UTILIZATION OF SOME NON-FLINT LITHIC RAW MATERIALS IN THE PALAEOLITHIC IN THE CSERHÁT MOUNTAINS AND THE GALGA VALLEY (NORTHERN HUNGARY)•

NÉHÁNY NEM-LIMNIKUS KOVAKŐZET EREDETŰ NYERSANYAG FELHASZNÁLÁSA A CSERHÁT ÉS A GALGA-VÖLGY PALEOLITIKUMÁBAN

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"Don't try to understand!

It's enough if you do not misunderstand."

— Nisargadatta Maharaj

Abstract

The systematic field surveys in the area of the Cserhát Mountains and the Galga Valley had begun after the excavations of the year 1992. The primary target was to localize new Palaeolithic sites; the secondary one was to find new possible raw material sources. The first results regarding the raw material sources were published in a paper dealing with the utilization of nummulitic chert in the Middle Palaeolithic (Markó & Kázmér 2004). This paper was followed by a detailed review of András Markó in the Hungarian language on the limnic quartzite occurrences in the Cserhát Mountains (Markó 2005). In the last one and a half-decade, primarily from point of some non-flint raw materials, such as andesite, nummulitic chert, petrified wood, quartzite and siliceous pebble, several new results have been achieved.

In the following summary, besides the geological occurrences, the archaeological utilization of these raw materials will be discussed as well. The results cannot be regarded as complete, neither concerning Nógrád County, nor Pest County. Implicitly the field surveys could not have been extended those parts of the Cserhát Mountains, which are either wooded or agriculturally not cultivated. The approximate size of the studied area is 1,200 km^2.

Kivonat

A szisztematikus terepkutatások a Cserhát és a Galga-völgy területén az 1992. évi ásatások után kezdődtek el. Ezek elsődleges célja új paleolit lelőhelyek lokalizálása volt, másodlagos céljuk pedig új nyersanyagforrások felkutatása. A nyersanyagforrások kutatásával kapcsolatos első eredmények a nummuliteszes kovakavics középső paleolitikumban való előfordulásával foglalkozó angol nyelvű cikkben kerültek ismertetésre (Markó & Kázmér 2004). Ezt követte Markó András magyar nyelvű részletes ismertetése a Cserhát hegység területén található hidrotermális és limnikus eredetű nyersanyag előfordulásokról (Markó 2005). Az elmúlt másfél évtized során elsősorban a nem hidrotermális vagy limnikus eredetű nyersanyagok, andezit, kovakavics, kvarcit, megkövült fa és nummuliteszes kovakavics terén számos új eredmény született.

Az alábbi rövid összefoglalásban ezeknek a nyersanyagoknak a geológiai előfordulása mellett a régészeti felhasználását is tárgyaljuk. Az eredmények sem Nógrád megye, sem Pest megye tekintetében nem tekinthetőek teljesnek. Értelemszerűen a terepkutatások nem terjedhettek ki a Cserhát erdővel borított vagy műveletlen területére. A vizsgált terület hozzávetőleges nagysága 1200 km^2.

KEYWORDS: NON-FLINT RAW MATERIALS, QUARTZITE, PALAEOLITHIC, RAW-MATERIAL UTILIZATION

KULCSSZAVAK: NEM-LIMNIKUS KOVA EREDETŰ NYERSANYAGOK, KVARCIT, PALEOLITIKUM, NYERSANYAG-FELHASZNÁLÁS

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Introduction

In 1990 and 1992 short excavations were carried out at Püspökhatvan−Diós and Püspökhatvan −Öregszőlők Palaeolithic sites (Cs. Balogh & Dobosi 1995). On the base of ^{14}C measurements, the date of the latter site is 27.700 ± 300 BP (Deb-1901). This date places the site in the elder phylum of the Gravettian entity (Cs. Balogh & Dobosi 1995). It corresponds to the previously assumed cultural assignment, based on the typological characteristics of the lithic assemblage. In the course of the excavations, in the surroundings, limnic quartzite banks were found, which served as raw material for the atelier sites. These very first authentic and well-documented excavations in the Cserhát Mountains gave the initial impulse of the Palaeolithic research that was realized in systematic field surveys, inclusive the prospecting after flakeable lithic raw materials. It was the first attempt in Hungary at all, to systematically localize and document lithic raw material sources in the Cserhát Mountains. The prospecting was facilitated through the fact that there were several geological studies available, published mostly before the Second World War (e.g. Noszky 1914, 1916, 1923, 1936, 1940; Peja 1937; Pávai-Vajna 1939-1940; Horusitzky 1942; Bogsch 1943; Szentes 1943; Láng 1967; Hámor 1985), dealing with the Cserhát Mountains.

During the prospection, from the beginning, a special focus was given to the gravel beds, as a possible geological source of various non-flint raw materials. After a very short period of field surveys, it was obvious that besides some non-local (regional or long-distance) raw materials, and the locally available limnic silicite, the presence of local non-flint artefacts was evidenced as well, practically at all localized Palaeolithic sites. The amount of the non-flint artefacts was strikingly high at some Palaeolithic sites, besides the waste products and cores; the lithic assemblages contained also tools. This fact was relatively unknown in the Hungarian Palaeolithic, until then, the presence and significance of non-lithic raw materials were ignored or underestimated. A possible explanation of this negligence may have been the lack of the mechanical and physical properties of these raw materials and the low morphological standardization of the products made of them. Ignacio Clemente Conte and Juan F. Gibaja Bao (2009), in their paper on the formation of use-wear traces in non-flint rocks, made a very essential statement concerning the "usability" of non-flint artefacts: "*… with regard to the raw material, the edges of the implements made from obsidian, rock crystal (hyaline quartz) or fine-grained flint usually show many scars. In contrast, the deficient conchoidal fracture of less homogeneous and coarser-grained rocks such as quartzite or rhyolite results in reduced scar development, because the quartz crystals joined to the matrix gradually detach themselves, generating a quick edge-rounding and dulling of the edge, making it ineffective after a few minutes of use. … This results in the presence of implements with relatively undeveloped wear traces, which in many cases do not display sufficient diagnostic criteria for a determination of the worked material.*" (ibid., 95).

The above statement can be supplemented by the fact that even the tools themselves made from non-flint raw materials are not always recognizable.

In the following, the geological background and the non-flint lithic raw material occurrences in the Cserhát Mountains will be reviewed. Thereafter a summarizing of the utilization of those raw materials will be given. Among the several dozens of archaeological sites where this utilization was recorded, only the most striking archaeological data will be mentioned in detail.

Geological backgrounds. Gravel banks and andesite outcrops in the Cserhát Mountains

The genetics of the gravely sediments in the discussed area is not well known in geological and geographical research. In the literature, there are only indicative hints on the gravel banks that can be found in the region (Noszky 1914, 1916, 1936, 1940; Peja 1937; Pávai-Vajna 1939-1940; Láng 1967; Hámor 1985). The issue was discussed mainly from a geological point of view on a macroregional level. However, in the case of the non-flint raw materials occurring in lithic assemblages, the geological age of the raw material source is of no interest. During the field surveys, to localize possible raw material sources, our starting-point was the assumption that the raw material sources of those non-flint raw materials should be looked for in the vicinity of the Palaeolithic sites. As regards the potential lithic raw materials suitable for tool manufacturing, the gravel banks of different geological ages are very rich in various rocks. Besides the raw material shatters of limnic origin, jasper and radiolarite, several non-flint raw materials, suitable for lithic tool manufacturing, can be found.

In **Fig. 1.**, gravel banks, andesite outcrops, nummulitic chert and post-volcanic limnic silicite occurrences and archaeological sites localized during field surveys by the author of this paper can be seen. The list of gravel banks (**N-1−N-107, P-1−P-26**) and the two andesite outcrops is given in **Table 1.**

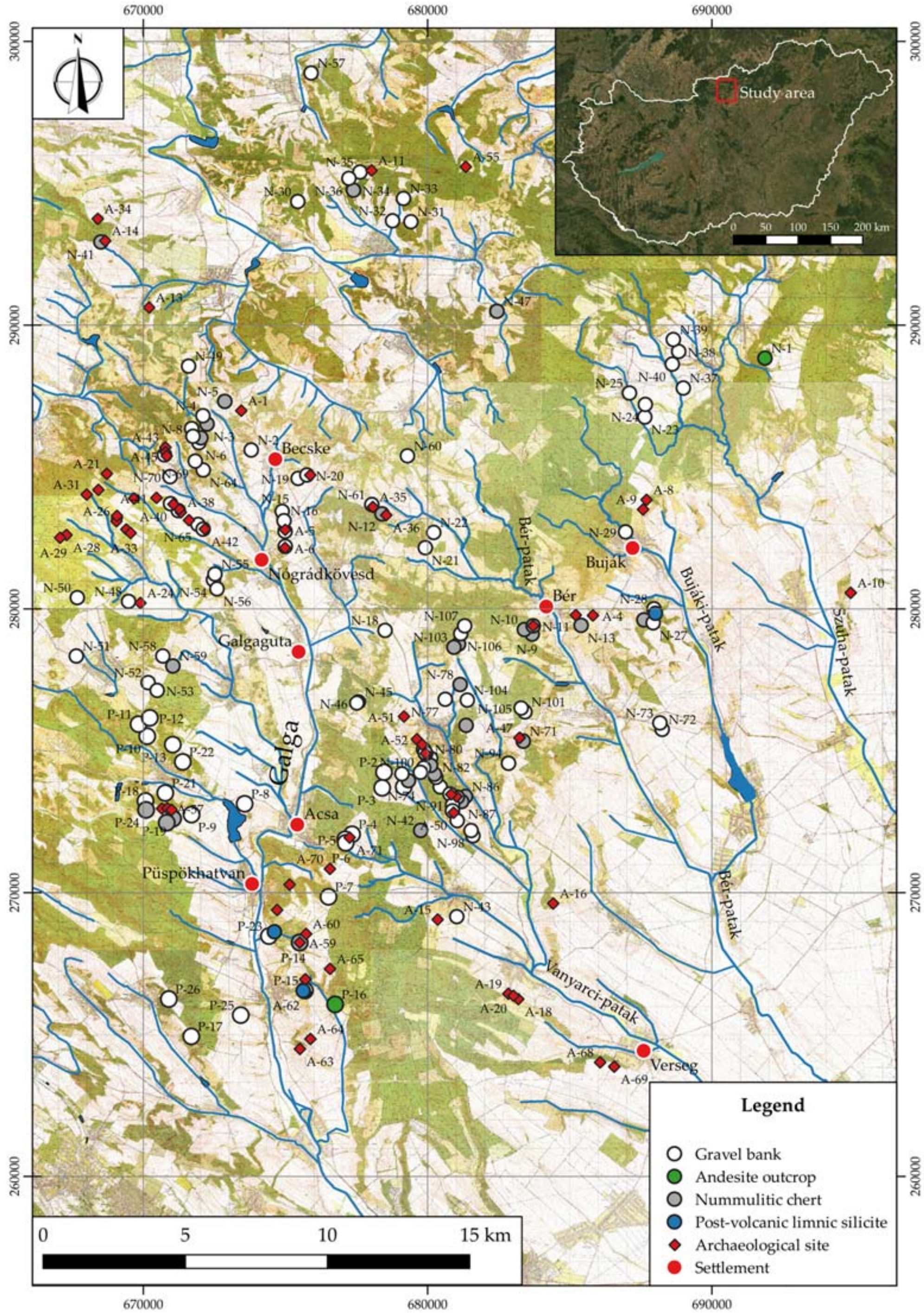

Fig. 1.: Gravel banks, andesite outcrops, nummulitic chert and post-volcanic limnic silicite occurrences and archaeological sites localized during field surveys by the author. White circles indicate gravel banks, green circles are known andesite occurrences (mentioned by Noszky 1914; Szentes 1943; Judik et al. 2001, 121; T. Biró 1992; localized and verified by the author), grey circles are nummulitic chert outcrops and blue circles are the post-volcanic limnic silicite outcrops.

