

Vicus Costanziaci between land and sea: Remote Sensing applications for the detection of the lost islands in the Venetian Lagoon

A. Traviglia¹, D. Cottica², L. Fozzati³

1 Department of Antiquity and Near East Sciences, University Ca' Foscari of Venice, Venice, 30123, Italy, traviglia@unive.it

Department of Archaeology – ACL, University of Sydney, 2006, NSW, Australia, atraviglia@usyd.edu.au

2 Department of Antiquity and Near East Sciences, University Ca' Foscari of Venice, Venice, 30123, Italy, cottica@unive.it

3 Soprintendenza per i Beni Archeologici del Veneto; Department of Antiquity and Near East Sciences, University Ca' Foscari of Venice, Venice, 30123, Italy, archeo@unive.it

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ABSTRACT.

“Vicus Costanziaci” is a project for the recovery, protection and evaluation of the historical and archaeological heritage of Costanziaco, an ancient small group of islands in the Lagoon north of Venice, of which currently just two emerged strips survive, namely: the abandoned islands of S. Ariano and La Cura. The project is being co-directed by D. Cottica (University Ca' Foscari of Venice) in collaboration with the Superintendency of Archeological Heritage of Veneto.

Exploring the area lying between the mainland and the lagoon represents an important opportunity for reconstructing the history of Venice before the well known medieval city arose. Through survey and excavations of the Costanziaco area, the project aims to shed new light on early patterns of occupation in the Venetian Lagoon, that is the history of ‘Venice before Venice’, to explore the communication network between the mainland and the sea and to examine the evolution of settlements along the commercial routes of the Lagoon.

The particular environment of research, the Lagoon, makes necessary the close collaboration of archaeologists and scientists of differing expertise. Remote sensing (RS) in this case is critical for investigating the ancient extent of the lost islands.

1. THE RESEARCH CONTEXT

In recent years the University Ca' Foscari of Venice and the Superintendency of Archeological Heritage of Veneto have been collaborating on common research projects aiming to investigate specific aspects of patterns of habitation in the Lagoon of Venice during the Roman period (Cottica et al, 2008). Recently, a new joint research project has been launched, co-directed by D. Cottica (University of Venice) in collaboration with L. Fozzati and the Superintendency of Archeological Heritage of Veneto. The project focuses on the study and archaeological excavation of two abandoned islands in the northern part of the Venetian Lagoon. These are located in the area where the Medieval site of *vicus Costanziacus* (currently named Costanziaco) is supposed to have existed on the basis of documentary evidence. At present the site is almost completely submerged: today of the ancient group of islands that formed *Costanziacus* only two strips of land still survive. These are the abandoned islands of Sant' Ariano and La Cura.

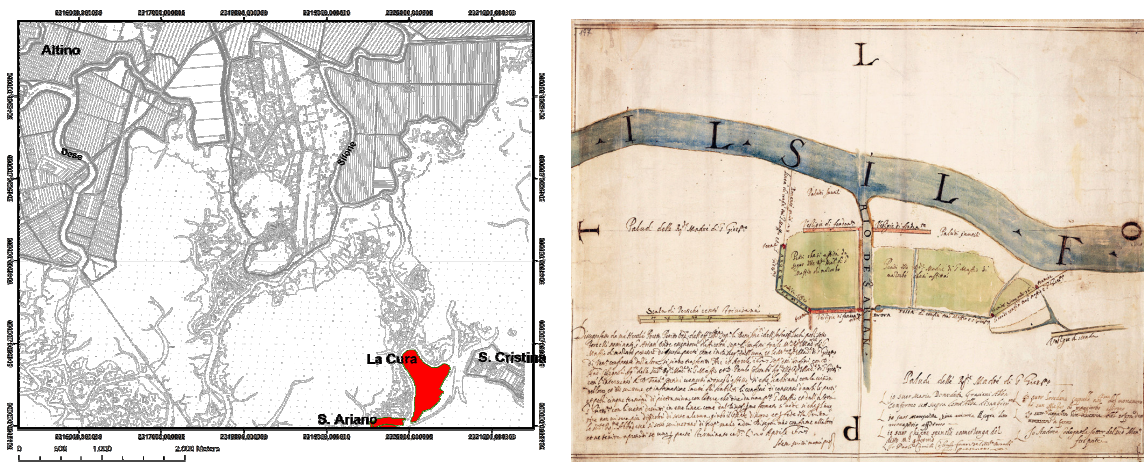


Figure 1: (left) the case study area and its relationship to the mainland; (right) map (Peretti 1627) representing the swamp lands close to Sile River, on the shores of the canal of S. Ariano. The area corresponds to part of the ancient Costancianus Major (from Canal 1998, ASVE, Misc. Maps, drawing n. 197).

Former Costanziaco originally had a much larger extension: according to documentary sources it consisted of four islands clustered in two groups mentioned as *Major* and *Minor Costancianus*, which were located respectively on the right and left shore of the former river Sile, towards the mainland fringe of the Lagoon (Fig.1, right).

In the past, the lack of specific research and of direct archaeological investigation has kept the importance of this island underestimated within the economical, cultural and social framework of the Venetian Lagoon. Usually the history of the origin of Venice has been made coincident with the history of the nearby Torcello Island (Vecchi, 1982) and it is often associated with the migration of the inhabitants of the mainland toward the North Lagoon, under the pressure of the barbarians during the 5th century CE. However, several studies have made clear that before that period the geo-morphologic state of the Lagoon was suitable for settlement. Moreover Costancianus was situated in the proximity of an endolittoral watercourse connecting the mainland, the North Adriatic Sea and the Lagoon with the Roman port of Altinum (Scarfi & Tombolani, 1987). In this same area some Medieval ecclesiastic buildings were once located: these, according to some scholars, may have overlaid former settlements dating to the Roman period¹. Interestingly, inland and underwater surveys carried out previously on Sant’Ariano and La Cura islands and in the surrounding shallows brought to light Roman and Late Antique finds, some of which date back to the early Empire (Fig. 2).



