**The field survey of the knappable raw materials in the East-Mecsek territory**

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The origin of the research

The chipped stone tool production activity of the Late Neolithic Lengyel culture is the origin of the research. Especially Alsónyék–Bátaszék site (Osztás et al 2013a; Osztás et al 2013b), where most of the stone tools made from Mecsek radiolarite like in the case of the more South-Transdanubian published site (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). Mecsek radiolarite has a very diverse texture, color variation, and pattern (Fig. 1).

 It is important first of all to clarify what is considered as a radiolarite. The radiolarite is that a sedimentary rock, which in the deep sea is arisen from the skeletal elements of flint-framed (radiolaria) in the historical geology meantime (Mesozoic). It can be found on a large area geographically, thus in the Alps, the Carpathian Mountains and across the Balkans to the Himalayas (Barabás 1986: 131-140; Hartai 2008, 17-24). It is highly resistant, hard rock, because of this, it is ideal for knapping. The radiolites are grouped according to the texture type, color, and brightness, which are characteristic of a particular mountain range, so they also represent territorial groupings. In the chipped stone research, we use by choice the radiolarite – and other rocks – groups to determinate the supply zone of the particular site. In Transdanubia, we distinguish the Bakony and Mecsek radiolarites. The latest type is typically silk brightness, that distinguishes it from the vivid colored Bakony radiolarite. The Mecsek radiolarite is characterized by two large color variations, one of the darker tone brown and claret shade, while in the lighter versions are distinguished by white, gray, green and blue and their variations (Biró 1988; Biró–Dobosi 1991; Biró–Szilágyi–Kasztovszky 2009: 27-29) (Fig. 2).

 The local supply zone of the listed Lengyeli sites can be localized to the East-Mecsek territory. The farthest sites localized just 40 kilometers from the Mountain. The raw material sources of the Mecsek radiolarite are Komló, Hosszúhetény, Kisújbánya, Magyaregregy és Vékény surroundings in the geological literature (Barabás 1986, Konda 1986; Gyalog 2005). In the East-Mecsek territory, it has not been happening thus systematic provenance (origin) research, like in the case of Bakony Mountain or the North-Mid-Mountain range, which confirmed the necessity of field research.

The aim of the research

 In the light of the local raw material dominance of the Southern-Transdanubian Late Neolithic site’s stone collections it is an important question, which is the knappable rock’s type, these are how many quantities, what kind of quality and, above all, where they are located. Therefore, during the field survey, we didn’t focus only just the raw material sources of the radiolarites which were in the archaeological collections, but we wanted to include all the rocks which suitable for knapping. Our aim was to map the entire rocks spectrum and thus to get to know the strategy for the selection of the knappable raw material for the Late Neolithic communities.

 The main aim of the field survey is to find the exact location of the raw material sources and measurement of its position, which may refer to the procurement method. Thus in the relationship between the site and the culture, it can answer the surrounding and the natural sources utilization and character. We look for the answer for the late Neolithic knappable raw material procurement activity, thus how much energy investment could be the collection of rocks, whether it was necessary for mining or other special extraction activities.

 By using a mathematical example, the Eastern Mecsek's knappable rocks represent the value set, in turn, the archaeological stone tools mean the interpretation range, the assignment rule is the human decision, the choice itself. In the archaeological viewpoint, the main aim is to recognize the decision, what were the criteria to apply the knappable raw material selection. This criteria is naturally diverse, not only the rock physical properties have played this role, although there is no doubt that this was one of the most important decision criteria probably.

The cultural tradition, the personal decision, the simple physical appearance are also strong elements of the decision. For this reason, it is not enough to search just radiolarites, thus it is necessary to get to know the entire petrographical palette.

The method of the field survey

Before the field survey, we overviewed the basic geological literature and chose the possible sampling places. The first step was collection and digitalization the covered[[2]](#footnote-2) and uncovered[[3]](#footnote-3) geological map sections of the East-Mecsek, from which we focused on the Jurassic and Cretaceous Formations. The situation is facilitated by the fact that almost all of the formations have their own descriptions (Gyalog 1996; ibid.. 2005: 76, Raucsik 2012). Therefore, these territories have priority, where the selected Formations are in the largest extent in the uncovered geological maps. We started out from the assumption, thus we can identify and document perfectly variety and characteristics of the searched rocks. The delineation of the research area and the time schedule were done by three aspects:

1. the presence of Jurassic and Cretaceous period’s formations
2. the quantity of formations, could be in greater extension on the surface
3. the literature processing of the formation (how is known the formation e.g.: type section, mapped at geological study path, known as valley level, mapping level of the rock’s age and position)

We chose for investigation four Limestone Formations, one Calcareous Marl, and one Sandstone Formations, which it need to be thoroughly explored for the purpose of finding knappable raw materials. These formations are (Fig. 3):

1. Mecseknádasd Sandstone Formation mJ1 (early-Jurassic) (Raucsik 2012d: 159-163)

2. Komló Calcareous Marl Formation kJ1-2 kmJ1-2 (early-middle-Jurassic) (Raucsik 2012b: 174-176)

3. Óbánya Limestone Formation (middle-Jurassic) (Raucsik 2012c: 177-179)

