

ГЛАСНИК

српског археолошког друштва

JOURNAL OF THE SERBIAN
ARCHAEOLOGICAL SOCIETY

Број
Volume 33

2017

Београд  Belgrade

ГЛАСНИК СРПСКОГ АРХЕОЛОШКОГ ДРУШТВА

Уредник: Дејан Радичевић

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За издавача: Адам Црнобрња

Издавач: Српско археолошко друштво, Чика Љубина 18–20, Београд

Лектура и коректура: Александра Шуловић

Лектура текста на енглеском: Ксенија Дуњић

Прелом: Кристијан Релић

Штампа: Colorgrafx, Београд

ISSN 0352-5678

УДК 902/904

JOURNAL OF SERBIAN ARCHAEOLOGICAL SOCIETY

Editor: Dejan Radičević

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Publisher's representative: Adam Crnobrnja

Journal of Serbian Archaeological Society is a peer-reviewed periodical published annually by: Serbian Archaeological Society, Čika Ljubina 18–20, Belgrade, Serbia

Proof reading: Aleksandra Šulović

Proof reading (english text): Ksenija Dunjić

Layout: Kristijan Relić

Printed by: Colorgrafx, Belgrade

Штампање часописа финансирало је Министарство културе и информисања Републике Србије.

The Journal was published with financial support of the
Ministry of Culture and Information of the Republic of Serbia

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MICRO-REGIONAL QUARRY–SETTLEMENT SYSTEM IN THE WEST–CENTRAL SERBIA: PRELIMINARY LOJANIK 2016 FIELDWORK REPORT

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e-mail: v.bogosavljevic@narodnimuzej.rs	Original research article
Received: 18. 7. 2017.	UDC: 903”632”(497.11)
Accepted: 13. 10. 2017.	902.2(497.11)”2016”

Abstract: *The tradition of exploitation and production of stone artefacts at Lojanik is very long, covering several archaeological periods, from early prehistory until nowadays. Direct acquisition of raw materials and artefacts from the Lojanik mine to the settlements from the Early Neolithic (Crkvine) and the Late Neolithic (Divlje Polje) near Kraljevo, has been confirmed. In the last three years, since the archaeological site Lojanik has been the subject of concern of museums and institutes for the cultural and natural heritage protection, a paradox is obvious, namely, although the entire zone formally presents a protected natural monument, it has been exposed to devastation for decades. During 2016, a set of broad archeological investigations was conducted, from mapping to analysing the main concentrations of human activities, i.e. stone raw materials mining from the Palaeolithic to modern times, which represents the first level of protection of this specific site. A total of seven archaeological clusters (chipped artefact concentrations) was recognized, mapped and analysed on the top of the Lojanik hill, where each cluster represents specific activities, from extraction zones to the places for production of tools. At Crkvine, the results of test-trenching showed that an Early Neolithic occupational horizon presents a space outside the residential structures. According to the characteristics of the shape, texture and decoration of ceramic pots, the relative chronological determination of this horizon approaches to the earlier phases of the Starčevo culture. The Mataruge rock-shelter presents another prospective prehistoric habitat, but it can be precisely defined only after previous preparation and realization of a protection project.*

Keywords: *Lojanik, Crkvine–Konarevo, stone raw materials, opals, silicified wood, exploitation, quarry, mine, Paleolithic, Neolithic, technology of chipped artefacts*

Introduction

During the last three decades, the first attempts to pay attention to pre-historic quarries, borrow pits and stone raw material mines came into view of our scholars. Such structures have been outlined and registered only as potential archeological sites, so until 1990, just three stone raw material mines were known in Serbia: Ramaća near Kragujevac (Jovanović and Milić 1998), Kremenac near Niš (Oršić–Slavetić 1936) and Lojanik near Mataruška Spa (Bogosavljević 1990). Identification and studying of the origin of stone raw materials at Neolithic sites was our initial motive to explore such mining resources. Petroarchaeological investigations and analyses of artefacts from large late Neolithic settlements, such as Vinča–Belo Brdo, Gomolava, Divostin and Divlje Polje have contributed to the formulation of question on the origin of raw materials for the purpose of obtaining blanks for making tools. Cryptocrystalline and microcrystalline silica rocks of different origin, from magnesite with a varying degree of silicification, amorphous cherts, silicified limestones, up to opals and chalcedonies, were the main materials in the chipping production.



Fig. 1. Lojanik: silicified wood in different phases of silicification (photos by D. Jovanović, V. Bogosavljević Petrović, and V. Dimić)

Сл. 1. Лојаник: примерци сировина петрификованог дрвета у различитим фазама силификације (фото: Д. Јовановић, В. Богосављевић Петровић и В. Димић)

At the end of the ninth decade of the 20th century, it was already assumed that the upper course of the Ribnica river had been the source of those raw materials because of striking domination of white opals, magnesite, but also the presence of distinctive black opals and silicified wood in the assemblage from Divlje Polje (Bogosavljević 1990; Богосављевић Петровић 1992, 9). The phenomenon of silicified wood in the context of the settlement, at that time seen as an unknown and even exotic, inspired questioning about its origin. The answer lay in the close vicinity of the prehistoric settlement, in the abovementioned region of the Ribnica river, on the Lojanik hill near Mataruška Spa (Fig. 1). The hill was visited for the first time already during 1989, when huge sediments from the production



Fig. 2. Lojanik (november 2015) – view from the south to the zone of recent 20th century mining activities (photo by D. Jovanović)

Сл. 2. Лојаник (новембар 2015) – поглед с југа на зону рецентних рударских радова из средине 20 века (фото: Д. Јовановић)

of silicified wood of mostly recent origin were registered (Fig. 2).¹ Occasional museum visits that followed were directed to track down original archaeological traces. It was only at the end of 2015 that topic-oriented surveys of the wider surroundings of the Lojanik hill were undertaken.²

In the meantime, intensive petroarchaeological investigations in this region were performed through the study of relationship between the prehistoric settlement of Crkvine in the village of Konarevo and Lojanik as the source of raw materials, which confirmed the assumptions on the strategy of local procurement of raw materials for an Early Neolithic settlement (Bogosavljević Petrović and

¹ Documentation of the National Museum Kraljevo, Archaeological Site Record Form, no. 32: the type of craft production of grinders for sharpening scythes and knives made of silicified wood during three decades, up to 1990.