1. ábra: A szerző terepbejárásai során lokalizált kavicstakarók, andezit kibúvások, nummuliteszes kova és utóvulkáni eredetű nyersanyag előfordulások és régészeti lelőhelyek. A fehér körök kavicstakarók, a zöld körök az ismert andezit előfordulások (említik Noszky 1914; Szentes 1943; Judik et al. 2001, 121; T. Biró 1992, a szerző által azonosítva), a szürke körök a nummuliteszes kovakavics előfordulásokat, a kék körök pedig az utóvulkáni eredetű nyersanyagok előfordulásait jelölik.

Table 1.: List of the localized geological raw material sources in the study area (N-1−N-107=Nógrád County; P-1−P-26=Pest County)

1. táblázat: A vizsgált területen lokalizált geológiai nyersanyagforrások (N-1−N-107=Nógrád-megye; P-1−P-26=Pest-megye)

Id	Settlement	Name	EOV_Y	EOV_X	WGS84 Lat	WGS84 Lon
N-1	Alsótold	Nagy-Mező-hegy	691867,49	288840,66	47,94187	19,60783
N-2	Becske	Eresztvény	673795,00	285602,00	47,91365	19,36576
N-3	Becske	Kása-árka	672241,29	286518,24	47,92195	19,34502
N-4	Becske	Kása-árka NW	672098,03	286810,86	47,92458	19,34312
N-5	Becse	Váci-völgy	672865,77	287315,10	47,92909	19,35342
N-6	Becske	Büdös-tó-hegy	671955,21	285861,55	47,91605	19,34116
N-7	Becske	Büdös-tó-hegy	672024,87	286032,21	47,91758	19,34210
N-8	Becske	Büdös-tó-hegy	671699,47	286360,43	47,92055	19,33777
N-9	Bér	Egresi-dűlő	683678,98	279114,71	47,85487	19,49749
N-10	Bér	Egresi-dűlő	683402,95	279275,39	47,85633	19,49381
N-11	Bér	Egresi-dűlő	683714,05	279405,17	47,85748	19,49798
N-12	Bér	Öreg-hegy	678396,60	283352,12	47,89323	19,42717
N-13	Bér	Öreg-hegy	685399,80	279423,20	47,85756	19,52050
N-14	Bercel	erdőben vége	674986,00	282733,00	47,88780	19,38153
N-15	Bercel	erdőben vége	674885,00	283441,00	47,89418	19,38022
N-16	Bercel	erdőben vége	674949,00	283112,00	47,89121	19,38106
N-17	Bercel	erdőben vége	674992,00	282206,00	47,88307	19,38158
N-18	Bercel	Mogyorós alja	678503,64	279244,84	47,85629	19,42834
N-19	Bercel	Pinurka	675445,00	284602,00	47,90460	19,38778
N-20	Bercel	Pinurka	675753,00	284722,00	47,90566	19,39190
N-21	Bercel	Szép-hegy DK-i lába	679919,52	282158,76	47,88243	19,44746
N-22	Bercel		680215,86	282696,89	47,88726	19,45146
N-23	Bokor	Bokori-földek	687640,88	286764,61	47,92345	19,55108
N-24	Bokor	Bokori-földek	687659,43	287208,34	47,92744	19,55137
N-25	Bokor	Temető feletti dűlő	687101,34	287610,29	47,93109	19,54394
N-26	Buják	Körtefa-tábla	687607,77	279616,03	47,85917	19,55003
N-27	Buják	Rózsás-tető	687935,19	279513,12	47,85822	19,55439
N-28	Buják	Rózsás-tető	687963,41	280006,24	47,86265	19,55481
N-29	Buják		686965,08	282716,69	47,88709	19,54170
N-30	Cserháthaláp	Tornyos-hegy	675432,36	294360,20	47,99235	19,38818
N-31	Cserhátsurány	Csipkés torok	679413,99	293647,24	47,98577	19,44147
N-32	Cserhátsurány	Kaponka	678766,42	293681,30	47,98611	19,43280
N-33	Cserhátsurány	Szilvágyi-völgy	679152,52	294467,35	47,99316	19,43802
N-34	Cserhátsurány	Szökoltvány	677392,58	294757,70	47,99585	19,41446
N-35	Cserhátsurány		677622,30	295398,45	48,00160	19,41758
N-36	Cserhátsurány		677231,70	295176,09	47,99962	19,41233
N-37	Cserhátszentiván	Bokori útnál	688996,14	287787,42	47,93257	19,56931
N-38	Cserhátszentiván	Kutasói-oldal	688832,61	289075,75	47,94417	19,56723

Table 1. cont.

1. táblázat folyt.

Id	Settlement	Name	EOV_Y	EOV_X	WGS84 Lat	WGS84 Lon
N-39	Cserhátszentiván	Szálláska	688644,27	289495,94	47,94796	19,56475
N-40	Cserhátszentiván	Szuha-patak völgye	688607,44	288630,40	47,94018	19,56418
N-41	Debercsény	Mogyorós	668506,78	292934,65	47,97977	19,29533
N-42	Erdőkürt	Kavicsos-tető	679756,54	272197,58	47,79285	19,44460
N-43	Erdőkürt	Szedmina	681026,88	269158,74	47,76546	19,46134
N-44	Erdőkürt		681595,25	272008,87	47,79107	19,46913
N-45	Galgaguta	Gutai-hegy alatt OP	677565,30	276725,25	47,83367	19,41564
N-46	Galgaguta	Gutai-hegy alatt	677509,26	276686,07	47,83332	19,41489
N-47	Herencsény	Padok alatt	682440,84	290493,34	47,95727	19,48178
N-48	Legénd	Hosszú földek	669479,58	280266,79	47,86581	19,30780
N-49	Magyarnándor	Kis-Kelecsény fölött	671592,00	288559,00	47,94032	19,33644
N-50	Nézsa		667677,00	280400,00	47,86706	19,28371
N-51	Nézsa	Belegrádi-erdő fölött	667641,67	278342,14	47,84856	19,28315
N-52	Nézsa	Parlag-dűlő	670166,00	277405,00	47,84005	19,31684
N-53	Nézsa	Verébi	670484,62	277130,48	47,83758	19,32108
N-54	Nógrádkövesd		672468,00	281030,00	47,87258	19,34778
N-55	Nógrádkövesd		672520,00	281230,00	47,87438	19,34848
N-56	Nógrádkövesd	Horváth-puszta	672590,00	280710,00	47,86970	19,34939
N-57	Nógrádmarcal	Ivántag-puszta	675902,60	298888,76	48,03306	19,39475
N-58	Nógrádsáp		670684,57	278342,82	47,84847	19,32381
N-59	Nógrádsáp	Peres	671039,26	277991,98	47,84531	19,32853
N-60	Szanda		679291,85	285396,87	47,91158	19,43928
N-61	Szanda	Patkányos-puszta	678037,00	283679,00	47,89619	19,42239
N-62	Szécsénke	Berecz-oldal	671228,00	283467,00	47,89454	19,33132
N-63	Szécsénke	Berecz-oldal	670956,00	283711,00	47,89674	19,32769
N-64	Szécsénke	Gyalogvár	672108,22	284897,04	47,90737	19,34316
N-65	Szécsénke	Kis-Ferenc-hegy	671921,00	282980,00	47,89014	19,34056
N-66	Szécsénke	Kis-Ferenc-hegy	672103,87	282814,68	47,88864	19,34300
N-67	Szécsénke	Visak	670743,00	285432,00	47,91223	19,32493
N-68	Szécsénke		671745,99	286085,78	47,91807	19,33838
N-69	Szécsénke		671826,04	285211,23	47,91021	19,33940
N-70	Szécsénke		670940,00	284662,00	47,90530	19,32752
N-71	Szirák	Balogi-tábla	683366,03	275341,92	47,82096	19,49302
N-72	Szirák	Sziráki-tető	688252,00	275756,00	47,82441	19,55830
N-73	Szirák	Sziráki-tető	688172,00	275985,00	47,82648	19,55725
N-74	Vanyarc	Hajnal-völgy	679326,03	273949,68	47,80863	19,43897
N-75	Vanyarc	Hajnal-völgy	679096,70	274188,87	47,81079	19,43593
N-76	Vanyarc	Hruskár-hegy	681354,62	275899,31	47,82607	19,46620

Table 1. cont.

1. táblázat folyt.

Id	Settlement	Name	EOV_Y	EOV_X	WGS84 Lat	WGS84 Lon
N-77	Vanyarc	Kertek mögötti	680620,27	276817,67	47,83436	19,45645
N-78	Vanyarc	Kopanyice	681143,90	277338,73	47,83903	19,46348
N-79	Vanyarc	Makói-erdő	680039,72	274675,84	47,81513	19,44855
N-80	Vanyarc	Makói-erdő	680027,66	274704,68	47,81539	19,44839
N-81	Vanyarc	Makói-erdő	680443,96	273729,60	47,80660	19,45388
N-82	Vanyarc	Makói-erdő	680290,99	274066,70	47,80964	19,45187
N-83	Vanyarc	Makói-erdő	680106,57	274732,88	47,81564	19,44945
N-84	Vanyarc	Makói-erdő	680242,37	274176,88	47,81063	19,45122
N-85	Vanyarc	Makói-erdő	679859,42	275051,41	47,81851	19,44617
N-86	Vanyarc	Makói-oldal #3	681332,88	273393,65	47,80354	19,46573
N-87	Vanyarc	Makói-oldal #4	681196,40	273215,91	47,80194	19,46389
N-88	Vanyarc	Makói-oldal #1	681046,00	273369,00	47,80333	19,46190
N-89	Vanyarc	Makói-oldal #2	680788,00	273479,00	47,80433	19,45846
N-90	Vanyarc	Róka-vár	680105,25	274487,33	47,81343	19,44941
N-91	Vanyarc	Saj-völgy #20	680876,62	273088,20	47,80081	19,45962
N-92	Vanyarc	Saj-völgy #21	680875,27	272885,11	47,79898	19,45958
N-93	Vanyarc	Saj-völgy #22	681041,38	272541,22	47,79588	19,46178
N-94	Vanyarc	Sváb-hegy	682846,30	274561,21	47,81396	19,48602
N-95	Vanyarc	Makói-erdő	679932,40	274905,31	47,81720	19,44713
N-96	Vanyarc		679925,75	274907,42	47,81722	19,44705
N-97	Vanyarc		679909,40	274942,92	47,81754	19,44683
N-98	Vanyarc		681529,37	272191,32	47,79271	19,46826
N-99	Vanyarc		679860,86	274399,18	47,81265	19,44615
N-100	Vanyarc		679746,74	274244,26	47,81126	19,44461
N-101	Vanyarc		683424,35	276373,27	47,83023	19,49387
N-102	Vanyarc		681086,92	278763,74	47,85184	19,46282
N-103	Vanyarc		680926,32	278653,19	47,85086	19,46067
N-104	Vanyarc		681396,57	276787,99	47,83406	19,46682
N-105	Vanyarc		683290,76	276508,32	47,83145	19,49210
N-106	Vanyarc		681165,97	279127,74	47,85511	19,46391
N-107	Vanyarc		681303,79	279405,64	47,85761	19,46577
P-1	Acsa		679161,86	273730,94	47,80667	19,43677
P-2	Acsa		678466,00	274250,00	47,81137	19,42751
P-3	Acsa	Hribik-hegy	678402,00	273697,00	47,80640	19,42662
P-4	Acsa	Rovnya	677343,00	272061,00	47,79173	19,41238
P-5	Acsa	Rovnya	677101,00	271881,00	47,79012	19,40914
P-6	Acsa		677119,00	271756,00	47,78900	19,40937

Table 1. cont.

1. táblázat folyt.

