

ABOUT TWO PROVINCES

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STONE AS A RESOURCE IN ISTRIAN ANTIQUITY

KATARINA ŠPREM

Abstract: Even though the information about provenance or source location of raw stone material found on archaeological sites can tell us a lot about societies and economies of the period in question, this type of research is not often in the focus of archaeology. Istria is a geographically relatively enclosed region with geological surface deposits that allow for different raw stone material exploitation. The oldest surface deposits in Istria are from Jurassic period, followed by Cretaceous deposits and so on. This paper is going to present relevant surface deposits of Istria, as well as mention the current state of research of ancient quarries.

Keywords: geology, Istria, antiquity, quarries

1. Limestone Surface Deposits of Istria

Stone has been a major resource since the beginning of what archaeologists consider our history. Starting with using chert or flint for making the stone tools necessary for survival to big limestone building blocks for fortification walls on bronze age settlements, and further. In this paper we will focus on limestone.

Limestone as a resource can be divided into dimension stone and crushed stone aggregate¹. Dimension stone can be defined as natural rock material quarried for obtaining blocks or slabs that meet specifications as to size (width, length, and thickness) and shape. Color, grain, texture and pattern, and surface finish of the stone are normal requirements. Durability, strength, and the ability of the stone to take a polish are other important selection criteria.² Crushed stone aggregate is produced by crushing quarry rock, boulders, cobbles, or large-size gravel and used today as an essential ingredient in concrete.³

1 Miko et al. 2013, Polšak 1963.

2 https://minerals.usgs.gov/minerals/pubs/commodity/stone_dimension/ (accessed April 26th, 2019).

3 <https://www.cement.org/cement-concrete-applications/concrete-materials/aggregates> (accessed April 26th, 2019).

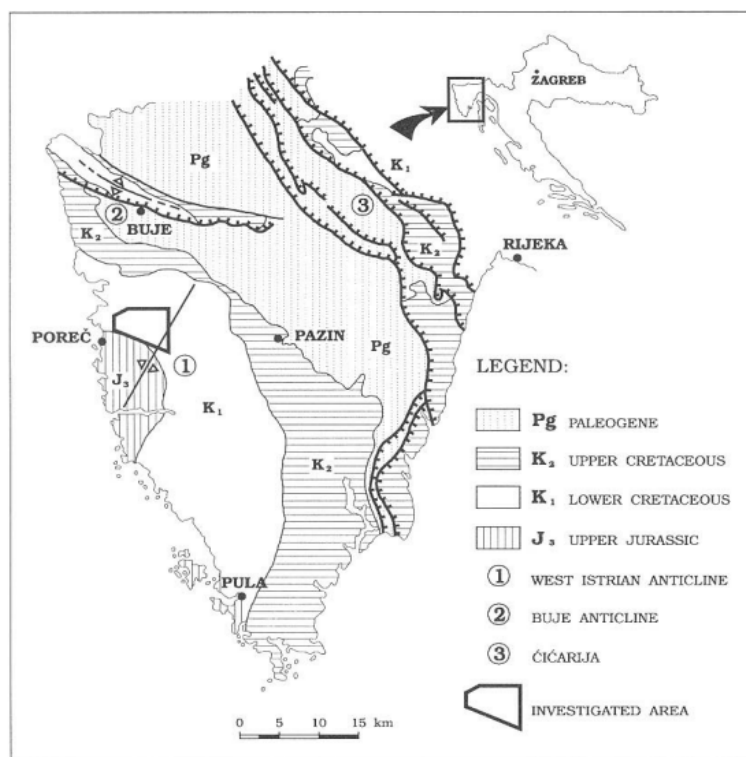


Fig. 1. Geology of Istrian peninsula after Matičec 1994.
New research suggests some of the surface deposits around Lim channel
are of Middle Jurassic age (Miko et al 2013).

