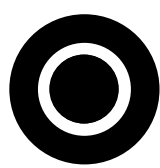




**HUMAN
HISTORY
PARK
IN MATERA**

**RUPESTRIAN
CHURCHES
AND
NEOLITHIC
VILLAGE
OF MURGIA
TIMONE**



**HUMAN
HISTORY
PARK**



**HUMAN
HISTORY
PARK**

PREHISTORY



**HUMAN
HISTORY
PARK**

**RUPESTRIAN
CIVILIZATION**

**HUMAN HISTORY PARK IN MATERA.
RUPESTRIAN CHURCHES AND NEOLITHIC
VILLAGE OF MURGIA TIMONE**

***edited by Marina Falla Castelfranchi
and Maurizio Lazzari***

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edited by

Marina Falla Castelfranchi

Maurizio Lazzari

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PRESENTATION

Human History Park project- *Rupestrian Civilization and Prehistory* is expressed through a series of punctual and linear interventions in the Archaeological, Historical and Natural Park of the Rupestrian Churches in Matera located in Murgia Timone area and which concern the following areas: rupestrian churches, trails, accommodation and fruition system in order to rebuild the environmental, historical and archaeological system to obtain a protection, conservation and fruition system integrated and unified.

Within the event Matera European Capital of Culture 2019, the project has the ambition not only to reactivate the route of the rupestrian churches and the prehistoric entrenched villages in Matera area, but above all to become a valorisation model of a tourism that is compatible with the state of architectural and landscape heritage places.

Landscape conservation interventions have been carried out through the definition of regulated paths to avoid uncontrolled walking, and enhancement interventions with the redevelopment of scenic areas that have been degraded until now, transformed into privileged observers that look towards the City of Matera.

In this way the potentialities related to cycle-tourism and nature-tourism, which is becoming an increasingly desirable attraction, for the reconversion towards new forms of sustainable development.

Several interventions have been carried out to achieve the goals set by the Administration and the bodies involved:

1. Investigations and surveys necessary to rebuild the state of the sites;
2. Recovery and protection of seven rupestrian churches (San Pietro in Principibus/San Nicola alla via Appia, San Canio/San Falcione, San Biagio Vecchio/San Vito alla Murgia, San Lupo so called Asceterio di Sant'Agnese, Sant'Agnese, Madonna delle Tre Porte, Madonna della Croce) with restoration work,



architectural consolidation and the protection of the frescoes on site;

3. Restoration of the existing road network and the accessibility to the area through the reconversion of the district of Murgia Timone in equipped, mixed, vehicular and cycle / pedestrian axis;

4. Safety and requalification of existing paths and trails oriented to the level of difficulty and/or time available to tourists;

5. Landscape conservation of the rocky ridges along the Belvedere of the City of Matera, in order to preserve the residual vegetation from erosion and restoration of hydraulic systems, such as canals and cisterns obstructed by vegetation and debris;

6. Use and enhancement of the sites through multimedia technologies with specific informative and popular contents;

7. Prehistoric tombs restoration and archaeological park enhancement with a new path capable of reorganizing the park and simultaneously protecting archaeological emergencies.

Considering the soil orography and the arrangement of the rupestrian churches, two visit routes and a sub-route have been identified, oriented on the level of difficulty and/or time available:

ROUTE 1

Low level of difficulty - short walk

ROUTE 2

High level of difficulty - long walk

For both the routes, the starting point, which will also act as the information centre and 'gateway' to the routes, is the Jazzo Gattini, which has been identified as an "information gate" dedicated to pre-visit study.

As regards the archaeological site of Murgia Timone, research carried out between the end of the 19th and the beginning of the 20th century by D. Ridola, G.



Patroni and U. Rellini, led to the discovery of chamber tombs of the Middle Bronze Age, of tumulus burials of Iron Age and a Neolithic village. Of Murgia Timone village there is only a long ellipsoidal perimeter moat, two access gates, some tombs and traces of a village huts.

Thanks to the excavations and restoration work carried out in 2020 as part of Prehistory project, it was possible to establish a relative chronology of the moat and new discoveries about the village life. The investigations and surveys have largely confirmed and enriched the information on the site structures of Murgia Timone.

The accuracy of the technologies used made it possible to obtain, for the first time, an accurate survey of the entire site an exact image of the two moat fences perimeter. The insertion of a new archaeological path that, from West to East of the trench there is the route of the visit, it allows a simple and discreet use of the numerous and exceptional testimonies of the Neolithic village of Murgia Timone.

Supervision of Works
Arch. Fernando Russo
Arch. Riccardo Russo



PREFACE

DOC - Archiviazione Documentale s.n.c., in the project “Realisation of Human History Park - Rupestrian Civilization”, took care of multimedia set-up and contents production inside the Jazzo Gattini and the Church of San Canio/ San Falcione (video for monitor and projection) and with digital publications (eBook and Digital Stories).

This digital volume has been realised with the contribution of Art History, Archaeology, Conservation and Restoration, Geology, Natural Sciences, Architecture experts and professionals.

DOC was responsible for the layout, graphic processing and revision of the digital publication.

DOC Administrator
Giuseppe De Vivo



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INTRODUCTION

Objectives and contents of eBook

The creation of this eBook is part of the wider project for the creation of the Human History Park, Rupestrian Civilisation and Prehistory, financed and developed as part of the celebrations for Matera European Capital of Culture 2019.

It aims to provide visitors with an in-depth overview of the main cultural and environmental aspects that characterise the Murgia Timone hill, proposed in an easy format that can be consulted remotely or on site during the visit.

The volume is divided in three main parts, following a logical/temporal construction and the zooming technique in the topics covered (from the natural and anthropic landscape to the single wall fresco or archaeological find), namely: **Natural Context**, **Settlement Context** and **Knowledge**.

The natural context introduces the reader to the discovery of the main geological and geomorphological features of the Murgia landscape, from its history and evolution to the intrinsic features of the outcropping rocks, which, due to their specific peculiarities, initially allowed the excavation of trenches to delimit Neolithic villages and the foundation of housing structures, and then of caves used as places of worship (partly frescoed), as well as other negative rock structures used as cisterns, neviere or processing tanks.

Also the natural context acts as the main backdrop to the settlement context that, from the first half of the 6th millennium BC (Early-Middle Neolithic) and the 9th - 8th centuries BC (Bronze Age) to the Early Middle Ages, has left clear traces of the human presence and his full integration in the Murgia Timone and Gravina di Matera environmental contexts.

The opportunity to study and deepen the knowledge of the site offered by the planning of the Human History Park has allowed to carry out new excavation



and cleaning activities of the Neolithic village archaeological evidences, acquiring new unpublished data, which have allowed to clarify some aspects of the site's history (see Angeli *et alii* in this volume).

About the settlement period of the Early Middle Ages, testified on the site by the seven rupestrian churches located along the visiting itineraries, an introductory chapter, edited by M. Falla Castelfranchi, on the origin and development of the rupestrian civilisation in Matera and its territory, provides a quick rebuilding of the rupestrian habitat knowledge from the first reports at the end of the 19th century to the first publications in the 1960s and later. This is followed by a detailed description of the rupestrian churches and frescoes of Madonna delle Tre Porte, Madonna delle Croci and San Biagio/San Vito, by M. De Giorgi, and the churches of San Canio/San Falcione, Sant'Agnese and San Nicola alla Via Appia/San Pietro in Principibus by M. Falla Castelfranchi.

The section of the volume dedicated to Knowledge is structured as follows: the first part deals with the Architecture and rupestrian civilisation in the Human History Park (MG Grano), the second part is about the Structural Diagnostics and direct and indirect geognostic investigations (M Lazzari) and, finally, the last part focuses on the rupestrian churches of Murgia Timone and their programmed conservation, considering diagnostics also as a possible tool for prevention (MC Grano).

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Enjoy your reading!

Maurizio Lazzari



NATURAL CONTEXT

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1. Geological features of Murgia Timone

by Maurizio Lazzari

The Murgia of Matera represents the final western stretch of the section of Murge and it is placed in the 189 “Altamura” and 201 “Matera” Sheets of the Geological Map of Italy at 1:100,000 scale. It appears as an imposing limestone relief that rises from a clayey-sandy hilly landscape. On the calcareous bedrock lie layers of Plio-Pleistocene calcarenites (Formation of the Calcarenes of Gravina¹), whose thickness can reach up to 45 meters.

The Murgia area (Fig. 1) is geologically constituted of Mesozoic limestone belonging to the so-called Apulian Carbonate Platform (Channel et al, 1979), a relict of the African passive margin that emerged at the end of the Cretaceous (Ricchetti, 1980).

Since the Middle Pliocene, the foreland (a stable area not involved in the Apennine orogeny and therefore in the mountain range uplift phases) has undergone a relatively rapid increase in regional subsidence as a consequence of the progressive eastward migration of the South Apennine orogenic system (Iannone and Pieri, 1982). In response to this subsidence, a progressive marine ingression (transgression) occurred, which led to the progressive drowning of the structural high of the Murgia, in this way, it became a vast island archipelago composed exclusively of Cretaceous limestone. The transgression led to the deposition of a thin (no more than ten meters thick) covering of bioclastic carbonates and/or lithoclastic (Gravina calcarenite formation, GRA) on the Murgia cretaceous calcareous (Tropeano and Sabato, 2000). Since the Middle Pleistocene, the Murgia and the Bradanic Trough (structural depression) have been affected by regional uplift (Doglioni et al., 1994;

¹ Calcarene of Gravina is defined as a geological formation because it is described and documented in its main stratigraphic extension in correspondence with outcrops close to the city centre of Gravina (bradanic side of the Murge) from Azzaroli et alii (1968). Then the word was extended by Pieri and Iannone (1979) to completely similar calcarenite deposits: stratigraphic position, age and paleoenvironmental meaning on the Adriatic side of the Murge.



Pieri et al., 1998; Lazzari, 2008) that triggered very intense erosive processes, which is responsible for the progressive formation of deep canyons (so-called “gravine”), cut into the calcaretes and limestone base (Altamura Limestone Formation, ALT).

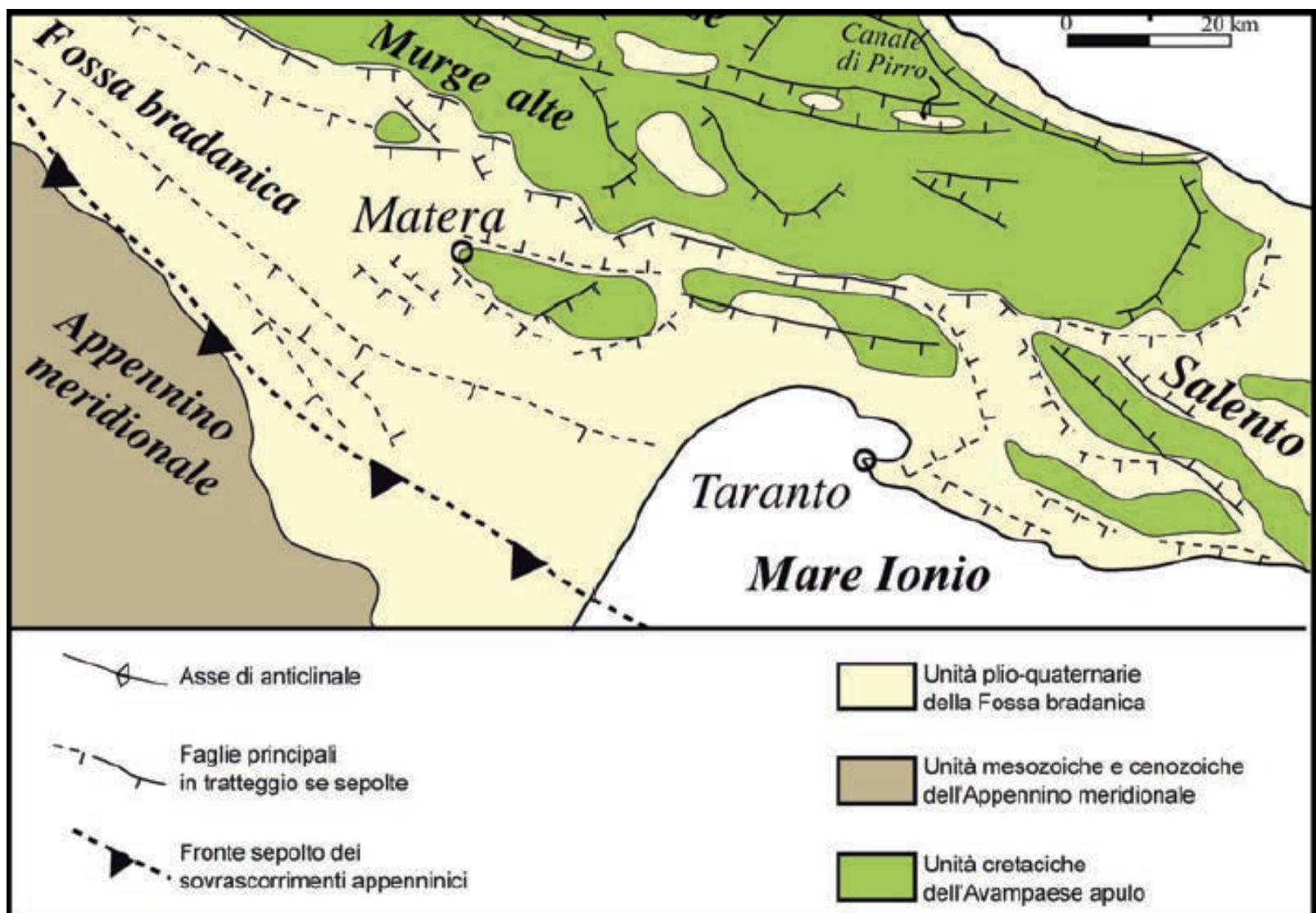


Fig 1 - Geographic and geological framework of Matera with the main geostructural domains in evidence (Murge, Fossa Bradanica, Appennino meridionale)

From a palaeogeographical point of view, in particular the area of Murgia Timone (area between the Belvedere and Jazzo Gattini), delimited to the west by the Gravina river of Matera and to the North by the Jesce river, once it was part of an island made up of marine sediments of a calcareous marine sediments (Altamura Limestone - Upper Cretaceous (Fig. 2), and about 70 million years ago), part of a wide archipelago. This geographical condition has changed over time, also due to the progressive structuring of the southern Apennines to the West of the archipelago, which led to a progressive superficialisation of the sea water and a change of sediment yield.

The flanks of this island were, in fact, subsequently covered by calcarenitic and bioclastic deposits, commonly known as ‘tufo’, yellowish in colour (Gravina calcarenite, Upper Pliocene age - Lower Pleistocene,

about 2 million years ago), where fragments of marine macrofossils are still clearly visible to the naked eye (Fig. 2). From the “piazzale del Belvedere” it is easy to identify the boundary between the two formations represented by the scenic road joining the two “Sassi” districts.

