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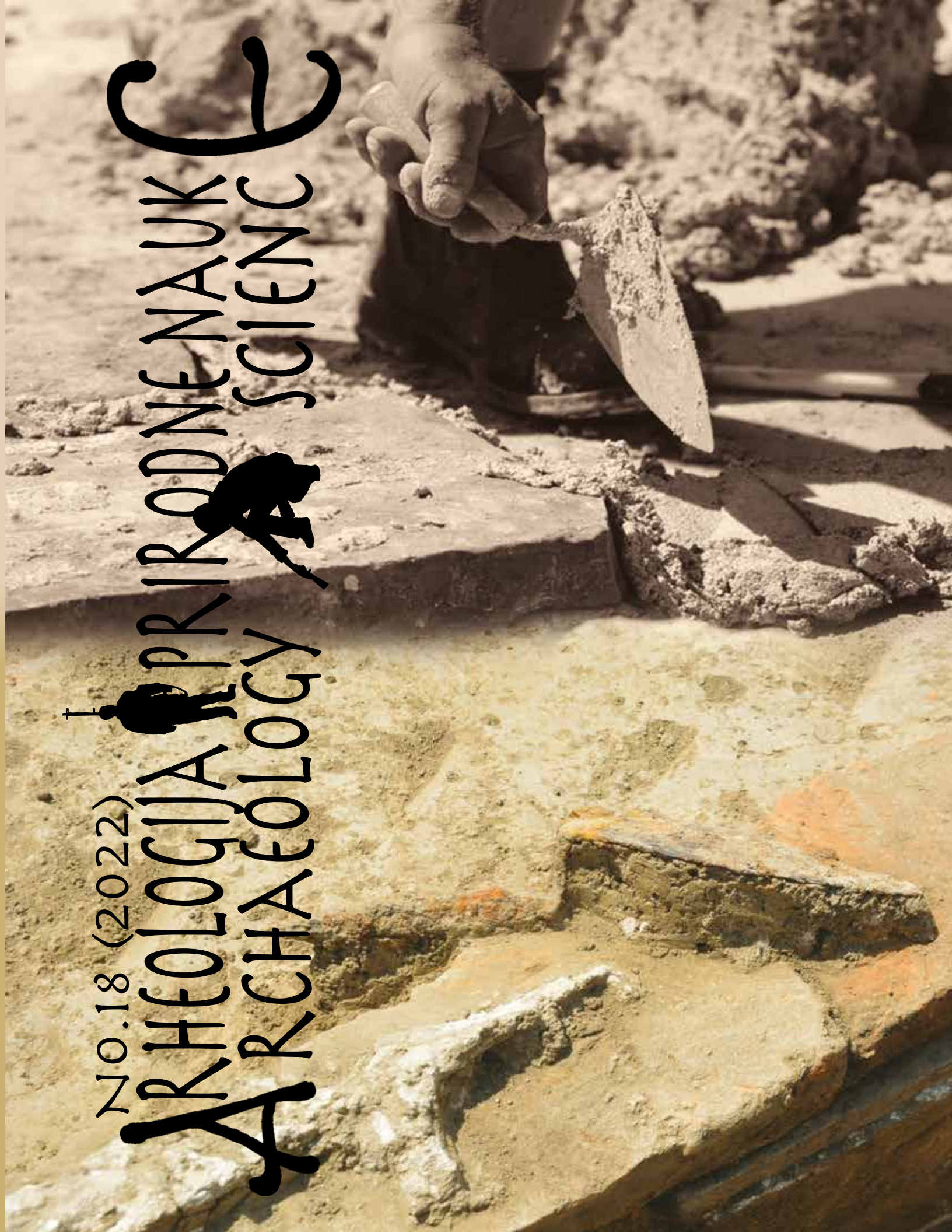
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ARHEOLOGIJA I
PRIRODNE NAUKE

ARCHAEOLOGY
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Center for New Technology
Institute of Archaeology Belgrade

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Traditional building methods with lime mortar,
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Roman trowel from Viminacium, site of Više Grobalja
(photo documentation of the Institute of Archaeology
Belgrade, Viminacium project).
Fragment of mortar from the rampart of Viminacium fortress
(photo documentation of the MoDeCo2000 project).*

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PREFACE

In the summer of 2022, the 1st *International Conference with Workshop - Science for Conservation of the Danube Limes* was held in Viminacium, as the final event of the project *Mortar Design for Conservation - Danube Roman Frontier 2000 Years After (MoDeCo2000)*, financed by the Science Fund of the Republic of Serbia, with the aim of gathering participants connected by a common interest - research and protection of cultural heritage. The lectures covered topics from archaeology, history of architecture and construction, geology, conservation science, archaeometry, chemistry, materials science, physical chemistry, biology, physics, history of art, practical conservation and restoration, interpretation, documentation, and protection of heritage, as well as its management. Practical work, through the building of a wall with the use of materials present in Roman Viminacium, as a unique experience, brought together a large number of participants.

Although the topic of the project was related to historical mortars, the organisers wanted to bring together researchers and experts who deal with different materials used throughout history for the construction of buildings but also for the production of artifacts. The results of extremely complex multidisciplinary studies of historical materials are important not only for gaining knowledge about their composition and methods of production, the process of exploitation of raw materials, transport, and trade, but also for all kinds of connections between people. Their use ensures responsible conservation practices with the application of materials compatible with historical ones, but also the development of new products in the field of industry. One of the project aims is the promotion of the use of local raw materials and traditional techniques in the production of conservation mortars, but also their improvement in accordance with today's circumstances and the environment in which historical buildings are located. What all historical materials have in common is that they were mainly created using locally available raw materials, they were guided by the experience and practicality of people, and improved over generations.

Most of the papers in this volume of the scientific journal *Archaeology and Science* are dedicated to the topics of the Viminacium event, with their authors as participants. Given that the theme of the event connected an extremely large number of scientific fields, this volume includes other papers that relate to them, all contributing to the research, protection, and interpretation of cultural heritage.

Archaeology, as a humanistic science, in collaboration with natural sciences, provides solutions from the past employed by technical and technological sciences for the development of modern ones, invaluable to the contemporary world, especially regarding some of the most current topics, namely climate change and sustainable development. It is with this thought in mind that the content of this volume of the journal *Archaeology and Science* was conceived.

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GLAMIJA - RTKOVO, NEW CONSIDERATIONS

ABSTRACT

Glamija - Rtkovo is one of the important archaeological sites on the lower course of the Danube in Serbia. The discovered parts of architecture and movable finds offer the possibility for the analysis of architectural elements, used materials and mutual relationships of structures of older and younger fortifications, as well as their dating. Also, with more detailed analysis, it is possible to draw certain conclusions and principles on the basis of which a proposal for the ideal architectural reconstruction of the older fortification could be made, as well as a comparison with similar fortifications in the immediate vicinity.

KEYWORDS: LIMES, THE DANUBE, LATE ANTIQUE, ARCHITECTURE ANALYSIS, FORTS.

INTRODUCTION

The fortification at the site of Glamija, near the village of Rtkovo is located on the lower course of the Danube in Serbia. It is positioned 12 km downstream from the village of Kostol (ancient *Pontes*), opposite the Romanian village of Hino-va (Fig. 1). The site is located on a small natural elevation along the steep bank of the Danube, due to which part of the fortification was irretrievably lost (Fig. 2). This is also the most prominent point opposite the Romanian bank, hence its strategic importance for the defence of the Danube Limes from enemy incursions. The existence of visible remains of the fortification was first recorded by Count L. F. Marsigli, and was then mentioned by other travel writers and explorers. In their reports, they mentioned a square fortification whose remains were visible even above the ground. (Marsigli 1726: 21; Kanitz 1892: 51) Today, the remains of the architecture are found only underground¹, mainly due to decomposition and the extraction of its stone and other building materials by the resident population after the Second World War.