The oldest surface deposits in Istria are Middle Jurassic and are limited to the northern and southern parts of the Lim channel⁴ (Fig. 1). Colloquially speaking, Istria is divided into “Red Istria”, “Grey Istria” and “White Istria” according to the soil or rock surface deposits. Red Istria is associated with abundant *terra rossa* deposits across the south-western part of the peninsula, while Grey and White Istria relate to flysch and clay Paleogene deposits, and Upper Cretaceous limestone deposits in northern Istria, respectively.⁵

2. Possible and Probable Roman Age Quarries in Istria

Stone was used for several different purposes in the Roman period – roughly shaped stone could have been used in rubble construction or as aggregate in concrete, for foundations or wall facings. Cut stone was

⁴ Miko et al. 2013, 20.

⁵ Miko et al. 2013, 19.

useful for building vaults and arches, for producing columns, capitals or bases, whereas stone that could be carved with fine detail was used for statues, reliefs, urns, sarcophagi etc.⁶ For all the above mentioned uses almost every variety of stone was used, depending on the rock from the nearest source. We have examples of extensive limestone usage in Classical Greece, at sites such as Corinth, Olympia and Epidauros as well as Parthenon, and in most cases, limestone sources were located near to where it was used. On the other hand, more valuable and scarcer materials such as marble had a more widespread trade networks in ancient times. However, at Neapolis in the Peloponnesus, large quantities of limestone were quarried through Classical and Byzantine times and transported by ship over great distances.⁷

Since limestone is the most common type of surface deposit in Istria, it has been quarried since prehistory, for example on Veli Brijun Island where an Illyrian hillfort was built using stone from a nearby quarry.⁸ There are several quarries on the Istrian coast and the hinterland that show clear signs of extraction by Roman stonemasonry tools, and several of them that are in an excellent location for further transport of extracted stone by boat. Quarries with traces of Roman usage, or ones in a position which would have been practical for the transport in Roman times, are described below.

Jurassic limestone deposits of Kirmenjak formation are one of the most famous dimension stone deposits in Istria. The stone itself is known by other names – *Orsera*, *Pietra d'Istria* and so on.⁹ Its popularity throughout history is evident by a series of out-of-use quarries along the western Istrian coastline – for example the quarry at Montauro near Rovinj which could have been used in Roman period due to its excellent position as well as its vicinity to the sea.¹⁰ Other quarries on Jurassic formations situated near or on the coast with traces of Roman exploitation are Rovinj – Uvala Soline (Valsaline), Rovinj – Sveta Eufemija and Vrsar – Sveti Juraj. Valsaline was a Roman quarry used for extracting smaller blocks, while Saint Eufemija exhibits traces of Roman exploitation for making sarcophagi.¹¹ The quarry on the island Saint Juraj near Vrsar also shows undoubtable traces of Roman exploitation, even though it was not used for extracting big blocks, but smaller ones.¹² Most

6 Russell 2014, 2.

7 Wenner & Herz 1992, 199.

8 Begović Dvoržak 1997, 83.

9 Cotman 2004, 135.

10 Matijašić 1998, 398.

11 Šonje 1980, 152; Matijašić 1998, 398.

12 Matijašić 1998, 399.

of the quarries in the vicinity of Rovinj and Vrsar were used during the Venetian rule¹³ which could have erased Roman age exploitation. According to Ante Šonje, the island of Saint Nikola west of Poreč is the place whence the stone used for the dome of Theodoricus' mausoleum in Ravenna comes from.¹⁴ This island is also part of the famous Kirmenjak formation, therefore the stone is of high quality.

