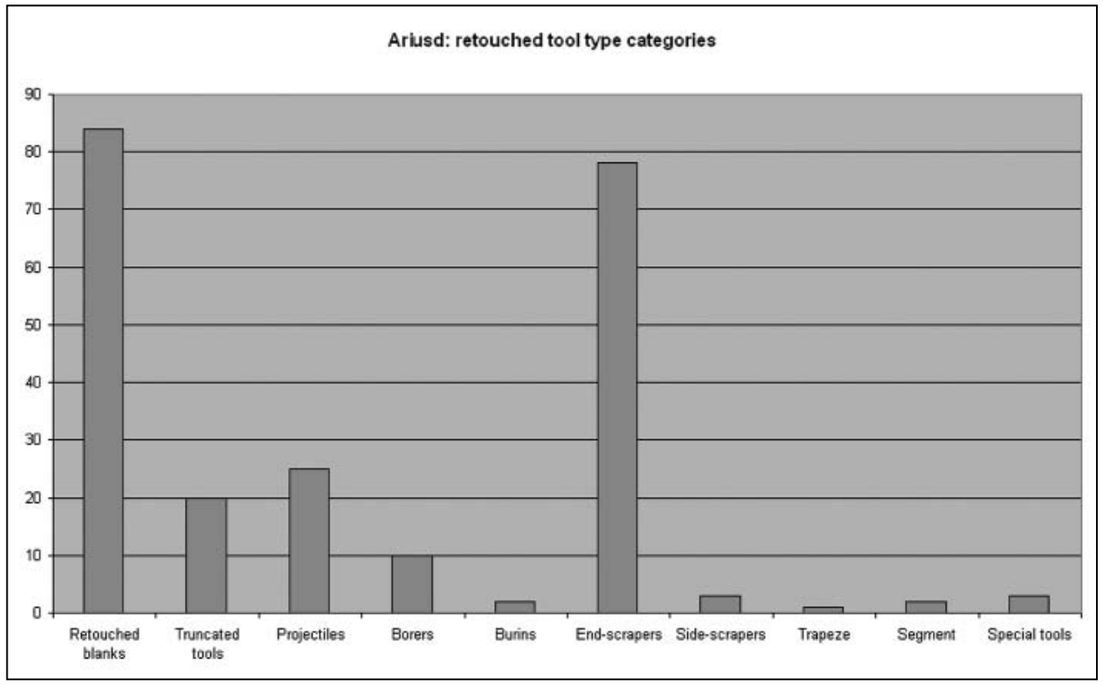

Fig. 6 Ariuşd-Tyiszk-hegy. Distribution of the morphological tool types among retouched artefacts
6. kép Erősd-Tyiszk-hegy, a retusált kőeszközök típusmegoszlása