² In November 2015, in the organisation of the National Museum in Belgrade and within the project “Interpretation, Origin and Distribution of Stone Raw Materials from Neolithic and Chalcolithic Sites in the Central Balkans“, there was a thematic survey of raw material phenomena in the surroundings of the Lojanik hill. The team: Dragan Jovanović, archeologist from the City Museum in Vršac, Divna Jovanović, geologist from the Geological Institute of Serbia, Andja Petrović, archaeologist, Dragan Vojinović, technician from the National Museum Kraljevo and Vera Bogosavljević Petrović (project director), archaeologist from the National Museum in Belgrade.

Marković 2014). That kind of assumption, but in the context of the Late Neolithic settlement–mine relationship, was already attested in the case of Divlje Polje (Bogosavljević Petrović 2015, 66). The directly promoted ideas on the relationship between the settlement and the mine were thus, for the first time, confirmed by exact methods. It was a great progress comparing with the previous decades, when the geographic framework of the source of raw materials for Neolithic settlements in Serbia used to be assumed only on the basis of a geological map.

What followed was a study on potential hidden reflections of Mesolithic continuity in the West Morava valley (Bogosavljević Petrović and Starović 2016). The study promoted the observation of the feasible relationships between the settlement at Crkvine and wider geographical scope, tracking the Early Neolithic forms in ceramic production. A striking result is that almost 80% of opals found at Crkvine present the direct flow from Lojanik toward the settlement. At the same time, its inhabitants also used quartzite, the inherited technological pattern from the preceding period – despite the abundance of good raw material potential (Bogosavljević Petrović and Starović 2016, 28–29, 36, 39, Figs. 10–11).

These results were the direct motive to start with a new research project, focusing on Lojanik and its surroundings as the region from which opal and silicified wood had been distributed for a long period of time and outside the local context.³ The main goal was to collect and systematize archaeological data on the stone raw materials exploitation techniques, from the Paleolithic until nowadays. A precise archaeological field study will enable us to clearly connect the already known assemblages of stone raw materials from prehistoric settlements, even when their original source was unknown and/or uncertain (such as the Kusovac near Kragujevac assemblage), with the original mine from which they were procured.

Besides these main questions which are important for archeological science, the project has a broader ambition, directly connected with the status and role of this micro–zone. It is important to emphasize here that even in the sixties

³ The project *Lojanik – the Stone Raw Material Mine of Prehistoric Communities in Central Serbia*, initiated in 2016 by the National Museum Kraljevo, is being funded by the Ministry of Culture and Information of the Republic of Serbia, no. 119–01–92/2016–02, of 04.05.2016. The members of the team are: Andrej Starović (National Museum in Belgrade), Dragan Jovanović (City Museum Vršac), Aleksandar Petrović (Faculty of Geography in Belgrade), Dragan Drašković and Predrag Radović (National Museum Kraljevo), Marko Pantić (Vekom Geo), Jugoslav Pendić, Kristina Penezić (BioSense), Jovan Galfi, Andja Petrović, Dragan Ćirković, archaeologists, as well as Marijana Urošević (Institute for the Protection of Cultural Heritage Kraljevo), and technical support from the National Museum Kraljevo – Aleksandar Maričić, Dragan Vujinović, Rade Pajović, Slobodan Milenković, and Srđan Vulović. The project director is Vera Bogosavljević Petrović, National Museum in Belgrade.

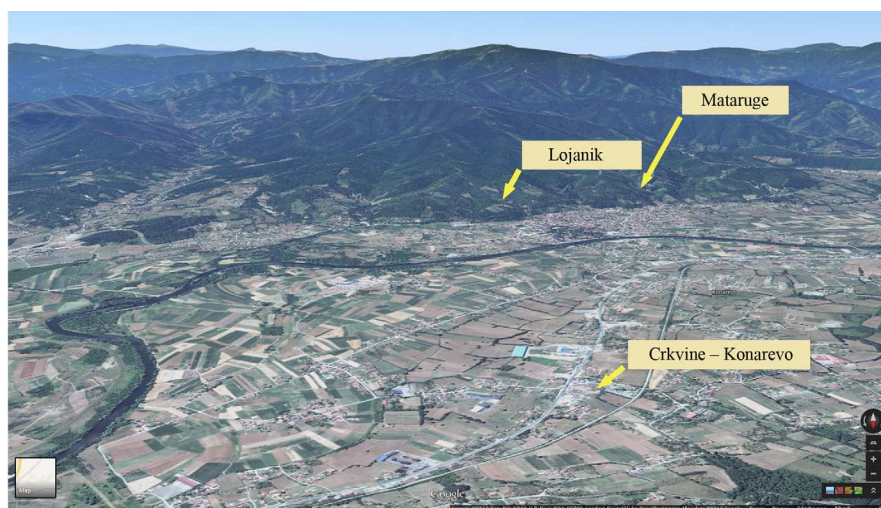


Fig. 3. Position of the explored sites of Lojanik, Crkvine, and Mataruge (modified after: Google map©2013)

Сл. 3. Позиција истраживаних локалитета Лојаник, Црквине и Матаруге (Google map©2013)

of the last century Lojanik was proclaimed as natural monument.⁴ Based on the results published so far, and particularly through the finalization of the first research campaign, the preconditions for initiating the process of proclaiming Lojanik *protected cultural heritage* were fulfilled. In the long run, it means to unite the existing status of the nature park with the future status of the archaeological park. Finally, the mentioned archaeological investigations will reconstruct the cultural history of the Lojanik mine and the settlements of early miners and thus allow creation of modern, creative and content-based tourist offer for users of different profiles, and especially for young people.

Natural and geographical framework

Lojanik is the first elevation from the south side of the settlement of Mataruška Spa. It is located 200 km south of Belgrade and some ten kilometers to the south-west of Kraljevo (Fig. 3). Lojanik is a hill with several ramified slopes, at an altitude of 280 m above sea level (asl). In this part, the predominantly meridian-oriented course of the Ibar changes into a quiet plain river, which

⁴ By the decree of the Council for Culture of the National Liberation Committee Kraljevo 03-No. 917/1 of 19th February 1963, Lojanik obtained the status of a scientific-research reserve and was put under state protection as *a natural monument*, and by its registration in the inventory of geoheritage objects in Serbia in 2005, it was introduced as *an archaeological object of geoheritage* (ordinal number 9).