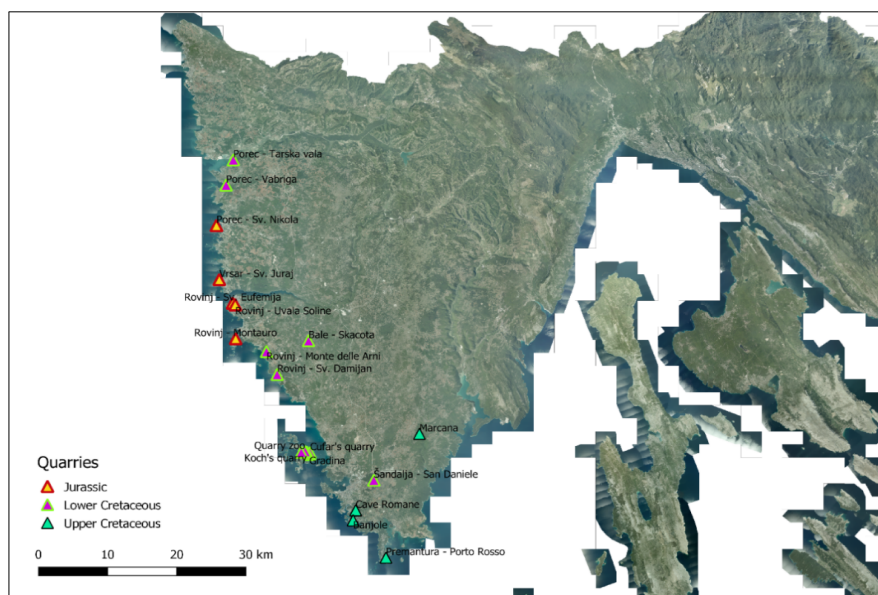


Fig. 2. Possible and probable Roman age quarries.

The Lower Cretaceous limestone deposits of Kanfanar formation represent the most famous Istrian dimension stone known as *Istrian yellow*. It is extracted today in the quarries at Kanfanar, Selina and Korenič.¹⁵ Monte delle Arni quarry near Rovinj, until recently, held several unfinished sarcophagi as well as their lids, and since it is situated near a Late Roman settlement of *Vistrum*,¹⁶ their connection should be investigated further. The quarry in San Polo bay south of Rovinj (Sveti Damijan; Fig. 2) shows undoubtable traces of Roman usage, and the Roman age surface finds¹⁷ testify to the Roman presence in this area. Today the quarry is situated right by the sea and its surface covers around 300 m².¹⁸ Quarries near Poreč – Tarska vala and Vabriga – do not

¹³ Šonje 1980, 152.

¹⁴ Šonje 1980, 153.

¹⁵ Cotman 2004, 131–134.

¹⁶ Benussi 1924, 62; Šonje 1980, 152.

¹⁷ Matijašić 1988, 56.

¹⁸ Matijašić 1998, 398.

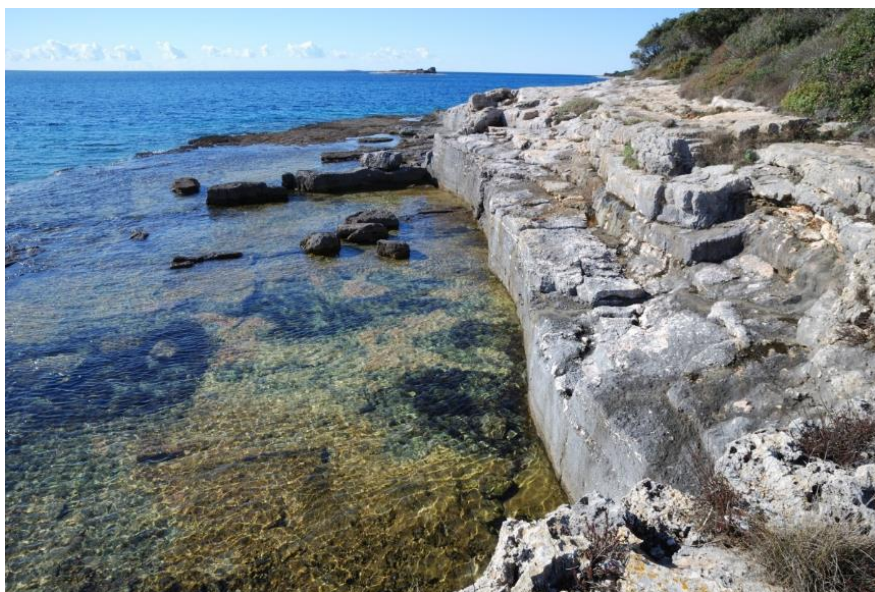


Fig. 3. Sveti Damijan Roman quarry south of Rovinj (<https://www.rovinj-tourism.com>, accessed May 7th, 2019)