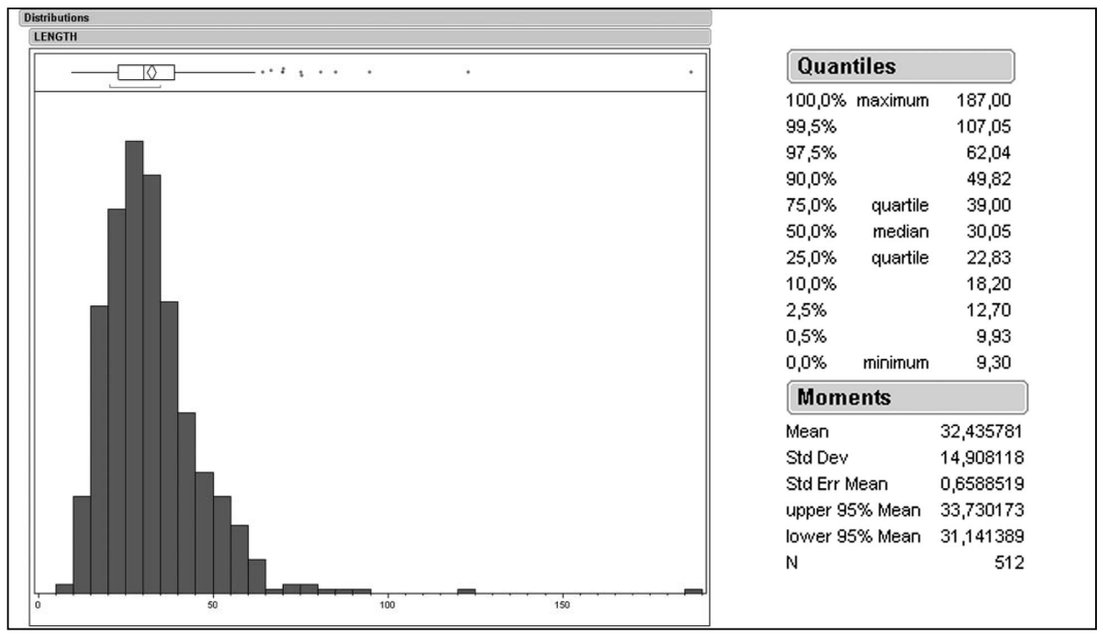

Fig. 7 Ariuşd-Tyiszk-hegy. Metric features of the lithic implements: distribution of length values
7. kép Erősd-Tyiszk-hegy, a kőeszközök metrikus jellemzői: hosszúság értékek megoszlása

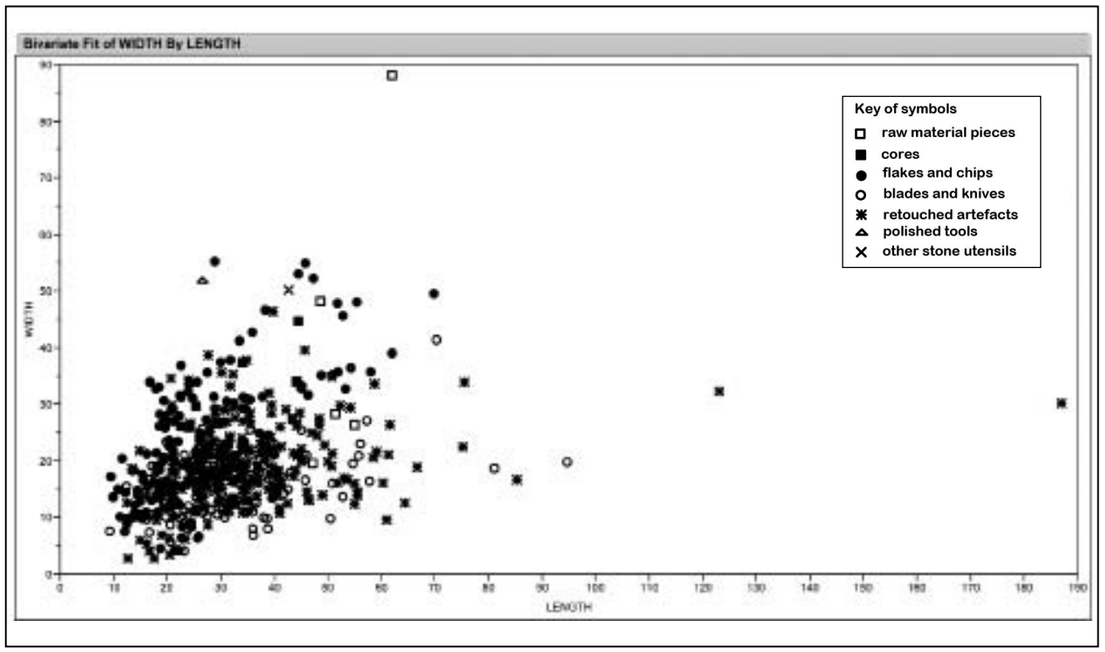

Fig. 8 Ariuşd-Tyiszk-hegy. Metric features of the lithic implements: scatterplot of length vs. width.
8. kép Erősd-Tyiszk-hegy, a kőeszközök metrikus jellemzői: hosszúság és szélesség értékek megoszlása kétváltozós diagrammon

als (see Tab. 1, Fig. 9–10). As we are in the beginning of our studies as yet, we are planning to complete information with extensive fieldwork in 2014.