¹ Apart from the excavated parts of the site.

It is probably for this reason that M. M. Vasić left this site out during the reconnaissance of this part of Limes (besides the fact that his focus was on prehistoric sites). (Vasić 1910: 9-15)

In order to obtain the necessary elements for determining the shape and dimensions of the fortification, as well as the dating, archaeological research was undertaken in 1980-1982, and revision excavations in 2020. Then, the remains of two fortifications were discovered and confirmed, the smaller internal one that was extensively explored and the larger outer one that was partially explored² (Gabričević 1986:71-91) (Fig. 3).

RESULTS OF ARCHAEOLOGICAL EXCAVATIONS

The smaller fortification, if we can call it that, has an irregular square base, irregularly placed in relation to the outer one, measuring 19.50 m x 19.50 m from the outside and 13.80 m x 13.80 m from the inside (Fig. 4). In some places, the huge rampart was preserved up to a height of 1.50 m,

² Documentation of the Museum of Krajina in Negotin from the excavation of the Glamija - Rtkovo site in 2020.



Fig. 1. Position of the site (drawing by B. Popović - on map in public use)

which was confirmed by the latest research, but in some places, it was devastated and broken down to the foundation level. The width of the foundation zone varies from 2.85 m to 3.05 m, while the width of the ramparts is reduced, on both sides, to 1.60 m via two symmetrical plinths. The foundations are solidly built with large pebbles and irregularly broken stones, bound with high-quality lime mortar (Fig. 5). The upper zone of the walls, above the level of the foundation, is built with half-hewn stone and in some places with

brick fragments, while at a certain height there is a whole brick, measuring 35 cm x 30 cm x 6 cm, built in four rows as a levelling course. The levelling course was discovered in the zone of the north-western corner, and we can assume that such courses were also in the higher zones of the ramparts, which was a common case in the technique of building fortifications in the immediate vicinity, such as the Borđej and Mihajlovac sites. (Цермановић-Кузмановић и Станковић 1984: 219; Цермановић-Кузмановић 1979: 129) We

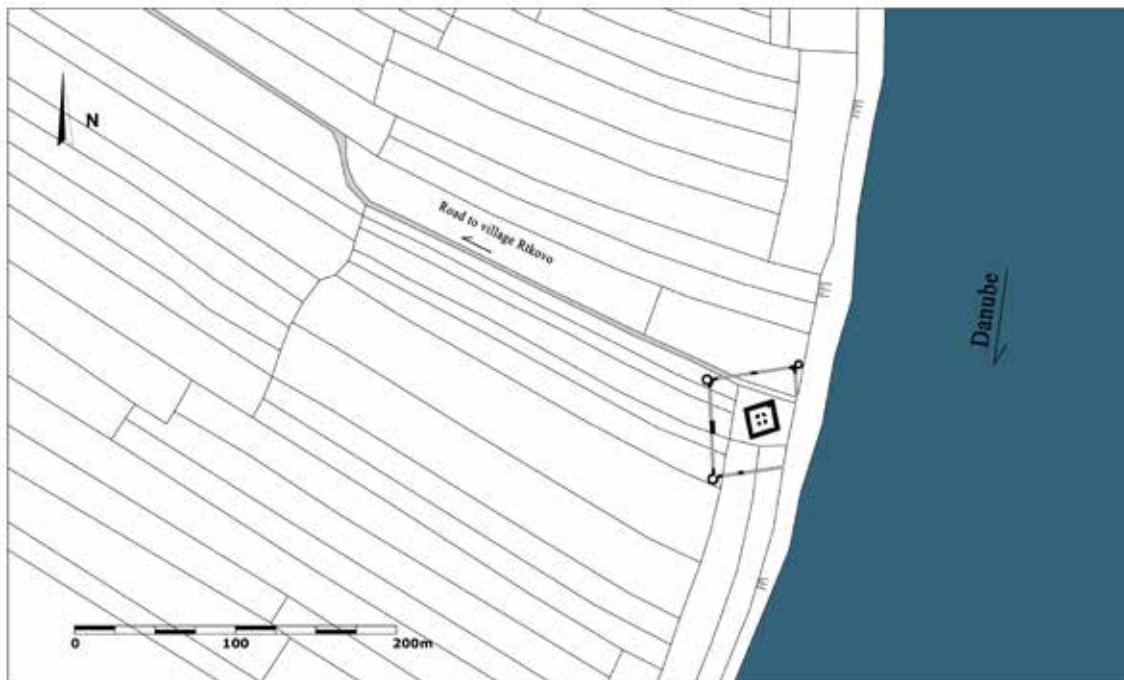


Fig. 2. The wider situation of the locality (drawing by B. Popović - based on technical documentation of the Museum of Krajina)

must emphasise that no bricks with seals have been found during the excavations so far, which makes it somewhat difficult to conclude which military unit was stationed here. The entrance to this fort was most likely located on the western side. Its position is not exactly determined, but it can be assumed based on the larger stone blocks in the zone of the walls' plinth. (Fig. 5)

In the central part of the internal fortification, four foundations were discovered, built of stone and, in some places, bricks bound with lime mortar (Fig. 6). They are arranged symmetrically, and they served as support for the masonry pillars of the upper structure. The pillars have irregular square bases with one rounded corner, measuring about 2.30 m x 2.30 m, and the bottom of the foundation was found at 2.20 m from the ground level, i.e., from the level of the preserved wall mass. The distance from the pillars to the rampart is about 3.50 m, while the distance between the pillars is about 1.50 m. In the inner part of the fortification, in the north-eastern corner, a masonry structure measuring 1.10 m x 1.90 m was discovered, emerging from the mass of the wall. There is a noticeable cascading level that can be connected to the stairs, while the larger levelled surface could be characterised as a landing from which one stepped on the second stair flight at a right angle (Fig. 7).

The same, uniform building material was used for the construction of the entire building, ramparts and pillars in the central part, which indicates that the building was built at the same time without any different construction phases, and with only later repairs. In places where it was possible, during the excavations in 1980-1982, the stratigraphy of the internal fortification was determined, which showed that the horizons were separated by layers of charred remains of wooden structures and rubble. (Gabričević 1986: 72) This was confirmed by excavations in 2020, to a greater extent, but there were no datable finds. Two horizons can be distinguished here, which are important for understanding the function of this fortification, the older of which is determined by the finds of coins of Valentinian I, Gratian, Theodosius, Honorius and Arcadius. The objects found in this layer, especially the fibulae and lamps, also belong to that period. The younger horizon, less rich in inventory, is defined by the coins of Anastasius and Justin I. (Gabričević 1986: 73) It is important to note that the presence of various finds, in addition to military ones, indicates considerable craft and agricultural activity of the residents of the fortification, as well as the importance of the Danube for their existence.