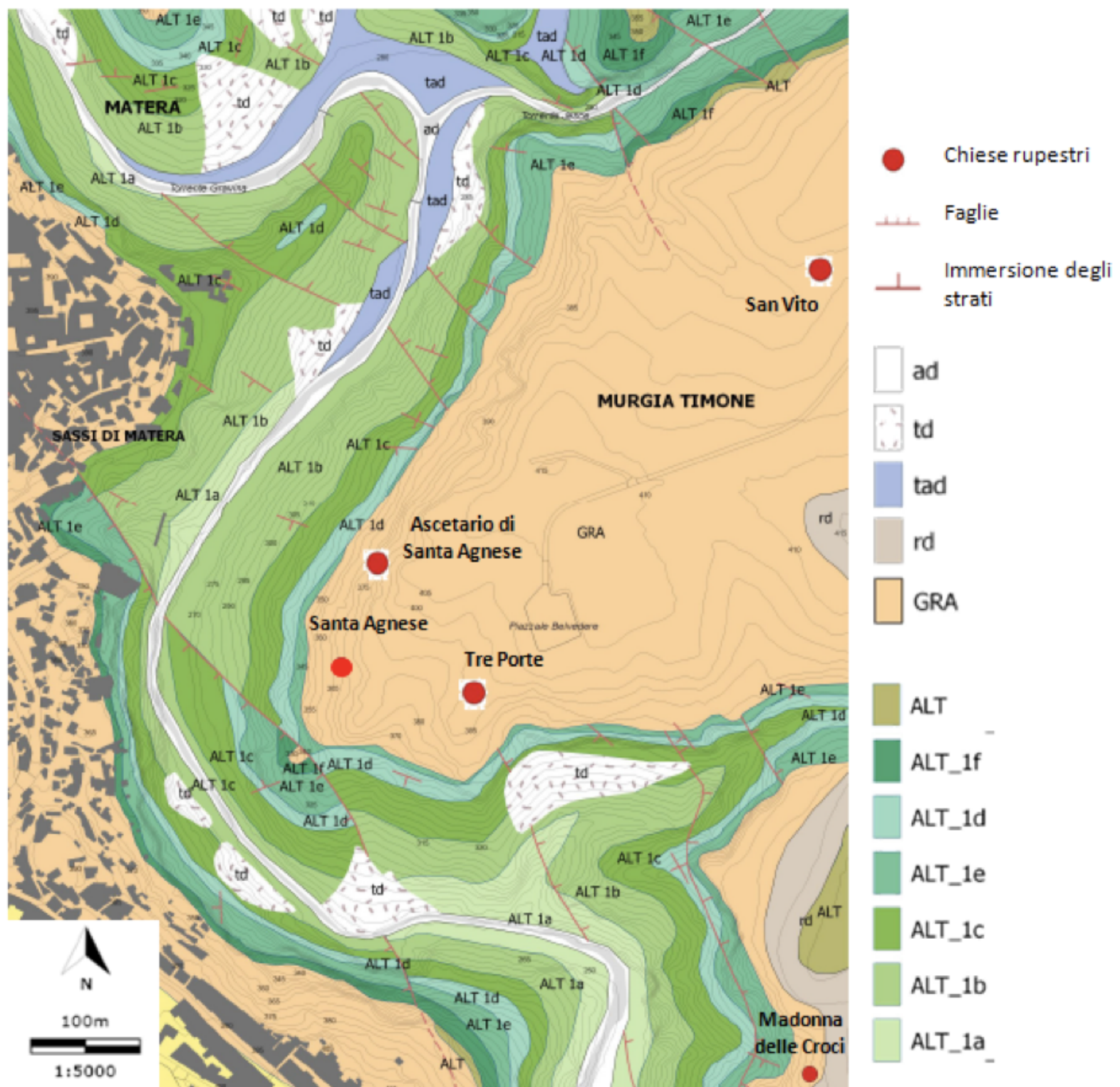


Fig 2 - Geological framework of the study in the Murgia Timone district. The map (redrawn and simplified by Festa et al, 2018) shows the geographical position of the rupestrian churches (red circles). Legend: ad) alluvial deposits; td) slope deposit; tad) terraced alluvial deposits; rd) regressive foredeep deposits; GRA) calcarenites of Gravina (Pleistocene deposits); ALT) Altamura limestone; ALT1a-f) several carbonate members in ALT.

1.1 Gravina Calcarenite Formation

The Plio-Pleistocene formation is characterised by organogenic calcarenites, variously cemented, porous, whitish, grey and yellowish (also known as “tufi”), consisting of clastics derived from the degradation of cretaceous limestones and Bryozoans, Echinoids, Crustaceans and Molluscs fragments. Sometimes in the basal part of the formation, in contact with

the limestone, there is a conglomerate of more or less rounded limestone pebbles, with more or less rounded, with a white, yellow or reddish calcareous matrix, locally also very extensive. It is essentially characterised by two informal members:

(i) The lower member consists of coarse facies with a grainstone texture. The calcareous granules, often bioeroded by the activity of lithophagous organisms, have a size ranging between a few millimeters and one meter. Besides there are also mixed calcarenic facies (silicoclastic/bioclastic). This member is organised into units that vary in thickness from 1 to about 20 meters, and each unit is limited at the base and at the roof by erosion surfaces. These units are organised in a retrogradation stratigraphic configuration.

(ii) The upper member has a maximum thickness of approximately 20 meters and consists of bioarenites and lithoclastic, derived from the deposition of shells and from the erosion of emerged carbonate rocks that formed the slopes of a paleo-island. These sediments probably accumulated along a depositional slope (scarp).

These two members are clearly visible along the slopes of the Gravina of Matera and of the rupestrian churches (Fig. 3), as well as in the Neolithic trenches of Murgia Timone (Fig. 4), where the excavation of



Fig 3 - Outcrop of bioturbated calcarenites levels inside the church of San Canio/San Falcione. The red line delimits the two calcarenitic members, with the bioturbated at the bottom.



Fig 4 - In the two photos it is visible part of the moat (trench) of Murgia Timone, emptied of the filling, where the two members of the Gravina Calcarene Formation are clearly visible, whose lower member is lighter and yellow ochre and it is characterized by evident fossil traces of bioturbations. The dashed black line marks the interface between the two members.

the trench was also facilitated by the presence of the lower member, easily workable compared to the more compact first layer, characterised by a higher degree of cementation and different depositional environments. In particular, the sediments that form the calcarenitic succession have been interpreted and attributed to three main depositional areas and to palaeoenvironments of shallow sea or littoral sedimentation:

(i) Shoreline, consisting of well-selected clasto-substantiated conglomerates with well-rounded elements with an average diameter of 2 to 5 cm. These conglomerates are organised in layers of decimeter thickness with stratification surfaces that are not always clearly evident. This deposit represents the most proximal facies of the system and can be interpreted as the area dominated by wave motion.

(ii) Submerged beach, consisting of poorly selected clast supported conglomerates with clasts ranging from a few millimeters to 2 cm. Towards the basin, there is a particle size decrease (granules and coarse sands) and an increase in matrix and bioturbation. Within this facies, the presence of bivalves and echinids can be recognised. The layers appear from sub-horizontal to inclined towards the basin at an angle of up to 1°-2° and show clear, erosive basal contacts. This facies represents the deepest portion of the underwater profile, which is still affected by ordinary waves and storm.



(iii) Platform transition area, characterised by microconglomerates and clinostratified calcarenites, dipping towards the basin with angles between 15° and 30°. The layers show a tangential geometry, forming a downlap contact with the substrate. The facies are often bioturbated; where bioturbation is less intense, it is possible to recognise a thin stratification with 15-30 cm thick intervals. This facies indicates the presence of a submarine escarpment, dominated by gravitational processes.

1.1.1 Mineralogical characteristics of Gravina Calcarenite

From a lithological and mineralogical point of view, the calcarenites consist of whitish and yellowish-white calcarenites with a variable particle size ranging from fine to medium coarse, sometimes ruditic, and, subordinately, by marly calcarenites. The characteristic lithotype is represented by biosparites with grainstone and sometimes packstone-grainstone texture, predominantly composed of bioclasts and in a minimal percentage of limestone granules, quartz and feldspars, all immersed in sparitic cement. The bioclasts are fragments of macrofossils and benthic and planktonic foraminifera.

The chemical-mineralogical data available are calcarenitic deposits of the Murgia area. These are lithotypes with a very high content of CaCO_3 . calcium carbonate (CaCO_3) has an average value of 97% and magnesium carbonate (MgCO_3) only occasionally exceeds 2.5%, with a significantly lower average value. The lower residue is in very low quantities, with an average value of 1.3%. Furthermore, there are in negligible quantities: amphiboles granules, hematite, pyroxenes, mica, magnetite, apatite and rutile .

The pelitic fraction consists mainly of siallitic minerals, including kaolinite and, to a lesser extent illite and montmorillonite; discrete quantities of iron hydroxides and quartz are also present.



1.1.2 *Technical characteristics and geotechnical parameters of the Gravina Calcarenites*

The main components of the Quaternary calcarenitic rocks of the western edge of the Murgia, as in many limestone soils, are:

- elements of greater granulometry (clastic limestone and bioclastic fragments and large chemical origin grains, ranging in size from 2 mm to 40 m);
- matrix (clay particles, small granular elements; microcrystals of chemical origin);
- cement (crystalline or amorphous calcium carbonate, precipitated on the surfaces of the granular elements or on the walls of inter-particle voids).

The quantitative ratios between the three components is determined by depositional and diagenetic processes, and it represents, as in other limestone soils, the key parameter on which the mechanical behaviour of the rock depends.

When the first component prevails, the rock has a skeletal structure with a high void ratio (percentage of voids within a given sediment volume) and high brittleness. Conversely, an abundance of matrix reduces the void ratio and acts as a stabiliser. Finally, the cement is the most important constituent of these rocks: in particular, the carbonate cement (linked to secondary precipitation of CaCO_3 in the sediment) is strongly structured with different morphologies that can also occur in more than one cementing phase.

The fundamental property of soils and limestones rocks is that each condition of formation, transport, sedimentation, loading and chemical composition of interstitial water, has had consequences on the rock components and on the phenomena of post-sedimentary diagenesis. This makes it possible to define material behaviour as part of a dynamic system (absence of an equilibrium point, a system that is always changing in space and/or time).

An element of decisive importance when talking about technical characteristics of calcarenite material, is the chemical-physical interaction with water, both



that captured by capillarity or from the atmosphere and by filtration. In fact, the water, in its movement by filtration, capillarity or evaporation, can involve the transport or leaching of fine particles (matrix), or the weakening of the material structure, with desquamation effects, aided by climatic conditions (thermal cycles, wind).

With high temperatures, water evaporation allows saturation and saline precipitation, with cementing effects on limestone particles. This phenomenon often leads to the detachment of the wall frescoes present in the rupestrian churches under study.

The geotechnical properties of calcarenitic rocks are conditioned by the low degree of cementation offered by the lithotype and by the substantial heterogeneity respect to its lithological and structural conditions. In fact, if on the one hand, the rock mass under examination is fundamentally homogeneous respect to its lithostratigraphic and structural conditions, on the other hand a “small” heterogeneity is evident due to frequent variations in lithofacies, which corresponds to an considerable variability in the technical properties of resistance.

The granulometric components of calcarenite show a clear predominance of sand (60-80%) over silt and clay. The water content is modest and it is between 5 and 17%, while the degree of saturation is low, with average values in the order of 40%.

The porosity is a function of the granulometric melt and the degree of cementation, it is possible to estimate heterogeneous values ranging between 23% to 50%. The weight characteristics are defined by a volume weight between 1.73 and 2.12 t/m³ with a mean value of 1.95 t/m³.

1.2 Altamura Limestone formation

Gravina limestones are in stratigraphic contact with the underlying Altamura Limestone Formation (Azzaroli 1968), which is geologically older and it does not



emerge directly in the study area, but in its proximity. It is composed of stratified white micritic limestone, intersected by banks and layers of dark grey dolomitic limestone near the bedrock and the roof of the formation. These rocks occur in layers and banks of variable thicknesses from 30 to 50 cm, diffusely fractured and karstified. The fossil macrofauna, found in these layers, is mainly composed of rudists and echinids, instead, the microfauna of planktonic foraminifera is much more. From a palaeogeographical point of view, these sediments would have been deposited on shallow seabeds; during brief periods of emersion, sedimentation would have stopped forming limestone breccias and crusts, testifying stratigraphic gaps. The stratigraphic discontinuities are also with tectonic structures at the mesoscale, such as faults and folds, which are linked to the tectonic influence of the southern Apennines structures in the western geographical sectors. In particular, several fault systems are recognisable in the field, oriented in the NNW-SSE and E-W. The folds, on the other hand, wide-ranging synclinal and anticlinal, testify the compressive phenomena to which the whole Murgia region has been subjected over time.



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2. Geomorphology and hydrography of the sector Belvedere - Murgia Timone

by Maurizio Lazzari

Murgia Timone shows morphological elements of great landscape impact especially along its outer edges delimited by erosive furrows that shape the plateau; among all, the most spectacular is “Gravina di Matera”, a deep gorge carved in the Gravina calcarenites and in the Altamura limestones for about 70-80 m.

Gravina and the Torrente Jesce valley are perfect examples of river valleys with a V-shaped (Fig. 1), with meanders and lateral tributaries, valley sides with sub-vertical walls, rarely terraced and shaped by bumps, small isolated reliefs, pinnacles, suspended valleys, etc.

The Murgia landscape is dominated by forms of erosion of the limestone and calcarenite substrate, because these rocks due to their porosity, determined by the countless interstices that divide the granules, and a high degree of fracturing, which characterises the superficial parts, they are easily carried away by the water, which triggers chemical dissolution phenomena, this favors the triggering of karstification processes that, through the aggressive erosive action of the water, it gives rise to typical forms such as: karren fields (karst landforms), sinkholes and cavities.