Analytical approach to the Ariuşd lithic assemblage

Prompt Gamma Activation Analysis (PGAA) was performed on eighteen selected samples as preliminary study. Three objects from Ariuşd itself and 15 from Boroşneu Mic (Fig. 9–10) have been investigated. The PGAA facility has been installed on a horizontal cold neutron beam of the Budapest Research Reactor (Szentmiklósi et al. 2010). The method is fully non-destructive, it gives a profound overview on the bulk composition of the samples, the major components and some minor and trace elements are quantified according to the routine discussed by Révay (Révay 2009). Besides the major components that are easily determined by other methods, hydrogen, boron and chlorine can be also effectively measured by PGAA, and according to our experience, these can be also successfully used for the characterisation of lithics sources (Kasztovszky et al. 2008). Our archaeometry research team has been collecting a growing data library of geological reference materials and archaeological items that we intend to systematically develop in the framework of the Hungarian Scientific Research Fund (OTKA Nr. 100385).

Summarising the data analysis (Tab. 2a–b), it is striking that all the specimens have very high SiO_2 content, even the lowest value is exceeding 79 wt%. This is naturally excluding basalt from the considerations on the dark grey dull and grainy local material formerly referred to as „basaltoid" (Bányai 1957, 21). Among the silicites, we have found pieces with very high SiO_2 content (over 95 wt%), which correspond dominantly to the flint groups. Radiolarites are typically in the range of 90-95 wt% SiO_2.

Analytical approach to the Ariuşd lithic assemblage

Petrographical thin sections were prepared from all the 18 samples after PGAA and the first result are already very interesting compared to both macroscopical hints and chemical composition. Petrographical thin sections were investigated first by Nikon Eclipse LV 100 polarising microscope, attached with Optikam Pro 5 CCD camera with Optika Vision Pro software in the Conservation Laboratory of the Hungarian National Museum. More recently, we had the possibility to use the