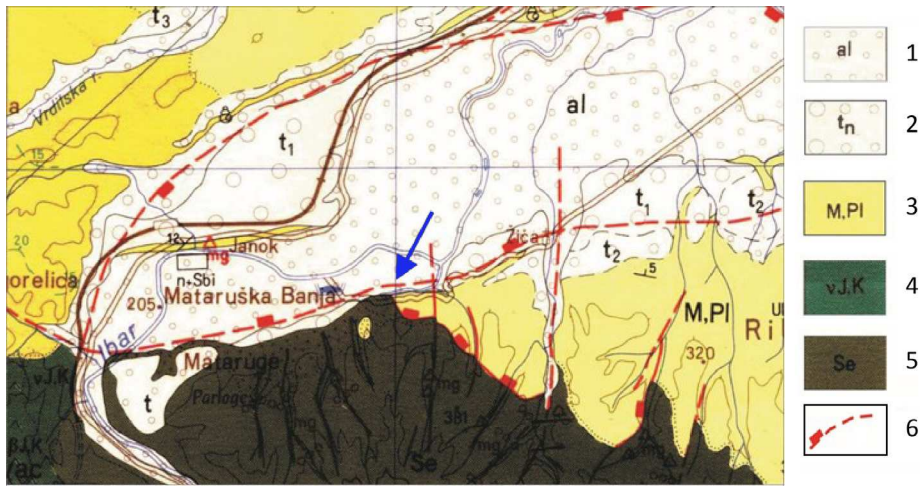


Fig. 4. Basic Geological Map of Kraljevo City, 1:100 000 – an excision (after Marković et al. 1963); Blue arrow is showing Lojanik hill: 1. alluvium, 2. river terraces, 3. clastites, limestones, clays with coal (Pannonian and Pontian), 4. gabbros, 5. serpentized peridotites, 6. faults

Сл. 4. Основна геолошка мапа Краљева, 1:100 000 – исечак (према Marković et al. 1963); Плава стрелица означава положај Лојаника: 1. алувијум, 2. речне терасе, 3. кластити, кречњаџи, глине с угљем (Панон и Понт), 4. габро, 5. серпентинисани перидотити, 6. раседи

flows into the West Morava near Kraljevo. These two rivers are at the same time natural communication lines through Serbia, sufficiently close and sufficiently far away from external influences in time and space. It is the western part of central Serbia, rich in natural resources, from hydrological and vegetation potentials, to abundant hunting areas. The diversity of this region is extremely pronounced, from big rivers to lateral smaller ones which cut deeply into mountain massifs in a small territory. Developed rich shapes of the relief, from river terraces with the altitude between 200 and 300 m asl to mountain peaks with traces of glacial erosion, with the altitude from 1300 to 2000 m asl, are a reduced representation of ecological potentials and features of the terrain (Marinčić 2014).

From the aspect of geological and geomorphological structures, Lojanik is at the border between the plain area of the Čačak–Kraljevo neogenic basin on the north and the northern part of the Ibar ultramaphite complex (Karamata 2000). The peridotites and serpentinites which sank along the fault during the formation of the Kraljevo tertiary basin dominate, and tertiary lake sediments are deposited over them (Marković et al. 1963), Fig. 4. It is assumed that the appearance of thermal mineral water in Mataruška Spa, with Lojanik in its close vicinity, is connected with those faults.

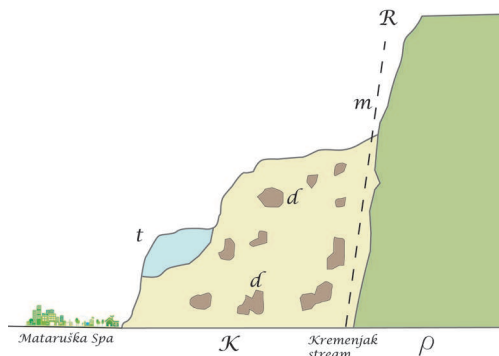


Fig. 5. A cross-section sketch of Miocene conglomerates with silicified wood in Mataruška spa (after: Pavlović, Stevanović, and Eremija 1977, 273):

ρ – serpentinite, K – conglomerates, d – remains of silicified wood (coniferous and deciduous trees), m. - on a fault (R) – dried springs, t – Ibar river terrace 20 m high

Сл. 5. Профил миоценских конгломерата са силификованом шумом (према Павловић, Стефановић и Еремија 1977, 273): ρ – серпентинит, K – конгломерати, d – остаци силифицираних стабала четинарског и белогоричног порекла, m. – на раседу (R) – усахли извори, t – речна тераса Ибра од 20 м висине

There are rare written records by Serbian geologists on the silicified forest and trees of Lojanik. While studying Miocene sediments of the Kraljevo depression, Petar Stevanović noticed the residues of “silicified trees of coniferous and deciduous origin on [...] the profile of Miocene conglomerate with petrified wood” (Pavlović, Stevanović, and Eremija 1977, 273), Fig. 5. Thereafter no synthetic works appeared, until a complex study on the protection of Lojanik as a nature park. It was written down for the purpose of an archaeological research project on old mining, elaborated by the Institute for Nature Conservation of Serbia at the request of the National Museum Kraljevo, as far back as 2004 (Marinčić 2014).

Archaeological investigations on Lojanik, Crkvine and Mataruge: methodological approach

The main research strategy was directed to detect and determine surface indicators of human activities on Lojanik and to collect material, then to define the character of archaeological traces in the nearby stream Pećinac in the village Mataruge and, finally, to establish main stratigraphic picture among anthropogenic layers at the site Crkvine–Konarevo (*cf.* Fig. 3). This spatial triangle defined by Lojanik, the stream Pećinac and the settlement at Crkvine represents a narrow geographical area on both banks of the Ibar river, whose course has considerably meandered during several thousand years. It was always a decisive moment for

of vital importance firstly to document precisely all surface features and record the current state. In the preliminary phase, two types of objects that had to be spatially defined and mapped were firstly recorded and separated:

- zones of extraction of raw materials
- workshops

Preliminary selection and processing of stone raw materials were most probably performed in workshops with a large amount of hammerstones, flakes, cores and tools.

Since the classical methods of documenting could not appropriately meet the requirements, it was decided to apply, simultaneously with the standard archaeological documentation, the combination of two relatively new methods of documenting – 3D laser surface scanning, and close range orthophotogrammetry, in making composites from a series of single shots made by DSLR camera. These two techniques fully confirmed their justification and practicality by the results obtained for a relatively large area, in optimal time.