The outer fortification is positioned on a

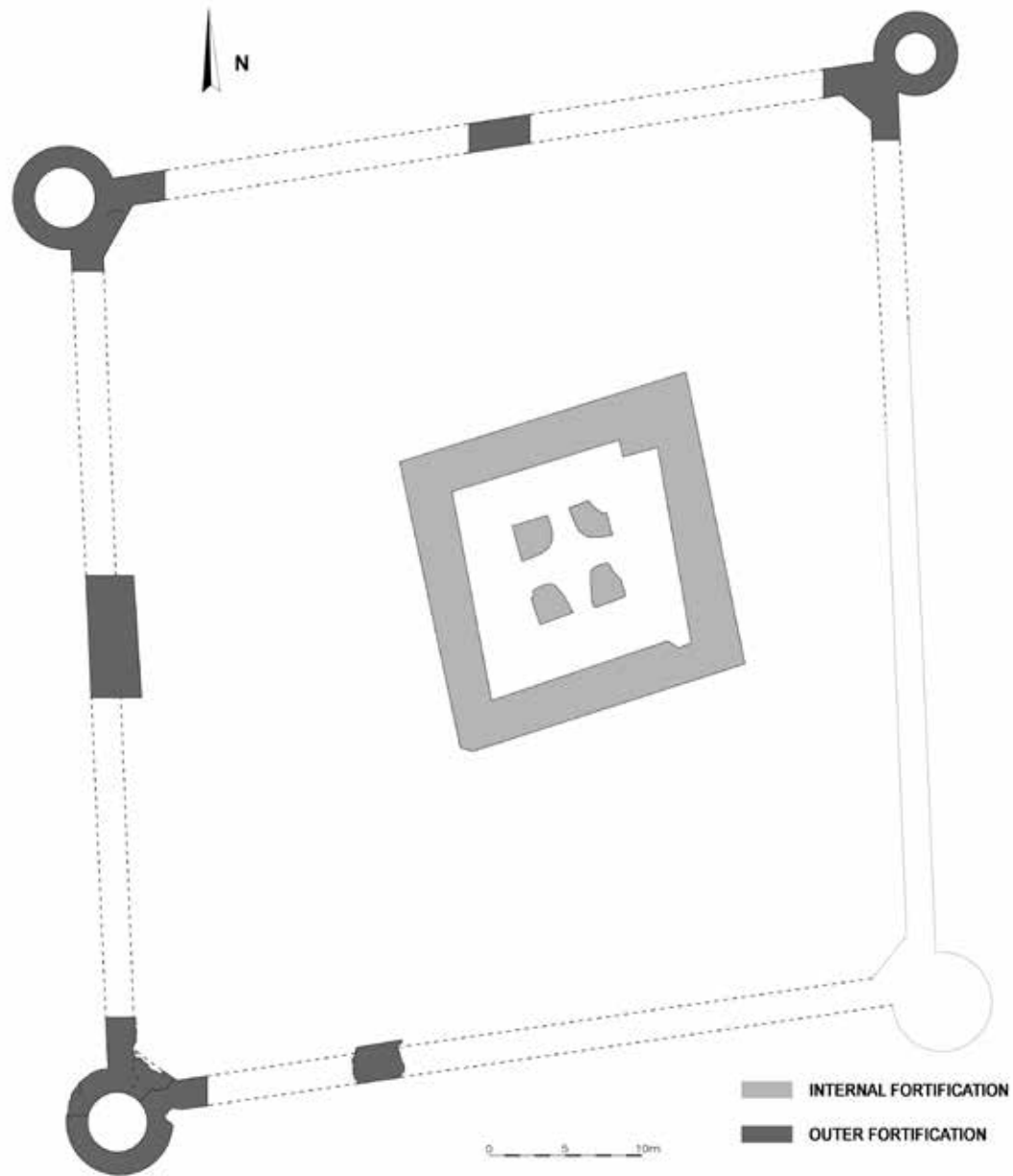


Fig. 3. Closer location of the site (drawing by B. Popović - based on technical documentation of the Museum of Krajina)

slightly sloping terrain that falls towards the river and follows an east-west orientation. Its base, which partially deviates from the regular square, consists of four angular circular towers and a rampart between them (Fig. 8). Excavations so far have confirmed the northern, southern and western ramparts, while the eastern one was probably destroyed by the flow of the Danube. The remains of the rampart are very poorly preserved, in some places only at the level of the foundation, and in

others up to about 1 m high, while its width is extremely large, about 2.4 m (Gabričević 1986: 73). Based on the uncovered parts of the ramparts, it is possible to determine their direction and position. The length of the fortification in the east-west axis is 51 m, while the dimension in the north-south direction has been roughly determined to be about 50 m. The thickness of the ramparts in the foundation zone is about 3 m, while the upper zone is about 2.4 m wide. Three angular circular towers

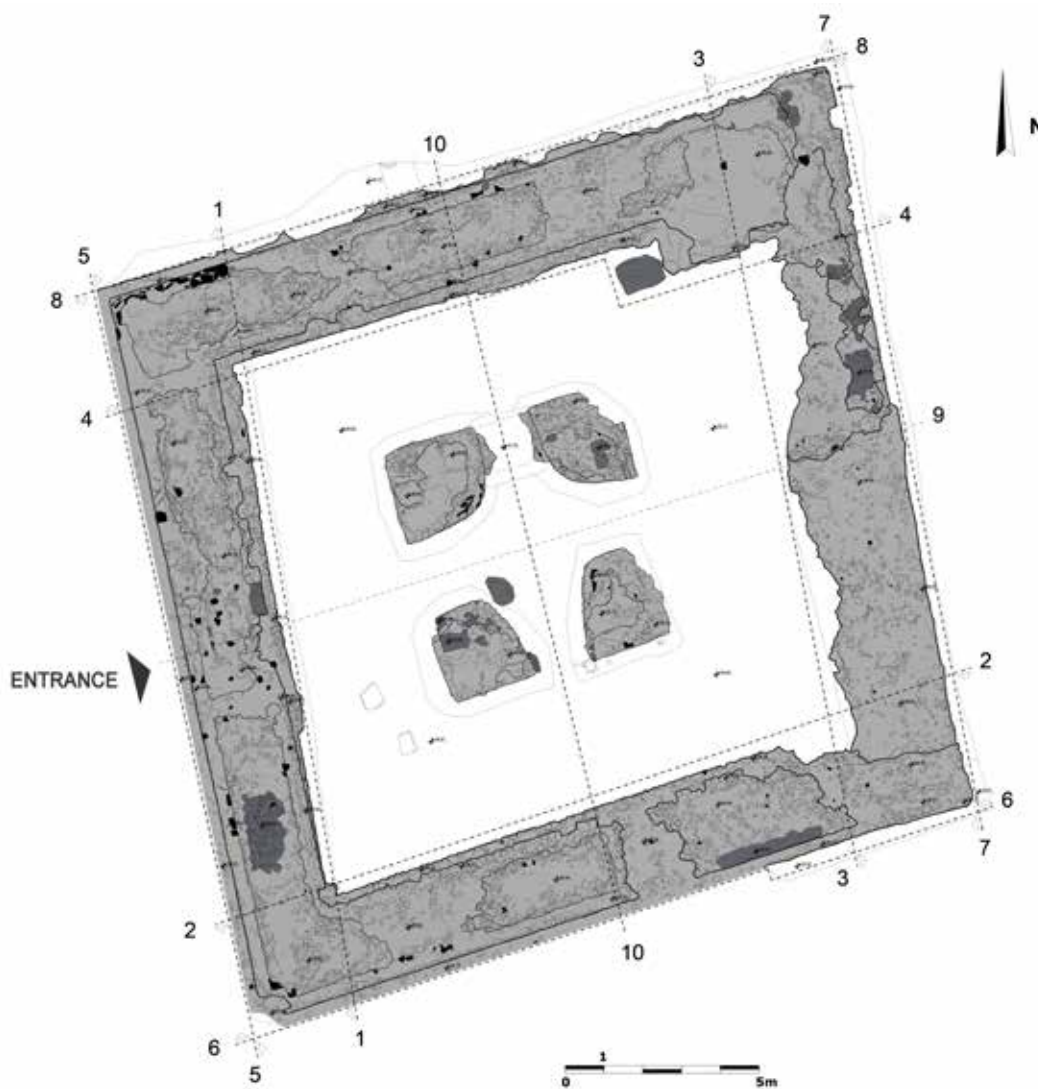


Fig. 4. Plan of internal fortification (drawing by B. Popović - based on technical documentation of the Museum of Krajina)