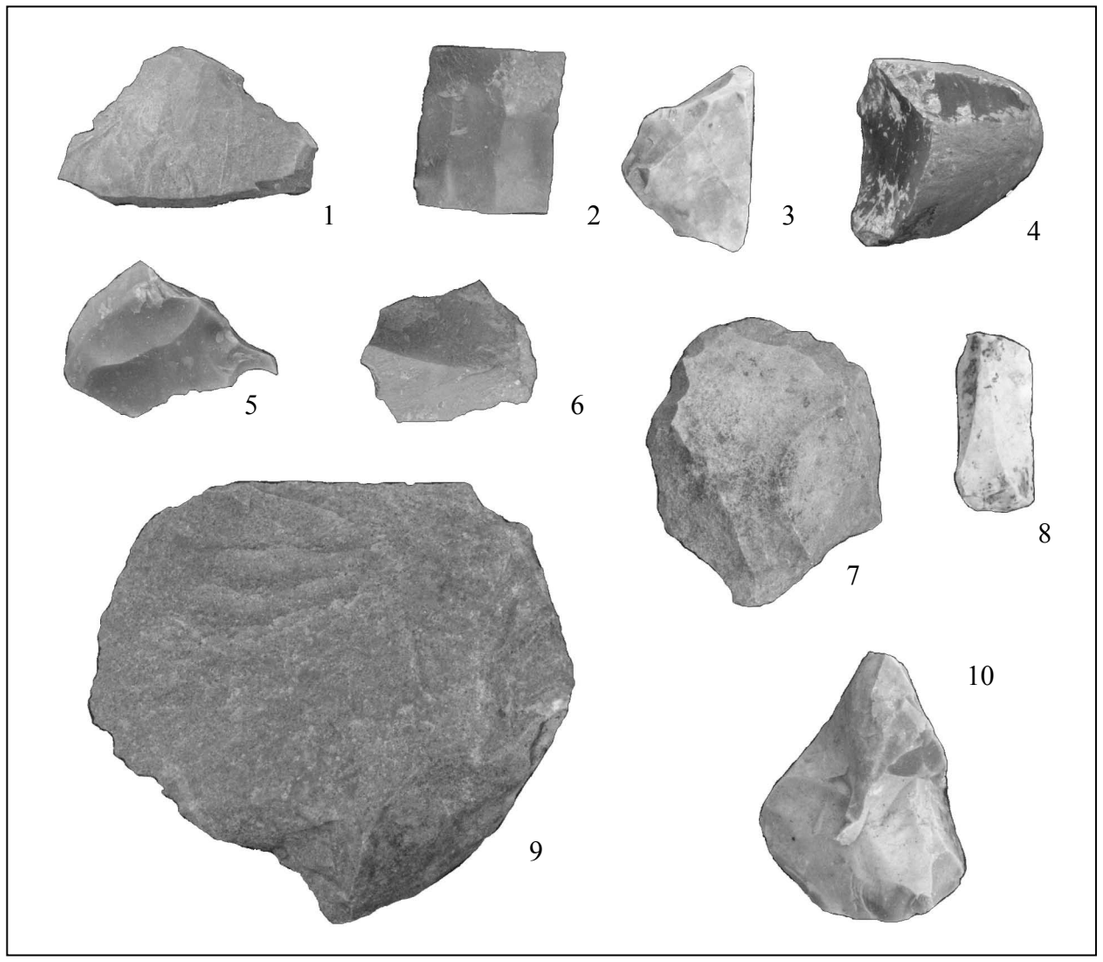

Fig. 9 Samples selected for geochemical and petrographical analysis. 1: Ariuşd 25; 2: Ariuşd 23; 3: Boroşneu Mic 8; 4: Boroşneu Mic 15; 5: Boroşneu Mic 1; 6: Boroşneu Mic 2; 7: Boroşneu Mic 10; 8: Boroşneu Mic 13; 9: Boroşneu Mic 9; 10: Boroşneu Mic 11
9. kép Geokémiai és kőzettani vizsgálatra kiválasztott minták. 1: Erősd 25. sz. minta; 2: Erősd 23. sz. minta; 3: Kisborosnyó 8. sz. minta; 4: Kisborosnyó 15. sz. minta; 5: Kisborosnyó 1. sz. minta; 6: Kisborosnyó 2. sz. minta; 7: Kisborosnyó 10. sz. minta; 8: Kisborosnyó 13. sz. minta; 9: Kisborosnyó 9. sz. minta; 10: Kisborosnyó 11. sz. minta

facility at Eötvös Loránd University, Department of Petrology and Geochemistry, using NIKON LABOPHOT2-POL polarization microscope. The thin section micrographs were prepared using COOLPIX DS-Fi1 camera. The images were recorded using NIS Elements BR program.

Flint corresponds to the very high SiO_2 items as seen by PGAA and by the petrographical thin section they can be further subdivided into at least three classes.

Flint (1) (Fig. 11, 1–2) is of very clear and transparent character, almost undetectable by 1N (one polariser). In crossed polarised light (XN, crossed polarisers), a matrix of cryptocrystalline quartz can be observed with sparse fragments of microfossil shells (forams, sponge spicules, echinoid fragments). The items classified to Flint (1) correspond to the macroscopic phenotype *Prut flint* mainly.

Flint (2) (Fig. 11, 3–4) is still characterised by a clear and transparent image on 1N, the matrix is microcrystalline, a little bit coarser than Flint (1). In crossed polarised light carbonatic grains can be observed scattered all over the texture. It corresponds mainly to macroscopic category *Volhynian flint*.

Flint (3) (Fig. 11, 5–6) is a very specific texture, already conspicuous by 1N. Small brownish globular forms (limonitic grains?) are floating in the siliceous matrix, which is rich in microfossils by crossed polarised light. This flint corresponds to the category of *Balkan flint*.