In the first phase of fieldworks, the main zones of investigation (sectors I and II) on the top of the hill were cleaned out, then the surface was prepared for the application of the named methods. Furthermore, a square grid (5 x 4 m) was made, with the aim to record spatial concentration of artefacts and archaeological structures (Figs. 7a–b). Specific zones of these sectors (such as the cluster 2, see below) were recorded in detail, in order to correlate their spatial data with the sets of information, taken from other prospective methods (Fig. 8).

A 2 x 2 m trench was opened at the cluster 6 (Kupinjača) because a dense surface concentration of chipped artefacts was noticed there (Figs. 9a–b). Finally, a surface structure that looked like a prospective mining shaft (GPS 7 in the 2015 survey, documentation of the National Museum in Belgrade) was explored.

At the site Crkvine in the village Konarevo, after an interruption of more than a decade, a field survey was applied, focused on the places where the surface configuration had been considerably changed, with large portions of the multi-layered settlement destroyed (Bogosavljević Petrović, Vukadinović and Maričić 2006). Two zones were preliminarily tested, with the application of three field research methods: archaeological assessment with the surface collection, then cutting and fine cleaning of vertical sections (where relevant, obtaining valid data), and test-trenches. In the area directly to the northwest of the complex of a today's gas station, where initial rescue excavations have been carried out in 1998 (Богосављевић Петровић 2005; Bogosavljević Petrović, Vukadinović and Maričić 2006), the existing vertical profile was carefully cleaned and, at a relative depth of *cca.* 1.65–1.90 m, the cross-section of an Early Neolithic pit-dwelling



Fig. 7. Lojanik, Sector III, cluster 5; a) the square grid location; b) surface material concentration and planned artefact collecting (detail)

Сл. 7. Лојаник, сектор III, кластер 5; а) положај квадратне мреже; б) подизање првог слоја артефаката по квадратима (деталј)

was exposed, with several instructive artefacts *in situ*. At about 450 m southwest of this place, at the farm of the Andelković family from Konarevo, (“Grandpa Brka’s Raspberry Patch”), a zone with highly increased concentration of surface Early Neolithic and Paleolithic artefacts was located.

Because of such a situation, more careful cleaning of the existing vertical section by the main highway road Kraljevo–Raška was done, where, at a relative depth of about 0.45-0.60 m, a section part, lying directly on the ancient riverbed



Fig. 8. Lojanik, Sector I, cluster 2: technical plan of the outcrop, its preliminary flaked stone raw material, and geofacts (drawn by D. Ćirković)

Сл. 8. Лојаник, Сектор I, кластер 2: технички снимак основе рудног извора, депозита сировина и геофакта (снимио: Д. Ћирковић)

of the Ibar, was physically discovered, with thick deposits of river gravel and pebbles. Only some 15 m to the west of this place, where the concentration of surface finds was highest, a test-trench with the dimensions 3 x 2 m was investigated (Fig. 10). The main task of this trench was to check prospective vertical stratification of archaeological material and the horizons. Complex stratigraphy was already indicated by a series of stone artefacts and raw materials, as well as by typical ceramic forms. That clearly confirmed the presence of human communities in at least three prehistoric horizons, within the range of several dozen thousands of years. A small series of augering probes was additionally made at the same farm, and their cores allowed clarification of the mechanism of layering at the site Crkvine.

The Pećinac stream, in the village Mataruge (*cf.* Fig. 3), as right tributary of the Ibar river, turned out to be very interesting for many reasons. During a field visit in 2015, it was established that, in spite of the name of the stream, neither the origin of its name nor the existence of any cave (in Serbian, the name „Pećinac“ implies the word „pećina“ – „cave“) were known to the contemporary local popu-



Fig. 9. Lojanik, Sector IV, cluster 6 (Kupinjača): a) Test-trench 1 – lower level of the surface artefact concentration; b) surface artefact concentration – a detail (photo by A. Starović)

Сл. 9. Лојаник, сектор IV, кластер 6 (Купињача): а) пробна сонда 1 – доњи слој површинске концентрације артефаката; б) детаљ (фото: А. Старовић)



Fig. 10. Early Neolithic settlement Crkvine, Konarevo near Kraljevo, Test-trench 1/2016: archaeological record *in situ* (photo by A. Starović)

Сл. 10. Ранонеолитско насеље Црквине, Конарево код Краљева, сонда 1/2016: основа са артефактима *in situ* (фото: А. Старовић)



Fig. 11. Rock-shelter Mataruge in the stream Pećinac, nearby Mataruška Spa: the entrance, from west (photo by D. Jovanović)

Сл. 11. Поткапина Матаруге у потоку Пећинац поред Матарушке бање: улаз са запада (фото: Д. Јовановић)

lation. The reason for that lies in an abrupt and almost complete demographic shift, which has taken place in the last 30–40 years. Only in 2016 did we succeed in finding one of the rare old natives, who was familiar with the „existence of a cave“ and could say a little more about it. According to the rather scarce information provided by Petar Golubović from Mataruška Spa, which coincided to a certain extent with the situation in the field, „the cave in the Pećinac stream was quite spacious“ and, as far as he remembered, „between 15 and 20 metres long“. According to the same information, until the Second World War, the Mataruge rock-shelter had served as a refuge for cattle and occasional flights of the local population, and just after the war „its entrance was buried“ for (in his opinion) „unknown reasons“.

Although the extent of archaeological potential of the site in the Pećinac stream has not been identified so far, considerable attention was devoted to it during 2016 because of its vicinity to the source of raw materials on Lojanik and more than favourable conditions for the formation of a small prehistoric habitat (Fig. 11). Based on the previous observations, it can be said that the potential archaeological site represents a rock-shelter filled, to an unknown extent, with