were also discovered, which intruded into the field in relation to the outer face of the rampart, with which they were connected by a heavily reinforced masonry segment that formed the bulk of the rampart. The towers were entered through this reinforcement, and the entrance was most likely formed into a barrel vault. The north-western and south-western towers have an external diameter of about 7.5 m, while the north-eastern one is slightly smaller at 5.3 m. They were built with half-hewn stone alternating with four rows of bricks, measuring 36 cm x 30 cm x 4.5 cm, which served as a levelling course, bound with high-quality lime mortar, creating huge joints 8 cm thick. During the excavation, it was found that the floor of the tower was paved with bricks. The walls of the tow-

ers have been preserved in some places up to 1.9 m high, which is very important for the later reconstruction during conservation. It is important to note that during the excavation, an expected layer of rubble along the ramparts was missing, whose existence would be expected in the case of a powerful structure, so the question arises whether the younger fortification was completed at all.

ANALYSIS OF FORT ARCHITECTURE

In order to clarify the connection between the outer and internal fortifications, excavations were undertaken in the intermediate space. No connection was found between these two structures either in their construction or in any other details.



Fig. 5. Construction and masonry techniques of the foundation and above-ground zone of the rampart (photo by B. Popović)

A significant height difference between the two fortifications was noted, which also contradicts any organic connection. In addition, the construction techniques used in both cases, as well as the asymmetric position of the internal and outer fortifications, support the hypothesis that these two structures were built at different times. Their construction was dictated by the strategic importance of this locality on the banks of the Danube. (Gabričević 1986: 74)

The investigation of the locality conditioned the level and scope of the analysis of the architecture, which would be significant for understanding the construction method and the constructive structure of this type of fortification, but also the basis for some future conservation solutions in order to present the site.

Older - Internal Fortification

A comprehensive analysis of the conditions on the ground and the documentation from the excavation concluded that the older fortification was compact and consisted of a huge masonry construction of a circumferential wall with four

masonry pillar bases in the central part.

The perimeter wall was built on a huge foundation, about 3 m thick, which was reduced via two symmetrical plinths to a final width of 1.6 m. Based on the size of the foundation and the width of the rampart of 1.6 m, we can assume that the rampart had a considerable height. This assumption is also indicated by a large amount of rubble that occurs right next to the rampart, which represents the collapsed wall mass. The masonry pillars, which also have huge foundations, most likely supported the upper floor construction, as well as the roof structure. The distance between the perimeter wall and the pillars in the centre is about 3.80 m, which indicates that this could have been spanned with wooden beams, which would have carried the floor construction. In the highest zone, a hipped roof could easily have been formed over the entire space or only over the central part with pillars.

In support of the thesis with a wooden upper construction, there is also a large number of finds of metal wedges, nails and clamps that were most likely used to connect wooden structural elements, as well as a large number of roofing bricks found



Fig. 6. Construction and masonry techniques of the foundation zone of the pillars in the interior of the fort (photo by B. Popović)

in the rubble above the floor. (Gabričević 1986: 74) Also, in support of the storey construction, there is a rectangular mass of masonry in the northeast corner of the fortification, on which the remains of three steps and a landing, from which the second flight of the stairs was accessed at a right angle, can be identified. The second flight of stairs was most likely wooden because no masonry structure was found, so such a solution is the only possible one. The first flight of three steps is parallel to the north wall and approached from the eastern side, while the second flight was probably parallel to the east wall and was approached from a masonry landing. The position of the staircase next to the rampart determines the height at the exit part of the upper floor construction, as well as the organisation and structural assembly of the upper zone. If we were to assume, based on the free space where it is possible to form a wooden flight of a staircase, the number of treads and the height of each step, we get an approximate height of about 6 m from the floor level.

This could be the elevation of the first-floor construction, but also the height of the walkway, if the rampart ends just above the level of the floor construction. The central part, which would be supported by the pillars in the centre, could then have a greater height with another floor that would have been accessed by stairs from the first floor. In that case, the assumed second floor could have served as an observation post and only the central part would have been covered. If the rampart had a full height, and the entire area was covered, the function of the fortification and the way it was used would be called into question (Fig. 9a and Fig. 9b). A similar masonry structure, positioned in the corner of the fortification, can be found at the sites of Donje Butorke and Mihajlovac (Цермановић-Кузмановић 1979; Цермановић-Кузмановић и Станковић 1986)

The entrance to the fortification, as we mentioned, was most likely from its western side, which is suggested by the stone blocks in the wall

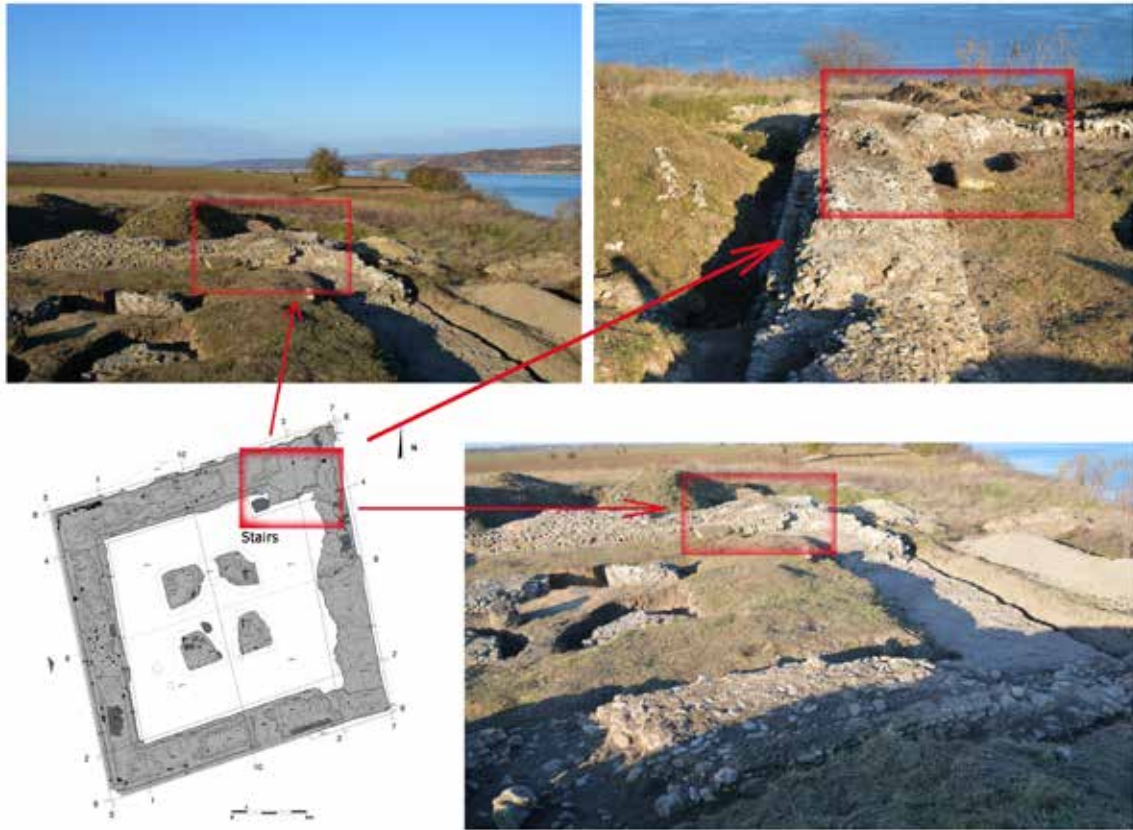


Fig. 7. Masonry structure of stairs (photo and drawing by B. Popović)