4. Kisújbánya Limestone Formation kJ3 (late-Jurassic) (Nagy–Raucsik 2012: 184-186).

5. Fonyászó Limestone Formation fJ3 (late-Jurassic) (Raucsik 2012a: 180-183)

6. Márévár Limestone Formation mvJ3-K1 (late-Jurassic‒early-Cretaceous) (Gyalog 2005: 76)

**The aspects of the reconnaissance map and documentation making**

The systematic field survey was started in 2017 February. The order of the selected research area defined by data maximum, where most of the basic information was known, there began the field collection, and continue through the less known areas. The principle of field survey was laid down in advance, and consistently the same detection criteria and data collection criteria were applied during the database construction. The followed information was fixed:

1. type of observations (e.g. source rock and outcrop)

2. GPS coordinates, relative high

3. key/signal code about the uncovered geological map, the identification of the formation in the case of unknown area, if it is possible

4. photo documentation

5. sampling (the rock was measured on a fresh fracture surface in every case, packing away suitable quantity for thin selection making)

6. field observation (the observation’s character in the case of exposure e.g.: what kind of the stream valley, from the root of the fallen tree, fixpoint, fixing a trace of artificial activity)

7. other comments (e.g. flint or radiolarite intercalations, tectonical kind, and post effects).

We tried to find observational point not in a modern gully in the field survey, thus we were in stream valleys, which presumably had similar geomorphology 6 000 years ago. Accordingly, the prehistoric knapper specialist could find these formations in a geological sense, furthermore, these formations could be on the surface and served as suitable collecting places (Fig. 4).

The state of research

The collected more then hundreds of sample are perfect reference collection to compare with the archaeological stone tools, moreover, it means a sufficient base for the farther measurement of scientific studies. We managed to do the determination of the texture markers by the microscopic way, aówhich is the first step of the planned petrographical examination.

In the archaeological collection, many radiolarite pebbles and nodules have been heavily worn cortex, which shows that we can assume tertiary position raw material sources. This which proves the collection of raw material in the stream valleys. The stream valley’s rocks mean good cross-section about the types of raw materials nearby, sithence the occurrent rocks in the stream’s drainage area can almost all be found as a bed load. The streamlining activity of the stream is well graded by rocks, the largest and most difficult pieces are deposited in the upper section of the downstream. while the smaller pieces, depending on their weight, transport the water stream towards the lower section (Mester 2013). As a result of this transport activity, the cortex of smaller pieces is heavily worn. The stream valleys are potentially a good place from the viewpoint of raw material collecting activity, however, we can not clearly infer the overall, mother rock’s character about the rocks which found here (Fig. 5).

 In the archaeological assemblage, many big-sized Mecsek radiolarite blades are found – these almost as grave goods – which are much larger than the largest length of the core stone in the settlement’s material (Szilágyi 2017: 114-118). During the field survey, it was not possible to find so large flint or radiolarite pebble or nodule in the stream valley, from which it could have been made such also large blade. This fact is a positive feedback in that regard, that our aim was to search the outcrops, and confirmed the assumption that was made during the processing of the archaeological material, that not just from the stream valley’ rocks were used in the tool production. In the outcrops, we managed to identify such large, extension and texture silicified or radiolarite layer, which was sufficient raw materials o create the mentioned large-sized blade (Fig. 6). These outcrops were probably available in the Late Neolithic period because we neglected the modern gullies. For thin-bedded structure, it can supply bigger blocks by movement or percussion the broken and removed parts, these are perfectly suitable to create – specifically longer – cores.

Summary

It can be concluded from the results, thus it depends on what kind of stone tool or tool-series have made, in the light of the prehistoric knappers chose raw material sources. The stream valley collected rocks were perfectly to produce smaller-sized stone tools, these collect, whose procurement did not require more energy investment or a serious time spent. in addition, we can assume, that it was consciously counted on the activity of the stream valley and its classifying properties, and the bigger stone blocks were searched in the upper part of the stream. However, the finding of the larger blocks could not have entrusted the ad hoc character of the stream for the reason of the big-sized core’s preparation, but they searched for the outcrops very consciously, from where it has surely succeeded to supply such raw materials blocks.

 Ont he whole, the raw material system of the South-Transdanubian Late Neolithic community could be closed, which oriented mainly toward the East-Mecsek and, and only a negligible amount of distant origin rock could be found in the assemblages.Excellent knappable radiolarite intercalation can find in the searched Jurassic and Cretaceous formations in the study area, which were available in sufficient quantities for the Late Neolithic communities. Their procurement did not require special exploitation activities, the adequate raw material and local knowledge were sufficient for the procurement, thus, a serious division of labor not assumed between the contemporary Lengyeli communities.

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2. The covered geological map depicts geological formations on the surface. Vid. Gyalog 2013: Magyarország földtani térképe, 1:500 000. — a Magyar Földtani és Geofizikai Intézet kiadványa, Budapest, továbbá <https://map.mfgi.hu/>. [↑](#footnote-ref-2)
3. The uncovered geological (pre-quarternary) map depicts a geological picture under the near-surface (usually quaternary) formations. Vid.: https://map.mfgi.hu/. [↑](#footnote-ref-3)