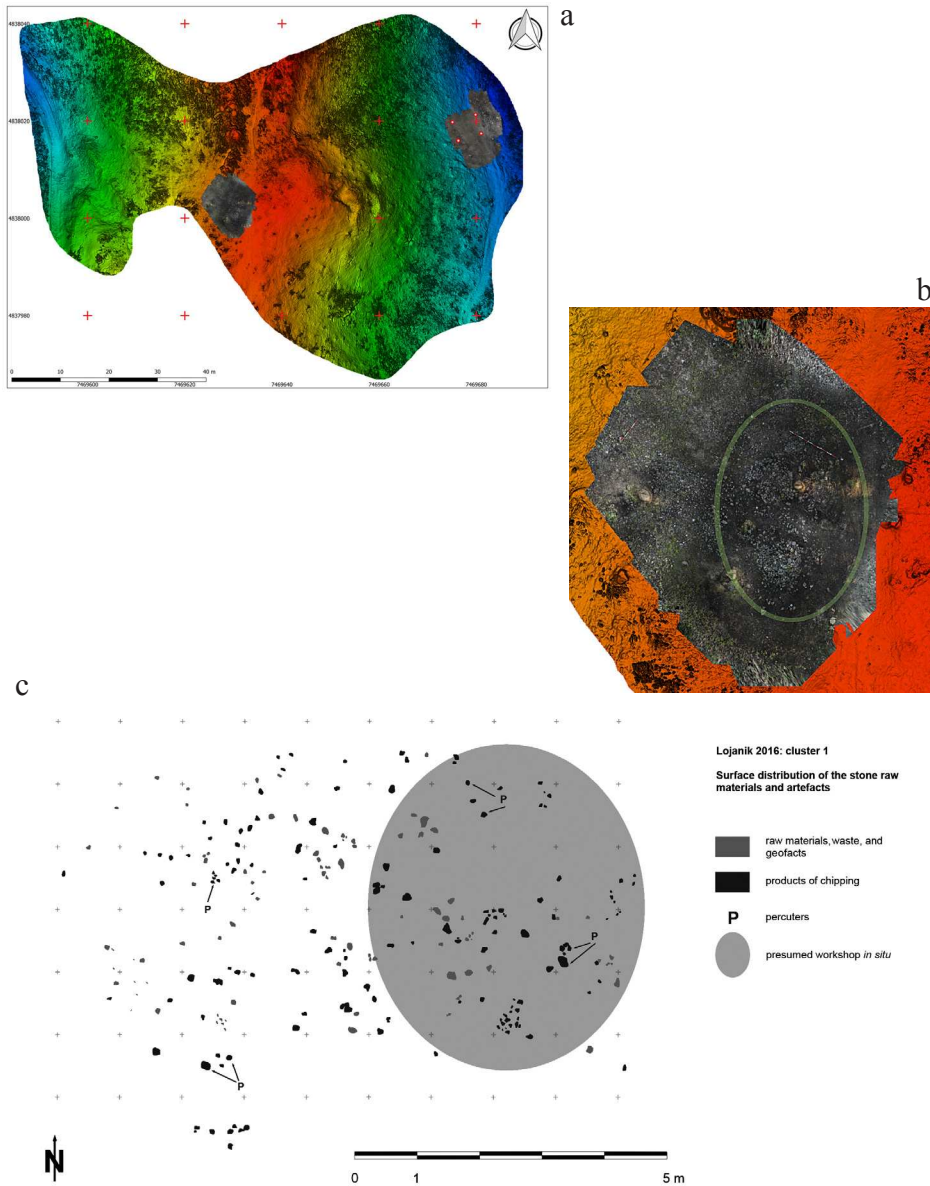


Fig. 12. Lojanik, Sector I, cluster 1: a) orthophotogrammetric plan on 3D scanned surface (cluster 1 is on the left); b) detail of the presumed workshop zone; c) workshop plan of the spatial distribution of artefacts and geofacts, based on technological analyses

Сл. 12. Лојаник, Сектор I, кластер 1: а) ортофото на плану 3Д скениране површине (кластер 1 је лево); б) означена површина претпостављене радне зоне; ц) основа радне зоне са распоредом артефаката и геофаката идентификованих на основу технолошке анализе

diluvial and colluvial sediments, which fell from the section above the entrance. The rock-shelter is located at an altitude of 293 metres above sea level, on the northwestern slope of the stream, so that it gets plenty of sunshine, and at the moment its entrance is elevated some 7 metres in relation to the stream level.⁶

The activities during 2016 in the Pećinac stream were directed to the clearing up of the access and the plateau at the point of formation of the rock-shelter in serpentinised peridotites. The aim of these preparative activities was to estimate the stability and calculate the thickness of the layer derived from material washed away from higher parts, in order to plan future archaeological research. That is why a part of the slope and the entrance were recorded by a 3D laser scanner during the autumn.

Preliminary fieldwork results

Concerning the site Lojanik, a total of seven archaeological clusters (chipped artefact concentrations) was recognized, mapped and analysed on the top of the hill, where each perceived structure (cluster) represents specific activities, from extraction zones to the places for production of tools (*cf.* Figs. 6–7b, 9a–b). The surface recent waste material was very precisely separated from these clusters.

One of important results implies that at Sector I, on the highest top of the hill, raw material preliminary selection, splitting and diminishing pieces to optimal size were performed, just next to the outcrop itself. A high concentration of surface opal material was recorded: heavily weathered pieces with multiple cracks, cortical massive flakes, as well as roughly fragmented (often torn) pieces of the raw material and waste, inconvenient for further processing. These are the most important categories of initial part of the stone raw materials reduction process (Bogosavljević Petrović 2005, 82, 92–100). It is a distinctive attribute of mining sites, where extraction is followed by the products of first activity, i.e. rough selection of suitable parts of ores from those that will not be used any more (Fig. 12). Based on a thorough technological and morphometric autopsy, the nature of the activity in this very zone turned out clear (*cf.* Fig. 12c). However, in using the advantages of 3D surface scanning and orthophotogrametric plans, the real living context became obvious and was preserved in details for future research (*cf.* Figs. 12a–b) The advantages are even more convincing, when another unit – cluster 2 is on the focus. Years ago, it was defined as an extraction zone of opals, based on the structure of its surface archaeological finds. Having new 3D scanned plans, it is

⁶ Based on A. Petrović written report on the soil geomorphology of Lojanik and its surroundings (October 2016). Project documentation.