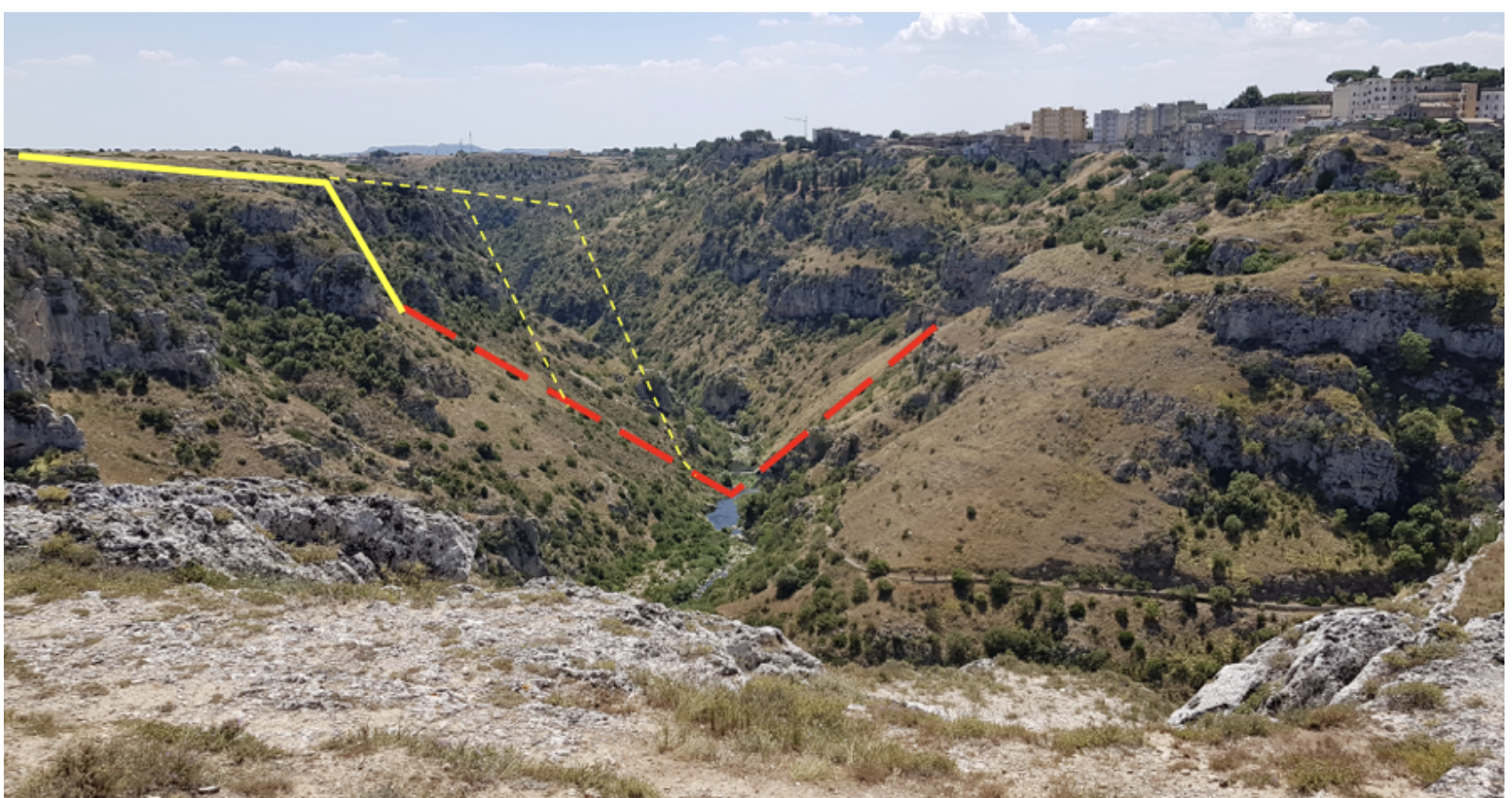


Fig 1 - Gravina di Matera with its classic V-shaped profile of the river valley (red dashed line). The yellow dashed lines show the progressive retreat of the valley sides over time.



The hydrological and hydrogeological characteristics of the study are fundamentally linked to the contribution of surface hydrography and to the infiltration into carbonate aquifers. The hydrographic network is almost completely absent and rainwater tends to follow the natural flow along the steepest lines of the slopes.

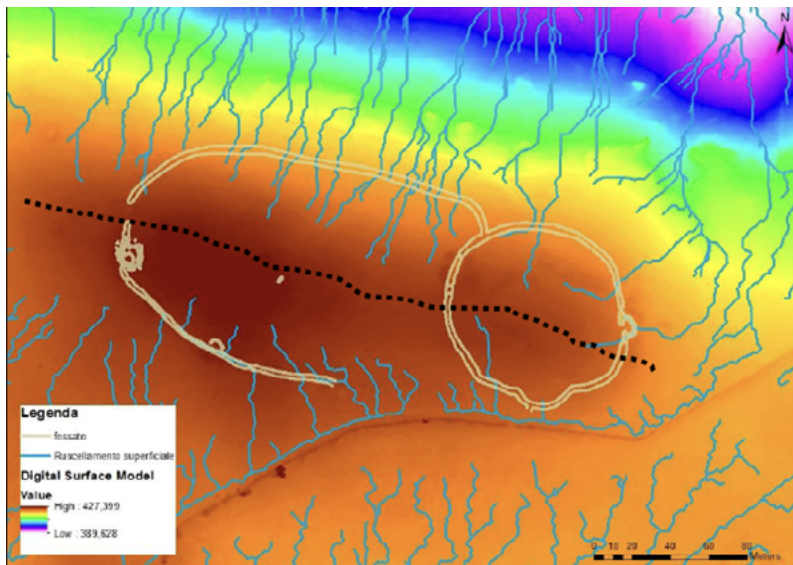


Fig 2 - Digital model of the soil showing the perimeter trenches of the Neolithic village of Murgia Timone and the superficial watershed (black dotted line).

Observing the digital soil model (DEM, Digital Elevation Model) of the internal area of Murgia Timone (Fig. 2), where Neolithic village and burial area Bronze Age (see Angeli et alii, this volume), it was possible to define a slope map (Fig. 3), which shows:

- how they are higher in the North area, where the ridge leading to the SS7 is located, instead in the highest part of the Neolithic village these are milder.
- the presence of a watershed that develops

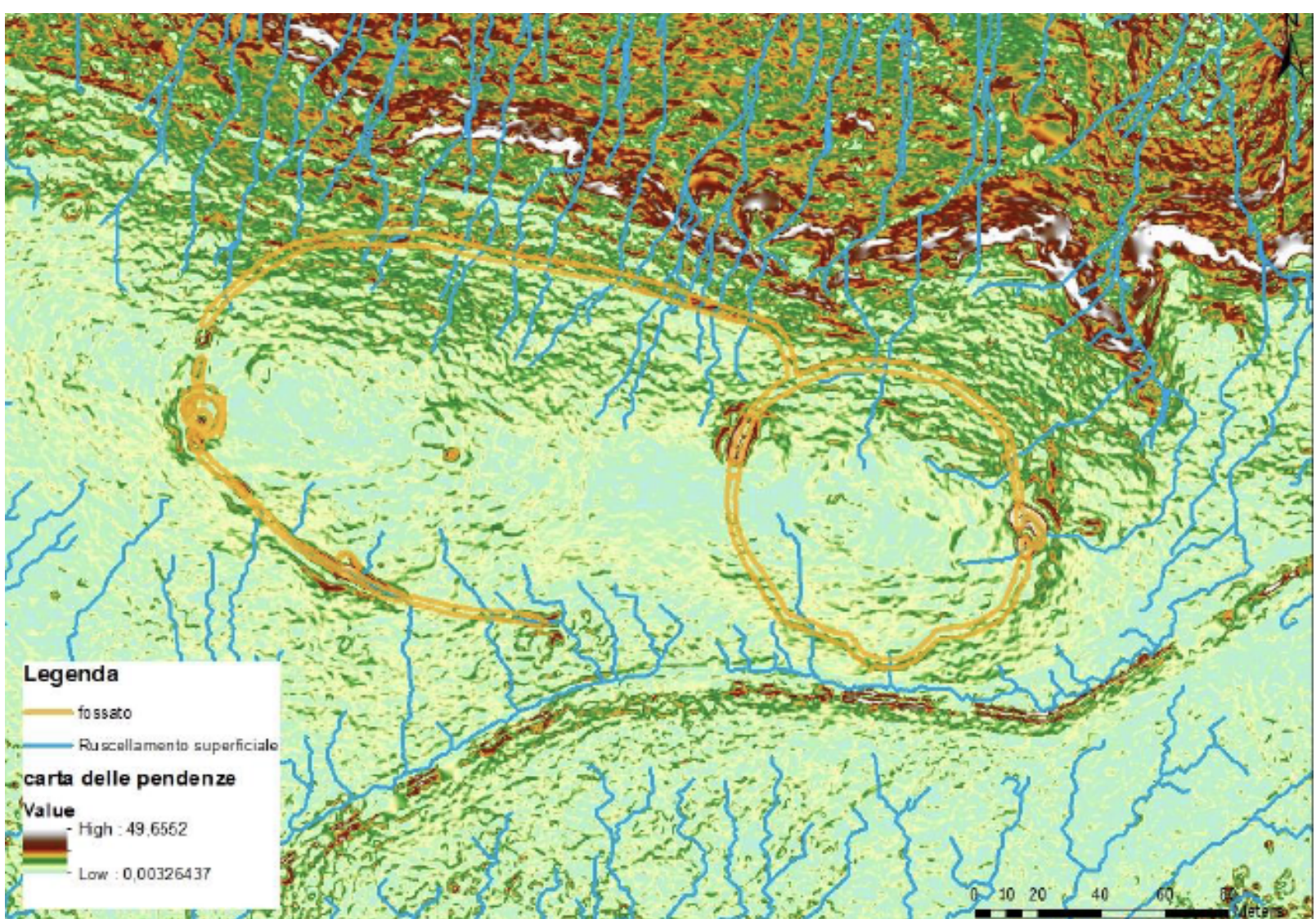


Fig 3- Slope map with the perimeter trenches (moat) in evidence of the Neolithic village of Murgia Timone.



3. Landscape and environmental features of the Murgia park territory in Matera

by Canio Alfieri Sabia

Every territory contains and reflects the history of the people who live there and it is, in its physical conformation and in the peculiarities of its resources, the result of the use that human communities have made of it for their own sustenance over time. Therefore, its transformation in the course of history is inevitable. Centuries of human presence, herding, agriculture and land management forged and shaped the landscape of the Murgia of Matera, fixing those features that testify to a relationship of mutual dependence never interrupted. Today, this area is a plateau enlivened by gentle undulations with cultivated fields (mostly used for arable lands) and uncultivated fields used for grazing, interrupted by widespread surface karst formations represented by outcropping rocks and sudden “lame” (shallow erosive furrows), sinkholes, gorges, caves and caverns, around which there are the most conservative natural environmental formations. The toponym Murgia derives from the Latin word *murex*, (rock), and gives an idea of the prevailing physical character of this large north-eastern area in Basilicata, which is also distinguished by the coexistence of extremely natural environments and areas that have always been used for agriculture and sheep-farming, an activity that has strongly contributed to shaping the characteristics of this territory. This is an extensive territorial mosaic, where the coexistence of different environmental matrices, represented by cultivated land, pastures and semi-natural environments, such as for example, the relicts of ancient and more extensive broadleaf, with some rupicolous areas, it is governed by a delicate balance obtained with the passage of time and whose preservation, today, is linked exactly to the preservation of this particular combination of sustainable human activities and nature, which gives life to a unique environmental context to which are associated a flora and a fauna that have specific



peculiarities and that help to rise the environmental and landscape value of the area.

3.1 Landscape transformations

The predominant landscape element of the entire protected area and of the surrounding territory, as already mentioned, is made up of the combination of areas for agricultural use consisting of large expanses of uncultivated land used for permanent rocky pastures, agricultural areas used for sowing and, to a lesser extent, for the cultivation of trees, such as olives and vines, as well as areas with a higher degree of naturalness represented by large grasslands, small wooded areas and almost intact rupicolous environments.

The reduced presence of wooded areas is to be considered one of the main results of the evolution of the landscape in many inland areas of southern Italy, which in the past saw an intensive exploitation of forest resources, a phenomenon that began several decades ago and reached its peak in the first decades after the unification of Italy. This strong transformation of the territory, which has changed from a purely forested area to a largely rural one, is also accompanied by new typical elements of the colonisation of man and his activities, such as the masserie and the widespread minor service structures linked to sheep farming and the peasant commuting, in fact it creates a new landscape context that sees development, far from the inhabited center, of a prevalence of cereal crops and sheep farming as well as the simultaneous establishment, immediately around the urbanised areas and villages, of non-extensive crops, such as olive groves, almond groves, orchards, vineyards and vegetable gardens, as already represented in the 18th century in a print of the time shown in **Figure 1**.

Centuries of feudal management of the countryside and the large ecclesiastical property ownership, where the lands were rented out for pasture or sowing, have had a considerable influence on the conformity of the territory and landscape of the Murgia area; as well as



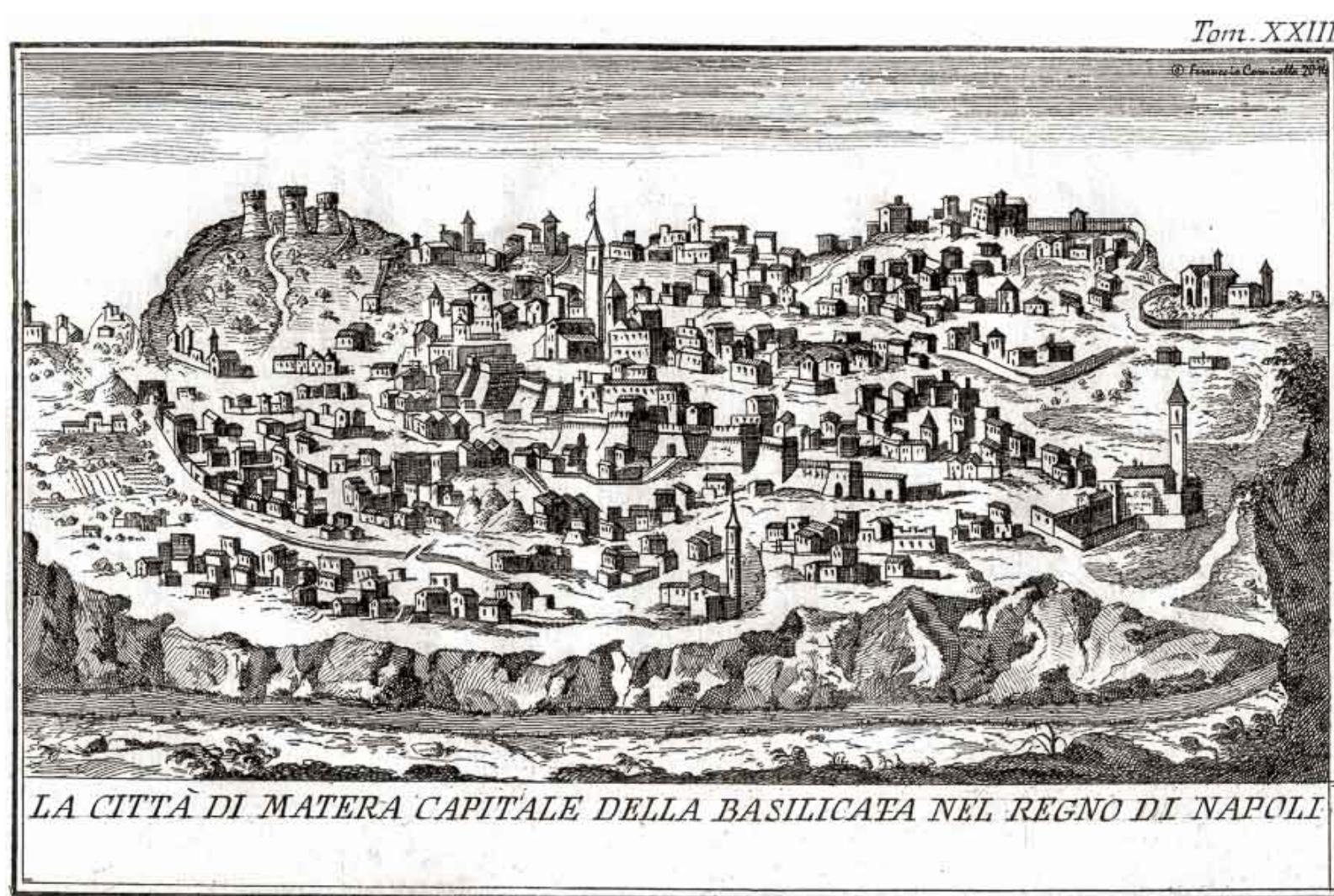


Fig. 1 - Representation of the city of Matera in a print taken from the private collection Orti e Culture Alboree by T. Salmon, *Lo stato presente di tutti i paesi e popoli del mondo...vol XXIII* 1737 - 1766. Image extracted from the site www.famedisud.it/matera-e-capitale-europea-della-cultura-2019-il-grande-riscatto-della-città-dei-sassi/.