There were two fine siliceous sandstones in the selected samples, very similar in thin section (Fig. 12, 1–2). They are distinctive elements among the local varieties of raw materials.

In the selected set of samples, Radiolaria may be more or less preserved in the siliceous matrix. Sometimes they are completely dissolved and only the „ghost" of the former Radiolaria can be observed in 1N or XN (Fig. 12, 5–6). Pigmentation (typically greenish or bluish grey, macroscopically) is hardly visible in the thin sections, unlike in the case of radiolarites from the Transdanubian Mid-Mts. We cannot classify them into texture groups as yet, and field experience will be essential in covering all varieties.

Most of the problems were encountered in the category of so-called „basaltoids". This group has been separated on the basis of macroscopic inspection and named according to previous macroscopic petroarchaeological categorisation (Bányai 1957, 21). They are fairly characteristic, dark grey dull and grainy but as it was evident from their geochemical composition, they are not related to basalts at all. In thin section, two categories seem to constitute this group, both of them of igneous origin: 1. (rock glass): a vitreous rock with felsitic texture, comprising rock glass in the matrix (Fig. 12, 3–4); 2. (silicified rhyolite): a rhyolite or rhyolite tuff, heavily silicified and probably hydrothermally altered (Fig. 12, 7–8). Both of these types are believed to be elements of the local raw material stock and fieldwork and systematical research of the sources is implemental.

Conclusions

We are at the beginning of an interesting study on an important and spectacular lithic assemblage. The first results are promising: we have found classical and well-known long distance (even extra-long distance) materials on the site and a well separated local raw material stock (Fig. 13). Geochemical data and petrographical studies can help us to specify the individual raw material categories, and on the long run, the sources proper.

The correspondence between petrographical texture type and macroscopic identification, however, is not fully consequent, and we have to consider how