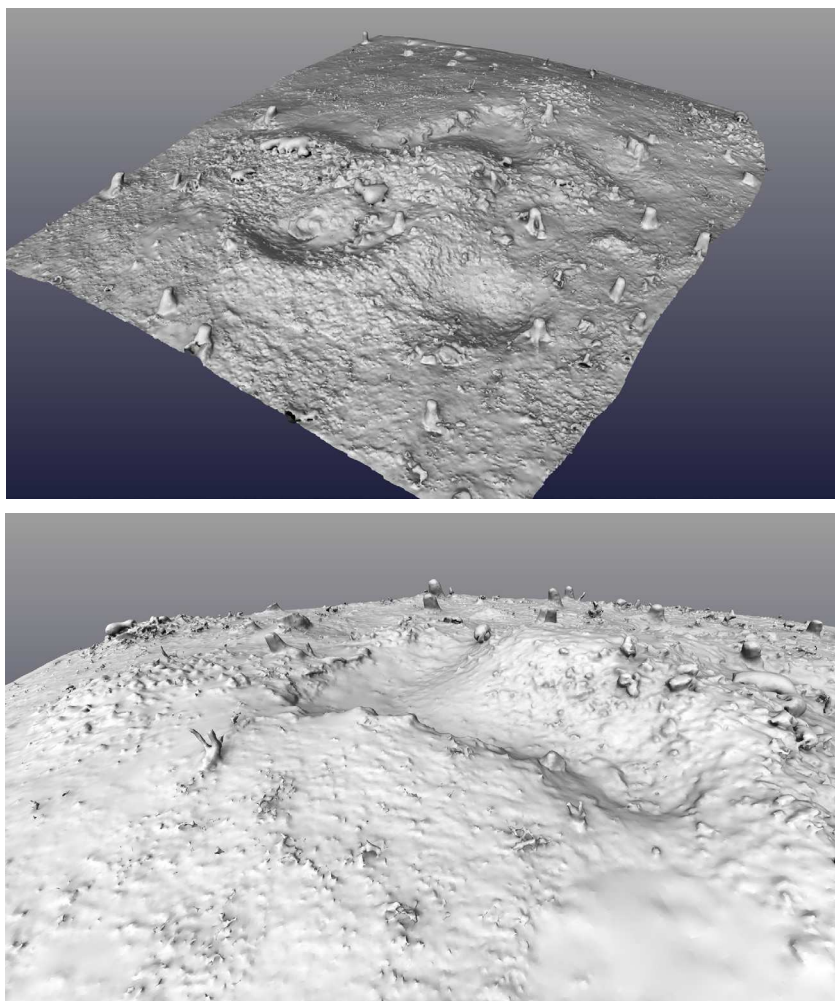


Fig. 13. Lojanik, Sector I, cluster 2, 3D laser scanned plans:

a) a view from the north-east; b) side view from the south

Сл. 13. Лојаник, Сектор I, кластер 2, 3Д ласерски скенирани планови:

а) са североистока; б) са југа

apparent that entire unit is even larger and more complex than we have previously estimated (Fig. 13a). The grid of some additional shafts (or surface pits?) to the south were recorded, even though those were naked-eye invisible (Fig. 13b).

On the other hand, on the southern and southeastern sides of the Lojanik hill, four concentrations of chipped artefacts which are several dozen meters distant from each other were registered. Two of them (clusters 3 and 4) present *in situ* workshop objects with intended purposes of exploitation and the complete reduction

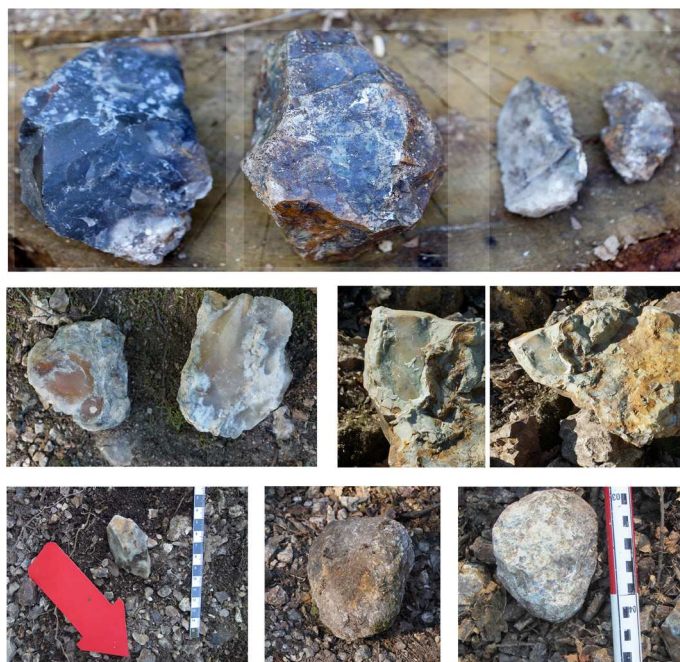


Fig. 14. Raw materials, chipped artefacts, and percuters from Lojanik (photo by V. Bogosavljević Petrović and S. Vulović)

Сл. 14. Сировине, окресани артефакти и перкутери са Лојаника (фото: В. Богосављевић Петровић и С. Вуловић)

process (“chaîne opératoire”) on opals specifically selected by colour (colorful, tiger-like nuanced and brown opals), whereas the other two concentrations are the consequence of motion of anthropogenic material from higher zones of the site – clusters 5 (the Square grid 1 – Fig. 14), and 6 (Kupinjača) (Fig. 15/1–8).

Calling the attention to the question of time and lifespan of activities on the Lojanik hill, it should be emphasized that named concentrations clearly show the presence of Paleolithic communities, as well. The nearest Paleolithic open-air non-stratified site is Vlaška Glava in the nearby village of Samaila, on the northern slopes of Mt. Jelica. Based on the preliminary examination, the technological markers of our artefacts are analogous to the specimens from Samaila, as well as to a series of sites registered recently by thematic surveys carried out by D. Mihailović (Mihailović 2014: 22–28). As those present surface finds, in the assemblage content the artefacts belonging to Early Neolithic technology, directly comparable with the examples from the Early Neolithic pit-dwelling at Crkvine (season 1998) are simultaneously deciphered (*cf.* Bogosavljević Petrović 2000: 22–23, Pl. IV).