On the left of the frame there is the representation of garden and tree cultures located just outside the inhabited center.

the establishment of the “*Dogana per la mena delle pecore di Foggia*”, which determines an inevitable infrastructure of these areas with the consequent transformation of the territory where, gradually, a network of connecting *tratturi*, *tratturelli* and *bracci* on the grazing lands, propped up by posts, *jazzi* (mansory structures composed of stables and large enclosures consisting of stone walls) and shelters and refuges.

From the second half of the 19th century onwards, with the abolition of the feudal subversion and with the Legge Forestale of 1877, which abolished the constraints of the previous Bourbon regulations, an indiscriminate and free exploitation of the territory began, which over time will lead to a further impoverishment of forest resources and to the homogenization of the landscape which now appears to be devoid of elements of discontinuity. However, the progressive process of parcelling and privatisation of the large estates of feudal and ecclesiastical origin, with the census and distribution of the land to the peasants, who became



owners or tenants of the land portion which they worked, changed the rural landscape of the Murgia and small regular and uniform plots of land, owned or parcelled up for rent, well defined by vegetation barriers (hedges or trees) or, most frequently by dry-stone walls, they took the place of large open fields and are still largely functional today (**Figure 2**).

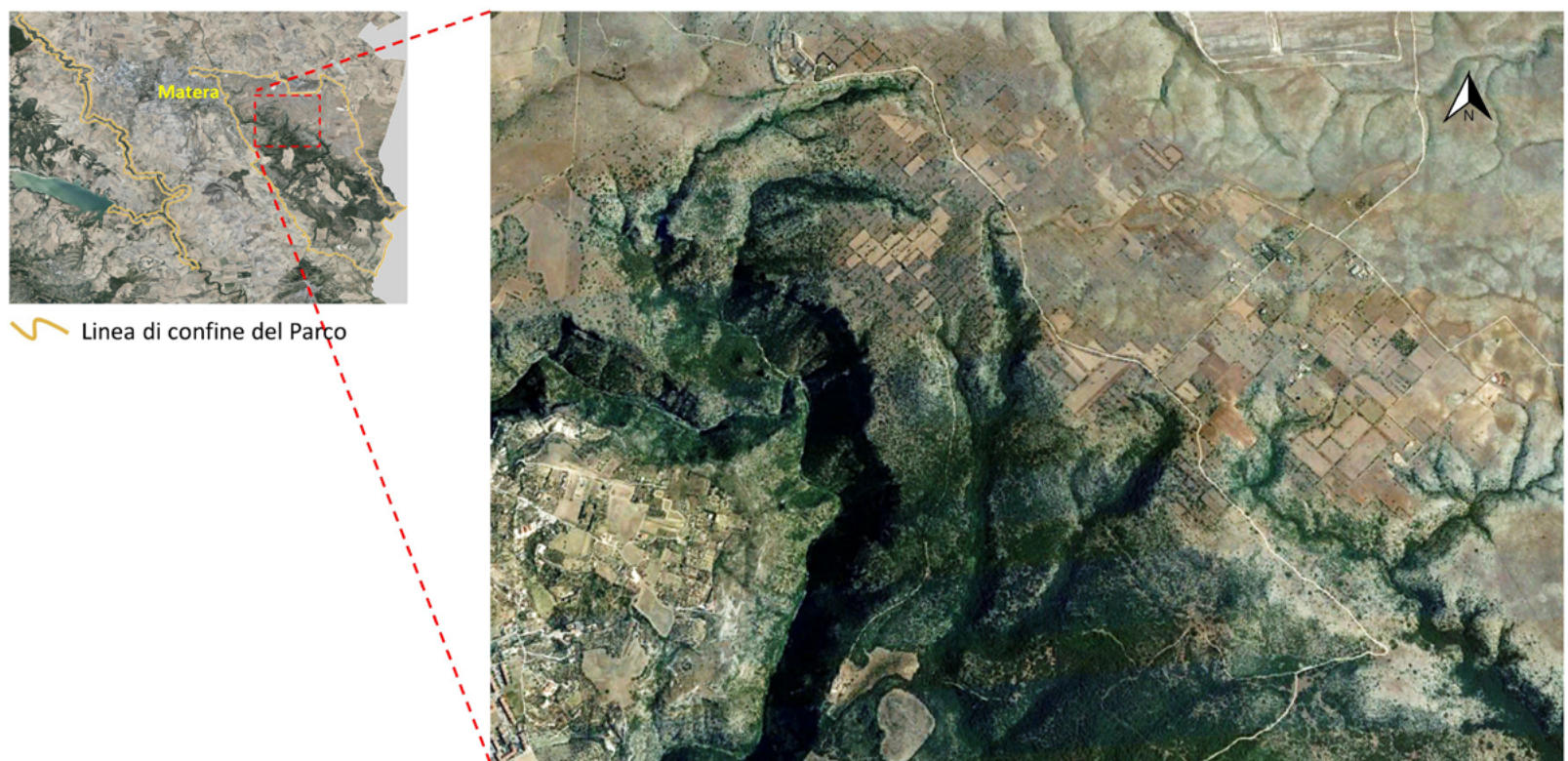


Fig. 2 - Agricultural divisions with dry stone walls or vegetation barriers still in use today in the northern part of the Murgia Park area (ortophoto 2017)

In the meantime, however, deforestation and tillage do not stop to give space for agricultural crops. On the land, once covered by woods, other small rural constructions are now being built (small houses, shelters, haystacks) which, however, with the modernisation of agriculture, the downsizing of sheep farming and the disappearance of the old farming system they see a slowly and progressively abandoned, with subsequent inevitable degradation, or at least increasingly occasional or improper use, as the essential functions sustained in the production cycles are no longer valid, if anything, retaining a residual usefulness as support for plowing, sowing and harvesting.

The modern agrarian system is now largely represented by production structures that use new cultivation and breeding technologies and that practice agricultural-zootechnical activities directed mainly towards extensive cereal monoculture and the practice of sedentary breeding that hardly uses the

rural network of sheep tracks any more, except for limited movements within the local area.

This determines the definition of a current landscape framework where the relationship that had been established overtime between human activities related to the agro-sylvo-pastoral and natural environment is much weaker, thus exposing the whole area to a new evolutionary phase that will probably further change its balance in the future towards a progressive renaturalisation of these areas.

In the meantime, it is useful to emphasise how an evolutionary process (subject to continuous changes in physical appearance, functional, environmental and aesthetic characteristics), also makes the landscape assume the value of a cultural asset as well as of naturalistic-environmental interest. In fact, the rural area of Murgia of Matera is not only a valuable environmental context to be protected, but also a set of elements that contribute to define an unrepeatable territorial identity, able to play a generative role for 'positive effects' (externalities) with regard to local development, or rather the possibility of preserving the territory and to be a stimulus for the development of other sectors that often are link with agriculture such as tourism, crafts or the trade of local products. Recognize that all this is essentially the result of the presence of man and his agricultural activities, which must necessarily continue in the direction of a 'sustainable' dimension and the environmental peculiarities made singular by this ancient coexistence, it can better define the area towards which to direct the actions of protection and territorial development. Environmental characteristics, therefore, set in a rural context that still retains its prevailing historical cereal and pastoral vocation of the agrarian soils that frame the Archaeological, Historical and Natural Park of the rupestrian churches of Matera, but which also creep into the most intact areas from a naturalistic point of view. This contributes to the composition of environmental and territorial areas that are different from each other but perfectly integrated to create a



concentration of biological and landscape variability that stands out from the greater homogeneity of the surrounding areas (**Figure 3**).

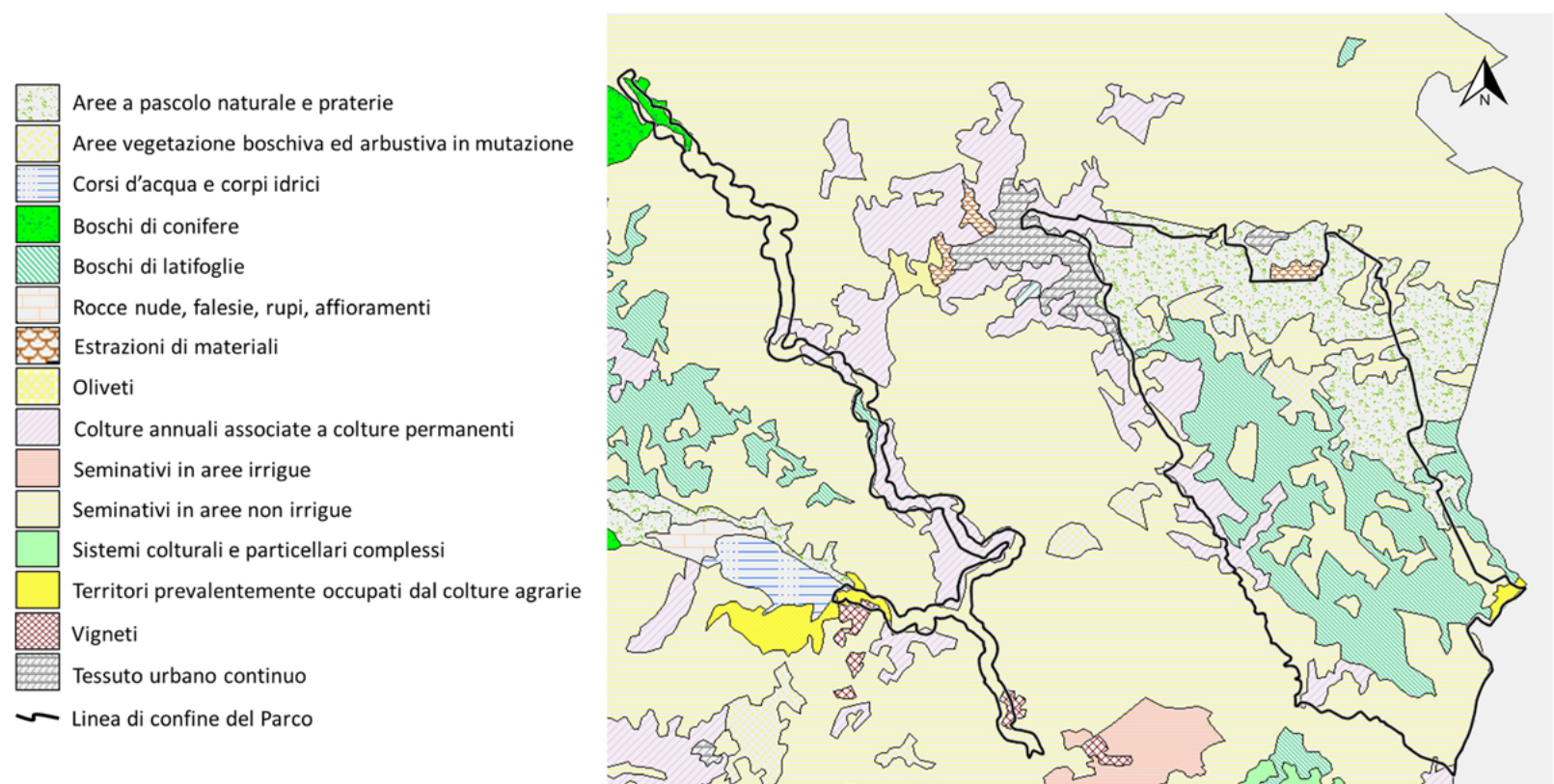


Fig. 3 - Map of the territory use of Murgia Park in Matera (data extracted from S.I.T. of the Murgia Park)

3.2 Brief notes on flora and habitats

The presence of natural and semi-natural habitats is also significant. In fact, in the Park area, about 8,000 hectares of protected area that largely coincide with the “Gravine di Matera”, a Special Area of Conservation, a certain number of habitats have been recognised, with characteristics that can be traced back to as many typologies defined by the European Directive 43/92/EEC on the “Conservation of natural habitats and semi-natural and then conservation of wild fauna and flora” (Figure 4).

Among these, the habitat classified as 62A0 predominates - Dry grass formation of the eastern sub-Mediterranean region (*Scorzoneretalia villosae*), which distinguishes the sub-Mediterranean xeric grasslands (dry and with little soil) in these areas used less and less frequently by non-intensive grazing and that, in the absence of use, it is possible to see a rapid growth of bushes by more common species such as *Prunus spinosa*, *Rubus sp.*, and so on. TThis habitat, according to a recent reinterpretation, also includes that one in the protected area previously classified

as 6220 - sub-steppe paths of graminaceous and annual plants of the *Thero-Brachypodietea*, priority importance for the European Directive, consisting of grasslands of xerophilous plants (adapting to long periods of dryness) and discontinuous small plants dominated by mostly annual grasses, (terophytes), but also perennial, which generally alternate with areas of Mediterranean macchia and mediterranea oaks. This formation is also distinguished by its rocky outcrops (mainly carbonates), and it represents, according to some scientific studies, the last stage of deterioration of spontaneous Mediterranean vegetation resulting from the millenary action of man's deforestation activity, combined with the subsequent meteoric runoff and the action of the strong summer drought with the poor water retention capacity of the substrate, which is strongly cracked by karst phenomena.

In these grasslands there are one of the most characteristic and suggestive vegetation formation in the Park area, deriving from spring grassy mantles surmounted by the supple and feathery snow-white inflorescences of the fairies flax (*Stipa austroitalica*), a species used in the past also to stuff or "to cram", as their name suggests, and listed among those of community interest by the above-mentioned directive, and by the intense yellow of the flowers of the ferula (*Ferula comunis*), large umbellifer plants, whose stem extends into a flowering scape that can reach 3 m in height and which persists on the plant even when it is dry. The ferula, a ubiquitous plant in this landscape and widespread because it is inedible to grazing cattle, also has a strong symbolic value, because 'ferula' is also the name given to the bishop's crosier, probably due to the fact that in the past shepherds used the dry stem of this plant, which is strong, light and easily available, to make a stick to help them guide and lead their flocks. The shallow and compact soils are ideal for the growth of other herbaceous plants that are not very attractive to grazing animals and they are also characteristic of the landscape of the Murgia, such as the Mediterranean asphodel (*Asphodelus*



microcarpus) with white flowers, characteristic of the meadows of the underworld described by Homer, and the yellow asphodel (*Asphodeline lutea*), both members of the liliaceae family.

But in spring the green meadows are also dotted with the remarkable variety of bright colours offered by the different types of orchids, mostly belonging to the large genera *Orchis* and *Ophris*, which include species that show a remarkable ability to adapt to the particular soil and climatic conditions of the Murgia area.

Another quite extensive habitat that can be found in the Park is classified by the “Habitat” Directive as 9340 - *Quercus ilex* and *Quercus rotundifolia* forests. This code identifies an environment largely made up of a layer of trees, which in this area is characterised by mesophilic and mesothermophilic plant species, dominated by holm oak (*Quercus ilex*), an evergreen oak characteristic of the Mediterranean *macchia*, which is mainly concentrated along the slopes of the steep walls of the *gravine*.