show traces of Roman exploitation, but since the position for the transport of stone is excellent, that may be due to extraction of a much later date which erased Roman age usage. On the other hand, the stone itself is of poor quality,¹⁹ so it may not have been interesting to exploit. Furthermore, it is interesting to note the four-thousand-year-old history of exploitation of Lower Cretaceous stone on the Brijuni islands northwest of Pula. The quarries were more intensively exploited after the Roman conquest of Histri in 177 BC.²⁰ The limestone of a light cream color, also known as “marble limestone”, was used for the construction of a residential complex in Verige Bay on Veli Brijun,²¹ as well as for several other building complexes on the aforementioned island.²² Five quarries have been exploited during and since the Roman age on Veli Brijun – Čufar’s quarry, Koch’s quarry, Quarry zoo, quarry below Gradina hill, and quarry in the Gospina uvala cove²³ (Fig. 4). It is important to mention that the toponyms and nesonyms of the Brijuni islands were changed several times in the 20th century.²⁴

19 Šonje 1980, 153.

20 Premužić Ančić & Gašparović 2017, 76.

21 Begović-Dvoržak 1996, 26.

22 Begović Dvoržak 1997, 83.

23 Premužić Ančić & Gašparović 2017.

24 Matijašić 2011.

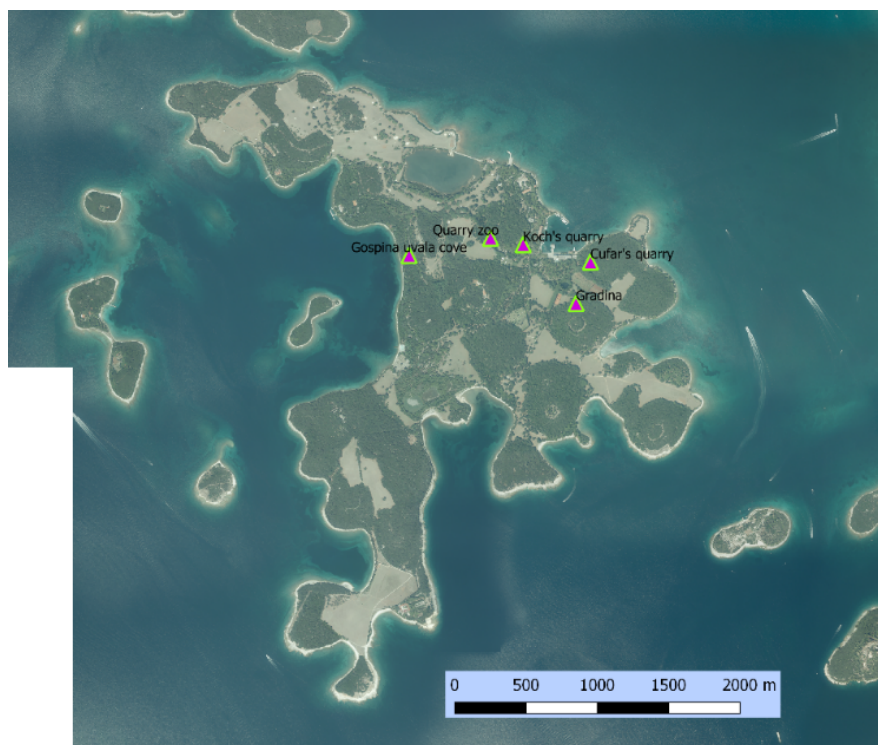


Fig. 4. Roman age quarries on Veli Brijun island
(after Premužić Ančić & Gašparović 2017).

