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A FIELD SURVEY OF KNAPPABLE RAW MATERIALS IN THE EASTERN MECSEK AREA

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The topic of the present article is a new geo-archaeological project in the Eastern Mecsek area, whose aim is to research knappable raw materials in this micro-region. The original focus of this examination is the assemblage of chipped stones amounting to nearly 6,500 pieces from the Alsónyék–Bátaszék (Tolna County) site. A significant portion of this lithic assemblage is made from Mecsek radiolarite, which indicates the local supply zone for the site, namely the Mecsek Mountains. From the aspect of provenance, this region is not as well researched as is the case for the Bakony Mountains or the North Hungarian Mountains. The main question of the research is what kind of knappable raw materials were available for the Late Neolithic stone tool making specialists and which were used for knapping. Furthermore, where were the raw material sources located, what types are these, how was it possible to procure the rocks and was it necessary to mine them? In light of the answers to these questions, we can conclude the local raw material procurement activity of the Late Neolithic Southern Transdanubian communities.

THE STARTING POINT OF THE RESEARCH

The basic topic for the research and the subject of the author's doctoral dissertation is the chipped stone tool production activity of the Late Neolithic Lengyel culture, in particular at the Alsónyék–Bátaszék site (Osztás et al. 2013a; Osztás et al. 2013b). Here most of the stone tools were made from Mecsek radiolarite, just as is the case for the other published sites in Southern Transdanubia (Zengővárkony, Mórágy–Tűzkődomb, Pécsvárad–Aranyhegy, Lengyel–Sánc, Villánykövesd) (Biró 1989: 26-28; ibid. 1990: 69; ibid. 1998: 36; Bácskay–T. Biró 1984; Bácskay 1989, ibid. 1990) (*Fig. 1*).

It is important first of all to clarify what is considered a radiolarite. Radiolarite is a sedimentary rock that originated in the deep sea from the skeletal elements of siliceous tests (radiolarians) in the Mesozoic Era in geology. It can be found throughout a large area geographically, such as in the Alps, the Carpathian Mountains and across the Balkans to the Himalayas (Barabás 1986: 131-140; Hartai 2008, 17-24). It is a highly durable, hard rock, and because of this it is ideal for knapping. The radiolarites are grouped according to their texture type, color, and brightness, which are characteristic of particular mountain ranges, so they also represent territorial groupings. Due to this we prefer to use groups of radiolarite, as well as other rock types in chipped stone research to determinate the supply

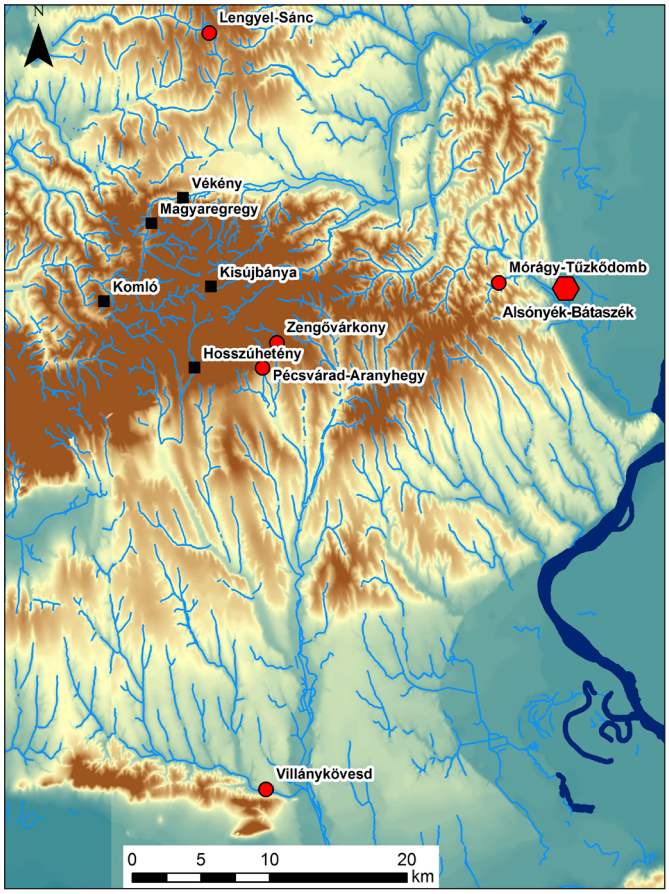

Figure 1. Location of Alsónyék–Bátaszék and the published sites of the Lengyel culture's Southeastern Transdanubian group (Legend: black squares – geological sources of Mecsek radiolarite; red dots – published sites; red hexagon – Alsónyék–Bátaszék). Created by Peter Czukor.