In the steep slopes of the *gravine* there are also herbaceous plants that are perfectly adapted to life on sun-beaten rocks which are able to optimally exploit the low amount of soil deposited over time in the cracks where the roots anchor themselves with extraordinary strength. right between these rocks it is not unusual to see some endemic chasmophytes, such as the Apulian bellflower (*Campanula versicolor*) or the rarer Greek kummel (*Carum multiflorum*), which can sometimes appear among the stones of old buildings or abandoned ruins. There are also some species of the genus *Saxifraga*, whose name comes from the Latin and it means rock-breaking and it refers to the characteristic of these plants to settle in rock crevices, and several examples of asteraceae such as the endemic Gargano cornflower (*Centaurea subtilis*) and the Basilicata vedovino (*Centaurea centauroides*). On the plateau above, where there is the strip of the *gariga* that acts as a transition area between the cultivated, uncultivated pasture and more natural



areas, this type of habitat continues to extend, but with a reduced presence of holm oaks and a greater presence of typically heliophilous species (plants that love intense exposure to sunlight) and xerophilous species, represented mainly by low shrubs. Alongside the most common elements of the Mediterranean macchia, such as the mastic tree (*Pistacia lentiscus*) and the terebinth (*Pistacia terebinthus*), there are also some truly endemic species such as the rare thyme (*Thymus spinulosus*) and the Ionian helianthemum (*Helianthemum jonium*) which is in particular found in some areas of Basilicata and Apulia and in a few other areas in Italy.

Wooded areas that are now little extensive and extremely localised, and for this reason very vulnerable, are made up of some particular species of *Quercus* such as the *fragno* (*Quercus trojana*) and the oak of virgil (*Quercus virgiliana*), which are characteristic elements of habitat 9250 of the European Directive (**Figure 4**). These formations are to be considered as relicts of extensive *fragnete* which in ancient times covered the whole Murgia, but which then began to be heavily exploited in Roman times when the *fragno* wood was used for the construction of ships, at that time used in large amount in the conflicts of the Mediterranean, because its technological characteristics made it particularly suitable for keel construction. But the peak of the exploitation of the *fragno* took place immediately after the Second World War of the last century, definitively causing the disappearance of the rare limbs of *fragneti* governed by high forest and only a few ceduo area survived.

In some limited areas located in the central-western part of the protected area there is a particular habitat, an ecotone (transitional ecosystem), that favours the ecological succession towards more evolved vegetation types. It is classifiable as 5210 - Arborescent Matorral with *Juniperus* spp., according to the Habitats Directive (Figure 4), and it consists of an environment where shrubs and small trees prevail, including the



evergreen red juniper (*Juniperus oxycedrus*). Like all junipers, this species, due to its morphological and physiological characteristics, it has few vital needs, which enable it to colonise hostile environments such as rocky and arid soils. It also has a deep, well-developed root system that helps it to supply itself with water and nutrients, thus, at the same time, it protects and consolidates the soil from erosion. In winter this species also provides a functional refuge for several mammals and wintering birds and in summer it offers protection and shelter from the heat.

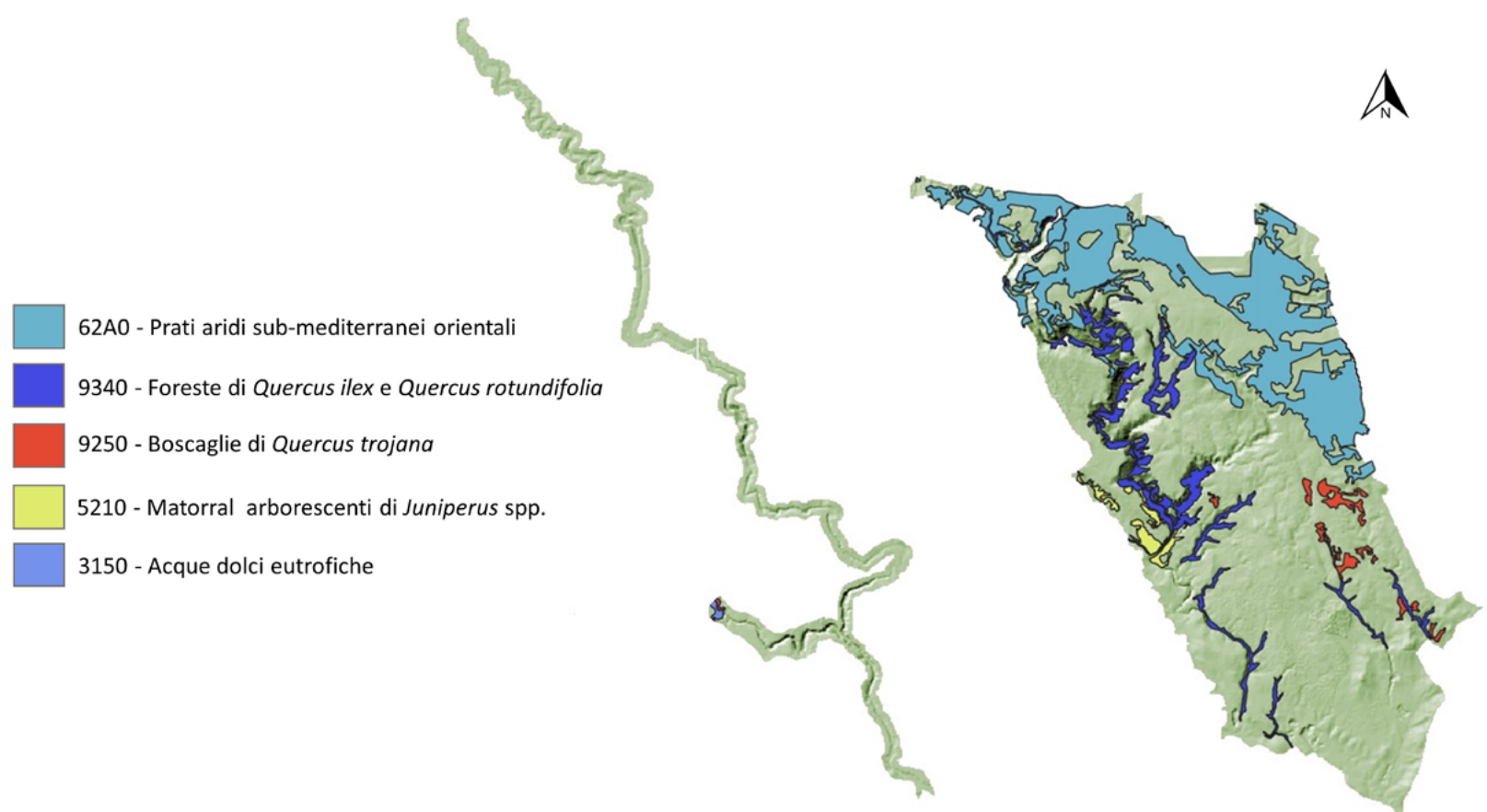


Fig. 4 - EList of the habitats most represented within the Park area according to the Directive 43/92/EEC (source: nostre elaborazioni su dati del Geoportale della Regione Basilicata)

3.3 Fauna aspects of the Murgia landscape

As already mentioned, the landscape of Murgia is rather arid, with little tree vegetation, undulating and with modest, rounded relief. The karstic nature of the substratum does not allow the collection or stagnation of surface water reserves, since the rainwater rapidly penetrate the fractured limestone to flow into the depths, generating cavities, cracks and *gravine*. Ephemeral rivulets and puddles are essentially created during particularly heavy rainfall, but they dry up in a short time. There are therefore no lakes or rivers in the Murgia area, where there are, in limited cases, a few humid micro-environments that can withstand the dry season.



These environmental peculiarities are the basis of the biotopo characteristics of this territory, which is ill-suited to host large mammals, that would not easily find refuge or sufficient water availability here, but rather medium and small animals, with a prevalence of birds, reptiles and insects, which are able to easily use the ecological niches present.

The several natural and semi-natural habitats described above, the safeguarding and protection action following the establishment of a Park, the low level of human use and the inaccessibility of many areas such as the rocky areas, mean that the territory of the Murgia allows to keep a certain degree of natural biodiversity, also in terms of fauna.

And it is precisely the slopes of the wide crevices or deep gorges, where ravines and small or large caves normally open up, once a refuge for bivouacking shepherds and flocks, and the several crevices and innumerable cracks offer birds a place to nest.

This is the case for some species considered the priority importance by Directive 2009/147/EC, known as the “Birds” Directive, this regulation provides for the adoption of special conservation measures and the creation of Special Protection Areas (SPAs). These include the lanner hawk (*Falco biarmicus*), a species considered to be in danger of extinction for which southern Italy represents the western limit of expansion and the Balkans is the eastern limit, then the lesser hawk (*Falco naumanni*), which is always present from spring to summer with a large population that also invades the urban area of the ancient Sassi districts of Matera, as well as other more common small birds of prey such as the common kestrel (*Falco tinnunculus*), very similar to the lesser kestrel but with different feeding habits. Lesser hawks’ population is so numerous here that it has a significant impact on maintaining the balance of the environmental and rural ecosystem of the territory, eating a considerable amount of grasshoppers, crickets and other large insects for its sustenance. The rare and elusive Egyptian vulture (*Neophron percnopterus*) also finds refuge



among the most inaccessible spires and pinnacles of the *gravine*. It prefers the remains of dead animals but it is also on the lookout for the cattle and sheep placentas that gave birth in the open air, following herds and flocks on their short and long transhumance journeys. Da qui il particolare nome di questo piccolo e ormai rarissimo avvoltoio interessato anche alle uova lasciate incustodite da altri uccelli che rompe con una pietra tenuta nel becco secondo un sorprendente comportamento che più che innato sembra essere appreso e tramandato.

Hence the particular name of this small and very rare vulture which is also interested in eggs left unattended by other birds that it breaks with a stone held in its beak according to an astonishing behaviour that seems to be learned and handed down rather than innate.

The entire Murgia area, from the prairies to the rocky areas, is constantly overflowed by other large birds of prey that find their ideal environment in this diversity of habitats, including the majestic short-toed eagle (*Circaetus gallicus*), a migratory species that reaches southern Italy in spring from sub-Saharan Africa, where it nests, following a very long route that passes through the Strait of Gibraltar. It has a large wingspan (up to 170 cm) and it is to be considered a real exterminator of snakes and other small reptiles. The elegant red kite (*Milvus milvus*), recognisable by its long forked tail, is a sedentary species in this area and it is possible to see it in almost all of the central and southern regions, but it has a large population in Basilicata, probably because it prefers to nest in small wooded areas close to small towns and this species finds its ideal environment in areas that are not densely populated and have small, widespread rural settlements.

In the several environments, between forest, prairie and rupestrian areas, wandering day and night, careful of its puppies, the wild boar (*Sus scrofa*), a gregarious species that lives in large herds, not uncommon in this areas, and solitary predators such as foxes (*Vulpes vulpes*), badgers (*Meles meles*) and martens (*Martes*



foina) which begin their movements at dusk, when the aerial patrols of the large birds of prey, their potential enemies. Also the porcupine (*Hystrix cristata*) leaves its burrow at dusk, but its aims are different. It has an exclusively vegetarian diet and is always on the lookout for bulbs, roots, fruit and berries, which it manages to reach thanks to its ability to dig and climb and thanks to its long quill, which are easily found scattered in the places of its passage.

The presence of the European otter (*Lutra lutra*), a mammal considered to be one of the most endangered species, has recently been confirmed in the area of the Gravina torrent, where it seems to have found an ideal environment and where it is also possible to see some rare species of migratory birds such as the black stork (*Ciconia nigra*) and the sea jay (*Coracias garrulus*).

The reptiles in these areas are: the leopard coluber (*Zamenis situla*), whose name refers to the patchy color of the leopard's skin, which with the coluber viridiflavus (*Hierophis viridiflavus*), the cervone (*Elaphe quatuorlineata*) and, a grass snake with a unique name, the ring-necked snake (*Natrix natrix*), which prefers to stay close to the watercourse at the bottom of the gravina, they are the non-poisonous species of the local herpetofauna. But there is also a common viper (*Vipera aspis*) a poisonous species that prefers poor vegetation, meadows, pastures and, above all, rocky areas.

Very important are some insect species, such as the *Cerambyx cerdo* beet, a saproxylic species whose cycle life is linked to the presence of old trees where it settles on the decomposing woody necromass, a fundamental element in the delicate ecological balance of the recycling of organic matter and food chains that feed the biodiversity of the macrofauna. It is considered to be in sharp decline in many forest environments due to short-cycle cutting and the tendency to remove dead wood from the forest for different uses. The presence of lepidopterans (butterflies), such as *Melanargi arge* and *Zerynthia*



polyxena, which are considered endangered species and have a fairly stable population in the Murgia area, should be highlighted.

The different zoocenoses found in the area of Murgia Park in Matera show the high environmental value of this territory and the richness in terms of biodiversity of these ecosystems.

All this, with the remarkable variability of the landscape, is a clear example of how the different ecosystems and the multiple animal and plant biocenoses are actually aspects of the same complex environmental and territorial system that is governed by a delicate balance, where the presence of man with his activities related to agriculture and pastoralism carried out in a sustainable manner, is a guarantee of protection and preservation.

It is an extraordinary environmental context and at the same time it is extremely complex and delicate. Balance depends on several factors, for example the climate change, which is the cause of extreme weather phenomena, the direct consequence of disastrous hydrogeological instability of the territory or the natural alternation of seasons, which increasingly show an irregular and anomalous pattern with consequences on the ecosystem balance.

It should be added that in these areas, over the last few decades, human activities and environment pressure on the territory is gradually decreasing due to depopulation and the gradual abandonment of rural life. The natural environment, with its grasslands, forests and shrubby, is gradually taking possession of the spaces no longer cultivated and the pastures no longer practiced, so the landscape is becoming increasingly wild. But it must be stressed that it is the shaping and regulating action of man, which over the centuries has created this unique and special environment, that today appears even more vulnerable.



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1.2 Murgia Timone and the Neolithic entrenched villages

1.3 Neolithic trenches, housing and domestic structure

1.4 Chamber tombs of Bronze Age

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1.4.2 Tomb 2

1.4.3 Tomb 3

1.4.4 Tomb 4

1.5 General considerations in view of recent excavations

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2. Origin and development of the rupestrian civilisation in Matera and its territory

2.1 Rupestrian churches: Cards of Madonna delle Tre porte; Madonna delle Croci; San Biagio/San Vito

Bibliography

2.2 Cards of the rupestrian churches of San Falcione, Sant'Agnese and San Pietro in Principibus

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1. Murgia Timone in prehistory

1.1 The site and excavations

Murgia Timone is the toponym of the plateau that extends to the North East of Gravina di Matera from 425 feet above sea level. The site is known in literature for its prehistoric and protohistoric findings (Patroni 1898; Ridola 1901; Ridola 1912; Ridola 1924-26; Rellini 1929; Lo Porto 1998; 2009) and it represents an amazing palimpsest of human history from prehistory to the modern age, perfectly exemplifying the settlement dynamics in the Murgia area of Matera.