Upper Cretaceous deposits of Rušnjak and Gornji Humac formations represent the greatest potential for dimension stone exploitation. The quality of this limestone was known in Antiquity – the *Cave Romane* quarry near Vinkuran was the place of exploitation of dimension stone used for the outer curved wall of the Pula Amphitheatre.²⁵ The quarry is located around 500 m from the coastline, but the stone itself is of very high quality and it is exploited even today.²⁶ Carbonate deposits of Gornji Humac represent a very attractive rudist limestone used in the time of Austria-Hungary from the quarry of Ližnjan, as well as in the Roman period from the quarry at Premantura,²⁷ a cape on the very south of Istria. The Porto Rosso bay on Premantura exhibits signs of Roman stonemasonry in the form of *pašarini* – troughs used for detaching the blocks.²⁸ A very interesting quarry of Upper Cretaceous surface deposits is Marčana. Several Roman and Iron Age stone monuments and

25 Crnković 1991.

26 Matijašić 1998, 396.

27 Matijašić 1998, 395–397.

28 Matijašić 1998, 395.

sculptures from both Pula and Nesactium show a similar structure to the stone exploited at the Marčana quarry,²⁹ although this connection should also be further investigated. San Daniele quarry near Šandalja, on the eastern outskirts of the city of Pula, holds several traces of big stone block extraction for sarcophagi manufacture. Also, according to Matijašić, there are several stone blocks near the quarry that clearly show some traces of processing that can be associated with Roman period.³⁰

3. Further Considerations

So far, all the Istrian quarries mentioned above have been linked to Roman period based on traces of extraction (*pašarini*) or their vicinity to the sea. Further research should aim at petrographical analysis and comparison to the archaeological finds, for example stone monuments from Nesactium and Pula. However, petrographical analysis is an invasive method and should be used sparingly, especially when working with archaeological objects of value, as are those from above mentioned sites. Nevertheless, a reference base of petrographical samples from assumed Roman quarries should be generated, and a new method should be found to more accurately assign a provenance for stone. We propose to start with quarries in a suitable transporting location, as well as those that are in the vicinity of Roman sites. Regarding that, Russell states: *Judging from areas that were closely surveyed – mainly France, Spain, Austria, Tunisia, western Turkey, and Egypt – the inhabitants of most cities relied most of the time on stone quarried no more than 20 – 30 km away, or a day's walk. In all of these areas customers were reliant on local resources and quarries were tied into local settlement patterns.*³¹

Taking that into consideration, figures 5 and 6 show thirty-kilometer buffer zones around major urban centers in Early and Late Antiquity of Istria, respectively. What is immediately evident is that the buffers cover all of Istria during all of Antiquity, and that these buffer zones mostly overlap, which could present problems for associating quarries to different urban centers. Of course, these buffers zones do not take into account the terrain, so they are only preliminary, but it is a start for researching Roman quarrying in Istria.