Id	Settlement	Name	EOV_Y	EOV_X	WGS84 Lat	WGS84 Lon
P-7	Acsa	Kopanyica	676515,00	269856,00	47,77193	19,40120
P-8	Acsa	Csibaj	673564,00	273134,00	47,80153	19,36200
P-9	Csővár		671696,00	272753,00	47,79817	19,33705
P-10	Csővár	Pázsit-rét	670136,00	275516,00	47,82307	19,31635
P-11	Csővár		669831,00	275941,00	47,82690	19,31230
P-12	Csővár		670228,00	276163,00	47,82888	19,31761
P-13	Csővár		671035,00	275219,00	47,82037	19,32834
P-14	Galgagyörk	Májóka-mellett 1.	675501,00	268244,00	47,75747	19,38758
P-15	Galgagyörk	Komárka fölött	675684,00	266552,00	47,74225	19,38992
P-16	Galgagyörk	Megyerke-patak	676746,63	266064,77	47,73783	19,40406
P-17	Püspökszilágy		671686,48	264936,38	47,72786	19,33654
P-18	Csővár	Arany-hegy	670074,12	273233,52	47,80254	19,31542
P-19	Csővár	Mocsolyák	671045,36	272613,45	47,79693	19,32836
P-20	Csővár	Mocsolyák	670823,21	272468,33	47,79563	19,32538
P-21	Csővár		670770,88	273514,92	47,80505	19,32474
P-22	Csővár		671386,59	274611,83	47,81489	19,33301
P-23	Püspökhatvan		674416,51	268471,59	47,75956	19,37312
P-24	Csővár	Arany-hegy	670095,62	272918,81	47,79971	19,31569
P-25	Galgagyörk	Cseres	673426,29	265686,12	47,73455	19,35977
P-26	Püspökszilágy	Mulató-oldal	670896,76	266251,75	47,73972	19,32607

Below, only the following non-flint raw materials will be discussed: andesite, petrified wood, quartzite, siliceous pebble and nummulitic chert. Instead of giving an accurate petrologic or petrographic description of these discussed raw materials, we settle for relatively popular, easily understandable but accurate enough definitions. However, we try to describe briefly the physical properties of the raw materials for flakeability.

Andesite

Andesite is an intermediate type of volcanic rock between basalt and dacite. Andesite lavas usually have porphyritic, or vitrophyric (having large phenocrysts in a glassy groundmass) textures (Le Bas et al. 1986; Le Bas & Streckeisen 1991; Le Maitre et al. 2002). The porphyritic nature means that these andesites will not fracture as evenly as a finer-grained variant.

In general, the raw materials for flaked stone tools must fracture conchoidally. Moreover, they should be elastic, but brittle, and homogeneous both in crystalline structure (amorphous or noncrystalline, and cryptocrystalline or microcrystalline, extremely fine-grained structure) and in lacking cracks, inclusions or other flaws. The crystalline structure is the most important factor in determining the knapping quality of a given raw material. The toughest and least amorphous raw materials like volcanic rocks are hard to work, and the fracture surfaces are usually rough, with a grainy or sugary texture. The slower the volcanic rocks cooled, the more different minerals sorted out into crystalline formations. For this reason, the flaking qualities are variable, ranging from fairly homogeneous, to coarsely grained, to completely unflakeable. Some volcanic rocks variants, in particular, are often porous or vesicular, that is, being pitted with many cavities at its surface and inside (after Whittaker 1994, 66, 69).

Ferenc Szentes (1943), in a geological sketchy map, represented several andesite outcrops in the Cserhát

Mountains, but in the discussed area, for the time being, there are only two definite occurrences of a fine-grained variant of andesite. It has a dark greyish-black colour, covered by a light grey weathering layer, and has relatively good knapping properties. The first geological occurrences are east of the settlement Galgagyörk in the Galga valley, in the quarries of the Megyerke Valley (Szentes 1943, 8). The raw material of some polished stone axes from Aszód–Papi lands (Lengyel culture) described as basaltic andesite (fine-grained andesite, type b), was regarded as local, and likely origins from those quarries (Judik et al. 2001, 121; T. Biró 1992). The second source is in the vicinity of the settlement Alsótold at the south-eastern foot of the heavily eroded Nagy–Mező-hill (Noszky 1914, 314-317). The latter occurrence was verified in the course of field surveys as well, but no petrographic analysis was made.

Petrified wood

Petrified wood (synonyms are fossil wood, silicified wood), in general, is formed by two types of wood silicification mechanisms. The process of *replacement* means the precipitation of minerals in spaces formerly occupied by organic matter. Contrarily, during the *permineralization*, cell materials remain at least partially intact and open spaces will be filled with mineral. The two processes are not independent, they commonly occur concurrently (Mustoe 2008, 2017, 2018). The resulting rock versions have different physical behaviour, which depends mainly on the minerals involved in the fossilization. From the archaeological applicability, that is the flakeability point of view, the best suitable fossil woods are those that are mineralized with polymorphs of silica, opal, chalcedony and quartz. Siliceous petrifactions (synonym is petrification) generally contain more than ninety per cent, by weight, of silica (Leo & Barghoorn 1976; Scurfield & Segnit 1984; Mustoe 2008; Viney 2016). The relatively homogeneous structure of the silica-rich fossil woods could ensure optimal workability. As noted by John C. Whittaker (1994, 71) "*Some petrified woods are composed of silica and will flake, but often tend to have odd angular fracture patterns*". According to Richard F. Leo and Elso B. Barghoorn (1976), many mineralized blocks of wood have a preferential tendency toward radial longitudinal fracture. It can be attributed partly to the factor of uneven distribution of silica through the specimen, with a pattern of discontinuities predetermined by the original wood structure.

N. R. Ramesh (1986) analyzed and described a lithic assemblage from the surroundings of Agartala, the capital of the Indian state of Tripura. He noted the following: "*It is noticed that majority of the flaked, from all the heavy tools like celts, bifacial tools and big scrapers, are removed either across or oblique to the fabric and not parallel to it, possibly for controlling the size of flakes. Controlled flaking is extremely difficult in petrified woods, except along an axis transverse to the growth rings. Consequently, the tool types are restricted to mainly tabular varieties*." (ibid., 306-307). In connection with the fossilized wood artefacts, collected by Hallam L. Movius in Burma during his expedition in 1937-38 in Central Burma, Robin Dennell (2014, 26-27) cited the comment of Movius (1943, 349): "*The bulk of the material is extremely friable, however, and controlled flaking is absolutely impossible except when executed along a plane more or less at right angles to the axis of the growth rings. This factor is of the utmost importance since it has exerted a very marked influence on the typology of the fossil wood implements, most of which are made on tabular fragments of wood*.".

Syed Ahsan and Singh Roy (2016) made the typo-technological classification of finished fossil wood tools from several archaeological lithic assemblages of the Chaklapunji area (Habiganj district, Bangladesh). Concerning the flakeability, they wrote: "*As a raw material, fossil wood pieces are removed either across or oblique to the wood structure and for this reason suitable square or rectangular shape core or large flake are produced. So, the use of fossil wood as raw material contributes to the shape of this tool*" (ibid., 13).

The occurrence of petrified wood in the Cserhát Mountains seems to be relatively common. On the area of some gravel banks, large blocks and chunks can be found (see, for example, **Fig. 1/P-19-20**, Csővár–Mocsolyák). The most interesting case is the gravel bank of Vanyarc–Balogi-tábla (**Fig. 1/N-71**). In a vast area of about 250×500 m, there are numerous blocks of 25×25×40 cm dimensions. Due to the intensive ploughing, they are generally freshly broken. It is just a vague hypothesis, still, it cannot be excluded that below the recent surface a petrified forest is located. The verification, however, requires further investigations.

Quartzite

Recently, the utilization of quartz and quartzite as a lithic raw material in the Hungarian Palaeolithic was reviewed (Péntek 2019). In that paper the elementary geological properties of these raw materials were described at large, here only a short basic definition will be given. Quartzite is a compact, hard, non-foliated, medium to coarsely crystalline metamorphic rock. It has a typical equigranular texture, that is, the grains mutually adjust their boundaries to achieve textural equilibrium. The pure quartzite is metamorphized from quartz-rich sedimentary rocks, such as, for example, pure quartz sandstone (Haldar & Tišljar 2014, 286). The extreme toughness of quartzite made it a favourite rock for use as an impact tool during the Palaeolithic. Its conchoidal fracture allowed it to be shaped into large cutting tools such as hand-axes and scrapers. Its coarse texture makes it difficult for producing tools with fine edges such as knife blades and projectile points.

Quartzite pebbles can be found in all gravel banks in the Cserhát Mountains, irrespectively of their geological age. However, in those of younger geological ages (Pliocene), the quartzite pebbles are much smaller and therefore lesser suitable for tool manufacturing.

Siliceous pebble and nummulitic chert

Concerning the state of the mineralogical and petrographical nomenclature of silica and SiO_2 rocks, recently Jens Götze made an analytical approach for the identification and classification of these materials (Götze 2010).

Nummulites are large lenticular (coin-shaped) fossil foraminifers, widely distributed in limestone formations from the Eocene Epoch to the Miocene Epoch of the Cenozoic. According to Markó and Kázmér (2004), nummulites are often present in rock-forming quantity in the Middle Eocene to lowermost Oligocene sediments of Transdanubian Central Range in Hungary and southern Slovakia. The uncommon occurrence of nummulites-bearings rocks is in Lower Miocene and younger conglomerates, which yield nummulitic chert pebbles of various colours (grey, brown or yellow), with a striated and usually black cortex. The circumstance of silification is an open question for the time being since the siliceous variety of rocks is unknown from primary geological outcrops.

In the Cserhát Mountains, the siliceous pebble is very frequent and it can be found practically in all gravel banks. However, the occurrence of nummulitic chert cannot be regarded as common. In **Fig. 2.**, the nummulitic chert occurrences can be seen. In connection with the geological age of the gravel banks, the necessary information has been taken from the literature (Noszky 1940; Hámor 1985, 2007). It is worthwhile to draw attention to the surprising frequent occurrences of nummulitic chert in gravel banks of the Late Miocene and Pliocene geological age.

Archaeological utilization

In **Fig. 1.,** besides the geological occurrences of non-flint raw materials the archaeological occurrences without any chronological or cultural categorization has been shown (**Fig. 1/A-1−A-71, Table 2**). On the grounds of the Figure, it is obvious that in the vicinity of the Palaeolithic sites using non-flint raw materials, at a maximum distance of five kilometres as the crow flies, there are always gravel banks as potential lithic raw material sources. It is worth mentioning that there are some general clusters of Palaeolithic sites. There is a cluster of fourteen Palaeolithic sites in the Galga Valley (**Fig. 3/A-56−A-67, A-70−A-71**). Another cluster of seven Palaeolithic sites can be seen in the vicinity of Vanyarc (**Fig. 3/A-48−A-54**). A large, significant cluster of Palaeolithic sites can be found in the territory of the villages of Legénd and Szécsénke, where not less than twenty-one sites show clear evidence of the utilization of non-flint raw materials (**Fig. 3/A-21, A-23−A-33, A-37−A-45**).

In **Fig. 3.,** only the archaeological sites, with the rough degree of the utilization of non-flint raw materials, can be seen (**Fig. 3/A-1−A-71**). Temperate utilization means a ratio of less than 10%, intensive utilization means a ratio greater than 10% (sometimes much higher %) in the total lithic assemblage. There is a concentrated, intensive utilization at three sites on the southern part of Vanyarc, at the locality Makói-erdő. From a technological and typological point of view, these sites seem to have a clear affiliation with the so-called Middle Palaeolithic, “Vanyarc-type” industry (Péntek & Zandler 2018). There is a greater concentration containing six sites at Szécsénke−Berecz-oldal and Szécsénke−Kis-Ferenc-hegy (**Fig. 3/A-37−A-42**).

In **Fig. 4.,** the archaeological sites, classified in a relatively simple manner, can be seen (**Fig. 4/A-1−A-71**). The group “Middle Palaeolithic” contains the site with strong Micoquian-Bábonyian characteristics and the sites listed under the term “Vanyarc-type” industry. Group two, “Early Upper Palaeolithic” is a somewhat loose classification of the Palaeolithic sites with leaf-points and/or bifacial tools, and tools with slightly Aurignacian resemblances as well. There is a single Aurignacian site in the third group, Legénd−Hosszú-földek (**Fig. 4/A-24**). The group “Upper Palaeolithic” contains all sites belonging to the *sensu lato* Gravettian entity regardless of their chronological position. Given the fact, that it will be dealt with surface collections, it is hardly possible an exact chronological classification. Lastly, for the sake of completeness, some known Neolithic sites will be shown as well.

Because of the well-known problems of the accidental heterogeneous, mingled character of surface collections, no obvious consequences can be drawn. That is why below only the observed phenomena will be reported.