mass at the level of the threshold. Such blocks are not found in other parts of the wall mass, so it is likely that they were part of the threshold or entrance zone. The area around the entrance is poorly preserved, but a regular unevenness of the wall mass is noticeable on that part of the western rampart. The level of the entrance and the level of the first step of the masonry part of the staircase, as well as their relationship with the second level of the plinth, lead to the conclusion that the floor rested precisely on the second level of the plinth, which indirectly indicates the level of the fortification's ground floor or the level of use, since the excavation reports do not mention a mortar floor. The position of the staircase also supports the assumption of the position of the entrance and the organisational scheme of the fortification in which only the western wall is suitable to contain the entrance opening. We find an almost identical structure at the sites of Mihajlovac-Mora Vagei, Donje Butorke and Borđej, which leads us to the conclusion that these were typical fortifications for this part of Limes.

Analysing the building materials used, it is noticeable that a uniform material was used for the construction of the internal fortification. The foundations were built with pebbles, sometimes with one row of bricks for levelling, while half-hewn stone was used for the upper zones of the face of the walls, for easier masonry work, and with a levelling course of four rows of bricks. The filling of the inner zone of the walls was usually rubble core - broken stone and pebbles with a lot of lime mortar (Fig. 5 and Fig. 6). This masonry work is characteristic of a fortification of the 4th century that is, of the period of Late Antiquity, and is found in many sites on the Limes built in that period. These facts support the assumption that the whole internal fortification was built at the same time and that the works on its construction were synchronised, and that they were carried out during the 4th century.

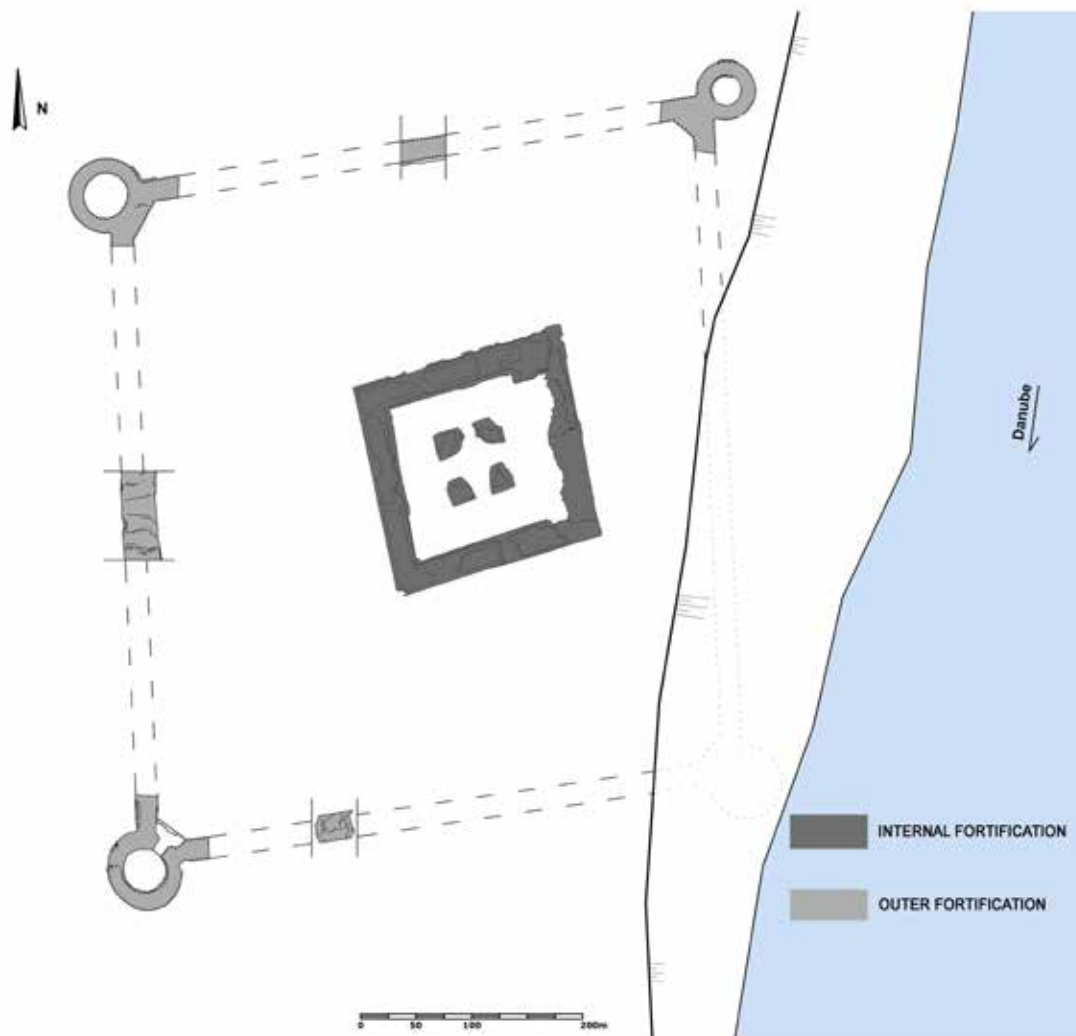


Fig. 8. Plan of external fortification (drawing by B. Popović)

Younger - Outer Fortification

The younger fortification, formed around the older one at a distance of about 20 m, has a completely different architectural structure and looks more like classic fortifications with towers and ramparts. The position of the towers on the corners is characteristic of the fortifications of Donje Butorke and Ljubičevac (Цермановић-Кузмановић и Станковић 1986; Паровић-Пешикан 1984), where the towers are placed on the corners, and their shape and dimensions almost match, with only minor deviations and differences. For example, in the Donje Butorke site, the towers have radially arranged buttresses on the outside, which had a constructive role to ensure stability due to the large slope of the terrain towards the Danube,

while in other sites the situation was much more favourable and there was no need for this type of reinforcement. Also, the position of the towers, which extruded in relation to the rampart, is a characteristic of late antique fortifications and one of the most significant changes in the development of Roman fortifications. (Pop-Lazić, Rummel 2020: 231) Certain overlaps are also noticeable in the dimensions of the fortifications, so that the fortification in Donje Butorke has dimensions of 46 m x45 m, Ljubičevac about 52 m x 54 m, while the other fortifications are somewhat smaller.