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zone of the particular site. In Transdanubia we distinguish between Bakony and Mecsek radiolarites. The latter type typically has a silky brightness that distinguishes it from the vivid coloration of Bakony radiolarite. Mecsek radiolarite is characterized by two major color types, one has a darker brown and maroon shade, while the lighter versions are distinguished by white, gray, green, blue and variations (Biró 1988; Biró–Dobosi 1991; Biró–Szilágyi–Kasztovszky 2009: 27-29) (*Fig. 2*).

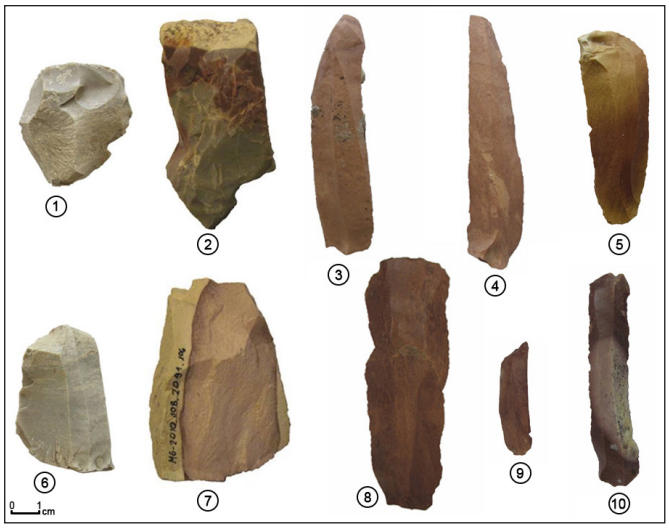

Figure 2. Stone tools from Mecsek radiolarite at the site Alsónyék–Bátaszék. Graphic design: Peter Czukor. Retouched flake: 1, raw material block: 2, cores: 6-7, blades: 3-5 and 8-10.

Since Mecsek radiolarite dominates in the stone assemblages of the listed Lengyel sites, the local supply zone for these can be localized to the Eastern Mecsek area. The sites farthest from the mountain range can be identified just 40 kilometers away. In the geological literature the sources of raw materials for Mecsek radiolarite are in the vicinities of Komló, Hosszúhetény, Kisújbánya, Magyaregregy and Vékény (Barabás 1986, Konda 1986; Gyalog 2005). There has not been systematic provenance (origin) research in the Eastern Mecsek area, as has been done in the Bakony Mountains or the North Hungarian Mountains, and this reinforced the necessity for field research.

THE AIM OF THE RESEARCH

In light of the local raw material dominance of the Southern Transdanubian Late Neolithic site's stone assemblages, important questions are, which the types of rocks are suitable for knapping, what are their quantities, what are their qualities and above all where are they located. Therefore, during the field survey we didn't focus only on the raw material sources of the radiolarites that were in the archaeological assemblages, but instead we wanted to include all the rocks that were suitable for knapping. Our aim was to map the entire raw material spectrum and thus to get to know the strategy for the selection of the stones for knapping by the Late Neolithic communities.

The main aim of the field survey is to find the exact location of the raw material sources and to examine their conditions, which may indicate the method of their procurement and may, indirectly, resolve the issue of the method and character of the utilization of environmental and natural resources within the system of relationships between the site and the culture. We are looking for an answer to the issue of knappable stone raw material procurement activity in the Late Neolithic period, or in other words what kind of energy investment did the collection of rocks represent, and was it necessary to mine them or perform other special extraction activities.

By using a mathematical analogy, the knappable rocks of the Eastern Mecsek area represent the value set, while in turn the archaeological stone tools represent the interpretation range, and the assignment rule is the human decision, the choice itself. From an archaeological perspective, the main aim is to recognize the decision, namely what criteria were applied in the selection of knappable raw materials. These criteria are naturally diverse, and it is not only the physical properties of the rock that play a role, although there is no doubt that this was probably one of the most important aspects in the decision.

Cultural traditions, personal choices and simple physical appearance could also have been major elements in the decision. For this reason it is not adequate to only examine radiolarites, but also to be familiar with the entire petrographic palette.