The archaeological evidence covers a wide time period between the first half of the 6th millennium BC and the 9th-8th century BC, testifying a continuous and varied use of the area. The site began life as an entrenched village during the ancient Neolithic, perhaps after a brief abandonment, then it was occupied again, first for funerary purposes in the Bronze Age, as the monumental chamber tombs attest, and then during the Iron Age, when the site was characterised by the stone mounds with pit tombs concealed below. The history of the site seems to end in protohistoric times, however the surrounding medieval rupestrian churches, often reused in modern times as animal shelters, demonstrate the lasting historical memory of the place.

The discovery of Murgia Timone and the first excavations are thanks to Domenico Ridola, a doctor from Matera, who in 1894, exploring the two hypogeum tombs outlined by the stone circles of the Bronze Age (tomb No 2 and tomb No 3), he brought to light - for the first time but still not having understood the nature - a stretch of the western moat. Ridola, digging the dromos/shaft that is the access to the tomb No 3, came across two dry stone walls and, assuming that they could hide the entrance to another tomb, he decided to disassemble the one on the right. In this first excavation Ridola understood that the entrance of the tomb had been obtained within pre-existing layers and the dry stone walls had been built to



contain the collapse of the sides (Ridola 1912). The researches continued in 1897 by Giovanni Patroni, who again investigated the tombs and the western trench, which he misinterpreted them as a road route. Patroni, in his publication, also described “rounded heaps of stones” which he interpreted as hut bottoms (Patroni 1898, p. 421-429) and only later correctly identified by Antonio Jatta as mound burials of the early Iron Age (Jatta 1904, p.74-78).

Ridola carried out a new excavation campaign in June 1898 and, by following the circular route marked by the most luxuriant vegetation, especially thistles, he definitely realized that he was not facing a “drainage pit” or a “road hollowed out of the rock”, but “what I had called a trench it could be a moat to isolate and protect a primitive village, made up of huts”. He describes in detail his intuition, deduced from observation of the traces on the ground, an example of crop marks “I had already noticed that on the ground, in the same direction of the stretch already explored, where the excavation ended, there was a wide strip of greener and taller grass, especially whit thistles. I thought that the secret of the moat could be revealed, and I would say almost betrayed, by that richer vegetation [...]”. Holding the line, on June 8 1898, I was able to ascertain that the avenue of thistles in Timone, a sign of the pit below, took place the form of a large circle” (Ridola 1924-1926, p. 102). In 1911-1912, Ridola carried out new excavation tests in the eastern moat, where he found the eastern entrance of the village which he called “lunetta”. Afterwards, in 1918 and again in 1925, two new excavation campaigns were conducted by Ugo Rellini (Rellini 1929), who recognized the same stratigraphy in the trench as had been identified by Ridola’s excavations (*fig. 1A*).

The last excavations in the village of Murgia Timone were carried out in 1967 by Felice Gino Lo Porto, who explored the “lunetta”, also a large area inside the eastern moat and a western sector of the village near the three Iron Age tombs called a, b, c (Lo Porto 2009) (*fig. 1B*).



After Lo Porto's investigations and the results of his excavations (Lo Porto 1998), the site of Murgia Timone was not more interested by specific researchers.

A new season of studies and a new interest in the site are due to the recent inspections of the chamber tombs of the Bronze Age, with particular reference to the history of the excavations and the detailed cataloging of the finds and funerary structures (Matarese 2018). The study has, for the first time, highlighted the peculiarity of the site and an analytical chronological and cultural framework of the settlements of Murgia Timone in the Bronze Age of the Italian peninsula.

In March 2017, as part of the Council of Matera's project "Recovery works and enhancement - visitors' centre Jazzo Gattini and Neolithic village of Murgia Timone" the Superintendence, under the direction of Dr. Annamaria Patrone, has carried out an archaeological surveillance with site cleaning and maintenance activities, in order to highlight the most significant structural emergencies. The operations allowed to restore the visibility of the trench in the western and the eastern entrances of the Neolithic village and of the chamber tombs No 2, No 3 and No 4. In that moment, for the first time, the tomb No 4 was the subject of a recovery intervention highlighting the *dromos* (fig. 3D) and the emptying of the two chambers affected by accumulations of soil and stones.

More than fifty years after the last excavation season, with the Enhancement Project of the "Human History Park - Prehistory" and under the scientific direction of the Superintendence ABAP of Basilicata, new archaeological excavations were carried out, which involved a stratigraphic test in the circular trench and the surface test of a long stretch to the north and to the south of the "lunetta".

In addition, for the protection, enhancement and public fruition of the site, cleaning operations were carried out outside the three tombs of the Bronze Age in the entrenched village (chamber tombs No 2, No 3, No 4) in order to improve safety, visibility and legibility of the structures and restoration work



through cleaning and consolidation, to promote the state of conservation of the burial chambers of the tombs.

1.2 Murgia Timone and the Neolithic entrenched villages

The territory of Murgia in Matera represents an area of particular interest for the study of the Neolithic, thanks to the rich archaeological evidence that comes from the entrenched villages and from the multi-layered site of Trasano (Guilaine, Cremonesi 1987), which allowed to rebuild in a detailed history of the agricultural communities from the most ancient to the recent phases of the Neolithic (Radi 1999; Guilaine, Radi, Angeli 2019).

Prehistoric research in the territory of Matera began at the end of the 19th century with Domenico Ridola who, as a result of his discoveries made the first archaeological excavations in the caves of Pipistrelli and Funeraria (Ridola 1912) and in the five prehistoric trenches of Murgia Timone, Murgecchia, lower and upper Tirlecchia and Serra d'Alto. Ridola was the first to understand the function of the moats delimitation and to refer the monumental trenches to the Neolithic period, based on the absence of material of classical era (and later) and the consistency of ceramic finds inside the moat.

Invited and solicited by Paolo Orsi, Ridola published the results of his research in the “Bullettino di Paletnologia Italiana” with “Le grandi Trincee Preistoriche di Matera. La ceramica e la civiltà di quel tempo” (Ridola 1924-1926). In this extraordinary summary Ridola reported the excavation data, detailed one of the first ever classifications of Neolithic pottery, of the lithic industry and of the fauna with observations and interpretations partly still valid today. His research in the entrenched villages was joined by the work of other scholars such as Giovanni Patroni (1896-97) and Ugo Rellini (1918 and 1925) and then some tests, in the village of Serra d'Alto, were made by Eleonora Bracco (1942), in that moment



manager of the Ridola Museum. New excavations in Murgia Timone, Murgecchia and Tirlecchia villages were carried out by Felice Lo Porto (1967-68) and then by Maria Bernabò Brea at Serra d'Alto and in the lower trench of Tirlecchia (1975).

After a long season of studies, the archaeological investigations in the entrenched villages stopped, nevertheless the prehistoric research in the Murgia continued in the years between 1984 and 1991 with a French-Italian mission engaged in the excavations of the site of Trasano, which has returned an important documentation relating to subsequent settlement from the Neolithic (Guilaine et alii 2018) to the age of metals (Guilaine et alii 2014).

Another interest in the entrenched villages is due to the reconnaissance activity conducted by Gianfranco Lionetti, who identified four new moats in the Vallone della Torre - Trasanello Cementificio, Trasanello Incompleto, Verdesca and Tirlecchia 3 - and four in the Vallone della Silica - Masseria Grottillo, Villaggio di Masseria Luisi, Villaggio di Masseria Fragnaro - (Camerini, Lionetti 1995). But the excavation campaigns were only in Trasanello Cementificio and Trasanello Incompleto (1997-1999) directed by the Superintendence (Nava 1997; 1999; 2000) in order to safeguard and protect the sites (*fig. 2A*). The last excavations in an entrenched village were carried out by Giovanna Radi in the years 2007-2017 at Trasanello Cementificio (De Siena 2009), where the researches took place in a long stretch of the Neolithic trench, two apsidal huts (Neolithic/Bronze Age) and an Iron Age mound (Angeli 2018a; 2018b).

1.3 Neolithic trench, housing and domestic structure

The entrenched village of Murgia Timone is characterized by the presence of several structures, which can be distinguished according to the following typologies: fencing and delimitation structures, housing structures and negative structures of various functions.



At Murgia Timone, the Neolithic settlement involved the realization of a complex border structure (NW-NE) with two tangent moats dug in the calcarenite. The western trench which is larger, has an elliptical shape and an interruption of about 4 meters, interpreted as an entrance to the village (*fig. 2B*). and two other interruptions (perhaps parts of trench not excavated) to the northwest (about 38 meters) and to the South near Parco Radogna (about 98 meters). The eastern trench has a circular shape is distinguished by a complex entrance, defined by Ridola himself as “lunetta”, formed by a semicircular forepart (*fig. 2B*). This structure has also been identified in the entrenched village of Tirlecchia 2 and it is also visible in Trasanello Cementificio and Tirlecchia 3 (Angeli, Rao 2018).

The width of the moat, that means the distance between the edges, is about 1.80-2 meters with vertical walls and a depth that varies from a minimum of 0.80 centimeters to a maximum of 2 meters. Remains of the wall were found within the moat and near the “lunetta”: suggesting the presence of a wall structure placed along the inner edge of the trench, a theory that also applies for the findings in the entrenched villages of Murgecchia and Serra d’Alto.

Based on archaeological evidence, the moats are interpreted as boundary system for the inhabited space and testify a systematic organization of Neolithic villages in southern Italy, but also in northern Italy, where villages are equipped with fencing systems, such as palisades.

The function of these remarkable works has been debated for a long time with several interpretative proposals, but the hypothesis which seems to prevail is that these structures were to delimit the space. In a recent work, Andrea Pessina perfectly synthesizes the several hypotheses proposed by the archaeological literature and suggests an alternative of symbolic character “The interpretative hypotheses proposed for these structures generally range from the defensive purposes, drainage (the moats) or



enclosures for animals, to a sort of “monuments” erected to separate the domestic space from an external environment which is still “wild”. In addition to the utilitarian functions hypothesized, which remain the most plausible, the symbolic and cultural functions of the fences are also taken into consideration, not as an alternative to the functional ones” (Pessina 2018, p. 613).

The total inhabited area bounded by the trenches (17,600 m² to the west and 6490 m² to the east) has an extension of about 25,000 m². The only excavations that have returned a detailed documentation on the evidence preserved in the area of the settlement are those of Lo Porto, which investigated two distinct areas (test A and test B), where they have been brought to light many structures: pole holes, silos, pits, storage holes, water and clay decanting systems. Some post holes in the test B have been interpreted by Lo Porto as huts which, for the morphological variety seem to testify a diachronic overlapping of settlements on the area. The housing structures, typologically considered as Neolithic on the basis of coeval contexts, could be that one of elliptical/oval shape that is elongated quadrangular with rounded corners (approximately dimensions 5-6 x 3 meters; *fig. 2B in green*), while it is not sure the rectangular hut with apse on the short side (*fig. 2B in blue*), which, considering the whole environment, finds direct comparisons with the apsidal huts brought to light in the entrenched village of Trasanello Cementificio (2 units) and with that ones of Trasano (2 units), dated on the basis of the ceramic material to the age of metals (Neolithic - first Bronze Age). Finally, linear formations may refer to small enclosures of elliptical or rectangular in shape for the stabling of the animals (*fig. 2B in red*). Service or domestic facilities are represented by numerous negative structure which does not allow to understand the original function because, in most cases, the inner part of the moat show the last use and suggest they served as waste place. In Murgia Timone there are several types of bores, mainly cylindrical and



bell-shaped or silos, likely used for food preservation and/or storage.

The ceramic materials coming from different excavation campaigns provide a relative chronology of the settlements in Murgia Timone during the Neolithic.

As in the other entrenched villages, the pottery found inside the moats testifies that the use of the trench is placed between an advanced phase of the ancient Neolithic (Advanced impressed pottery and graffito and painted pottery with narrow bands) and the Middle Neolithic (red-banded figulina pottery), period between the first half of the 6th and 5th millennium BC. The presence of Middle and Recent Neolithic ceramics (Serra d'Alto and Diana's style), found exclusively outside of the moat and on the huts floor, shows that the moat was no longer in use and almost completely filled in.

1.4 Chamber tombs of Bronze Age

In addition to the remains of the Neolithic entrenched village overlap some funerary structures of Bronze Age (*fig. 1C*). These include the four chamber tombs which were investigated in the late 19th century by Domenico Ridola, a doctor from Matera, and the archaeologist Giovanni Patroni. Each tomb had a small well or a short access shaft and an external stone circle (a feature for three out of four chamber tombs).

The excavation results of tombs No 1, No 2 and No 3 were the subject of publication by Giovanni Patroni in 1898 and the artifacts recovered during the investigations became part of Domenico Ridola's private collection (donated to the State in 1911 and core of the Museo Archeologico Domenico Ridola di Matera). Some of them were brought to the Museo Archeologico Nazionale di Napoli and they are still exhibited today in the showcases of the Prehistoric Section of the Museum. Tomb No 4, instead, investigated by Ridola, remained unpublished until its rediscovery (following a report by Gianfranco Lionetti) and its latest edition (Matarese 2018).

1.4.1 Tomb No 1



Tomb No 1 (*Fig. 3A*), discovered, still intact, by Domenico Ridola in 1894 (Ridola 1912, pp. 47-48), was investigated in May 1897 by Giovanni Patroni (Patroni 1898).

It is a hypogeum chamber tomb with an entrance shaft. The upper part is surrounded externally and in a circular way by limestone boulders, in the lower part there is the access to the funeral cell, quadrangular in shape with rounded corners, an irregular coverage and slightly lowered in the middle. In the funeral chamber there are benches and two steps, placed in the two corners of the back wall.

During the excavation Giovanni Patroni identified as many as 76 depositions (22 in the entrance shaft and 54 in the cell) with a set of ceramic containers, amber ornaments, glassy materials, quartz, bronze and bone objects (Patroni 1898). In the pottery set found in the chamber there are cups, bowls and fragments of vases. The furnishings in the cell consisted exclusively of drinking cups and two large jar (sometimes with circular or triangular perforations) perhaps placed in correspondence of the two steps at the bottom of the chamber. Thanks to the typology of the ceramic finds found, it was possible to understand the use of the tomb in the Middle Bronze Age 3 (14th century BC) (Matarese 2018). In addition to the pottery set, in tomb No 1 there was a bronze dagger, studs and spiral rings in bronze, bone disks and pendants, beads in amber, quartz and vitreous material, that highlight the elite role played by the groups that used the hypogeum burials. In particular the decorative objects take on a status-symbol value, this shows the different social levels, those who belonged to elite groups could take part in the exchanges of luxury goods, accessing prestigious raw materials (such as amber) and the exchange of exotic goods (such as pearls in glassy and quartz beads) (Matarese 2016; Matarese 2018; Matarese et alii 2018).

This consideration is supported by the peculiarity of the funerary structures of Murgia Timone: hypogeum chamber tombs with “monumentalized” external



access through stones circles, currently a unicum in Italy. It is evident the desire to point out the pre-eminent social role of those who were buried there (Matarese, Onnis 2014).

1.4.2 Tomb No 2

Tomb No 2 (*Fig. 3B*), already partly explored by Ridola who ascertains its violation (Ridola 1901, p. 28-29; Ridola 1912, p. 47), was fully investigated by Patroni in 1897 (Patroni 1898).

Tomb No 2 is the only one of the four hypogeum burials of the plateau to feature a double stone circle, which externally surround the access of the entrance shaft. At the point where the two circles come closest (on the south side), there is a double row of roughly hewn stones placed transversely to the circles, which seem to form a sort of passage between the area outside the circles and the access shaft. This passage is not excavated in the rock, but is bordered by boulders and it is oriented in the same South-South-West direction as the entrance of cell A.