The ensemble of the younger fortification - ramparts and towers, was built with larger stones and bricks in four rows, bound with lime mortar. The presence of larger broken stones with a lot of mortar that was used to fill the ramparts is also

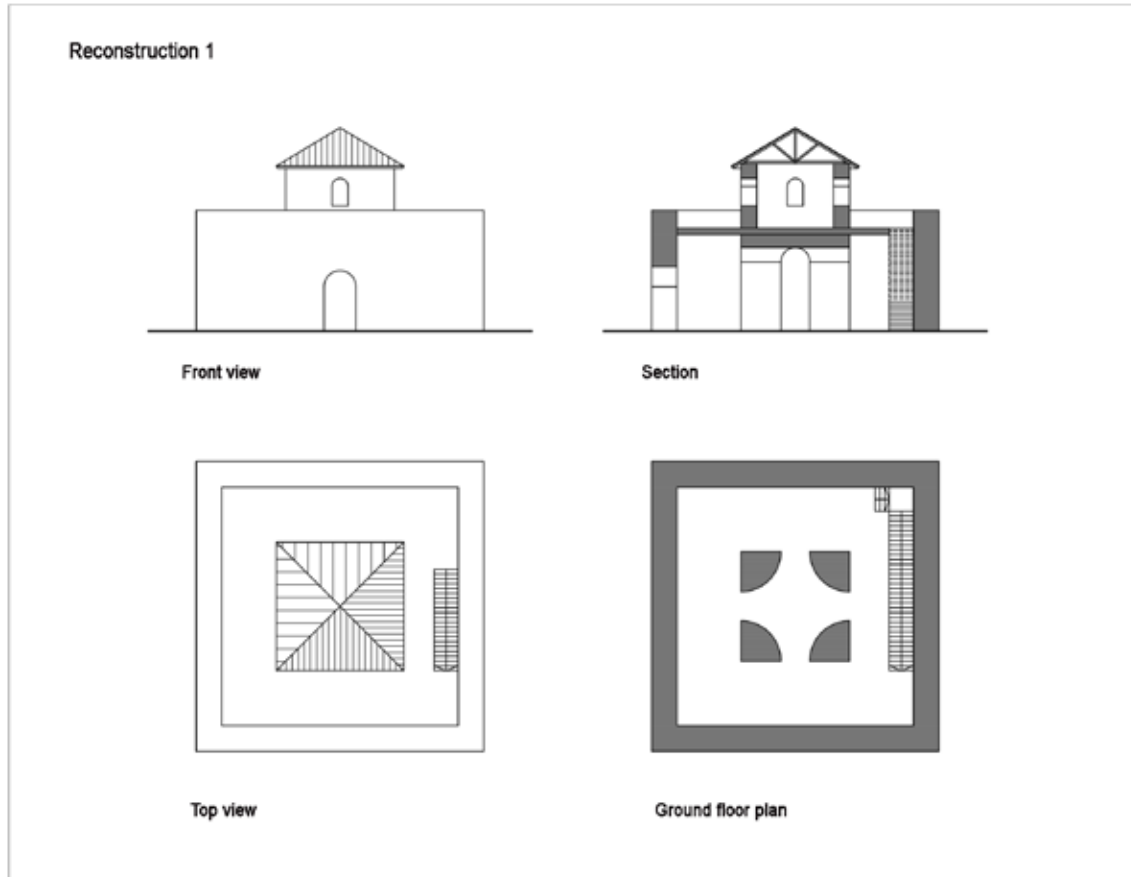


Fig. 9a. Schematic reconstructions of the watchtower (drawing by B. Popović)

noticeable. Here it is obvious that there are certain differences in the material used.

Although it is assumed that the fortifications were built independently of each other, this can be said for the older fortification, while the construction of the younger one was influenced indirectly by its position, size and orientation. The choice of location was an important factor in the functioning of fortifications on the Limes. We can notice that it was influenced by many factors, but the most important is the relationship with the river, which was undoubtedly the main geographical feature that determined the border. One of the factors was the distance between the fortifications, as well as the relationship to the enemy territory. It is particularly interesting to note that from a micro-locational point of view, the positioning of the fortifications, in the part of the lower course of the Danube in Serbia, was followed by a lot of differ-

ent parameters that defined the setting up of bases in Đerdap. The main characteristic of the fortifications from Čezava to Egeta is that they were placed directly along the Danube, or as close as possible to the river. Therefore, their direct topographical relationship to the river is fundamentally different from those observed in the upper course of the Danube in Serbia, where the fortifications were placed on the tops of the loess plains and terraces that formed next to the river, i.e., a few tens of meters above the Danube, as is the case, for example, in *Bononia*, *Cusum*, *Ad Herculem*, *Acumincum* and *Ritium*. (Pop-Lazić, Rummel, 2020: 227) This characteristic has led to the fact that in several cases, the Danube has washed away parts of fortifications that were often built on the unfavourable ground right next to the river, which is also the case with the younger fortification in Glamija.

As for the building materials used for the construction of the outer and internal fortifications, there are noticeable differences in their dimensions. The material used for the construction of the

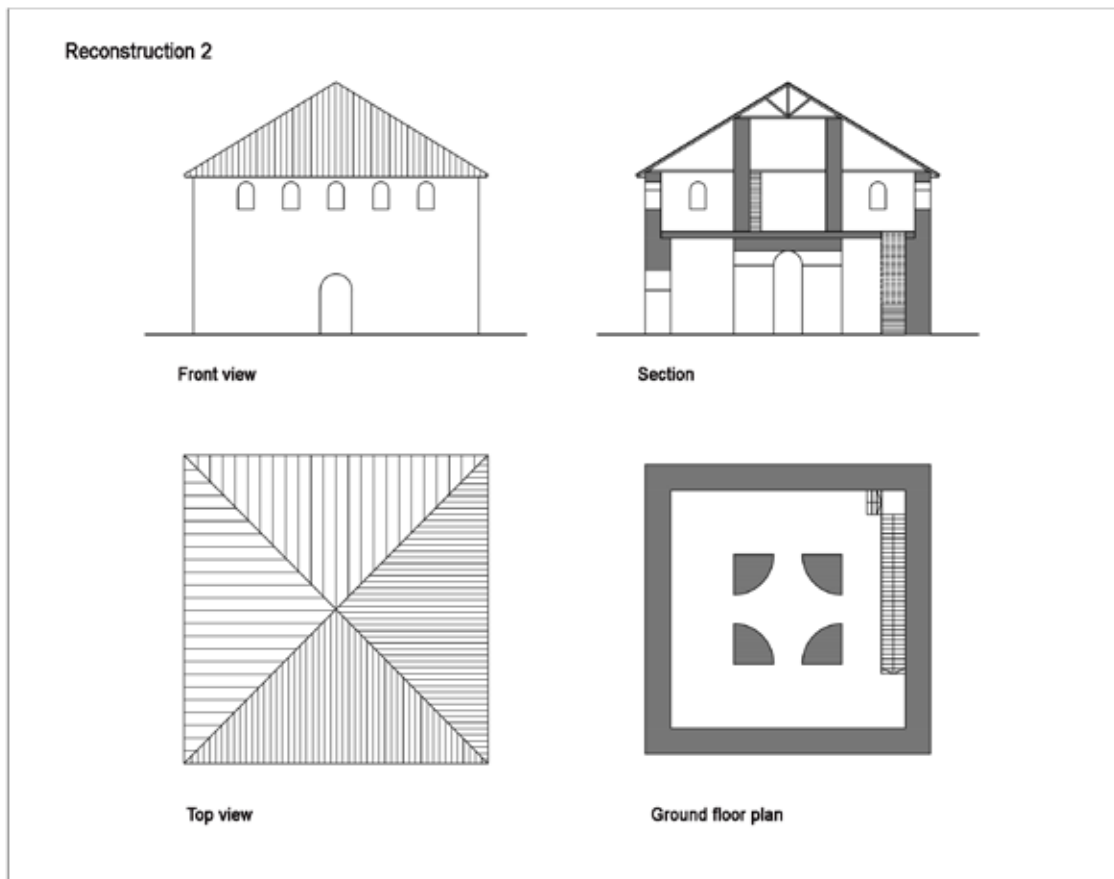


Fig. 9b. Schematic reconstructions of the watchtower (drawing by B. Popović)

outer fortification was larger than that used for the construction of the internal fortification, which is characteristic of a building of this size. The difference in the dimensions of the bricks and the mortar joints between them also stands out. For the internal fortification, the bricks measure 35 cm x 30 cm x 6 cm with 4 cm – 6 cm joints, while for the external fortification, the brick dimensions are 36 cm x 30 cm x 4.5 cm, and the joints are 8 cm. With the lime mortar, apart from the fine sand, the use of very coarse aggregate is noticeable in both fortifications, which is especially pronounced in the younger fortification.