29 Matijašić 1998, 395.

30 Matijašić 1998, 397.

31 Russell 2014, 65.

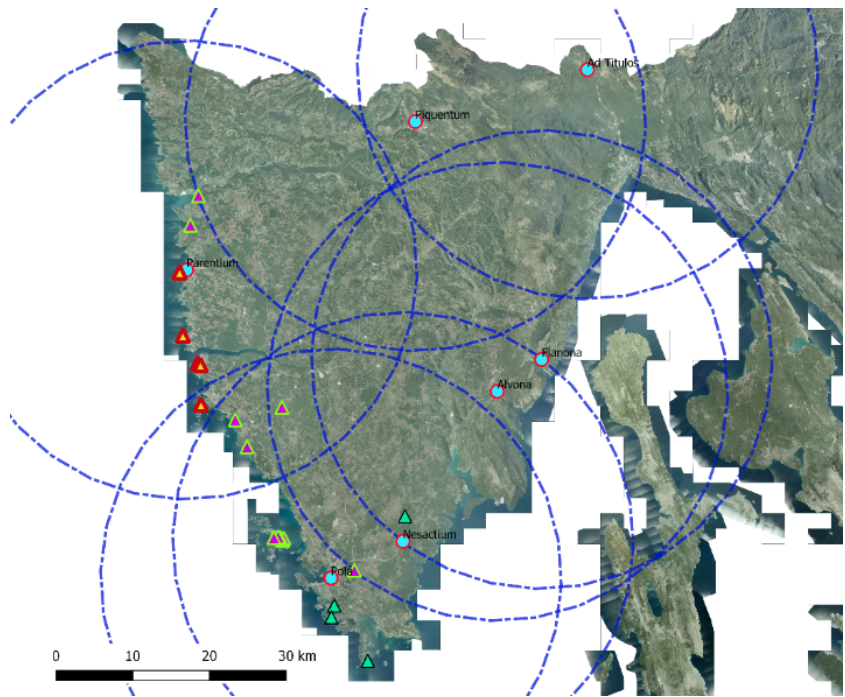


Fig. 5. Thirty-kilometre buffer zones around major urban settlements of Early Antiquity in Istria (made by: Katarina Šprem).

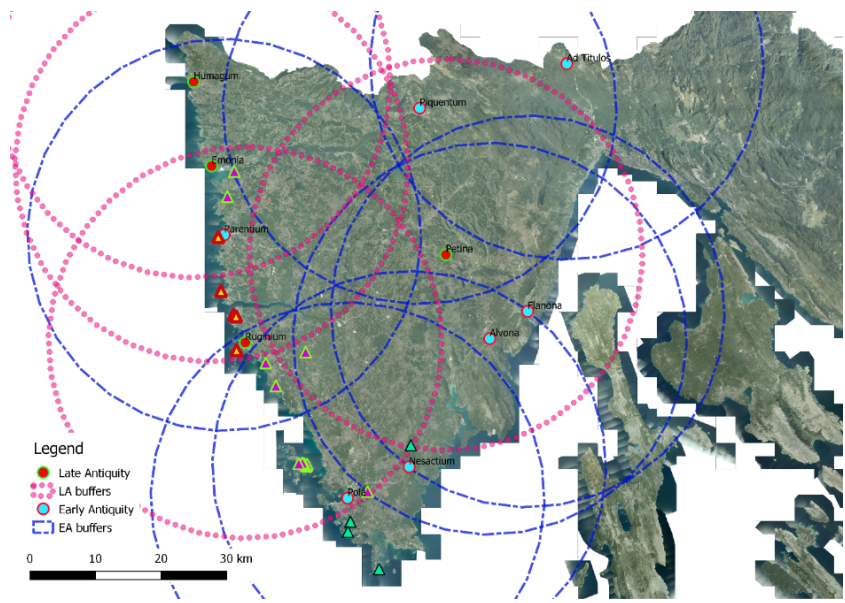


Fig. 6. Thirty-kilometre buffer zones around urban settlements of Late Antiquity in Istria (made by: Katarina Šprem).



Fig. 7. Out-of-use quarry in Kloštar, municipality of Vrsar (photo: Robert Matijašić).

We must not forget the smaller settlements or *villae rusticae* for example, that also had the need for stone and that probably used quarries of smaller size, not necessarily close to the coast line. Several quarries in the hinterland of Vrsar municipality were found during a field survey as a part of *ArchaeoCulTour* project³² (Figs. 7–9). Their connection to the close-by Roman age sites is not attested, but they should also be subjected to petrographical analysis. Some of them had a long history of exploitation and were decommissioned (Fig. 7 and 9), but others were apparently used only during a short period (Fig. 8). These quarries were noticed during ALS interpretation of data which showed scar-like features in the landscape (Fig. 10). This type of data could help us identify and locate other quarries overgrown with vegetation and not visible in satellite images. Similar quarries of small size mentioned in the bibliography are Bale – Skačota east of Rovinj and two quarries in Banjole, south of Pula and near the famous *Cave Romane* quarry.³³ Banjole – Rupice quarry is interesting due to several unfinished columns left there, as well as an unfinished stone head of a woman. The quarry was certainly used during the Austrian times, and it is today overgrown with vegetation.³⁴

32 Full name: *The Archaeological Landscape in a Sustainable Development of Cultural Tourism in the Municipality of Vrsar*, <https://ffpu.unipu.hr/cirla/en/projects/archaeocultour> (accessed May 14th, 2019).