Figure 2. Shreds of Terra Sigillata from S. Ariano (image by D. Cottica).

Exploring the area between the ancient Roman town of Altino, on the mainland of the Veneto Region, and the island of Torcello in the Lagoon, represents an important opportunity for reconstructing the history of ‘Venice before Venice’. Through survey and archaeological excavations, the project aims to bring new evidence to light and provide an amplified perspective on the question of the origins of the city of Venice. Furthermore, it will also add useful details to the study of routes, exchange and communication networks between the mainland, the Adriatic Sea and the Mediterranean.

¹ Dorigo 1994, p. 53. For general information about Roman presence in the Venetian Lagoon see Dorigo 1983 and Dorigo 1995. With regard to the navigation within the Lagoon in the Roman period see Fozzati & Toniolo 1998 and D’Agostino & Medas 2005.

2. AN RS ORIENTED APPROACH TO THE RESEARCH

The project foresees the use of field walking survey campaigns and stratigraphic excavations in the emerged, semi-submerged and underwater areas of the islands of S. Ariano and La Cura. The first field activities will take place during the summer of 2008, while the study of the archive documentation, the historical cartography, the remotely sensed data and the finds collected during past interventions in the two islands is already in progress.

The peculiar environment of research, the Lagoon, makes necessary the close and careful collaboration of land-based archaeologists, underwater archaeologists specialized in humid environments, and various scientific experts². Remote sensing (RS) in this sense becomes critical to investigate the ancient extension of the lost island and to support the detection of archaeological traces both in the still-exposed land and in the submerged areas of barene (typical formations of the Venetian lagoon -shallows that emerge from the water during low tides and are covered by vegetation of brackish water-). RS will assist in the detection of the remains of the infrastructures and buildings of the ancient settlements, the former presence of which are suggested by historical sources and other archaeological finds. In previous archaeological impact assessment projects on the Lagoon of Venice, in fact, RS has proven to be quite efficient in the detection of archaeological features even in the submerged environment. Remotely sensed data will also provide crucial indicators for the identification of the areas that will be excavated during this and the next field season.

2.1 Available data and their processing.

Several types of RS data are being applied, including vertical and oblique pictures and satellite images³. Available aerial pictures range from historical oblique images to modern orthophotos, the coverage being very good including historical pictures from the 50s (IGM, Italian Military Geographic Institute) and almost one photographic survey from each year in the last ten years and around one every five years previously. The images are currently being processed through the use of the most common filters and stretches in order to emphasize certain characteristics that can improve the visibility of the traces.

The main focus however is put on High Resolution (HR) satellite images: Ikonos (2001, 2004 and 2007) and QuickBird (2003) scenes have been acquired and are currently under processing and analysis. Different processing techniques are adopted according to the different types of encountered environment (barene, land, lagoon waters etc.) including Vegetation Indices (NDVI, DVI, MSAVI2), Soil Index, Principal Component Analysis (PCA and SPCA) and band ratios. Focus will be on identifying from time to time those processes which best fit the goal of emphasizing features that can be related to the archaeological past of the islands.

From a methodological point of view, it is rather complex to predict the potential impact of the use of remotely sensed data for studying this portion of the Lagoon, considering the morphologic peculiarities of this type of eco-environmental context. Caution is due in the application of the remote sensing techniques since, in addition to the normal physic characteristics of a context that have to be kept in consideration -like soil use, pedology, climate and seasonal factors-, other phenomena, typical of the lagoon environment and able to generate peculiar situations, present themselves. Conditions like stress of the vegetation or increased humidity in bare soils in fact can distort and confuse interpretation, since they can result in manifestations similar to those indicating the presence underground of structures or of covered depression with possible archaeological nature. In this sense the constant consultation of environmental data, which makes the correct interpretation of the remotely identified features easier and whose consultation is guarantee through GIS, becomes fundamental.

The remotely sensed data are managed through a GIS that combines them with archaeological, topographical, hydrological data collected in the form of georeferenced datasets in order to support the interpretation of the detected traces. A systematic collection of published data was completed prior to the research and organized in the GIS platform in order to collect as much mapped or mappable information as possible for support in the disambiguation process of the traces detected in the remotely sensed data. Traces and anomalies identified on RS images are recorded by drawing them in apposite graphic layers of the geographical information system in order to be more easily compared with the information.

² At present the research team includes: A. Traviglia (GIS and Remote Sensing), D. Busato (archive and ancient cartography), P. Sfameni (excavation and survey), A. Toniolo (ceramicist) and M. Bon (archaeozoologist).

³ The images have been provided by the Italian Ministry of Infrastructure – *Magistrato alle Acque (Consorzio Venezia Nuova- Servizio Informativo)* in whose archive they are conserved and that the authors desire to thank for the collaboration.

3. CONCLUSIONS

The photo-interpretation process that will be performed during the 2008 research season will aim at the detection of the presence of possible surface traces (on vegetated areas or bare soil) or anomalies on the settlement distribution of the islands and of the surrounding lagoon area, which can be put in relationship with underground archaeological features.

The state of abandonment of the studied islands and the almost total inexistence of elevated structures that could obscure the investigated surface are ideal for investigation of photo-interpretation techniques, due to the prevalence of vegetated spaces or areas left uncultivated, which work as ideal “detectors” for the identification of the alterations on the surface caused by the presence of subterranean modifications. Ground truthing activities including field walking survey and excavation will follow in order to test the achieved results and define procedures that could be used in surrounding areas.

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