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Table 2.: List of the archaeological sites with non-flint raw material utilization

2. táblázat: A nem-limnikus eredetű nyersanyagokat használó régészeti lelőhelyek listája

Id	Settlement	Name	EOV_Y	EOV_X	WGS84 Lat	WGS84 Lon
A-1	Becske	Júlia-major	673444,7	286988,3	47,92613164	19,36115129
A-2	Bér	Egresi-dűlő	683714	279405,2	47,85748285	19,49797635
A-3	Bér	Papi-földek	685214	279784	47,86081046	19,51805075
A-4	Bér	Szár-hegy	685817	279771	47,86066067	19,52610812
A-5	Bercel	Erdőben-vége 1	674992	282789	47,88830839	19,38161504
A-6	Bercel	Erdőben-vége 2	674985	282155,1	47,88260794	19,38148505
A-7	Bercel	Pinurka	675872,6	284717,2	47,90561494	19,39350303
A-8	Buják	Szente	687702,5	283846,9	47,89721039	19,5516563
A-9	Buják	Szente	687580,4	283506,7	47,89415779	19,54999455
A-10	Csécse	Szőlős-domb	694885	280568,8	47,86727378	19,64737186
A-11	Cserhátsurány	Bányai-oldal	678027,5	295455,3	48,00209581	19,42301557
A-12	Csesztve	Öreg-szőlők	665902,9	296207,9	48,00927386	19,26057051
A-13	Debercsény	Bakosi-rét	670202	290623	47,95892874	19,31792907
A-14	Debercsény	Mogyorós	668659	292976	47,98013577	19,29737014
A-15	Erdőkürt	Cigány-part	680355	269054	47,76455227	19,45237377
A-16	Erdőtarcsa	Daróci-hegy	684417,5	269622,9	47,76946754	19,50660983
A-17	Hont	Csitár	648058	299633	48,04026671	19,02139712
A-18	Kálló	Puszta-hegy 2	683189	266250	47,73919544	19,48996666
A-19	Kálló	Puszta-hegy 3	682841,2	266437,4	47,74089883	19,48534359
A-20	Kálló	Puszta-hegy 4	683020,1	266367,7	47,74026243	19,48772331
A-21	Kétbodony	Halyagos-hegy	668713	284766	47,90629905	19,29774236
A-22	Kisgéc	Fehér-hegy	688781	304947	48,08689953	19,56795638
A-23	Legénd	Halyagos-patak völgye	669671	283895	47,89843756	19,31051707
A-24	Legénd	Hosszú-földek	669896	280210	47,86528947	19,31335906
A-25	Legénd	Káldy-tanya 1	669072	283198	47,89218687	19,30247593
A-26	Legénd	Káldy-tanya 2	669055	283093	47,89124305	19,30224404
A-27	Legénd	Káldy-tanya 3	669072	283281	47,89293333	19,30247954
A-28	Legénd	Remete	667296,2	282607,6	47,88692662	19,27870659
A-29	Legénd	Remete	667071,6	282512,5	47,88607761	19,27569927
A-30	Legénd	Rovnya 2	668419,2	284197,9	47,90119795	19,29378926
A-31	Legénd	Rovnya 1	668006,3	284033,1	47,89972758	19,28826028
A-32	Legénd	Káldy-tanya 5	669402	282803,2	47,88862673	19,3068716
A-33	Legénd		669552,4	282676,9	47,8874861	19,30887625
A-34	Mohora	Baglyas	668396	293748	47,98708599	19,29387987
A-35	Szanda	Patkányos-puszta	678073,9	283594,2	47,89542457	19,42287543
A-36	Szanda	Jákotpuszta fölötti plató	678544	283307	47,89282102	19,42914257
A-37	Szécsénke	Berecz-oldal 1	671605	283128	47,89147832	19,33634397

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Table 2. cont.

2. táblázat folyt.

A-38	Szécsénke	Berecz-oldal 2E	671318	283406	47,89398796	19,33251975
A-39	Szécsénke	Berecz-oldal 2W	671257	283526	47,89506918	19,33170984
A-40	Szécsénke	Berecz-oldal 3	671057	283692	47,89656859	19,32904325
A-41	Szécsénke	Berecz-oldal 4	670463	283916	47,89860205	19,32111001
A-42	Szécsénke	Kis-Ferenc-hegy	672162,6	282817,5	47,88866685	19,34378385
A-43	Szécsénke	Visak 1	670776	285696	47,91460049	19,32538046
A-44	Szécsénke	Visak 2	670782	285522	47,91303545	19,32545247
A-45	Szécsénke	Visak 3	670824	285393	47,91187395	19,32600819
A-46	Vanyarc	Balogi-tábla	683243	275459,6	47,82202248	19,49138232
A-47	Vanyarc	Balogi-tábla	683227,8	275457,4	47,82200341	19,49117919
A-48	Vanyarc	Makói-oldal 19/1	681017,5	273388,8	47,80350791	19,46151722
A-49	Vanyarc	Makói-oldal 19/2	680827	273465	47,80420192	19,45897924
A-50	Vanyarc	Saj-völgy 21	680916	272821	47,79840572	19,46012207
A-51	Vanyarc	Szlovácka-dolina	679169,7	276211	47,82897486	19,43703773
A-52	Vanyarc	Tovi	679624	275409	47,8217415	19,44305073
A-53	Vanyarc		679808,8	275221,2	47,82004436	19,44550561
A-54	Vanyarc		679931,6	274909	47,8172308	19,44712397
A-55	Varsány	Alsó-kő-forrás	681343,2	295582,9	48,00309211	19,46745463
A-56	Csõvár	Arany-hegy 4	670654	272965	47,8001063	19,32314909
A-57	Csõvár	Arany-hegy 5	670845	272977	47,80020816	19,32569926
A-58	Csõvár	Arany-hegy 8	670997,3	272921	47,7996995	19,32772893
A-59	Galgagyörk	Májóka-mellett 1.	675501	268244	47,75747481	19,38757632
A-60	Galgagyörk	Májóka-mellett 3.	675727	268547	47,76019111	19,39060837
A-61	Galgagyörk	Páskomok	675698	266947	47,74580191	19,39012817
A-62	Galgagyörk	Komárka fölött	675729	266473	47,74153753	19,39051388
A-63	Galgagyörk	Kelemen-föld	675508	264495	47,72375599	19,38745269
A-64	Galgagyörk	Csonkás-hegy	675877	264846	47,7268984	19,39239179
A-65	Galgagyörk		676567	267317	47,74909492	19,40173849
A-66	Püspökhatvan	Öreg-szőlő	674707	269391	47,76782137	19,37705039
A-67	Püspökhatvan	Takács-hegy	675146	270287	47,77586316	19,38295803
A-68	Verseg	Tatár-domb 3	686071	264021	47,71899502	19,52821023
A-69	Verseg	Tatár-domb 4K	686566	263870	47,71760939	19,53479506
A-70	Acsa	Provosznya	676563,2	270841,2	47,78079106	19,40190076
A-71	Acsa	Rovnya	677258,3	271942,9	47,79067104	19,41124338

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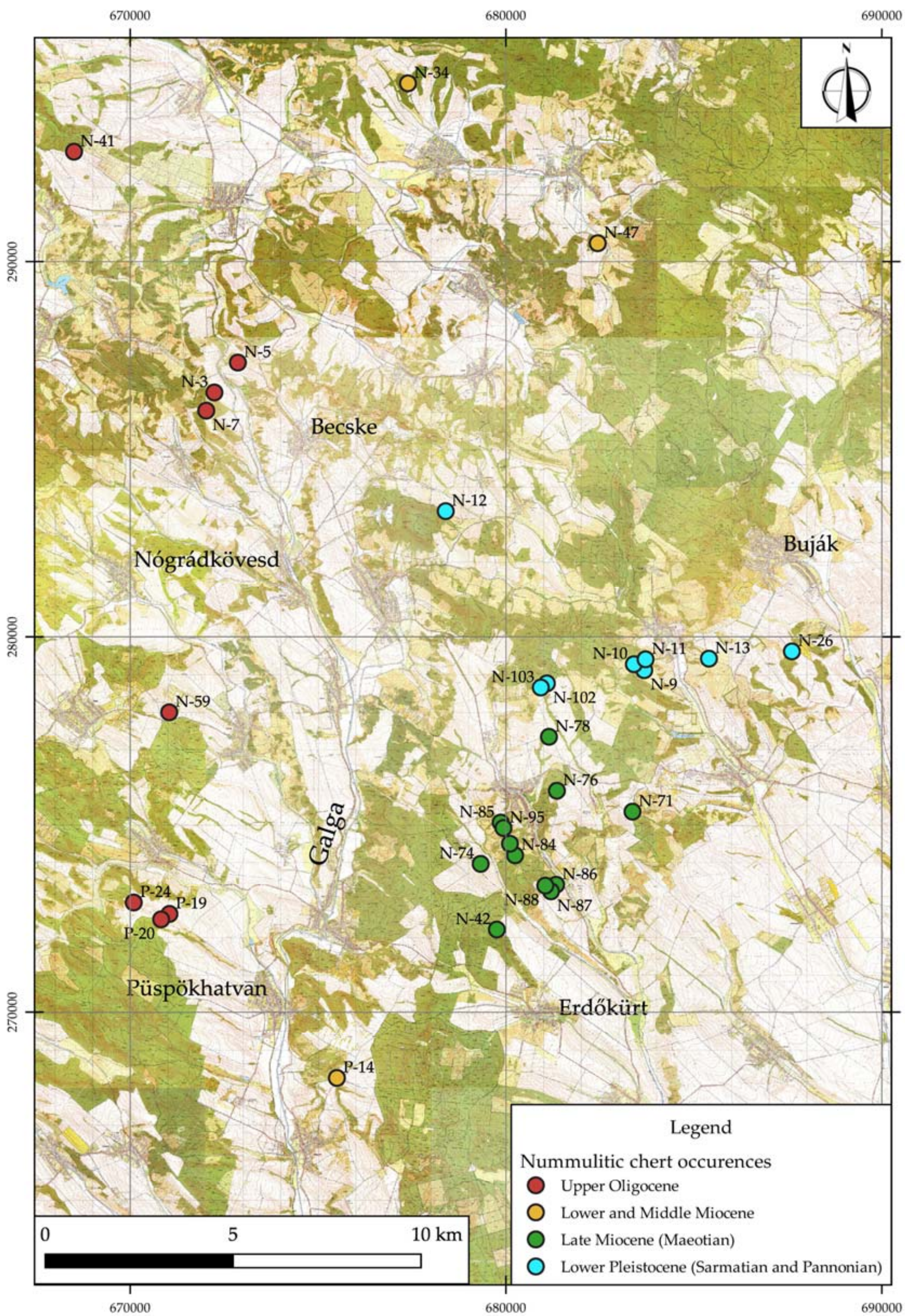

Fig.2.: The nummulitic chert occurrences in gravel banks of different geological age

2. ábra: A nummuliteszes kovakavics előfordulások a különböző geológiai korú kavicstakarókban