CONCLUSIONS

The facts presented indicate that the two fortifications, the internal and the outer, were built in different time periods. The internal fortification, or watchtower, is dated in the literature to the second half of the 4th century, according to the coins found during the excavations (Gabričević

1986: 74), but it can also be dated thus based on the masonry technique and the materials used. It is assumed that the fortification suffered some damage at the beginning of the 5th century, when it was partially rebuilt (Gabričević 1986: 72). Also, (Fig. 10) analogies with similar fortifications in the immediate vicinity, Donje Butorke, Mihaelovac, Borđej and Ljubičevac, (Цермановић-Кузмановић 1979; Цермановић-Кузмановић и Станковић 1984; Цермановић-Кузмановић и Станковић 1986; Паровић-Пешикан 1984) indicate that this fort was built during the 4th century, i.e., that there was a series of fortifications built in the period of the first tetrarchy, at the time of Diocletian. The older fortification, which is a fortification in the true sense of the word, has not been clearly dated in the literature due to the complete absence of movable finds. (Gabričević 1986: 73) We assume, based on the dimensions, masonry techniques, as well as analogies with the already mentioned fortifications of Borđej (Цермановић-Кузмановић и Станковић 1984: 217) and Donje

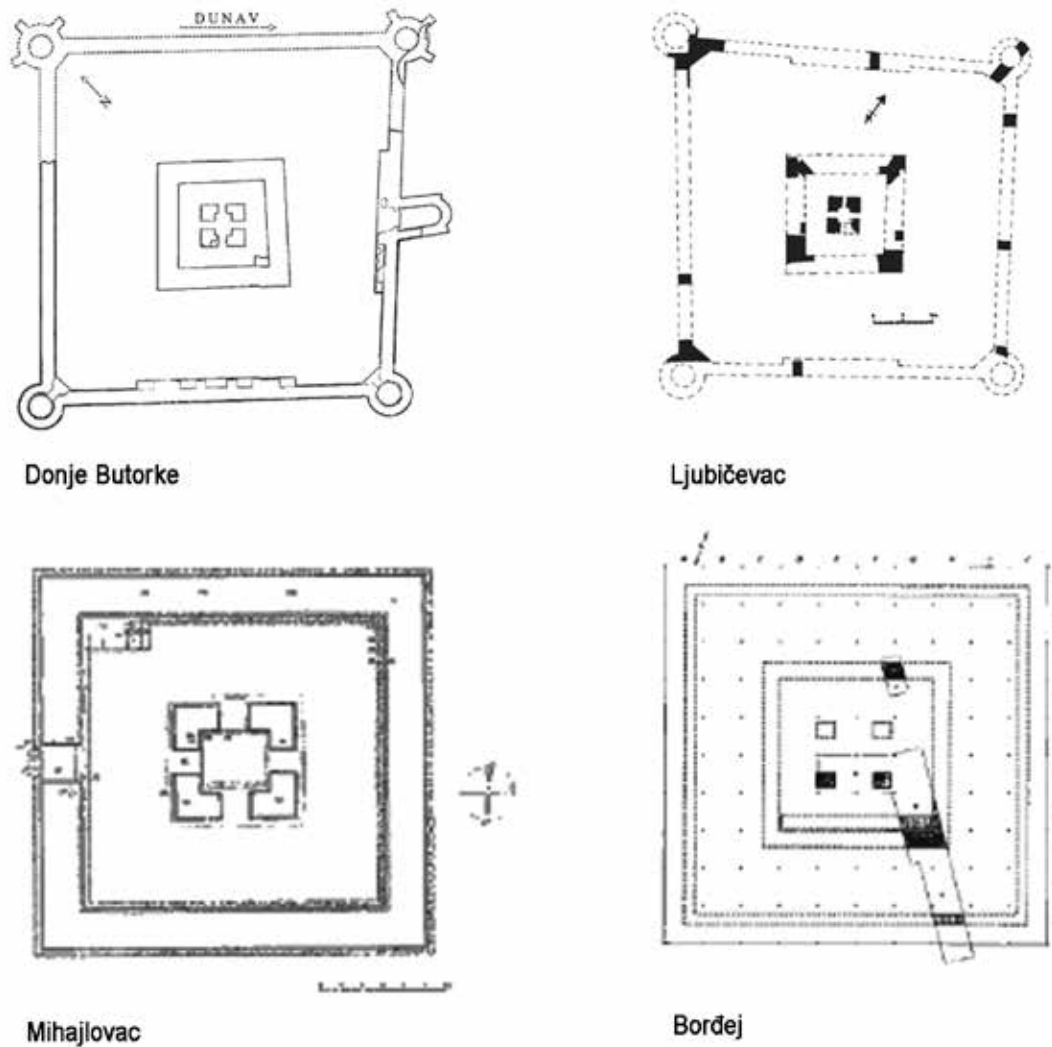


Fig. 10. Analogies - the fortifications that are most similar (according to Pop-Lazić, S. and Rumel, C., 2020)

Butorke (Цермановић-Кузмановић 1979: 127), that its construction was started in the 6th century, during Justinian's renovation of the Limes, and it is questionable whether it was completed. It is clear that it was built as an upgrade or modification of the existing structure in order to improve defence capabilities, that is, to fit in with the new trends of development in military architecture.

A number of questions also arise, to which we cannot now give an exact answer, one of them being how many soldiers were stationed in this fort in the first and later periods of its functioning, as well as the purpose of the building, which we assume was a watchtower. The question arises whether the soldiers were stationed in the watchtower or whether they came from a nearby fortifi-

cation such as *Pontes*. Also, the question remains open as to what the watchtower looked like, how many floors it had and what its relationship was to the environment, from a military-tactical point of view. These and many other questions will hopefully be answered by new research.

The sites discovered so far, Glamija among them, provide us with a certain picture of the functioning of the Danube Limes over time, its formation, restoration and decay. The fortification on the site of Glamija is only one of the known mosaic fragments that shed light on the powerful phenomenon called the Limes.

BIBLIOGRAPHY**Vajenaru, C. 2010**

Minor fortifications in the Balkan – Danubian Area from Diocletian to Justinian, Cluj-Napoca: Editura Mega.

Цермановић-Кузмановић, А. 1979

Римско утврђење код Кладова, *Старинар XXVIII-XXIX* (н.с), 127-134.

(Cermanović-Kuzmanović, A. 1979

Rimsko itvrđenje kod Kladova, *Starinar XXVIII-XXIX* (n.s.), 127-134).

Цермановић-Кузмановић, А. и Станковић, С., 1984

Борђеј, касноантичко утврђење - извештај о археолошким истраживањима у 1980. години, in *Ђердапске свеске II*, ed: В. Кондић, Београд: Археолошки институт, 217-220.

(Cermanović-Kuzmanović and A., Stanković, S., 1984 Borđeј, kasnoantičko utvrđenje – izveštaj o arheološkim istraživanjima u 1980. godini, in: *Ђerdapske sveske II*, ed: V. Kondić. Beograd: Arheološki institut, 217-220.)