THE METHOD OF THE FIELD SURVEY

Before the field survey, we made an overview of the basic geological literature and chose possible sampling locations. The first step of the research was the collection and digitalization of the covered and uncovered

geological map sections of the Eastern Mecsek area. A covered geological map depicts geological formations on the surface, and an uncovered geological (pre-quarternary) map depicts a geological profile under near-surface (usually quaternary) formations (Vid. Gyalog 2013; https://map.mfgi.hu/). Jurassic and Cretaceous formations stand at the center of our research. The situation is facilitated by the fact that almost all of the formations have their own descriptions (Gyalog 1996; ibid. 2005: 76, Raucsik 2012a; ibid. 2012b; ibid. 2012c; ibid. 2012d). Therefore, the areas where the selected formations can be found to the greatest extent in the covered geological maps have priority. We started out from the assumption that we would be able to identify and document the variety and characteristics of the rocks we were seeking to the greatest extent.

The delineation of the research area and the time schedule were chosen according to three criteria:
1. the presence of Jurassic and Cretaceous period formations
2. the quantity of formations, they should be found on the surface in major expanses
3. the extent the formation has been studied in the literature (how well known is the formation e.g.: type section, mapped on the level of a geological study path, known on the valley level, level of charting of the rock's age and position)

We chose four Limestone, one Calcareous Marl, and one Sandstone formation for investigation, and these needed to be thoroughly explored for the purpose of finding knappable raw materials. These formations are (*Fig. 3*):
1. Mecseknádasd Sandstone Formation $_{m}$J1 (Early Jurassic) (Raucsik 2012d: 159-163)
2. Komló Calcareous Marl Formation $_{k}$J1-2 $_{km}$J1-2 (Early-Middle Jurassic) (Raucsik 2012b: 174-176)
3. Óbánya Limestone Formation $_{ó}$J2 (Middle Jurassic) (Raucsik 2012c: 177-179)
4. Kisújbánya Limestone Formation $_{k}$J3 (Late Jurassic) (Nagy–Raucsik 2012: 184-186).
5. Fonyászó Limestone Formation $_{f}$J3 (Late Jurassic) (Raucsik 2012a: 180-183)
6. Márévár Limestone Formation mvJ3-K1 (Late Jurassic–Early Cretaceous) (Gyalog 2005: 76)

THE CONSIDERATIONS FOR THE PREPARATION OF THE RECONNAISSANCE MAP AND DOCUMENTATION

The systematic field survey was started in February of 2017. The order of the research areas selected on the basis of the pre-determined criteria was defined by the data maximum. Field collection began where the greatest amount of the basic information was known and then continued through the less known areas. The fundamental principle of the field survey method was set in