33 Šonje 1980, 151; Matijašić 1998, 395–396.

34 Matijašić 1998, 396.



Fig. 8. A small, out-of-use quarry in Flengi, municipality of Vrsar (photo: Robert Matijašić).



Fig. 9. Out-of-use quarry in Marasi, municipality of Vrsar (photo: Sara Popović).

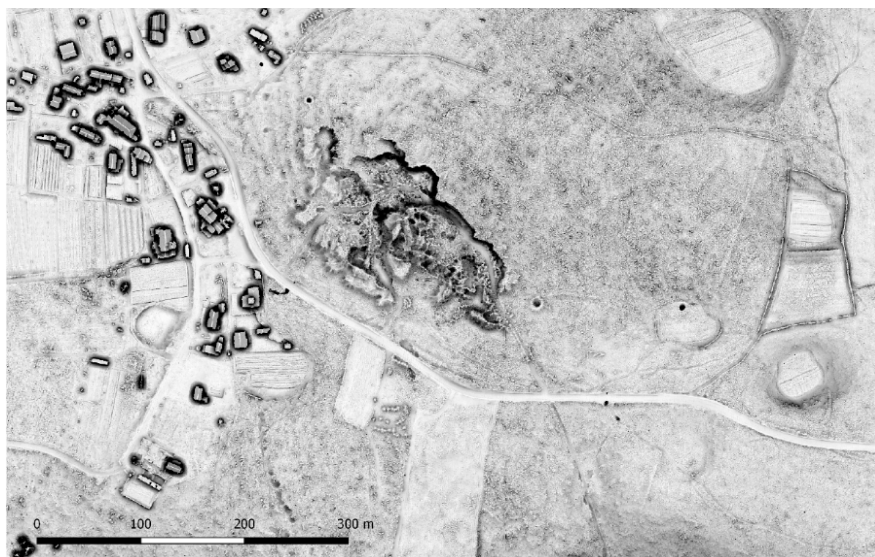


Fig. 10. Scar-like feature in ALS data showing the quarry in Kloštar (made by: Katarina Šprem).

Conclusion

As mentioned before, stone was used for several different purposes in Antiquity – it was used in rubble construction, as aggregate in concrete, for building vaults and arches, columns, capitals, reliefs, sarcophagi and so on. For all the above mentioned uses almost every variety of stone was used, depending on the nearest source. Istria has abundant limestone surface deposits exhibiting different colors and textures and the history of its quarrying is very long. For example, Crnković has determined the source of stone used for the outer curved wall of the Pula Amphitheater, and it is the *Cave Romane* quarry near Vinkuran.³⁵ The quarry itself has retained an interesting name that points to its Roman use.

We have also mentioned petrographical analysis as a more certain way to determine stone sources for Antiquity. The analysis itself is invasive for archaeology, and should be used cleverly. Another method which could help us identify new and forgotten quarries is *Airborne Laser Scanning*. The method is expensive, nevertheless it is used more often in archaeology in the last couple of years. Since the municipality of Vrsar has been laser-scanned as a part of the *ArchaeoCulTour* project, it is a good starting point. Vrsar itself is close to Parentium and Ruginium, big Roman urban centers, and it is within their buffer zones (Fig. 6). Vrsar

³⁵ Crnković 1991.

municipality also has Roman sites; for example, Monte Ricco – an Ancient Roman cistern³⁶ – the construction of which also required stone resources. Generated buffer zones around Roman urban centers do not take into account the terrain of Istria. Our next step will be just that – looking at the terrain and possible transport routes. Since some of the quarries mentioned here are not on the coastline, and transport by sea was not an option, we should look into ancient land routes.

All data presented here is only preliminary, but we believe it is a valid starting point for gathering precise and accurate information about Roman quarrying in the Istrian peninsula.

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