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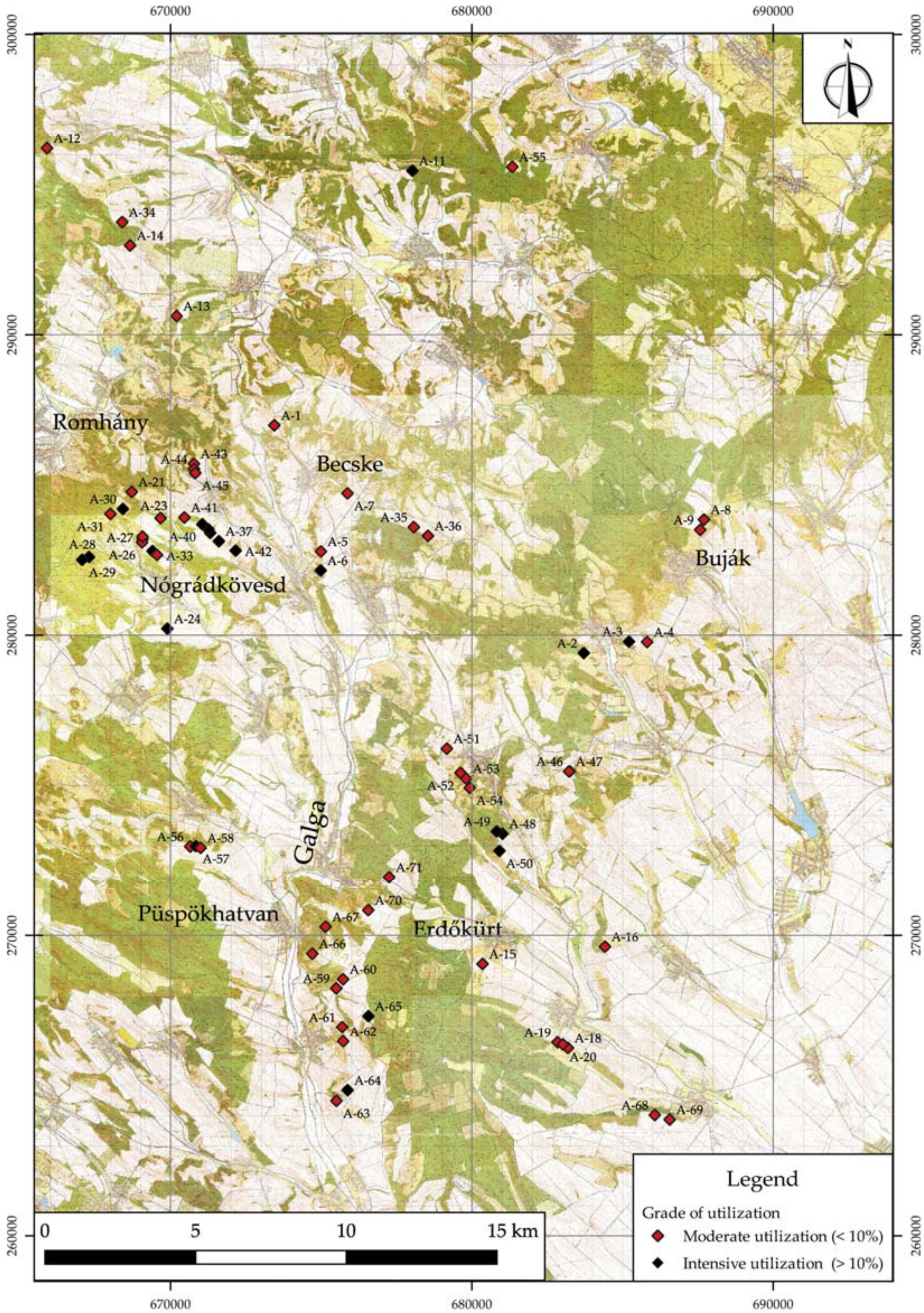

Fig. 3.: Archaeological sites with a rough degree of utilization of non-flint raw materials. Temperate utilization means a ratio of less than 10%, intensive utilization means a ratio greater than 10% (sometimes much higher %) in the total assemblage.

3. ábra: Régészeti lelőhelyek a nem limnikus nyersanyagok felhasználásának intenzításának feltüntetésével. Mérsékelt (Temperate) felhasználás 10%-nál kisebb, intenzív (Intensive) felhasználás 10%-nál nagyobb (gyakran sokkal nagyobb) arány az összleletszámon belül.

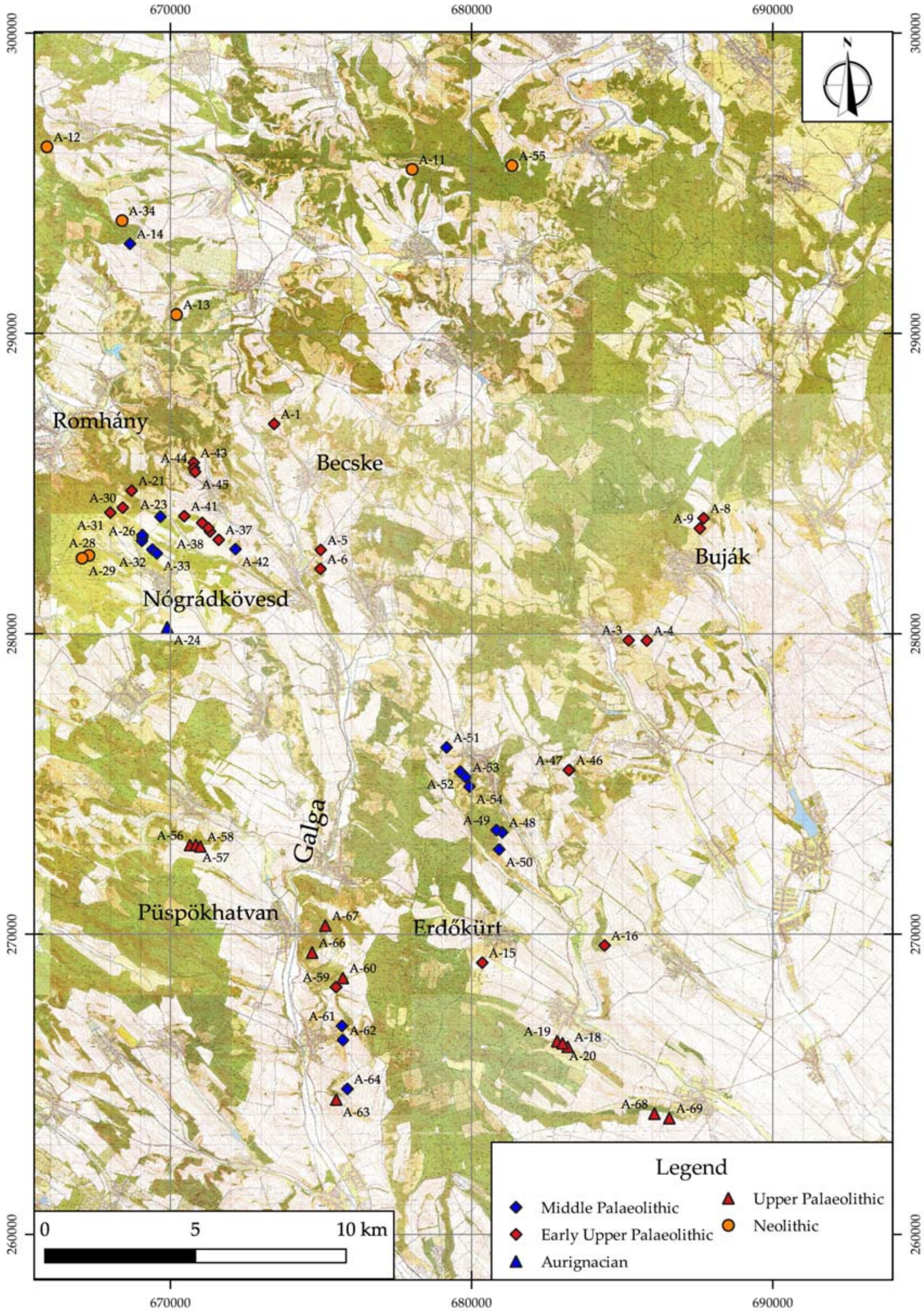

Fig. 4.: Archaeological sites, classified simply, utilizing non-flint raw materials

4. ábra: A régészeti korok alapján besorolt, nem limnikus nyersanyagokat felhasználó régészeti lelőhelyek

Andesite utilization

Intensive utilization of andesite as a raw material can be observed only at two sites.

The surface collection of the site of Galgagyörk−Csonkás-hegy (**Fig. 3/A-64; Fig. 4/A-64**) was attributed to the Bábonyian (Ringer 1983), a Late Middle Palaeolithic Micoquian industry. Among andesite artefacts, there are several retouched tools, mainly side-scrapers. The short review of a hand-axe had occurred earlier in Hungarian (Markó 2004). The intensive andesite utilization should be considered a local speciality of this Bábonyian industry. In the assemblage of the Legénd−Káldy-tanya (**Fig. 3/A-25−A-27; Fig. 4/A-25−A-27**) site-complex, having similar technological and typological characteristics, the andesite lacks entirely (Markó & Péntek 2003-2004).

The other site is situated at Galgagyörk as well (**Fig. 3/A-65; Fig. 4/A-65**). The somewhat mingled assemblage of the site contains a large number of andesite artefacts, mainly great-sized flakes. A bifacial tool, a side-scraper made of felsitic porphyry, and some retouched flakes of great-dimensions (roughly manufactured side-scrapers) connect the site to the Micoquian-Bábonyian site-complex postulated in the surroundings. However, based on the Neolithic artefacts, occurring in the assemblage, the incidental existence of an atelier manufacturing polished Neolithic hand-axes cannot be excluded.

It is worth mentioning the site Szécsénke−Berecz-oldal 3. The percental ratio of andesite is less than 1%, but there are some "blady" artefacts, mostly, however, elongated flakes (**Fig. 15, 1-3, 5**). At the same time, in **Fig. 15, 4**, there is a large, massive flake of great dimensions (91×74×28 mm), with some short removals.

Siliceous pebble and nummulitic chert utilization

Among the Palaeolithic sites, the use of siliceous pebble and nummulitic chert is high at the sites typologically related to the Middle Palaeolithic "Vanyarc-type" industry (**Fig. 3/A48 – A50; Fig. 4/A48 – A50**). At the same time, the use of siliceous pebble in the vicinity of the eponymous site of the industry (Vanyarc-Szlovácka-dolina; **Fig. 3/A51; Fig. 4/A51**) is negligible (Markó 2012). In **Fig. 14, 3**, there is a large siliceous pebble fragment from the small lithic concentration Vanyarc 16 (**Fig. 3/A53; Fig. 4/A53**). Dimensions are 77×47×33 mm.

Both the siliceous pebble and the nummulitic chert have high occurrence at the site of Legénd−Káldy-tanya 5 (**Fig. 3/A-32; Fig. 4/A-32**). In the assemblage containing 467 lithic artefacts, the percental ratios are 17.34% and 4.07% respectively. Among the 39 tools, there are 24 (61.54%) tools made of siliceous pebble, and there is a single tool (2.56%) made of nummulitic chert. The assemblage, on the whole, shows clear evidence of a pronounced pebble-industry. From a cultural point of view, it cannot be classified unambiguously. Many technological and typological characteristics of several Middle Palaeolithic and Transitional industries (Moustérian, Micoquian-Bábonyian, Szeletian) are present (Péntek & Gábriel 2018; Péntek 2020a) which are known mainly from surface collections in the study area.

The utilization of the siliceous pebble at the sites of Szécsénke−Berecz-oldal and Szécsénke−Kis-Ferenc-hegy is rather frequent (**Fig. 3/A-37−A-42; Fig. 4/A-37−A-42**). All lithic assemblages consist of some hundreds of artefacts, even more than a thousand at the site of Kis-Ferenc-hegy. The ratios of siliceous pebble utilization vary between 12.32% and 16.39%, among the tools, the ratios are much higher, they vary between 28.57% and 37.5% (Péntek & Zandler 2013b; Péntek 2015:64-65 Table 1-2.). In **Fig. 5.,** some selected tools, end-scrapers from Kis-Ferenc-hegy (**1, 3**), an end-scraper (**2**) and a bifacial tool (**4**) from Berecz-oldal 3 can be seen. The use of siliceous pebble at the recently localized sites (likely three related lithic concentrations) of Szécsénke−Visak is not negligible. The share of the siliceous pebble in the total assemblages and the tool-kit is 2.99% (of 735 artefacts) and 14.29% (of 49 tools), 6.67% (of 195 artefacts) and 31.58% (of 19 tools) and 9.80% (of 153 artefacts) and 25.00% (of 16 tools) at Szécsénke−Visak 1, Visak 2 and Visak 3 respectively (Péntek 2021b)

At the site of Szécsénke−Kis-Ferenc-hegy, there is a leaf-point made of nummulitic chert (**Fig. 6, 2**). At the site Legénd 88, nearby the site Szécsénke−Berecz-oldal 4 (**Fig. 3/A-41; Fig. 4/A-41**), there is a broken leaf-point made of siliceous pebble (**Fig. 6, 1**). At the site Szécsénke−Berecz-oldal 3 (**Fig. 3/A-40; Fig. 4/A-40**), there is a "gigantolith", a large curved side-scraper. Its left edge and the distal part of the right edge are retouched. Dimensions are 92×67×29 mm (**Fig. 8, 2**). In **Fig. 10, 2, 4**, there are two siliceous pebble cores from the site Szécsénke−Berecz-oldal 2E (**Fig. 3/A-38; Fig. 4/A-38**) (see, also Péntek 2015, 54, Fig. 6.7).