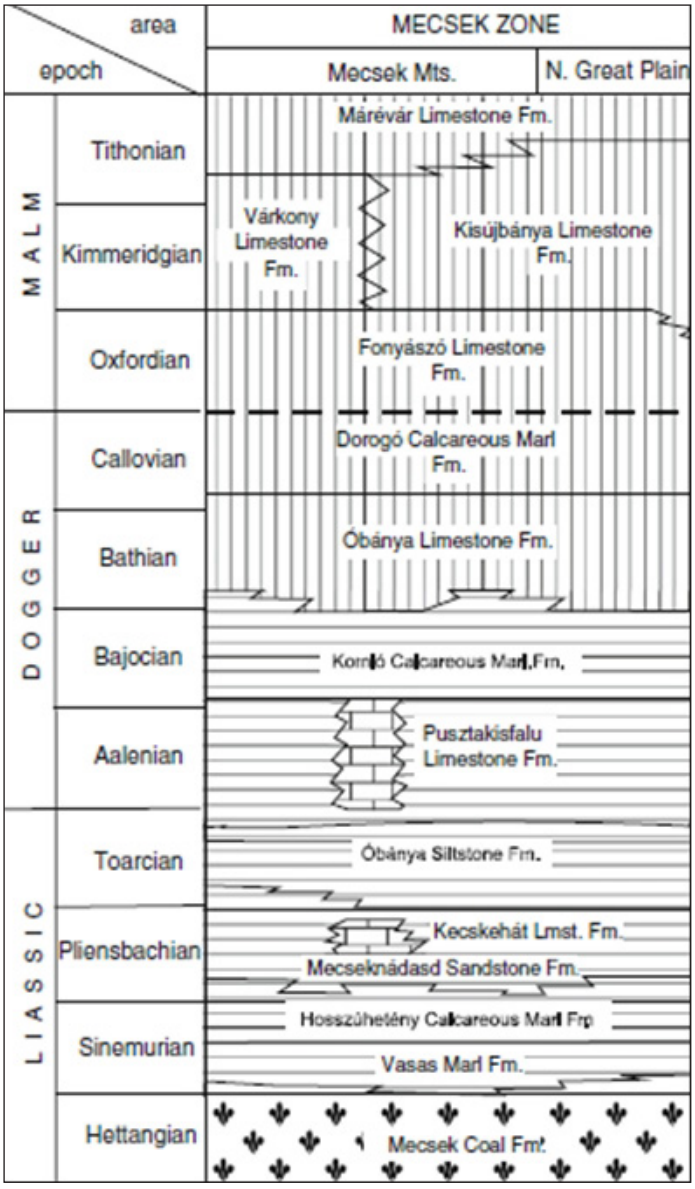

Figure 3. Jurassic formations of the Mecsek Zone (Haas 2001:128 Fig. 2.22.)

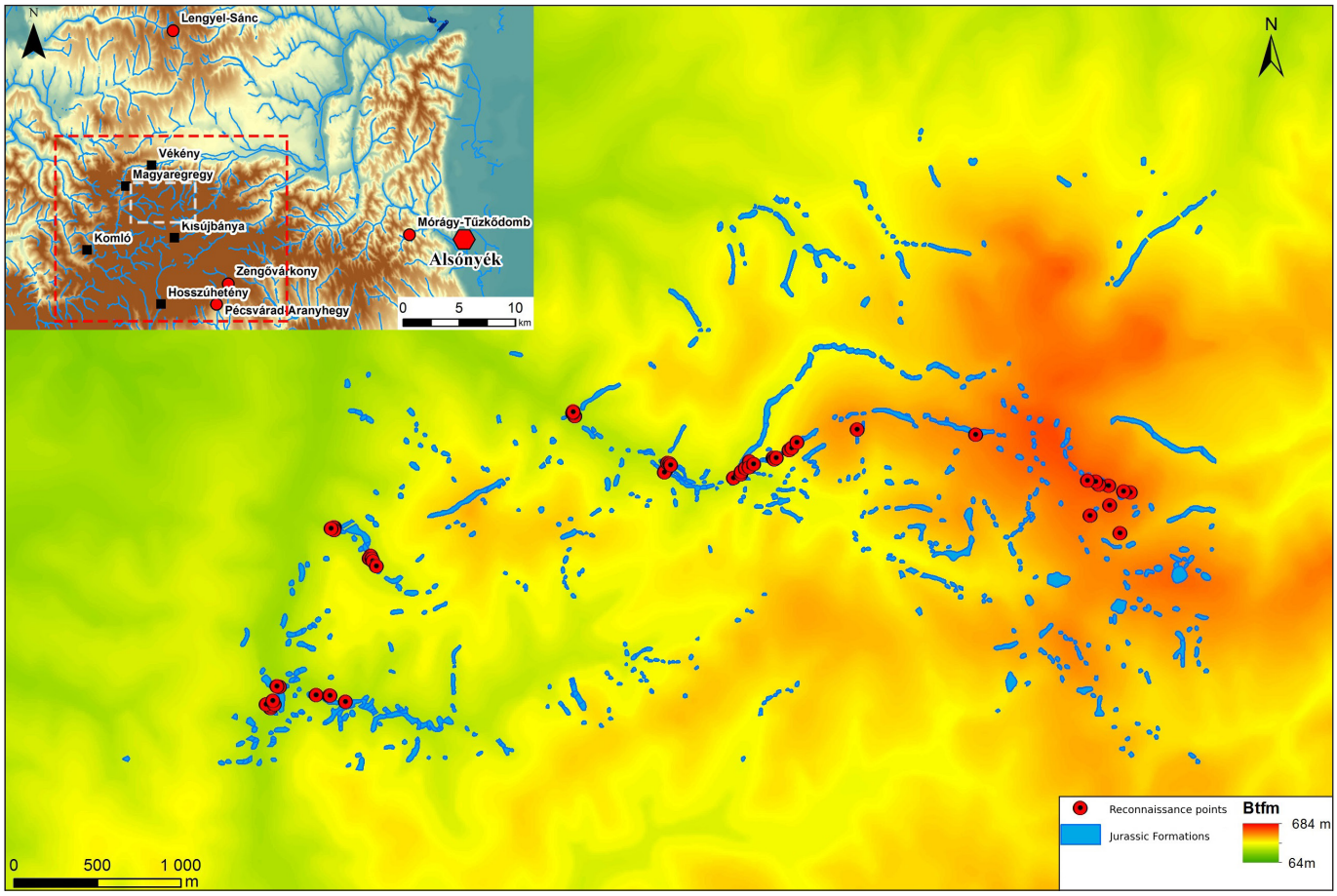

Figure 4. The micro-regional map of the Eastern Mecsek field survey project

advance, and the same detection and data collection criteria were consistently applied during the compiling of the database. The following information was recorded:

1. type of observations (e.g. source rock and outcrops)
2. GPS coordinates, relative altitude
3. key/signal code on the basis of the covered geological map, the identification of the formation in the case of an unknown area, if possible
4. photographic documentation
5. sampling (the rock was examined on a fresh fracture surface in every case, keeping a suitable quantity for polishing)
6. field observations (the character of the observation in the case of outcrops e.g.: what section of the stream valley, from the roots of a fallen tree, fixed point, recording evidence of human activity)
7. other comments (e.g. flint or radiolarite intercalations, tectonic type, and possible after effects).

During the field survey we tried to find observation points that were not in a modern gully, but instead were in stream valleys that presumably had similar a geomorphology 6,000 years ago. Accordingly, the Neolithic specialist in knapping could have found these formations in a geological sense, and furthermore these formations could have been on the surface and served as suitable collection sites (*Fig. 4*).

RESULTS TO THIS POINT

The several hundred samples that were gathered are an excellent collection for reference to compare with the archaeological stone tools, and moreover, they represent a sufficient basis for later scientific studies. As

Figure 5. Stream bead in the Márévár Valley

Figure 6. Outcrops in the Márévár Valley

the first step in the planned petrographic examinations we determined texture markers through microscopic observations.

In the archaeological stone materials, the heavily worn outer surface of innumerable radiolarite pebbles and nodules indicates that we can assume the raw material sources are in a secondary position (they have been moved from their original position and have accumulated through erosion e.g.: slope debris or alluvial deposits), which is shown by the collection of the raw materials in stream valleys. The rocks in stream valleys represent a good cross-section of the types of raw materials nearby, since almost all rocks found in a stream's drainage area can be considered deposits. The transporting activity of the stream also sorts the rocks quite well; the largest and heaviest stones are deposited in the upstream area, while the smaller stones, depending on their weight, are transported by the water current towards the downstream area (Mester 2013). As a result of this transporting activity, the outer surfaces of the smaller pieces become heavily worn. Stream valleys could potentially be a good place for the collection of raw materials, but it is not possible to clearly infer the overall character of the bedrock that has produced the rocks found there (*Fig. 5*).

Numerous Mecsek radiolarite blades are found in the archaeological assemblage – almost always as grave goods – that are much larger than the largest length of the core stone in the settlement's materials (Szilágyi 2017: 114-118). During the field survey, it was not possible to find pebbles or nodules of this size in the stream valley that could have produced such large blades. This fact is positive feedback regarding our primary aim to search the outcrops, and confirmed the hypothesis that was made during the processing of the archaeological material that it was not only rocks from stream valleys that were used in tool production. It was possible to identify silicified or radiolarite layers of such size, extent and texture in the outcrops that would have provided sufficient raw materials to create the aforementioned large blades (*Fig. 6*). These outcrops were probably also available in the Late Neolithic period. Due to the thin-bedded structure, larger blocks can be supplied by the movement or percussion of sections that have been broken off or displaced, and these are specifically suitable for the creation of cores for longer blades.

SUMMARY

It can be concluded from the results that Late Neolithic knappers chose raw material sources depending upon what kind of stone tools or sets of tools they were making. The rocks collected in stream valleys were presumably perfectly suited for the production of smaller stone tools, and their procurement did not require a major investment of energy or time. In addition, we can hypothesize that they understood the transporting activity of the streams and their sorting properties, so they searched for bigger stones upstream. However, they could not have counted upon the ad hoc character of the stream in their search for larger blocks to make large core stones, so they searched for outcrops where they were certain to obtain these kinds of blocks of raw material.

On the whole, the Southern Transdanubian Late Neolithic community's method of obtaining raw materials can be considered a closed system, which was mainly oriented towards the Eastern Mecsek Mountains. Only a negligible amount of rock with origins further away can be found in the assemblages. Excellent knappable radiolarite intercalations (layers with rock of very different texture within the series of sedimentary layers of the host rock) can be found in the Jurassic and Cretaceous formations of the study area, and were available in sufficient quantities for the Late Neolithic communities. Their procurement did not require special exploitation activities, adequate knowledge of the raw materials and the local area were sufficient, so a strict division of labor cannot be assumed between the contemporary Lengyel communities.

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