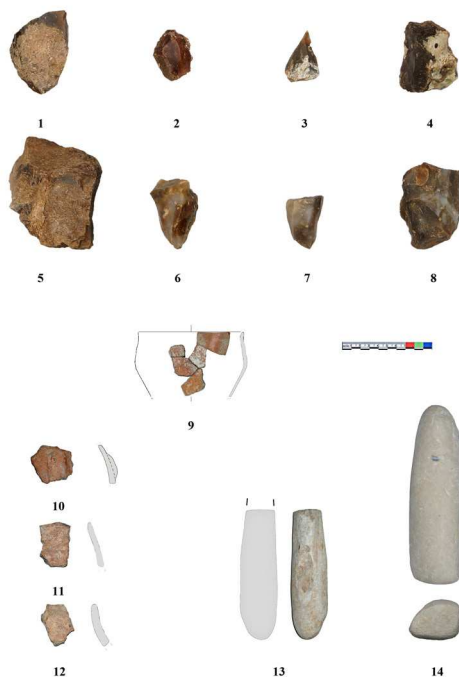


Fig. 15. Chipped artefacts from Kupinjača – Sector IV, cluster 6 (1–8);
ceramical pot sherds (9–12), a fragmented mallet (13), and a hammer (14)
from Crkvine–Konarevo, test-trench 1/2016

Сл. 15. Окресани артефакти са Купињаचे – Сектор IV, кластер 6 (1–8);
уломци керамичке посуде (9–12), фрагментовани ударач (13) и чекић (14)
са локалитета Црквине–Конарево, сонда 1/2016

These first indications may provide a basis for putting forward a thesis on the existence of mining works of Paleolithic origin, which were partly destroyed in the exploitation by Early Neolithic, new population that occupied the banks of the confluence of the Ibar and the West Morava, in the territory around Kraljevo. Such a practice has been confirmed on a series of prehistoric, the classical period, and mediaeval mines of metal raw materials, when new works „go against the older ones“. The identical situation was recorded in the Lopatnica valley, as well as on the western slopes of Kopaonik, where the concessionary mining at the end of the 19th century destroyed the classical period and medieval works these regions were famous for (Богосављевић, Мркобрад and Богосављевић 1988, 22).

The Mataruge rock-shelter in the Pećinac stream, which is nowadays covered with a thick layer of deposits, could be more precisely defined only

after a prepared and performed previous protection project, in order to physically secure future archaeological research.

At Crkvine, the results of test-trenching showed that an Early Neolithic occupational horizon existed at a relative depth of 0.30–0.40 m (Fig. 15/9–12). It seems that excavated level presents a space outside the residential structures. According to the characteristics of the shape, texture and decoration of ceramic pots (“bomb-like“ small pots, bowls, impressing by nail, white painting), the relative chronological determination of this horizon approaches to the earlier phases of the Starčevo culture, concurrent with Grivac (Bogdanović 2008), Vlagotin (Станковић, Реџић and Зечевић 1997, references included), and even with geographically remote Dzuljunitsa in Bulgaria (Krauss *et al.* 2014). Stone artefacts are massive and with roughly processed surfaces, determined as fragmented mallet and a hammer, based upon the use-wear traces (Fig. 15/13–14). The other chipping products are made from typical Lojanik opal, with rare cores, sporadic fragments of blades and a multitude of highly fragmented debitage.

The cultural layer at this place is extremely thin (the level of the virgin soil appears already at 0.60 m!), and directly under the Early Neolithic horizon, only some 5–6 cm below, several stone flakes which, based on their technological characteristics, could be determined as Paleolithic, were discovered. Nevertheless, the question of vertical stratification could not be answered: complex taphonomic processes probably resulted in significant denudation, and that is a specialist issue and a challenge which should be dealt with within prospective research at this site. The initial task of such a study was started by augering geo-probes of the terrain at five points, where the thickness of the pedological layer was established to be up to 5 m.

Conclusion

In the first field season, the clustering of surface archaeological material across the hilltop of the Lojanik quarry was documented. The spatial distribution and structure of each individual cluster was particularly considered. The existence of organization of planned exploitation on Lojanik is obvious, with the division of activities, visible in the zones of scattered material on the top and northern slopes (tailing ponds) on one side, and the workshop zones (southern sectors of the hill), on the other side. According to the technological-typological criteria, documented artefacts belong to a broad time range, from the Paleolithic to the Late Neolithic.

These investigations have initiated one of the most intriguing research questions – how to attribute artefacts in the sense of the culture sequence and

chronology, even when there are no clear and reliable stratigraphic indicators. When taken into account, still non-investigated caves and rock shelters (which, by default, comprise the stratification and defined contexts) in the territory of the Čačak-Kraljevo neogenic basin, as well as a series of scattered surface concentrations in the same geographical matrix make tangible this issue's size and importance, even for a wider territory of Serbia. For the time being, an additional obstruction consists of nothing but the initial level of investigation of ancient stone mines: it is not certain whether there are elements for application of any method of absolute dating (such as, for example, cosmogenic exposure dating), as well as indications of the existence of underground forms of exploitation.

The investigations of the Crkvine settlement with workshop-origin chipped artefacts, together with its diagnostic ceramic material, allow more reliable conclusions at a level of technology. The same criterion is applied for the correlation between the assemblage of chipped artefacts from Divlje Polje and, up-to-now individual artefacts from Lojanik, which are directly comparable by all parameters, from raw material, applied hard- and soft-hammer direct percussion (basic knapping technique), up to typological similarities of retouched tools. On the other side, the future fieldwork at Crkvine has to answer complex questions on the spatial and economic organization of the Early Neolithic settlement, its relations with adjacent high-quality stone raw material source and possible craft-specialization. Having in mind that at least some other Early Neolithic sites from Šumadija (such as Divostin and Kusovac) have stone material possibly deriving from Lojanik, important question on contingent exchange network could be the main focus of archaeological research.

At the end, what should be emphasized is the undeniable importance of the initial studies on Lojanik and the possibility of implementation of new and the latest methodological procedures in order to define the strategy of stone raw materials supply in early prehistoric times, the technology of production and use of chipped artefacts through a long period of time, in a geographically limited territory in west-central Serbia, a range for checking new hypotheses and the results already accomplished.

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**ПРАИСТОРИЈСКИ РУДНИК КАМЕНА И НАСЕЉА
У МИКРОРЕГИЈИ ЗАПАДНО–ЦЕНТРАЛНА СРБИЈА:
ПРЕЛИМИНАРНИ ИЗВЕШТАЈ СА ИСТРАЖИВАЊА
ЛОЈАНИКА, 2016. ГОДИНЕ**

Кључне речи: *Лојаник, Црквине–Конарево, камене сировине, опал, силификовано дрво, експлоатација, каменошлом, рудник, палелолит, неолит, каменолом, рудник, технологија окресаних артефаката*

Традиција у експлоатацији и производњи камених артефаката на Лојанику је временски изузетно дуга, од ране праисторије до данашњих дана. Директне аквизиције опала и силификованог дрвета у виду протока сировина и артефаката потврђене су између рудника Лојаник и ранонелитског насеља Црквине и Дивљег поља из периода позног неолита (сл. 1). У последње три године археолошки локалитет Лојаник је предмет бриге институција културе и заштите културног наслеђа, а парадокс је да је као заштићено природно добро деценијама био изложен девастацији (сл. 2). Током 2016. године спроведена су прва археолошка истраживања ширег обима преко пројекта *Лојаник – рудник камених сировина праисторијских заједница централне Србије*, од мапирања до анализирања концентрација људских активности рударења и обраде камених сировина, што представља први ниво заштите овог налазишта.