At the site of Legénd−Rovnya 2, the ratio of the siliceous pebble is 17.08% (**Fig. 3/A-30; Fig. 4/A-30**) in the heterogeneous assemblage of 972 artefacts. Among the 46 tools, 22 pieces are made of siliceous pebble (47.83%).

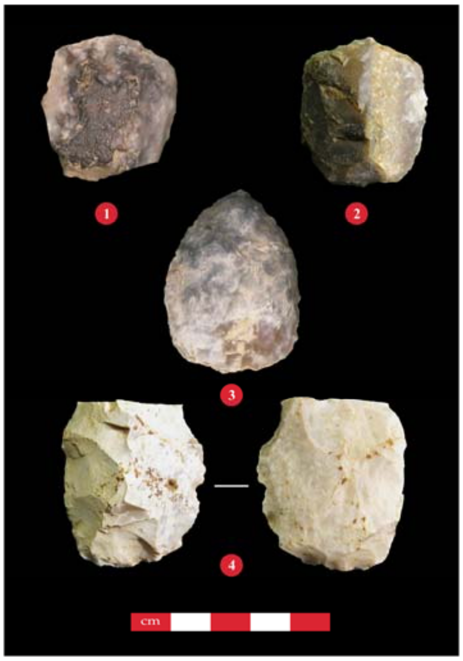

Fig. 5.: Selected tools made of siliceous pebble.
5. ábra: Válogatott kovakavics eszközök.
1, 3 = Szécsénke−Kis-Ferenc-hegy (A-42); 2, 4= Szécsénke−Berecz-oldal 3 (A-40):
:

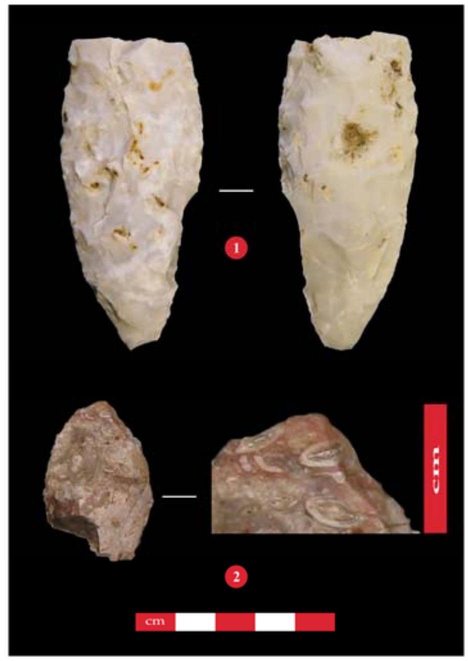

Fig. 6.: Selected leaf-shaped tools made of siliceous pebble (1) and nummulitic chert (2).
6. ábra: Válogatott levéleszközök kovakavicsból (1), nummuliteszes kovakavicsból (2).
1 = Legénd 88 (A-23); 2 = Szécsénke−Kis-Ferenc-hegy (A-42)

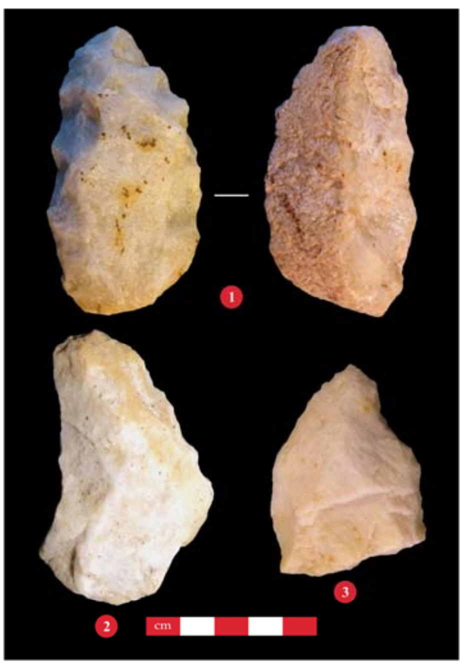

Fig. 7.: Selected tools made of quartzite.
7. ábra: Válogatott kvarcit eszközök.
1 = Bér−Szár-hegy (A-4); 2 = Legénd−Rovnya 2 (A-30); 3 = Buják−Szente 2 (A-9)

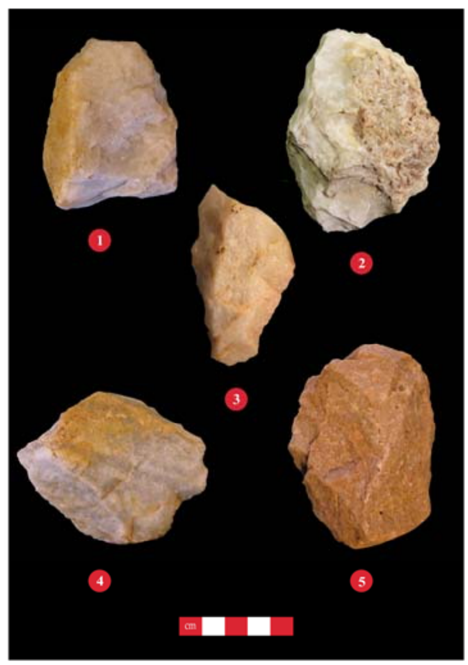

Fig. 8.: Selected artefacts made of quartzite (1, 3-5) and siliceous pebble (2).
8. ábra: Válogatott leletek kvarcitból (1, 3-5) és kovakavicsból (2).
1 = Bér−Szár-hegy (A-4); 2 = Szécsénke−Berecz-oldal 3 (A-40); 3 = Bercel−Erdőben-vége 2 (A-6); 4, 5 = Legénd−Hosszú-földek (A-24)

Fig. 9.: Selected flakes made of quartzite.
9. ábra: Válogatott kvarcit szilánkok.
1 = Szécsénke−Berecz-oldal 3 (A-40); 2 = Bercel−Erdőben-vége 2 (A-6); 3, 4 = Legénd−Hosszú-földek (A-24)

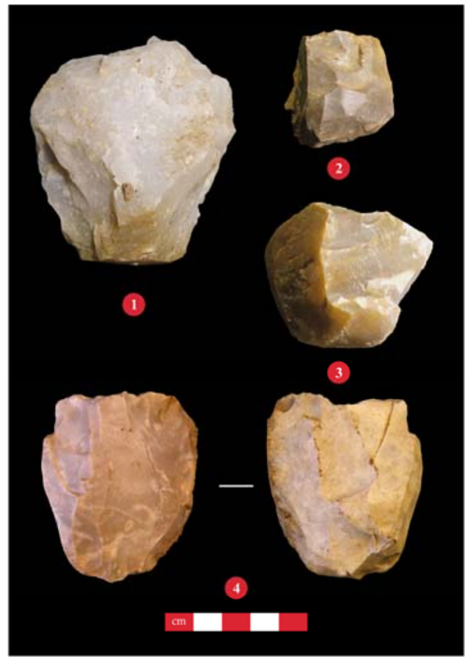

Fig. 10.: Selected cores made of quartzite (1, 3) and siliceous pebble 2, 4).
10. ábra: Válogatott magkövek kvarcitból (1, 3) és kovakavicsból (2, 4).
1 = Szécsénke−Berecz-oldal 3 (A-40); 2, 4 = Szécsénke−Berecz-oldal 2 (A-38); 3 = Szécsénke−Berecz-oldal 1 (A-37)

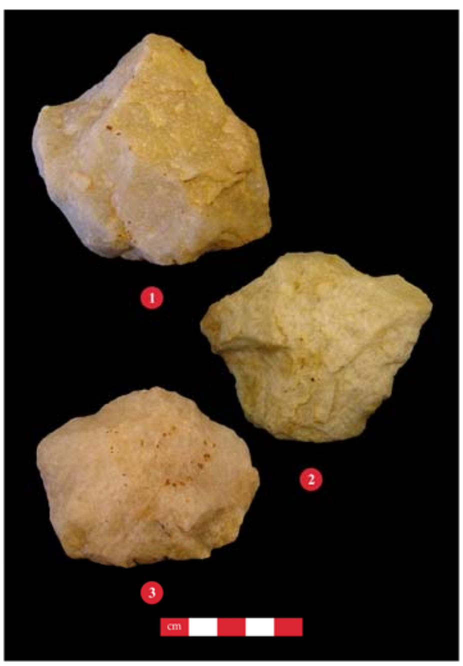

Fig. 11.: Selected cores made of quartzite.
11. ábra: Válogatott kvarcit magkövek.
1 = Szécsénke−Berecz-oldal 3 (A-40); 2 = Bercel−Pinurka (A-7); 3 = Buják−Szente 2 (A-9)

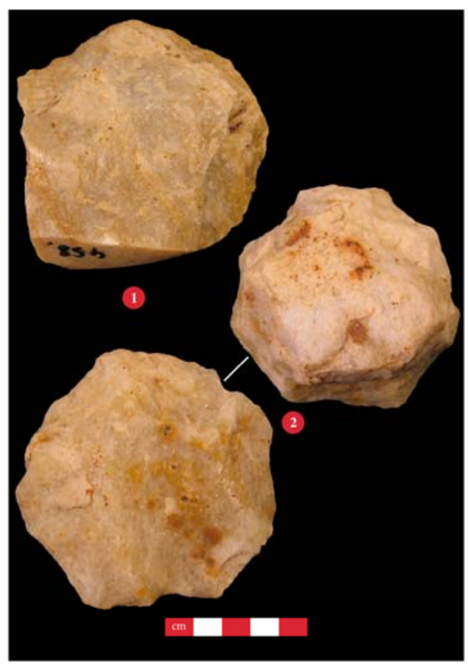

Fig. 12.: Selected cores made of quartzite.
12. ábra: Válogatott kvarcit magkövek.
1 = Bercel−Erdőben-vége 2 (A-6); 2 = Bercel− Erdőben-vége 1 (A-5)

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The Palaeolithic artefacts can be associated with the Micoquian-Bábonyian industry of the nearby Legénd−Káldy-tanya site-complex (Markó & Péntek 2003-2004), or with the assumed Szeletian-like industry of the surroundings of Szécsénke (Péntek & Zandler 2013b; Péntek 2015). The Aurignacian-blades, burins and fragments of backed pieces are likely in connection with the Upper Palaeolithic Aurignacian site of Legénd−Hosszú-földek (Péntek & Zandler 2013a; Péntek 2016, 2018).

The occurrence is high at the Middle Palaeolithic to Upper Palaeolithic Transient and/or Early Upper Palaeolithic sites, such as the Bér−Egresi-dűlő site (**Fig. 3/A-2; Fig. 4/A-2**). The proportion of siliceous pebble in the total lithic assemblage is 9.68%, and among the 42 tools, there are seven (16.67%) made of this raw material. The assemblage of the site is somewhat mingled, containing also Neolithic artefacts, which were not difficult to isolate during processing. Palaeolithic finds are more likely to be classified as Middle Palaeolithic. In the Bér−Papi-földek (**Fig. 3/A-3; Fig. 4/A-3**) the proportion of siliceous pebble in the total assemblage is 14.0%, six of the 12 tools are made on siliceous pebble blank. The assemblage contains leaf-points, bifacial tools and Aurignacian end-scrapers. The site has been rated as *sensu lato* Aurignacian site (Péntek & Zandler 2017).

At the Early Upper Palaeolithic site Bercel−Erdőben-vége 2 (**Fig. 3/A-6; Fig. 4/A-6**), among the recorded 109 lithic finds, there are 15 siliceous pebble artefacts (13.76%). There are no siliceous pebble tools or cores present, but the importance of the raw material is evidenced by the presence of mostly unretouched flakes of great dimensions (Péntek 2021a, Péntek in press).