Through the shaft, cylindrical in shape, it is possible to access to two burial chambers.

Cell A, whose access faces South-South-West, has an irregular rectangular shape with rounded corners, with a large niche on the west wall. Access to the burial chamber is via a step which rests on a sort of platform which runs along the perimeter of the chamber and is characterized by the presence of numerous rises.

On the eastern wall of the access shaft is the entrance to a second chamber. Cell B has a trapezoidal shape and has a lowered floor in the center and is very narrow, ending in correspondence with a square section pillar, tapering upwards, placed in support of the vault and from its sides start some curbs which seem to internally divide the space of the burial chamber. The number of the depositions contained in the tomb No 2 is uncertain, because the context was already violated at the time of the investigation (Ridola 1901, pp. 28-29; Patroni 1898, coll. 420-421).



The pottery set found inside the two funerary cells consist of bowls, drinking cups, vases with engraved decorations in the Apennine style. The typology of the artifacts shows the settlements of people that have followed one another over time, which begins in an advanced phase of the Ancient Bronze Age or in the Middle Bronze Age 1 to the Middle Bronze 3 (18th/17th - 14th century BC) (Matarese 2018).

1.4.3 Tomb No 3

Tomb No 3 (*fig. 3C*) was the first to be investigated by Domenico Ridola in 1894 (Quagliati 1896; Patroni 1898). The access shaft of tomb No 3 is located inside the moat of the Neolithic village.

This access shaft is preceded by a short passage just excavated in the rock and running in the same direction South-South-West of the entrance to the burial chamber.

The access shaft, externally surrounded by a stone circle similar to those of other structures, it is bordered by two dry stone walls, one of these was demolished by Ridola during the excavation in 1894, when he was looking for other tombs nearby, instead, the other is still visible (Patroni 1898, col. 430; Ridola 1912, p. 47). The cell is rectangular in shape with rounded corners; along the north and west sides there is a platform 0.08 m high with a rise in the corner. Along the east side a bench m 0.52 high features several rises. Above this bank the ceiling is interrupted, forming a sort of niche.

During the emptying of the access shaft, skeletons of buried individuals were found, although it is not possible to have information about the type and number of depositions (Quagliati 1896; Patroni 1898). In the chamber were found remains of burials and bronze objects: a tip of a buckle, a spiral ring, a stud and three buckles with a serpentine arch, no longer available (Patroni 1898, fig. 104-109), which the excavators delivered to Ridola (Quagliati 1896).

Patroni reports that tomb No 3 was found violated as the closing slab was out of place (Patroni 1897). Inside



the cell a series of modern objects were found, like a iron buckle, that probably belonged to the violators (Patroni 1897; Patroni 1898).

The few bronze objects recovered by Riola in 1894 are the only surviving finds of the grave goods. However, these are objects related to a reuse of the tomb in the Iron Age (Matarese 2018).

1.4.4 Tomb No 4

TT. E. Peet, in two contributions, one from 1909 and one from 1910, refers to a fourth Bronze Age burial that, however, Ridola have discovered in Murgia Timone and was about to publish (Peet 1909; Peet 1910). The publication regarding this funerary structure and its excavation never took place.

Even A. Jatta in a paper on the Bulletin of Palethnology of 1904 states that there would be more than just three tombs at Murgia Timone but also a group of tombs located in the central area of the plateau (Jatta 1904).

Tomb No 4 is very similar to the other three, although it seems to be devoid of the external stone circle. The chambers are preceded by a short aisle oriented South-South-West, deeper than tombs No 2 and No 3, slightly inclined downwards and bordered at the opening by lithic elements (*fig. 3D*).

At the bottom of the access shaft are the entrances to two funerary cells: one faces South-South-West, with the same orientation as the aisle, the other one opens on the eastern wall of the entrance shaft and faces West. Chamber A has a rectangular floor plan, with well-defined corners and a lower ceiling towards the bottom. The second chamber, with a rectangular plan and slightly rounded corners, has a low platform along the back wall.

The few materials from the tomb, preserved in the warehouses of the Museo Domenico Ridola di Matera, show a wide range of use between Middle Bronze 1-2 and Middle Bronze 3 (16th -14th century BC) (Matarese 2018).

1.5 General considerations in view of recent excavations



The excavation and cleaning of archaeological evidence conducted as part of the “Human History Park - Prehistory” enhancement project, have allowed for the collection of new data that clarify some aspects of the site history.

The choice of the survey location (*fig. 1D*) was based on the results of the georadar that in preliminary cognitive investigations reported an anomaly and identified during the excavation as a cut with NW-SE orientation which can be interpreted as a channel behind the trench.

The evidence is characterized by a flat and smooth bottom and by a U-shaped profile with concave and irregular walls (size: 50 cm wide, 2 m long in the southern part of the moat and 1.30 m in the northern part of the moat and a depth of less than 10 cm). The moat did not return any archaeological material.

The stratigraphic excavation (size: 6x5m), made it possible to check the successive contents in the Neolithic trench, which has walls inclined towards the concave bottom, a depth of about 3 meters, a width of 1.80 meters on the western border of the excavation (*fig. 2C*) and 2.40 meters on the East excavation limit. Of particular interest is the discovery of a structure in situ within the trench, in correspondence with a small oval niche carved in the outer wall of the moat. The structure can be interpreted as a pyrotechnic installation with circular morphology with an arrangement of stones in the upper level (*fig. 2C*) and a coating of clay hardened by fire in the lower level. In the area surrounding this structure combustion residues have been identified, with abundant coals, calcined stones and (reddish) rubefied soil, which testify the activities taking place within the Neolithic trench.

The identification of a domestic structure in a primary location is an archaeological data very interesting, which opens new research perspectives and questions about possible secondary uses of the large Neolithic trenches.

On the basis of the material found, it is possible to define a relative timeline for the use of the trench, framed



during the Ancient Neolithic and the Middle Neolithic. Next to the ceramics, there are chipped lithic objects realized with local flint and lithotypes of exogenous origin (flint of Gargano and obsidian of Lipari), along with lithic objects including fragments of millstones and grinders, and an axe blade, remains of domestic animals (ovis-goat and bos) and a pendant with hole made by a rib (*fig. 2C*). The sampling carried out on sediments and carbons will allow for deeper research in laboratory including paleobotanical, palynological, sedimentological and micromorphological analyses and the possibility to conduct new radiometric dating, which will enrich the current chrono-cultural and economic framework regarding the development of the Neolithic of the Murgia in Matera.

The cleaning of tomb No 4, which began in 2017 and ended with conservation works in 2020, made it possible to verify the structuring of the access and to highlight unpublished structural elements that were discovered at the entrance and on the floor levels of the two cells (*fig. 3D*). The hypothesis proposed at the time regarding the access system of tomb No 4, described as “a short corridor oriented South-South-West, deeper than the tombs No 2 and No 3, slightly inclined downwards and bordered at the top by lithic elements. [...] this access structure would seem more likely a dromos for an entrance shaft with a step down. Unfortunately, the structure is completely invaded by vegetation, as well as earth and stones, which makes it more difficult to assess the size of the dromos and whether it is actually a corridor or the dismantled structure of a shaft” (Matarese 2018, p. 50) found an evident confirmation with the cleaning intervention. The access is, in fact, made up of a short corridor with an elongated shape similar to a dromos, with a step down made with lithic elements (*fig. 3D*). A similar access structure also precedes the entrance shaft of tomb No 3, which was brought to light in 2020 and looked like a short passage carved into the rock and which turned out to be a short corridor similar to a dromos, characterized by a slight slope towards the



top of the entrance shaft and a descent step featuring lithic elements at the entrance of the dromos itself (*fig. 3C*). Also, in tomb No 4, at the bottom of the access structure and in front of the entrances of the two chambers, a hole was discovered – partly created from the side wall forming a small niche – that could be interpreted as a functional structure to place items or for use in funerary rituals or it could be the beginnings of a third funerary chamber, begun but never completed. In the absence of excavation data it is difficult to define all this.

The cleaning of the floors of the two chambers in tomb No 4 also brought to light interesting internal structural elements. In chamber A the space is divided by a step, which separates the chamber into two portions, which could represent the limit between the space of the living and dead. The entrance is at a higher level: this space could have been used for funeral ceremonies or for the deposition of the equipment. The innermost part of the hypogeum, instead, was probably destined for the deposition of the dead. This organisation of the funerary space finds a comparison with the chamber tomb No 3 of Toppo Daguzzo in the Ofanto valley. In the use phase of the Middle Bronze Age 3 (mid fifteenth century. BC - early fourteenth century. BC) the funeral chamber of the tomb No 3 of Toppo Daguzzo was internally divided into two parts by a wooden partition: in the outermost part near the entrance vases fragments and a fire with remains of fauna were found, in the second half of the chamber - in depth - were deposited the inhumations (Cipolloni 1986).

In the second chamber of tomb No 4 two steps leading down to a platform were found which runs along the right side of the entrance and a cruciform curb outlines four spaces on the floor (perhaps used for burials of different family groups). The internal division of the second chamber of tomb No 4 looks like the chamber B of tomb No 2, where there is, however, a central pillar.



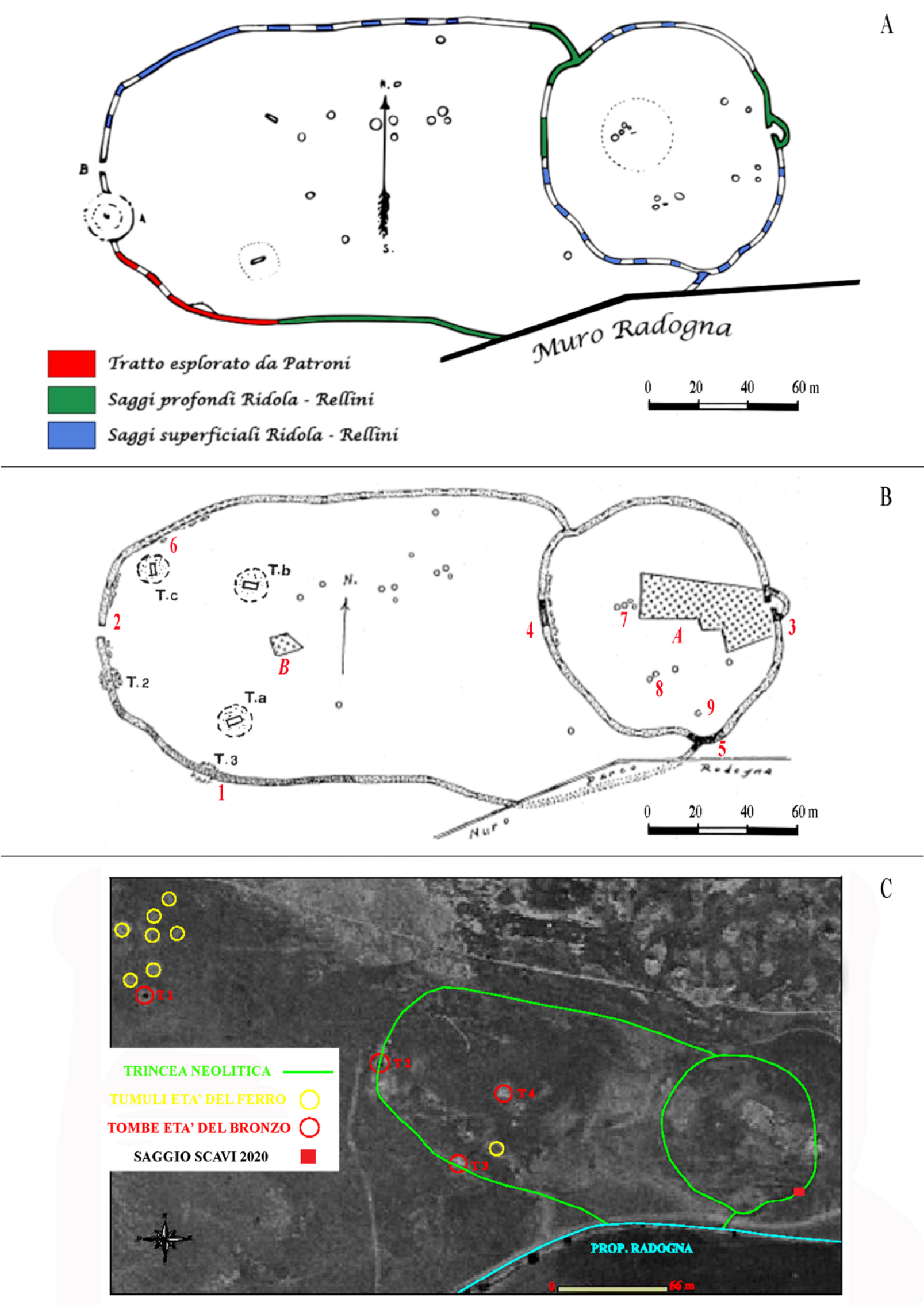


Fig. 1 - Murgia Timone site. A. Plan of the village and placement of Ridola's excavations, Patroni and Rellini (Ridola 1924-1926, Tab. VI modified); B. Plan and placement of Lo Porto's excavations (Lo Porto 1998, fig.3 modified) ; C. Orthophoto with identification of the prehistoric life on the plateau.