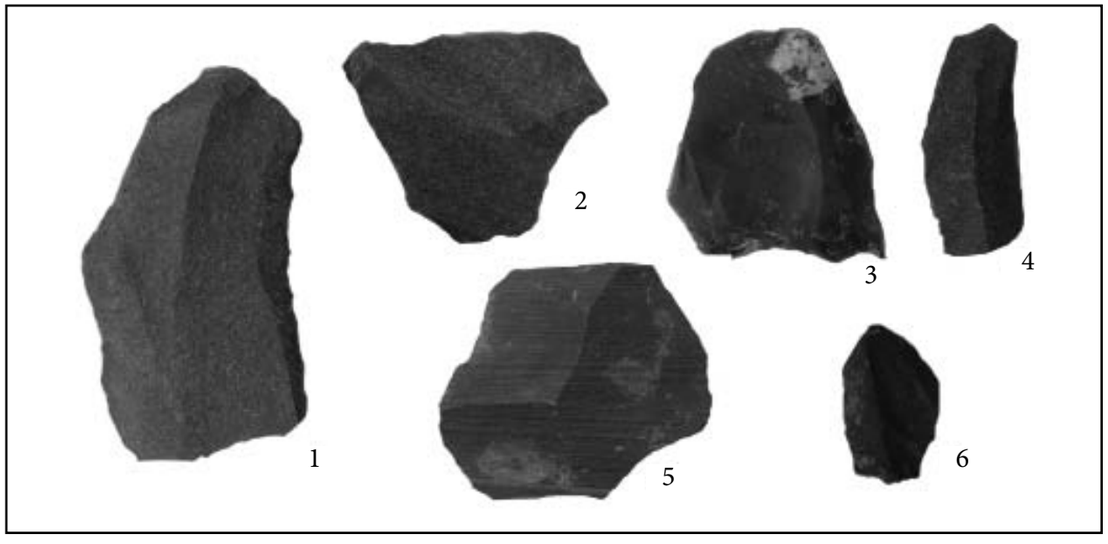

Fig. 10 Samples selected for geochemical and petrographical analysis. 1: Boroşneu Mic 4; 2: Boroşneu Mic 5; 3: Boroşneu Mic 6; 4: Boroşneu Mic 12; 5: Boroşneu Mic 7; 6: Boroşneu Mic 14
10. kép Geokémiai és kőzettani vizsgálatra kiválasztott minták. 1: Kisborosnyó 4. sz. minta; 2: Kisborosnyó 5. sz. minta; 3: Kisborosnyó 6. sz. minta; 4: Kisborosnyó 12. sz. minta; 5: Kisborosnyó 7. sz. minta; 6: Kisborosnyó 14. sz. minta

Site name	Code	Type	Raw material macroscopic description	Dimensions	Figure
Ariuşd-Tyiszk-hegy	E-23	blade fragment	Prut flint?	25.4×20.9×3.7 mm	Fig. 9/2
Ariuşd-Tyiszk-hegy	E-25	flake	greenish grey radiolarite?	39.1×24.7×4.7 mm	Fig. 9/1
Ariuşd-Tyiszk-hegy	E-31	chip	cream coloured silica rock	24×20×2 mm	–
Boroşneu Mic-Borzvára	KB-1	chip, core rim	Volhynian flint?	22×21×3 mm	Fig. 9/5
Boroşneu Mic-Borzvára	KB-2	chip	greenish grey radiolarite?	21×19×4 mm	Fig. 9/6
Boroşneu Mic-Borzvára	KB-3	chip	Volhynian flint?	21×19×4 mm	–
Boroşneu Mic-Borzvára	KB-4	blade-like flake	‘basaltoid’	63×34×5 mm	Fig. 10/1
Boroşneu Mic-Borzvára	KB-5	flake	‘basaltoid’	35×27×10 mm	Fig. 10/2
Boroşneu Mic-Borzvára	KB-6	core remnant	dark bluish grey radiolarite	40×30×9 mm	Fig. 10/3
Boroşneu Mic-Borzvára	KB-7	flake	dark grey silica rock? menilite?	38×44×12 mm	Fig. 10/5
Boroşneu Mic-Borzvára	KB-8	chip	Balkan flint? (honey coloured, patinated)	26×18×5 mm	Fig. 9/3
Boroşneu Mic-Borzvára	KB-9	flake	greenish grey fine grained sandstone?	71×67×19 mm	Fig. 9/9
Boroşneu Mic-Borzvára	KB-10	flake	greenish grey radiolarite?	40×35×12 mm	Fig. 9/7
Boroşneu Mic-Borzvára	KB-11	core remnant	Volhynian flint?	30×35×20 mm	Fig. 9/10
Boroşneu Mic-Borzvára	KB-12	blade-like flake	‘basaltoid’	27×17×4 mm	Fig. 10/4
Boroşneu Mic-Borzvára	KB-13	microblade	Balkan flint? (honey coloured, translucent)	20×12×3 mm	Fig. 9/8
Boroşneu Mic-Borzvára	KB-14	chip	black silica rock - lydite?	16×17×3 mm	Fig. 10/6
Boroşneu Mic-Borzvára	KB-15	core remnant with cortex	Prut flint?	28×27×23 mm	Fig. 9/4

Table. 1 Samples selected for geochemical and petrographical analysis
1. táblázat Geokémiai és kőzettani vizsgálatra kiválasztott minták

