

Roman Stone Monuments from North Dobruja, Romania: digital survey and historical-architectural interpretation of the Halmyris fortification

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Introduction

In the last years technologies have been employed to revise and re-examine Roman stone monuments. In many cases, new discoveries were thus possible and the potential of the digital technologies' use in the archaeological research once more pointed out: digitization of archival data, digitization of old literature, data analysis, visualization and especially 3D scanning and modelling as well as structure from motion. In only few cases the interest got behind the re-documentation of individual monuments (inscriptions, statues, architectural elements etc.), i.e. into the information on the provenance, archaeological context (eventually in secondary use), as well as into aspects of making and provenance determination of the lithic material.

This paper presents a case study focused on the Roman stone monuments found reused as building materials within the Late Roman fortification at Halmyris (Murighiol, Tulcea county, Romania) as well as on the fortification itself, on its making of and used lithic materials.

The Late Roman Halmyris fortification

At the end of the Roman Danube limes on the Lower Danube (in the province Moesia inferior and later Scythia minor), the Halmyris fortification was strategically located in a region with access to both the Danube and the Black Sea, this being the explanation of its use and repeated rebuilding activities over the centuries. The archaeological excavations, started 1981, identified four main periods of use, from the first century AD towards the 7th century AD, with finds and findings attesting settlements earlier (Greek and Getic) as well as later (up to 13th century).

During the last century the research strategy in the entire region suffered from a concentration on the fortified places and a main focus on the epigraphical evidence. Given the fortunate situation of finding evidence of the earlier fortifications on the same spot (from the 2nd and 3rd century AD) Halmyris is an ideal case study for the building materials used and the exploitation of local and regional resources during Antiquity and the Middle Ages. Up to now the site was investigated more or less

separately by archaeologists and architects¹. Further several less fortunate restoration activities severely changed the appearance of the fortification.



Fig. 1. Halmyris fortification, Murighiol, Tulcea county, Romania (© C.-G. Alexandrescu).

Revision of the archaeological excavation data and digital survey

Starting with 2021 the site has a new research strategy, aiming to investigate the fortification and its surroundings during the centuries, taking into account both the dramatic changes of the landscape (important changes in the morphology of the Danube) and the continuity and changes of the settlement nuclei in and around Halmyris. One important task in order to (re)evaluate and use the results of the previous research is the revision of the archaeological excavation data. However the documentation is very scarce, but provides some photographic materials. Of special interest is the documentation of the fortification walls and of the in situ pictures of several reused inscriptions.

The present project started the digital survey through low cost photogrammetry, corroborated with an intensive geological survey of the used lithic materials and determination of their provenance.

The photogrammetric capture was made with a DJI Mavic Mini drone and a standard Nikon D90 digital camera, assuring the registration of suitable GCP with an Intergrated RTK GNSS Surveying System SOUTH S82. The accuracy of data acquisition is affected by external (visibility, access) and technical factors. This documentation was considered necessary for the proper documentation of all the excavated and still standing building features within the about 3.5 ha fortification, as their state of degradation is very advanced and the perspectives for suitable interventions for conservation and restoration in the near future are most uncertain.

¹ See Zahariade and Alexandrescu (2011) with a corpus of selected specific finds; Mărgineanu-Cârstoiu and Apostol (2015), publishing a most significant study of the Western and Northern Gates of the fortification; while the actual archaeological publications are up to now limited to a synthesis on the first decades of excavations, the preliminary publication of the extraordinary bishopric basilica with martyric crypt, and several yearly short reports.

Documentation drawings (2D and 3D) made directly and derived from the 3D model were thus made possible and are used by geologist, architects, and archaeologists in the evaluation of the used building materials, analysis of the use of spolia, analysis of the chronology of the fortification and its different repairs, analysis on the workflow of the building activities (based on the kind and sizes of used stones, characteristics of the reused materials etc.).

Preliminary results

This method proved to be a fast, low cost and flexible technique for documenting and visualizing the monuments in a 3D environment. It provides a high accuracy and high-resolution documentation for otherwise not accessible areas of the fortification and enables a quantitative analysis of the used materials (For a similar approach, but based on a complete architectural documentation of the fortification made in the last century, see Baltres and Stanciu (2011) Furthermore, and very valuable, it allows the positioning of the old photographs, documenting structures that underwent changes through modern interventions. The final results of the study will also provide an important tool for the monitoring of the different kinds of deterioration, as the lithic materials are mainly sedimentary rocks. The historical-architectural interpretation of the fortification will be enriched by the observations on the lithic materials and construction methods and repairs.

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