At the Aurignacian site of Legénd−Hosszú-földek(**Fig. 3/A-24; Fig. 4/A-24**), the local siliceous pebble makes up 22.45% of the lithic assemblage. With a much higher percental ratio (38.36%) it is the most frequent raw material among the tools (Péntek 2018, 60, Table 1-2). The most likely source of the siliceous pebbles is the gravel exposed at 200-250 m to the southwest of the site. Its geological age is Upper Oligocene (Noszky 1940, 43-47). This gravel bank dominantly contains quartzite pebbles, but siliceous pebbles of good knapping quality are abundant too. In the lithic assemblage, only a small number of artefacts are covered partly with a cortex, so the initial shaping of the cores presumably happened in the area of the gravel outcrop (ibid., 61).

The utilization of the siliceous pebble is rather high (*ca.* 50%) with about 100−150 lithic artefacts in the unpublished lithic assemblages of some Neolithic sites, such as Cserhátsurány−Bányai-oldal (**Fig. 3/A-11; Fig. 4/A-11**) and Legénd−Remete (**Fig. 3/A-28−A-29; Fig. 4/A-28−A-29**).

3.3. Petrified wood utilization

Despite the relatively common occurrence of petrified wood in the discussed area, the utilization is rather infinitesimally low.

In **Fig. 13/2**, there is an atypical tool made from a tabular petrified wood piece from the small lithic concentration Vanyarc−28 (**Fig. 3/A-52; Fig. 4/A-53**). The orientation of the specimen is arbitrary. Dimensions are 41×30×10 mm. The "distal" end is "pointed", on the left side, there is a notch-like removal and fine retouch, the right side is retouched with abrupt retouch. The right lateral side of the "proximal" end and the base itself is also abruptly retouched. It can be attributed very likely to the so-called Middle Palaeolithic "Vanyarc-type" industry. As accompanying artefacts, the side-scraper made from a thick siliceous pebble flake (**Fig. 13/1**), and the quartzite flake (**Fig. 13/3**) were found at this concentration too.

As a scattered find, there is a microblade core of likely Neolithic character from Buják−Aranykút-puszta somewhere between **Fig. 1/N-13** and **Fig. 1/N-26**. This artefact is made actually of wood opal. It is a form of petrified wood which has developed an opalescent sheen or, more rarely, where the wood has been completely replaced by opal. Other names for this opalized sheen-like wood are opalized wood and opalized petrified wood.

At the Palaeolithic site of Becske−Júlia-major (**Fig. 3/A-1; Fig. 4/A-1**), there is a fragmented simple side-scraper with an irregular lateral working edge, made of petrified wood (Péntek 2021c, 26, Fig. 4, 8). From a technological and typological point of view, the lithic assemblage of the site can be considered as heterogeneous, in which Late Middle Palaeolithic and/or Early Upper Palaeolithic tools (including leaf-shaped tools) dominate.

Quartzite utilization

Quartzite pebbles have the most common occurrence in the gravel banks. This fact can therefore obviously explain the very frequent presence of quartzite artefacts almost without exception at all Palaeolithic sites. There are mainly large flake cores, very often unimodal discoid cores, but the majority of quartzite artefacts are flakes of different sizes without retouching. The general presence of the unworked flakes in great quantities can be explained through the fact, that because of the resistance of the edges the flakes may have been suitable to fulfil some working functionalities, such as cutting or scraping. The tools made of quartzite are mostly rough-and-ready manufactured tools without any finer elaboration.

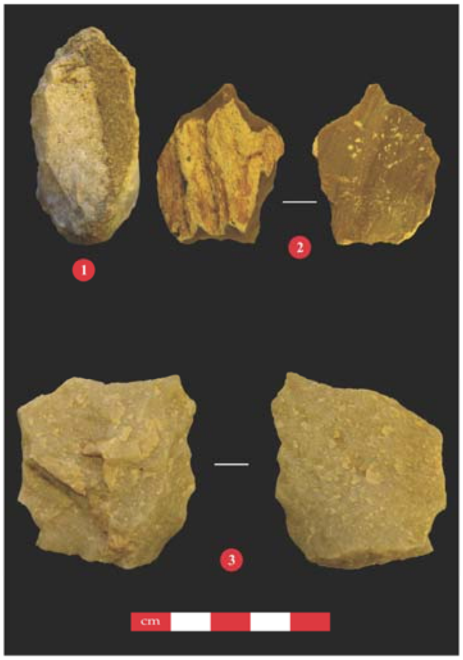

Fig. 13.: Selected tools from the lithic concentration Vanyarc 28 (A-54)
13. ábra: Válogatott eszközök Vanyarc 28 (A-54) lelet-koncentrációból

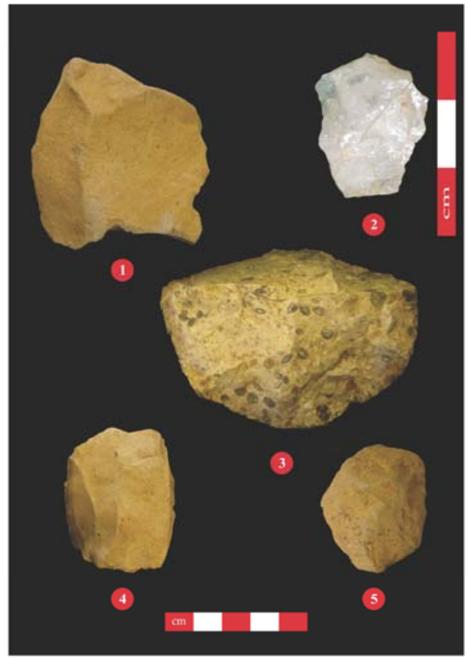

Fig. 14.: Selected artefacts from various sites.
14. ábra: Válogatott leletek különböző lelőhelyekről.
1 = Vanyarc−Szlovácka-dolina 1 (A-51); 2, 4 = Szécsénke−Berecz-oldal 3 (A-40); 3 = Vanyarc 16 (A-53); 5 = Vanyarc−Makói-oldal 19/2 (A-49)

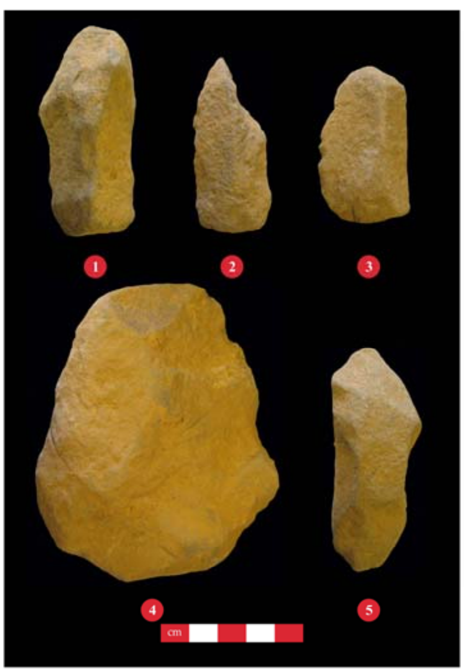

Fig. 15.: Selected andesite artefacts from Szécsénke−Berecz-oldal 3 (A-40) site
15. ábra: Válogatott andezit leletek Szécsénke−Berecz-oldal 3 (A-40) lelőhelyről

These quartzite tools do not belong to the primary, principal tool-kit of the industries, they belong to the so-called "collateral industry" („*Begleitindustrie*" *sensu* Karel Valoch at some Moravian and Slovakian Szeletian sites (Valoch 1955, 28-32).

Szécsénke−Kis-Ferenc-hegy site and other sites and find concentrations localized on both sides of the Halyagos streamlet, which are regarded as parts of a Szeletian site-complex, are characterized by relatively significant quartzite utilization (**Fig. 3/A-37−A-42; Fig. 4/A-37−A-42**). The ratio of quartzite artefacts varies between 0.22% to 4.92% (Péntek 2015, 64, Table 1.). The likely source of the quartzite pebbles is either the Szécsénke-Kis-Ferenc-hegy site itself or the gravel bank which can be found in the area of the Szécsénke-Berecz-oldal 2W site 1 km to the Northwest. The quartzite pebbles dominate the composition of the gravel bank. In **Fig. 9, 1**, there is a large quartzite flake of relatively rare greenish colour from the site

Szécsénke−Berecz-oldal 3 (**Fig. 3/A-40; Fig. 4/A-40**). In **Fig. 10, 1, 3**, there are quartzite cores from the sites Szécsénke-Berecz-oldal 3 (**Fig. 3/A-40; Fig. 4/A-40**), and Szécsénke−Berecz-oldal 1 (**Fig. 3/A-37; Fig. 4/A-37**). Another quartzite core from the previous site is in **Fig. 11, 1**.

For the time being, there is only one, rather atypical microlithic tool made of vein quartzite from the site

Szécsénke−Berecz-oldal 3 (**Fig. 3/A-40; Fig. 4/A-40**). The broken-lined distal end is finely retouched. The tool can be classified in a broad sense as an end-scraper (**Fig. 14, 2**). Dimensions are 21×18×8 mm (Péntek 2015).

At the Szeletian site of Buják−Szente, among the 1,495 artefacts, there is a single quartzite artefact, a double side-scraper (Péntek & Zandler 2014, 5, Table 1-2). The semi-abruptly retouched left lateral edge is a convex working edge. The right lateral edge is semi-abruptly retouched; the distal end is concave and the proximal end is almost straight (**Fig. 7, 3**).

At the Early Upper Palaeolithic site Bercel−Erdőben-vége 2 (**Fig. 4/A-6; Fig. 5/A-6**), the ratio of quartzite is very high, among the recorded 109 lithic finds, there are 34 quartzite artefacts (8.31%). The quartzite artefacts include a large number of cores, core fragments and flakes. There are no retouched quartzite tools. Based on the general morphology of the flakes, it is more than likely that not only freehand knapping, but the bipolar-on-anvil technique was also applied on the site. In **Fig. 9, 2**, there is a quartzite flake, removed probably with freehand knapping. In **Fig, 12, 1**, there is a quartzite core from the site (Péntek 2021a, Péntek in press).

At the Aurignacian site of Legénd−Hosszú-földek (**Fig. 3/A-24; Fig. 4/A-24**), the ratio of quartzite artefacts in the entire assemblage of 1,782 pieces is 5.15% (Péntek 2018, 60, Table 1). Among the tools, there is a bifacial knife ("*Keilmesser*") with a natural back ("*couteau à dos naturel*"), made on a massive quartzite flake. Its straight right side-edge is unworked. The basis and the slightly curved left side-edge are partly covered by the original pebble cortex. Its dimensions are 67×37×17 mm. Besides this single tool, the other artefacts are mainly flakes of different sizes and shapeless, amorphous pieces (**Fig. 9, 3-4**). It is necessary to make some remarks regarding the amorphous artefacts. On the one hand, quartz is a fragile mineral; the massive varieties (microcrystalline or cryptocrystalline quartz) are somewhat tougher than the macrocrystallized ones. Quartz is more brittle than siliceous rocks and therefore the fragmentation is much more common during knapping (Tallavaara et al. 2010, 2442-2443). On the other hand, in connection with the bipolar anvil technique, William Andrefsky Jr. (2005, 153) wrote that the bipolar cores are generally amorphous and are easily interchangeable with angular fragments. Lastly, quartzite as a metamorphic rock, because of the rigidness of the quartz mineral, is very resistant to thermal effects. Despite this fact, as a consequence of a sudden change of temperature, quartzite pebbles tend to burst, fracture into blocky fragments and remain in place without scattering over distances (Petraglia et al. 2002, Section 11-6.).

In **Fig. 7, 1**, there is a denticulated tool from the site of Bér−Szár-hegy, which has been classified as *sensu lato* Aurignacian site despite the present bifacial and leaf-shaped tools. In the lithic assemblage of 1,447 artefacts, quartzite as a lithic raw material has a subordinate role (7 artefacts; 0.48% of the total assemblage) and there is only this single tool made of quartzite (Péntek & Zandler 2017).

At the site of Legénd−Rovnya 2, in the lithic assemblage of 972 artefacts, there are 10 quartzite artefacts altogether (1.95% of the total assemblage). Among the 46 tools, two side-scrapers (denticulations) were made of quartzite (see, for example, **Fig. 7, 2**) (Péntek & Zandler 2013a; Péntek 2016).