Code	Raw material code	SiO_2	TiO_2	Al_2O_3	Fe_2O_{3t}	MnO	MgO	CaO	Na_2O	K_2O	H_2O	CO_2
E-23	924	98.5		0,24							1.11	
E-25	921	93.2	0.114	2.9	0.79	0.0042	0.54		0.18	0.61	1.54	
E-31	999	95.8	0.0018	0.21	0.0373					0.0212	1.08	3
KB-1	943	98.3	0.0102	0.32	0.0290			0.383		0.080	0.79	
KB-2	21	95.07	0.078	2.2	0.25	0.0067	0.4	0.19	0.18	0.40	1.25	
KB-3	924	98.6		0.24							1.107	
KB-4	92	95.7	0.075	0.89	1.11	0.082	0.1	0.60	0.089	0.13	1.2	
KB-5	92	91.8	0.11	1.7	1.2	0.22	0.5	2.4	0.3	0.39	1.3	
KB-6	21	95.5	0.024	0.54	0.17	0.0054	0.2	1.9		0.11	1.27	
KB-7	999	89.4	0.18	3.1	2.2	0.02	0.4	0.88	0.2	0.58	2.4	
KB-8	973	97.3	0.015		0.04			1.62		0.081	0.88	
KB-9	951	93.0	0.146	2.39	2.1	0.0242		0.41	0.10	0.49	1.32	
KB-10	921	92.1	0.101	2.93	0.55	0.0415		1.9	0.30	0.49	1.53	
KB-11	943	92.1	0.0075		0.035	0.005		1.46		0.050	0.77	6
KB-12	92	95.1		2.4	0.73	0.53				0.21	0.96	
KB-13	973	98.2	0.014					0.20		0.067	1.5	
KB-14	999	79	0.170	4.5	1.14		0.30	0.14	0.11	0.75	2.50	11
KB-15	943	98.5	0.0041					0.07		0.04	1.4	

Table 2a PGAA results – Major components. The concentration data are in wt%, The missing data mean that “lower than the detection limit”
2a. táblázat PGAA mérések – Főösszetevő adatok. A főkomponens adatokat tömegszázalékos formában (wt%) adjuk meg. Az üres mezők a kimutatási határnál alacsonyabb értékeket jelentenek

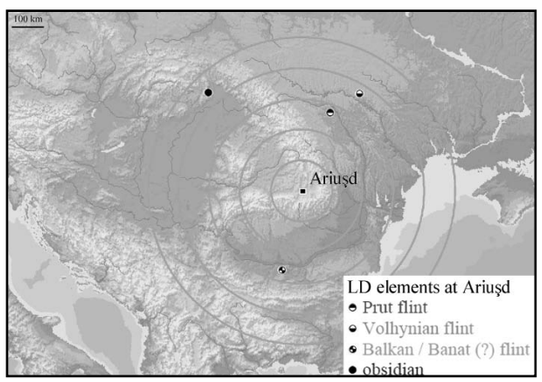

Fig. 13 Long distance contacts of the Ariuşd site on the basis of the petroarchaeological analysis results
13. kép Távolsági kapcsolatok révén bekerülő nyersanyagok az erősdi településen a petroarcheológiai vizsgálatok szerint

much the local lithology at one source is acting on the textural features. A further comparison with the petrographical data obtained in the area of the Precucuteni and Cucuteni cultures (see Crandell 2012) will also be needed in solving the issues raised.

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Notes

1 The first version of this paper was presented at the Symposium ’Stories written in Stone,’ Iaşi, 2013 (Crandell–Cotiugă 2013). We are grateful to Otis N. Crandell whose comments helped to make the manuscript better.

Code	Raw material code	B	S	Cl	V	Nd	Sm	Gd
E-23	924	0.00619		0.0015				0.0000034
E-25	921	0.0031		0.0057	0.0027	0.0009	0.00009	0.000119
E-31	999	0.00595		0.0041				0.0000055
KB-1	943	0.00468		0.0017			0.000016	0.000016
KB-2	21	0.00345		0.0016	0.0032		0.000063	0.00008
KB-3	924	0.00619		0.0015				0.0000034
KB-4	92	0.00374		0.001			0.0000635	0.000079
KB-5	92	0.00382	0.06	0.001			0.0000988	0.000114
KB-6	21	0.00320	0.056	0.0023			0.0000337	0.0000517
KB-7	999	0.00459	0.26	0.001		0.00159	0.000173	0.000227
KB-8	973	0.00334		0.0018		0.0009	0.0000671	0.000093
KB-9	951	0.0039		0.0009			0.00007	0.00011
KB-10	921	0.00356		0.0138		0.0012	0.000114	0.00017
KB-11	943	0.00369		0.0010				0.0000142
KB-12	92	0.0038		0.002			0.00018	0.00011
KB-13	973	0.00890		0.001			0.00000784	0.0000103
KB-14	999	0.00547		0.0017			0.000059	0.000033
KB-15	943	0.00648		0.0009				0.0000074