Основна истраживачка стратегија била је усмерена на утврђивање површинских манифестација људских активности на Лојанику и прикупљање материјалних остатака, затим на дефинисање карактера археолошких трагова у оближњем потоку Пећинац и на успостављање основне стратиграфске слике антропогених слојева на локалитету Црквине у селу Конарево. Овај троугао између Лојаника, потока Пећинац и насеља на Црквинама представља уско географско подручје на обе обале реке Ибар, чији ток је значајно меандрирао уназад неколико хиљада година. То је увек био одлучујући моменат за сваки период активности на Лојанику, што је директ-

но утицало на систем организације, екстракције и транспорта сировина са брда у околна насеља.

Основни проблем приликом издвајања зона праисторијских радова на Лојанику (сл. 6) представљали су упадљиво велика количина артефаката уочљива на широком простору, као и јасни показатељи рецентних активности. У прелиминарној фази најпре су утврђене и издвојене зоне екстракције сировина и радне зоне са великом количином батова, одбитака, језгара и алатки. Будући да класичне методе документовања нису могле да на одговарајући начин одговоре захтевима, одлучено је да се паралелно са стандардном (обавезном) археолошком документацијом примени и комбинација две релативно нове методе документовања – 3Д ласерско скенирање терена и израда ортофотограметријских композита са малих висина.

У првој фази радова рашчишћене су основне зоне истраживања (сектори I и II) на врху брда, као припрема за наведена снимања и скенирање терена са бележењем површинске дистрибуције артефаката. Затим је постављена квадратна мрежа ради праћења концентрације артефаката и археолошких структура (сл. 7, 7а). Детаљно су потом технички снимане одређене зоне ових сектора ради корелације са информацијама других проспективних метода, као што је случај са кластером 2 (сл. 8). На микролокацији Купињача (кластер 6) отворена је сонда, због уочене јаке површинске концентрације окресаних артефаката (сл. 9, 9а). На локалитету Црквине у Конареву лоцирана је зона са појачаном концентрацијом површинских ранонеолитских и палеолитских артефаката, где је поред тест-сонде (сл. 10) урађена и мања серија геосонди, чији стубови омогућавају да се појасни механизам наслојавања на локалитету Црквине.

Иако до сада није одређено у којој мери локалитет Матаруге у потоку Пећинац поседује археолошки потенцијал, али због близине лежишту сировина на Лојанику и више него повољних услова за формирање мањег праисторијског станишта, методом 3Д ласерског скенирања снимљена је површина улаза. Поткапина се налази на 293 метра надморске висине, на северозападној падини клисуре, тако да је већи део дана осунчана, а улаз се у овом тренутку налази на 7 метара релативне висине у односу на ниво потока (сл. 11).

На основу приказаних проспективних метода и минимално спроведених сондажних истраживања дефинисана је структура кластера окресаних артефаката, од екстракционих зона до места за израду оруђа (сл. 12 а, б, сл. 13 а, б, сл. 14). На највишој коти брда (сектор I) обављала се прелиминарна селекција рудног излива опала (сл. 12 ц). Велика концентрација

површинских делова опала који су атмосферски промењени, са мноштвом пукотина, кортикалних одбитака масивних форми, уз грубо фрагментоване сировине и отпад су најзначајније категорије овог дела редуccionoг процеса камених сировина (Богосављевић Петровић 2005). Почевши од кластера 1 до кластера 5 (статистичка мрежа), Купињача (кластер 6) технолошки и типолошки издвајају се артефакти палеолитских заједница. На основу прелиминарног прегледа технолошки маркери наших артефаката аналогни су са примерцима из Самаиле, као и са низом локалитета регистрованих последњих година тематским рекогносцирањима Д. Михаиловића (Mihailović 2014:22–28). Пошто је реч о површинским колекцијама, истовремено се у кластерима дешифрују артефакта ранонеолитске технологије која су директно упоредива са артефактима из ранонеолитског објекта на локалитету Црквине, са истраживања 1998. године (Богосављевић Петровић 2000: 22–23, Табла IV), сл. 14.

На основу ових првих индикација може се изнети теза о постојању рударских радова палеолитског порекла, који су делом уништени експлоатацијом нове популације из периода раног неолита која запоседа обале ушћа Ибра у Западну Мораву на простору око Краљева. Таква пракса је касније потврђена на низу праисторијских, античких и средњовековних рудокопа металних сировина, када нови радови „иду по старим”.

Овим истраживањима покренуто је једно од најинтригантнијих истраживачких питања – атрибуирање артефаката на површини терена када нема поузданих статиграфских показатеља. Када се има у виду неистраженост пећинских станишта која подразумевају стратификацију и контекст на територији чачанско-краљевачког неогеног басена, и низа површинских концентрација у истом географском амбијенту, постаје опипљива димензија и значај овог проблема и за ширу територију Србије. Додатну опструкцију засада представља тек почетни ниво истраживања рудника где није извесно да ли има елемената за примену методе апсолутног датовања попут археомагнетизма, као и индиција за постојање подземних видова експлоатације.

Истраживања насеља Црквине са окресаним артефактима радионичког порекла уз керамички материјал дијагностичког карактера омогућава на технолошком нивоу поузданија закључивања. Исти критеријум се односи када је у питању корелација збирке окресаних артефаката са познонеолитског насеља Дивље поље и засада појединачних артефаката са Лојаника који су директно упоредиви по свим параметрима, од сировине, примењене технологије меких ударача до типолошких сличности ретушираних алатки.

На крају треба да се нагласи неоспорни значај почетних студија на Лојанику и могућност примењивања нових и најновијих методолошких поступака како би се дефинисала стратегија камених сировина у раној праисторији, технологија израде и употреба окресаних артефаката кроз дуг период на географски ограниченом простору централно-западне Србије, полигону провере нових хипотеза и већ постигнутих резултата.