Discussion

According to Andrefsky (1994), a primary and important distinction has been made between tools with little effort in their production (informal tools) and tools with more effort expended in their production (formal tools). "*Formal tools have been characterized as flexible tools, or tools are designed to be rejuvenated and have the potential to be redesigned for use in various functions*." (Goodyear 1979, 4). Following the argumentation of Andrefsky, formal tools have generally been linked with hunter-gatherer groups practising mobile settlement strategy and thus having short-term site occupations. Since mobile groups may not find lithic raw materials suitable for manufacturing tools in the occupied region, so they must have ready-made tools available.

Informal tools are unstandardized or casual concerning to form and believed to have been manufactured, used, and discarded over a relatively short period. Informal tools are thought to be associated with sedentary settlement strategy, having longer-term site occupation. Unlike mobile groups, sedentary groups do not have to expend extra effort in the production of formal tools. Based on the analysis of archaeological data from different parts of western North America, against these above-mentioned generalizations, Andrefsky suggested that "*… mobile prehistoric populations would not necessarily produce formal tools if good-quality lithic raw materials were readily accessible at needed locations. Similarly, if sedentary populations did not have access to readily available lithic raw materials, the production of wasteful informal tools would not necessarily be a common practice. Instead, I suggest that availability of lithic raw materials will influence the kinds of stone tools produced at a site, and that such influence may be only indirectly related to settlement configurations*." (Andrefsky 1994, 23).

In the Cserhát Mountains and the Galga Valley, no "base camp" *sensu* Lewis R. Binford (1979; 1980) has been located. There are, however several "large open-air sites" *sensu* Michael Bolus (2004), which are very often situated near raw material sources. In most cases these sites had extensive surface scatters, sometimes with several smaller find concentrations. These find concentrations may be separated from each other by gaps, areas without having lithic artefacts. These large open-air sites were repeatedly visited over a long period. The raw material utilization of this type of sites indicates well-aimed exploitation of the nearby raw material sources. The sites are also characterized by a high amount of debris, which should reflect the remains of flaking activities from several occupation events. In a very wide sense, the 5-6 larger sites and about the same number of smaller lithic concentrations, attributed to the "Vanyarc-type" industry can be considered as such a large open-air site or rather as site-complex (**Fig. 3/A-48−A-54; Fig. 4/A-48−A-54**). They are all located along with a 1,000 m wide comb in a range of 4,500 m long between the settlements Vanyarc and Kálló. The separating gaps have a length of about 200-300 m. Based on the excavated lithic material (Markó 2008-2009, 184), the local limnic quartzite dominates (62.03%), followed by the long-distance raw material felsitic porphyry (33.35%).

The sites at Szécsénke−Berecz-oldal (1, 2E, 2W, 3, 4; **Fig. 3/A-37−A-41; Fig. 4/A-37−A-41**) are situated along the southwestern verge of a comb, in a range of 2,000 m length. The centres of the sites are separated from each other by 100-350 m long gaps. The sites share the same technological and typological characteristics. Based on the previous publication of the lithic assemblages (Péntek 2015), the ratio of the dominant local limnic silicite in the total assemblages is between 52.17% and 68.56%, followed by the siliceous pebble (12.32%-32.30%). The long-distance raw material felsitic porphyry has only a subordinate role with at most 7.58%. In contrast, the proportion of diatomaceous earth among the tools is significantly higher; it varies between 28.57 and 45.16%. Especially concerning siliceous pebble, the most frequently used non-flint raw material, it is necessary to mention some new results of field surveys at the above-mentioned sites of recent years (Péntek 2020b, 2020c). According to the new data, the ratio of siliceous pebble in the total assemblages (390, 474 and 2,058 artefacts) is 18.46%, 15.61% and 8.36% at the sites of Szécsénke−Berecz-oldal 2E, Szécsénke−Berecz-oldal 2W and Szécsénke−Berecz-oldal 3 respectively. As regards the tools, the ratios are 32.08% (of 53 tools), 37.18% (of 55 tools) and 38.41% (of 151 tools) at Szécsénke−Berecz-oldal 2E, 2W and 3 respectively. The proportions are practically constant in the meanwhile significantly increased assemblages.

In general, the raw material utilization of non-flint raw materials, especially the high ratio of the quartzite and siliceous pebble (including nummulitic chert) artefacts on some Palaeolithic sites in the Cserhát Mountains may be explained as a particular tradition in raw material use, but it seems more likely that opportunistically the hunter-gatherer groups preferred the quartzite or siliceous pebbles of the nearby gravel banks over the local limnic silicite. A possible explanation of this behaviour is a practical one, the tools made of non-flint raw materials are very frequently *ad hoc*, spontaneous, rough-and-ready tools, which were discarded without reworking. There are, however, numerous examples where very fine elaborated tools had been manufactured from a siliceous pebble or even from nummulitic chert. Another possible explanation and it is likely a very striking one, that the manufacturers of the lithic tools did not know the accessibility of the geological sources of raw materials of better quality. They might have been "pioneers" in the Cserhát Mountains, lacking a kind of "know-how" on the conditions. In addition to the concepts of curated and expedient technologies, described by L. R. Binford (1979, 1980), Margaret C. Nelson (1991, 62) added the opportunistic behaviour, contrasting this opportunistic, unplanned technological behaviour with expediency. According to Binford, expediency refers to the minimized technological effort under conditions where time and place of use are highly predictable. Opportunistic behaviour is a response to immediate, unanticipated conditions. It is very likely that in the case of locally available raw materials of relatively low flaking quality, such as some non-flint lithic raw materials, an opportunistic behaviour can be assumed.

Only detailed lithic analyses made on complete lithic assemblages, containing not only manufactured tools but debitage products as well, can imply the nature of the used technological behaviour.

Conclusion

The utilization of some non-flint lithic raw materials in the Palaeolithic in the Cserhát Mountains and the Galga Valley (Northern Hungary) was investigated. A sketchy geological map with geological outcrops (**Fig. 16.**) visualizes some interesting facts (showing only a rough classification by the main geological epochs with a colour scheme that corresponds to what used by the Hungarian Institute of Geology). Though the map is not tightly joining to the archaeological information of this paper, it is apparent that most of the gravel occurrences connected to the Lower Miocene (to the west of the settlement Becske) and Upper Miocene (between the settlements Buják and Vanyarc and in the surroundings of Cserhátszentiván) geological formations.

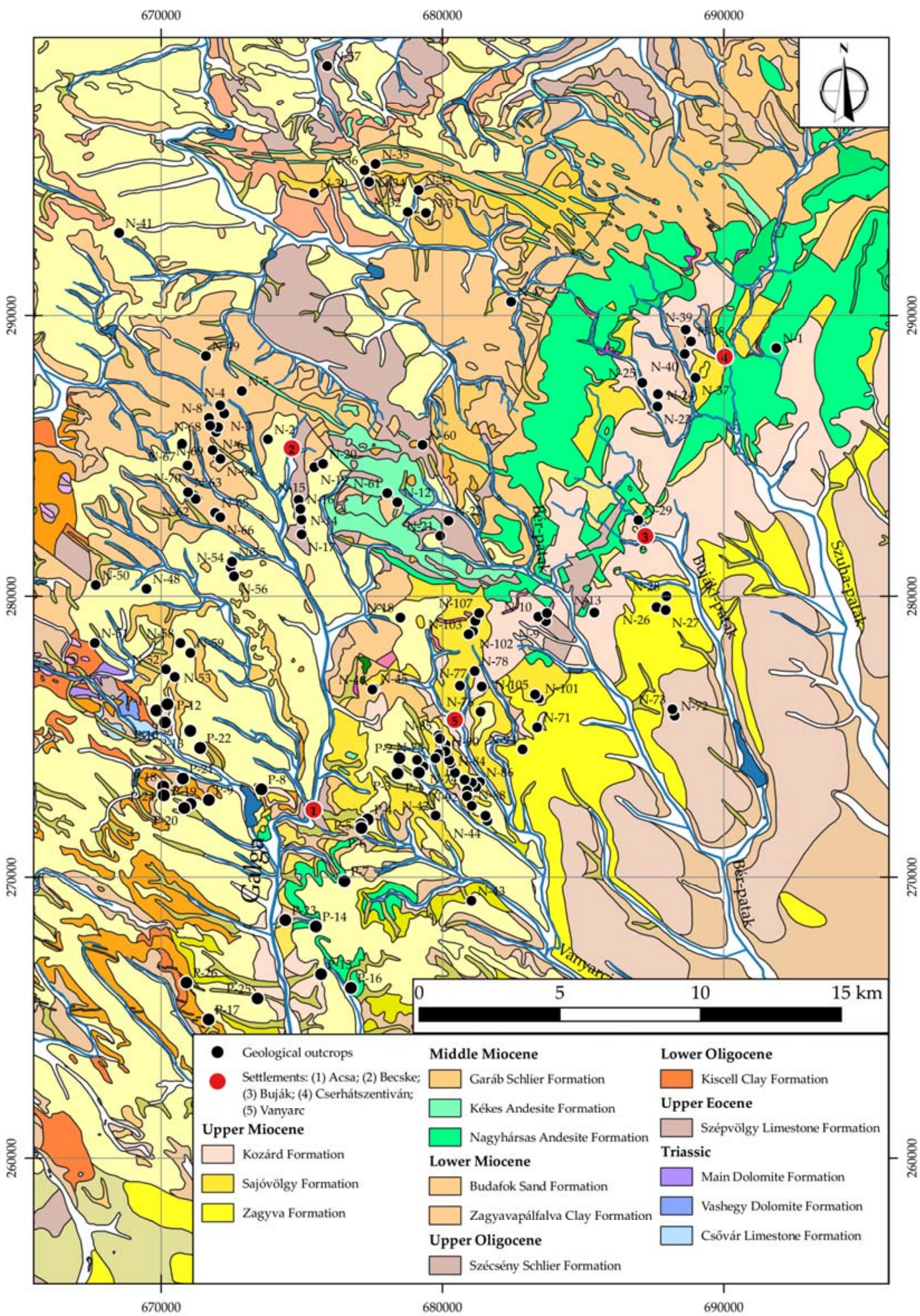

Fig. 16.: A sketchy geological map of the discussed area. Only some relevant geological epochs are shown. The geological outcrops are indicated with black circles.

16. ábra: A vizsgált terület vázlatos geológiai térképe. Csak néhány jelentősebb geológiai korszak lett feltüntetve. Fekete körök jelölik a geológiai előfordulásokat.

The former area was placed by Jenő Noszky (1940, 43) erroneously into the Upper Oligocene Chattian, according to the recent nomenclature it belongs to the Budafok Sand Formation (Hámor 1985, 235). Noszky (1940, 114) placed the latter area to the Lower Pliocene "higher Sarmatian terrestrial deposits", according to the recent nomenclature it belongs to the Sajóvölgy Formation (Hámor 1985, 262).

Based on such elementary correspondences, it is possible with successive approximation containing several feedback steps, to create a satisfactory predictive model. Let us assume that there are given one or more archaeological sites in an area with documented utilization of some non-flint raw material, such as quartzite or siliceous pebbles, and given some gravel beds in the vicinity of the site. With the help of such a sketchy geological map, there is always a possibility to formulate hypotheses referring to further gravel beds. These hypotheses should be checked and so they will be proved or disproved, in any case, supplying additional information. According to our observations made in the Cserhát Mountains, several gravel beds containing also debris, waste products from manufacturing chipped stone implements. This can indicate the occurrence of some unknown archaeological sites as well. Applying this Sisyphean prospecting method systematically, both from an archaeological and geological point of view, we can have a more complex image of a given region.

In the recently published paper (Péntek 2019), the utilization of quartz and quartzite as lithic raw materials in the Hungarian Palaeolithic was reviewed. The ratio of these raw materials is significantly low at all open-air Palaeolithic sites both in the Eger–Bükkalja and the Sajó Valley area. On the contrary, their intensity is higher at the Palaeolithic sites of the Cserhát Mountains. The only conceivable explanation is the research hiatus likely caused by disinterest. To the author, no field surveys or prospects are known concerning the geological formations and possible lithic raw material sources from an archaeological point of view in the above-mentioned areas. Up to now, only one attempt has been made to discuss the raw material utilization of a Palaeolithic site. It is the Upper Palaeolithic "Epiaurignacian" site Andornaktálya–Zúgó-dűlő (Mester 2009; Mester & Kozłowski 2014). It would be very desirable to change drastically this situation and make up the research hiatus.

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