Table 2b PGAA results – Minor and trace elements. The concentration data are in wt%, The missing data mean that "lower than the detection limit"

2b. táblázat PGAA mérések – Akcesszóriák és nyomelemek. A mért értékeket tömegszázalékos formában (wt%) adjuk meg. Az üres mezők a kimutatási határnál alacsonyabb értékeket jelentenek

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ERŐSDI KŐESZKÖZÖK. ELŐZETES JELENTÉS

Kivonat

Erősd (Ariuşd) a rézkori Erősdi csoport névadó lelőhelye. Régészeti kutatása több, mint száz éve vette kezdetét. A közelmúltban megtörtént a lelőhely rétegtani adatainak kritikai értékelése és a leletanyag jelentős részének, elsősorban a kerámiának a feldolgozása. Az alábbi tanulmány az erősdi kőanyaggal foglalkozik. A szakirodalomban fellelhető adatok szerint Erősdről mintegy 1200 kőeszköz került elő, amelynek többsége a Székely Nemzeti Múzeum gyűjteményében található. További jelentős mennyiség került a Magyar Nemzeti Múzeum gyűjteményébe. Terveink szerint a teljes kőanyagot szeretnénk feldolgozni és közzétenni; ennek első lépése a jelen tanulmány, mely több, mint 500, zömében pattintott kőeszköz feldolgozását tartalmazza. A feldolgozás a kőeszközök tipológiai és nyersanyag-összetétel jellemzőire is kiterjed. Ez utóbbi tekintetben elsősorban makroszkópos nyersanyag meghatározást végeztünk. A leletanyagot szabad szemmel elkülöníthető nyersanyagcsoportokba soroltuk. Ezek közül az ún. távolsági nyersanyagok azonosítása viszonylag egyszerű feladat, mert ezek a magyarországi (és általában, a kelet-közép európai) leletegyüttesekben gyakran előforduló, közismert és a régészeti lelőhelyeken széles körben elterjedt nyersanyagok.

A feltehetően helyi elemekként meghatározható nyersanyagokat szintén csoportokba soroltuk, ezeknek pontos azonosítása még további terepmunkát és vizsgálatokat igényel. A makroszkópos vizsgálatokat jellemző összehasonlító anyag geokémiai és kőzettani vizsgálatával egészítettük ki. A kémiai összetétel vizsgálatára roncsolásmentes, prompt gamma aktivációs vizsgálatot (PGAA) alkalmaztunk, a kőzettani vizsgálat vékonycsiszolat preparátumokon történt.

Az erősdi kőipart tipológiai szempontból nagy változatosság és a megmunkálás, illetve megmunkáltság magas foka jellemzi. A leletegyüttes tipológiai képe – a kerámia leletanyagnak megfelelően – alapvetően egyezik a Precucuteni és a Cucuteni kultúrákból megismert formákkal. A retusált eszközök száma és aránya magas, valószínűleg erősen felülreprezentált. A távolsági nyersanyagok között dominál a pruti és a volhíniai tűzkő – ezeknek egymástól való elkülönítése még nem egyértelmű, inkább „fenotípusokról" beszélhetünk. Jelentős mértékben jelen van az ún. balkáni és bánáti kova is; ezeknek a nyersanyagféleségeknek valószínűleg közös származási helyet feltételezhetünk E. Starnini és P. Biagi (2013) terepi megállapításai alapján. Szerény mértékben, de jelen van az ún. kárpáti 1 (szlovákiai) obszidián is. A helyi nyersanyagok között radiolaritot, homokkövet és kovás riolitot azonosítottunk.

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