Цермановић-Кузмановић, А. и Станковић, С. 1986

Античко утврђење Мора Вагеи код Михајловца, in *Ђердапске свеске III*, ed: В. Кондић, Београд: Археолошки институт, 453-466.

(Cermanović-Kuzmanović and A., Stanković, S 1986

Antičko utvrđenje Mora Vagei kod Mihajlovca, in *Ђerdapske sveske III*, ed: V. Kondić, Beograd: Arheološki institut, 453-466).

Gabričević, M. 1986

Rtkovo-Glamija I - Une forteresse de la basse époque, foullies de 1980-1982, in *Ђerdapske sveske III*, ed. V. Kondić, Beograd: Arheološki institut, 71-91.

Gabričević, M. 1988

Natpis sa lokaliteta Glamija I, in *Ђerdapske sveske IV*, ed: V. Kondić, Beograd: Arheološki institut, 143-146.

Jeczimenovski, E. 1882

Roman fortifications along the Former Upper Moesian Limes AD 270-378, in *Roman in the Middle and Lower Danube valley, 1st century BC – 5th century AD: Case studies in archaeology, epigraphy and history*, eds. E.C. De Sena, C. Timoc, Oxford: BAR Int. Series, 97-106.

Kanitz, F. 1892

Römische Studien in Serbien, Wien: Denkschriften der kaiserlichen Akademie der Wissenschaften.

Marsigli L.F. 1726

Danubius Pannonico-Mysicus, Volume 1. Amsterdam: Gosse, Alberts, de Hondt.

Паровић-Пешикан, М. 1984

Љубичевац-Гламија, in *Ђердапске свеске II*, ed: В. Кондић, Београд: Археолошки институт, 71-92.

(Parović-Pešikan, M. 1984

Ljubičevac-Glamija, in *Ђerdapske sveske II*, ed: V. Kondić, Beograd: Arheološki institut, 71-92).

Pop-Lazić, S. and Rumel, C. 2020

Characteristic of Late Roman fortifications on the Middle Danube Limes in *ILLYRICVM ROMANVM*, Studiola in honorem Miloje Vasić, eds: I. Popović, S. Petković, Beograd: Arheološki institut, 224-239.

Васић, М. М. 1910

Жуто Брдо, *Старинар* (н.р.) 5: 9-15.

(Vasić. M. M. 1910

Žuto Brdo, *Starinar* (n.r.) 5: 9-15).

REZIME**GLAMIJA – RTKOVO, NOVA RAZMATRANJA**

KLJUČNE REČI: LIMES, DUNAV, KASNA ANTIKA, ANALIZA ARHITEKTURE, UTVRĐENJA.

Utvrđenje na lokalitetu Glamija kod sela Rtkova nalazi se u donjem toku Dunava kroz Srbiju. Pozicionirano je 12 km nizvodno od Kostola (Pontes), a nasuprot rumunskog sela Hinova. Da bi se

dobili potrebni elementi za utvrđivanje oblika i dimenzija utvrđenja, kao i datovanja, preduzeta su arheološka istraživanja od 1980. do 1982. godine, kao i reviziona iskopavanja 2020. godine. Tada su otkriveni i potvrđeni, ostaci dva utvrđenja, manjeg unutrašnjeg, koje je istraženo u velikoj meri i većeg spoljašnjeg, koje je delimično istraženo.

Manje utvrđenje, ako ga tako možemo nazvati, je nepravilne kvadratne osnove, nepravilno postavljeno u odnosu na spoljašnje, dimenzija 19,50 m x 19,50 m. U središnjem delu unutrašnjeg utvrđenja otkrivene su četiri temeljne stope zidane kamenom i mestimično opekam, vezanim krečnim malterom. Spoljašnje utvrđenje pozicionirano je na blago nagnutom terenu koji pada prema reci i prati orijentaciju istok-zapad. U osnovi je oblika koji delimično odstupa od pravilnog kvadrata, dimenzija 50 m x 51 m, a čine ga četiri ugaone kružne kule i bedem između njih. Da bi se razjasnila povezanost između spoljašnjeg i unutrašnjeg utvrđenja, rađena su iskopavanja u međuprostoru, međutim nije pronađena veza između ove dve strukture, ni u njihovoj konstrukciji, ni u drugim detaljima.

Istraženost lokaliteta uslovlja je nivo i obim analize arhitekture koja bi bila značajna za razumevanje načina gradnje i konstruktivnog sklopa ovakvog tipa utvrđenja, ali i osnova za buduća konzervatorska rešenja u cilju prezentacije lokaliteta. Na osnovu masivnosti temelja bedema i stubaca u središtu, kao i širine bedema od 1,6 m, možemo pretpostaviti da je bedem imao znatnu visinu, a da je karaula imala najmanje jednu etažu. Rastojanje između obimnog zida i stubaca u središtu je oko 3,80 m što ukazuje da je taj raspon mogao biti savladan drvenim gredama, koje bi nosile međuspratnu konstrukciju. U najvišoj zoni bi se lako mogao formirati četvorovodni krov iznad celog prostora ili samo iznad centralnog dela sa stupcima. Takođe, u prilog spratnoj konstrukciji ide i pravougaona zidana masa u severoistočnom uglu utvrđenja na kojoj se prepoznaju ostaci tri stepenika i podesta sa koga se pristupalo drugom kraku stepenica pod pravim uglom. Položaj stepeništa uz bedem uslovljava i visine na izlaznom delu međuspratne konstrukcije, pa tako i organizaciju i konstruktivni sklop osnove, ali i gornje etaže. U organizacionoj šemi osnove upitno je mesto ulaza u utvrđenje, koji je najverovatnije bio sa zapadne strane, na šta sugerišu kameni

kvaderi u zidnoj masi na nivou praga. Ovakvi kvaderi se ne sreću u ostalim delovima zidne mase, pa je verovatno da su bili deo praga ili ulazne zone. Analizirajući upotrebene materijale, dolazimo do istih zaključaka - da je starije utvrđenje, odnosno karaula, građeno nezavisno od mlađeg, čiji je položaj, orijentaciju i veličinu indirektno odredilo starije utvrđenje. Primetna je razlika u veličini građevinskog materijala, opekama i kamenu, kao i u granulaciji frakcija za spravljanje maltera.

Iznete činjenice ukazuju da su dva utvrđenja, unutrašnje i spoljašnje, građena u različitim vremenskim periodima. Unutrašnje utvrđenje, ili karaula-osmatračnica, je opredeljeno u drugu polovinu IV veka, prema nalazima novca, ali i prema tehnici zidanja i upotrebljenom materijalu. Takođe, analogije sa sličnim utvrđenjima u neposrednoj okolini, Donje Butorke, Mihajlovac, Borđej i Ljubičevac, ukazuju na to da je ovo utvrđenje građeno tokom IV veka, tj. da je to bio niz utvrđenja izgrađenih u periodu prve tetrarhije i vremenu Dioklecijana. Starije utvrđenje, koje je utvrđenje u pravom slislu te reči, možemo opredeliti u VI vek, na osnovu dimenzija, tehnika gradnje, kao i analogija sa već pomenutim utvrđenjima, odnosno u vreme Justinijanove obnove limesa, a upitno je da li je bilo završeno. Jasno je da je građeno kao nadogradnja ili modifikacija postojeće strukture u cilju poboljšanja odbrambenih sposobnosti, odnosno uklapanja sa novim tendencijama razvoja vojne arhitekture.

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. - Beograd : Centar za nove tehnologije Viminacium: Arheološki
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