SETTLEMENT CONTEXT

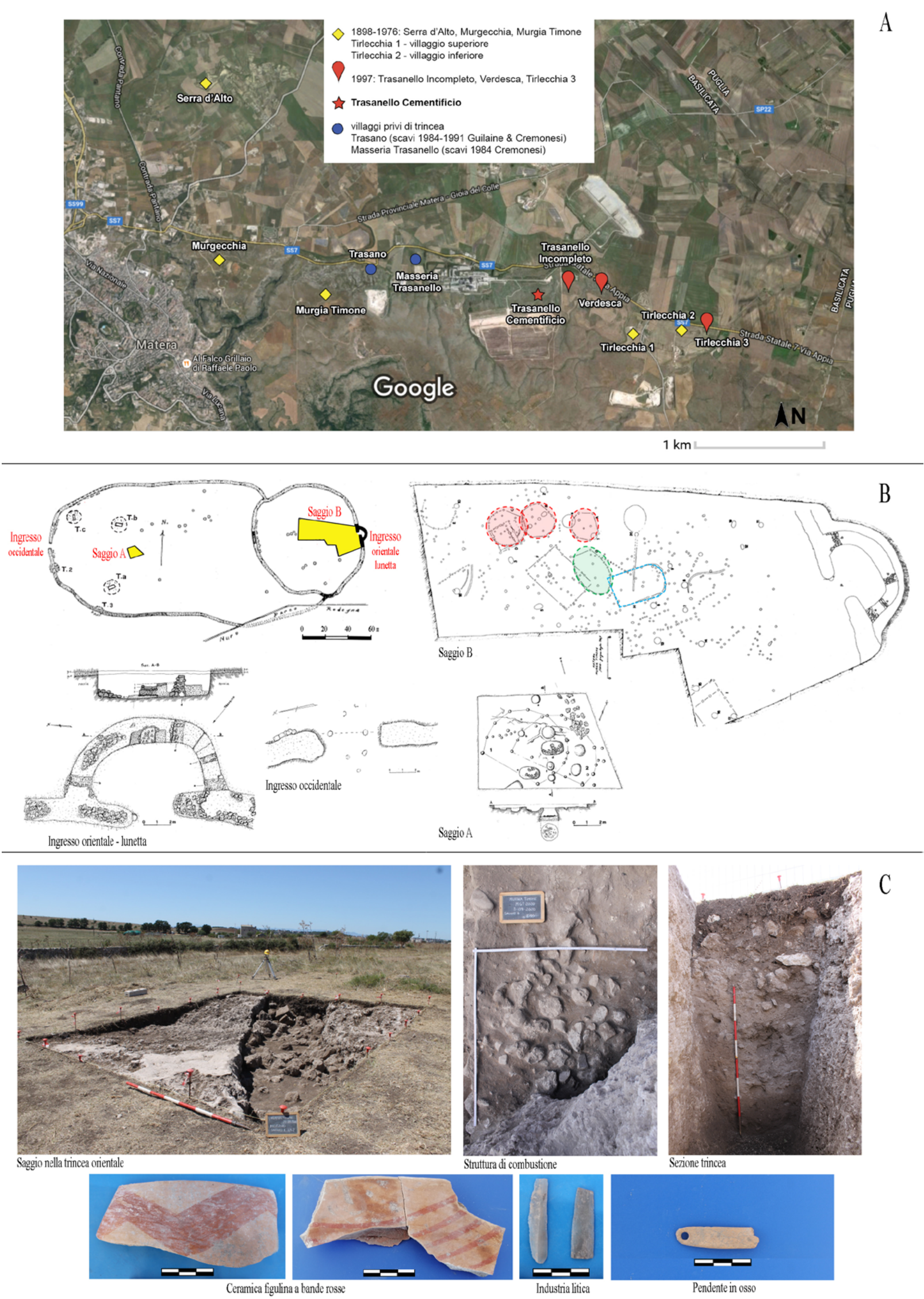


Fig. 2 - Neolithic village in Murgia Timone. A. Location of entrenched villages (Angeli 2018b, fig.2) ; B. Plan of the survey in the living area. Lo Porto's excavations (Lo Porto 1998, fig.3 5-7 modified); C. excavation photos 2020.



Fig. 3 - Chamber tombs of Murgia Timone. From left to right: plans of the circles stones (Matarese 2018,fig.23), excavation photos 2020 (concession of the ABAP Superintendence of Basilicata - MiBACT) , plans and sections of the funerary structures (A) tomb No 1 (Patroni 1898,fig. 24 and 25), (B) tomb No 2 (Patroni 1898, fig. 35,36 and 37), (C) tomb No 3 (Patroni 1898, fig. 39 and 40), (D) tomb No 4 (Matarese 2018, fig. 35 and 36 modified).



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2. Origin and development of the rupestrian civilisation in Matera and its territory

by Marina Falla Castelfranchi

In the context of rupestrian civilisation in southern Italy and Sicily, there is no doubt that Matera area, which until the 17th century was part of the Terra d'Otranto, is one of the most important for its settlement systems, for the complex reality and conformation of the rupestrian habitat, and for its historical and cultural identity, understood as a sort of microcosm. Especially after the publication of the volume published in Rome in 1966 by the Matera club 'La Scaletta' and coordinated by Raffaello De Ruggieri, at that time already mayor of Matera, then reprinted and reformulated in 1995, the perception of this priceless heritage, little known even to the insiders, become clear. It is true that between the end of the 19th century and the beginning of the 20th century, two French scholars, Charles Diehl and Émile Bertaux, had already pointed out the case of the rupestrian churches of Matera, with those in Apulia: at that time, in fact, the notion of rupestrian civilisation, of rupestrian villages and the phenomenon of living in caves were not well perceived. After the publication, in 1966, of the rupestrian churches volume of Matera, especially Prof. Cosimo Damiano Fonseca, member of the Accademia dei Lincei and first Rector of University of Basilicata, has dedicated several volumes and proceedings of national and international conferences. He, for example, inaugurated, from 2003, a new series of conferences on rupestrian settlements held every two years at the prestigious Masseria San Domenico in Savelletri, Fasano (BR), made available by the owner, Mrs Marisa Lisi Melpignano, with the support of the *Fondazione del Centro Italiano di Studi sull'Alto Medioevo di Spoleto* and its president Enrico Menestò, member of the Accademia dei Lincei: an international Scientific Committee was therefore formed, of which I am also a member. And it was in the latest volume of the Proceedings of the San Domenico Foundation, published in 2018 and dedicated to cave churches



in rupestrian civilisation areas and to territorial planning tools, that Lorenzo Rota published his essay *Dalle chiese in grotta alle aree della civiltà rupestre: gli strumenti di pianificazione territoriale. Il parco regionale della Murgia materana*. The park project, in the context of the protection and enhancement policy of the territory and its identity, had already been undertaken since the second half of the last century. To keep talking about settlements, it should be noted that in the blades and gravine real rupestrian villages gradually formed, which determined processes of social aggregation, of farmhouses whose model is the city, with houses and vegetable gardens, wells and canals, crossed by roads carved into the rock.

These are two different but certainly not antithetical settlement realities. Matera model revolves around the concept of excavated or constructed living space, based on verticality. After all, the limestone rock lends itself well to being excavated and shaped, whether it be for dwellings or places of worship.

In this exchange of roles, the choice of models used for rupestrian churches is extremely varied, from the type with a single nave and a single apse to the widespread type with two apses and a nave which ending in three apses. The Byzantine type of Greek cross enclosed in a square is also widely attested. Very interesting are some types of roofing, with two roof pitches, for example in the rupestrian church of Madonna delle Croci (or Madonna della Croce) animated by mirrors, and with a sort of low lenticular dome that includes crosses in relief; there are many examples and they can also be found in Mottola and in southern Salento, the most Greek enclave in the Terra d'Otranto. A further aspect concerns the absorption of liturgical furnishings from the subdial churches, and there is no lack of internal divisions of space – *naos* and *bema* – with lithoid iconostases, as in the church of Santa Lucia alla Selva in Matera: there is also evidence of the *prothesis* and *diakonikon* opening at the sides of the central apse.

UA further analogy, in terms of excavated architecture,



between Matera and Taranto Murgia areas (thinking of, for example, the rich catalogue of rupestrian churches in Mottola, Massafra, Palagianello, Laterza, etc.) is the very frequent the presence of blind arches along the walls, especially on the sides, with the intention of making the link of verisimilitude with the built architecture even more tangible.

It should also be borne in mind, in general, that the origin of the villages and rupestrian churches is chronologically framed no earlier than the 9th-10th centuries, and ended around the end of the 14th century. The crypt of the *Peccato Originale*, with its extraordinary paintings dating from the first half of the 9th century, whose frescoes were restored a few decades ago by the *Istituto Centrale del Restauro* in Rome thanks to the initiative of the ICR Director of that moment, the late Michele D'Elia, it represents a significant case for its unusual iconography, exuberant language and vivid colours. It is a “*beneventano*” graft, as indicated by the similarities with many contemporary paintings from Campania and Apulia that are part of this cultural season.

On the other hand, the surviving decoration of the Madonna delle Croci rupestrian church (or Madonna della Croce), where, in the central apse the Virgin and Child are represented, seated on a lyre throne and held by two figures of archangels on the sides, it is a model of exquisitely Byzantine origin, marked by a high level of quality, which is fully recognisable in the late-Comnena painting current. The painting is set against a two-colour background, according to a tradition widely documented in Byzantine painting in the Terra d'Otranto. The name probably derives from the many crosses engraved on the walls, and other crosses placed in the centre of the low lenticular domes that animate the vaults of the nave. The crypt of Madonna delle Tre Porte is certainly a case of great interest for its pictorial decoration, articulated in several layers: its name is from the presence of three large entrances opening on the southern side. Inside, the surviving paintings that are placed chronologically between the end of the 12th and the beginning of the



13th century, and the 15th century. The earliest painting is the face of the Virgin, late comneno style too (late 12th- early 13th century), and probably part of a larger composition, similar to the catino of the Madonna delle Croci church (but in this case without the angels). The frescoes of the later period include a *Deesis* - *Deesis* in Greek means prayer, and it is the prayer that the Virgin and St John the Baptist address to Christ for the salvation of humanity -, a panel with Virgin and Child in an affectionate attitude - this is the type known as *Glikophylousa* - and other painted fragments. In this varied context, there is no lack of grafts with a French stamp, which arrived in Basilicata through the Naples Angevin. In the crypt of Santa Lucia alle Malve in Matera, there is a rare scene of the Coronation of the Virgin, unique in rupestrian churches: the panel dates from the early 14 century (Leone De Castris, 2004).

The pictorial decoration of the crypt of San Falcione is even more fragmentary and late. First of all, the crypt has an irregular layout with two naves (a type very common in the Mediterranean area), with a few fragments of frescoes and a painting of the *Presentazione di Gesù al Tempio*, with Anna the prophetess who holds a scroll with the Greek inscription of her prophecy. It should also be borne in mind that there is no documented in hagiographic catalogs: it is possible that it derives from San Falcione, a holy abbot of the famous abbey of Cava dei Tirreni (Salerno), who lived in the first half of the 12th century. Regarding the hypothetical dedication to San Canio, it should be noted that the cathedral of Acerenza (Potenza) was dedicated to the same saint: however modern documentation refers to the crypt as San Falcione.

The presence of the Greek inscription in a late work leads to reflect on the rare use of the Greek language in Matera's exegetical inscriptions. I believe that this phenomenon is linked to the presence, in the iconographic programmes, of the rupestrian churches in this area - where the dioceses were of Latin origin even during the period of Byzantine domination - of



saints mainly of western origin, and the situation is reflected in that one of the Taranto area. Moreover, there are many similarities between some of the rupestrian paintings in Taranto and Matera which suggest the presence of itinerant painters who moved, with their workshops, from one area to another.

In Matera, for example, the interesting pictorial decoration of the crypt of San Nicola dei Greci preserves traces of inscriptions in Greek. The plan is obtained, in this specific case, by joining a hall with an elliptical apse to a space also with an apse similar to the crypt of Christ in the same city. Outside, there are two tombs carved into the rock, with the apse where a Crucifixion nestles, and the association is certainly not accidental, linked to the funerary use of many rupestrian churches, whose private size comes from the analysis of some aspects: even the two-apse scheme is often found to be linked to this specific function. The 14th century Christ is depicted in the iconography of the Christus Patiens, particular in the West especially following the Franciscan preaching, instead the choice of inserting the symbols of the sun and moon, humanising them, refers to oriental models based on a passage from the Gospels. In the left-hand side of the apse, San Nicola and Santa Barbara are depicted, then covered by a later layer (around the middle of the 13th century) with San Pantaleon and Santa Barbara, saints of oriental origin: Pantaleon was a doctor and he is depicted with the tools of his profession, while Santa Barbara, who was of imperial origin, shows a hairstyle with pearls and gems: however, little is left of the figure. Outside, not far from the tombs carved in the rock, on a pillar, there is a depiction of a saint largely covered by successive layers of painted plaster, which are illegible: this figure would seem to belong to the primitive decoration of the rupestrian church.

UAnother interesting case is the church of Santa Barbara, both for its refined layout where a Byzantine-style liturgical furniture flows and for its late pictorial decoration. Of particular note is the beautiful lithoid



iconostasis (or *templon*) with arches and a large central entrance leading into the bema area: in the lower part of the iconostasis are two images of the saint, marked by her name in Latin letters, which are partially preserved. As well as San Nicola dei Greci, a tomb carved in the rock is placed in axis with the iconostasis, so with the apse.

UA peculiarity of rupestrian churches, which distinguishes them from sub-dial churches, for example, is the absence of Christological cycles - with the exception of rare cases - polarising on the depiction of a scene, usually the Annunciation, as it is an image that anticipates and summarises the whole history of salvation. Moreover, their hermitic function should be questioned: in most of southern Italy, in fact, monasteries are usually coenobitic and subdial, so that images of holy monks or hermits are very rare in rupestrian churches; also, the overused expression of Basilian monks should be definitively set aside, as well as the reference to a massive emigration of monks who moved from the East to our peninsula following the iconoclastic climate. San Basilio of Cappadocia Cesarea was a famous bishop of the second half of the fourth century who did not found any monastic order, but he had simply drawn up a kind of decalogue for the use of monks. The myth of the '*transfughi*' monks cannot be sustained any longer, in fact, the historical research has amply demonstrated that Italo-Greek monasticism has its own identity and autonomy and it includes very important personalities among the saints. And what about the so-called 'iconic images'? In Greek, the word *eikon* simply means image: in the rupestrian churches, after all, the images are essentially votive and their choice reflects the popular devotion of the area.

From this brief outline emerges, as anticipated at the beginning, the particular physiognomy of the Matera rupestrian settlements and the decoration of their crypts: with those of the Vulture, they are a complex and varied reality within this specific context.



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2.1 Rupestrian churches: Cards of Madonna delle Tre porte; Madonna delle Croci; San Biagio/San Vito

by Manuela De Giorgi

Madonna delle Tre porte

In the rich panorama of Murgia Timone rupestrian milieu, the crypt of Madonna delle Tre Porte is – without doubt – the most interesting context, both for the architectural structure (partly collapsed), and for the pictorial decoration which, although heavily defaced by vandalism and theft, it preserves one of the most complex programs in the entire area. The critical luck, but also the ‘material’ bad luck of the crypt (Gabrieli, 1936, p. 48; La Scaletta, 1966, p. 244-246; Rizzi, 1973 [2007], p. 186; Pace, 1994, p. 281 and fig. 360; La Scaletta, 1995, p. 103-104; Villani, 2000, p. 49, 110; Heissenbüttel, 2000, p. 134-135; Heissenbüttel, 2004, p. 21, note 91; Grelle Iusco, 1981¹ [2001²], p. 29 and fig. 50; Falla Castelfranchi, 2006, pp. 767-768; / *luoghi di culto*, 2010, p. 71; Castelluccio, 2010, p. 33-34, 39; Heissenbüttel, 2011, p. 177 and note 32) is due to the very early attention paid by scholars, first of all the French Charles Diehl, who gives a very detailed description (Diehl, 1894, p.157-158), and Émile Bertaux, interested in the site, but much more concise in his considerations (Bertaux, 1904, p. 150 and fig. 64).

The peculiar title is documented in a manuscript (no. 959) which is in the *Biblioteca del Museo Nazionale “D. Ridola”* of Matera, where it is specified that it is «so called because of the three doors giving access to three distinct oratories» (La Scaletta, 1995, p. 104, note 1). The crypt, as mentioned above, was affected by a ruinous and not at all limited collapse (already in ancient times, and in any case at an unspecified time) which cleared the entire access side aligned with the rock face, where the original entrance to the church must have been (Fig. 1) (Cappelli, 1954, p. 250). The space of the internal volumes of the cave-church is signed by four central pillars, three of which still sketch a planimetric scheme that can be remotely





Fig. 1 - Matera, Madonna delle Tre Porte, external view

to the Mid-Byzantine model plan of the cross-in-square on pillars (Fig. 2); the supports are connected by a system of arches that mark the sequence of spans against the flat ceiling. The Byzantine reference model is, however, integrated (or rather, almost distorted)

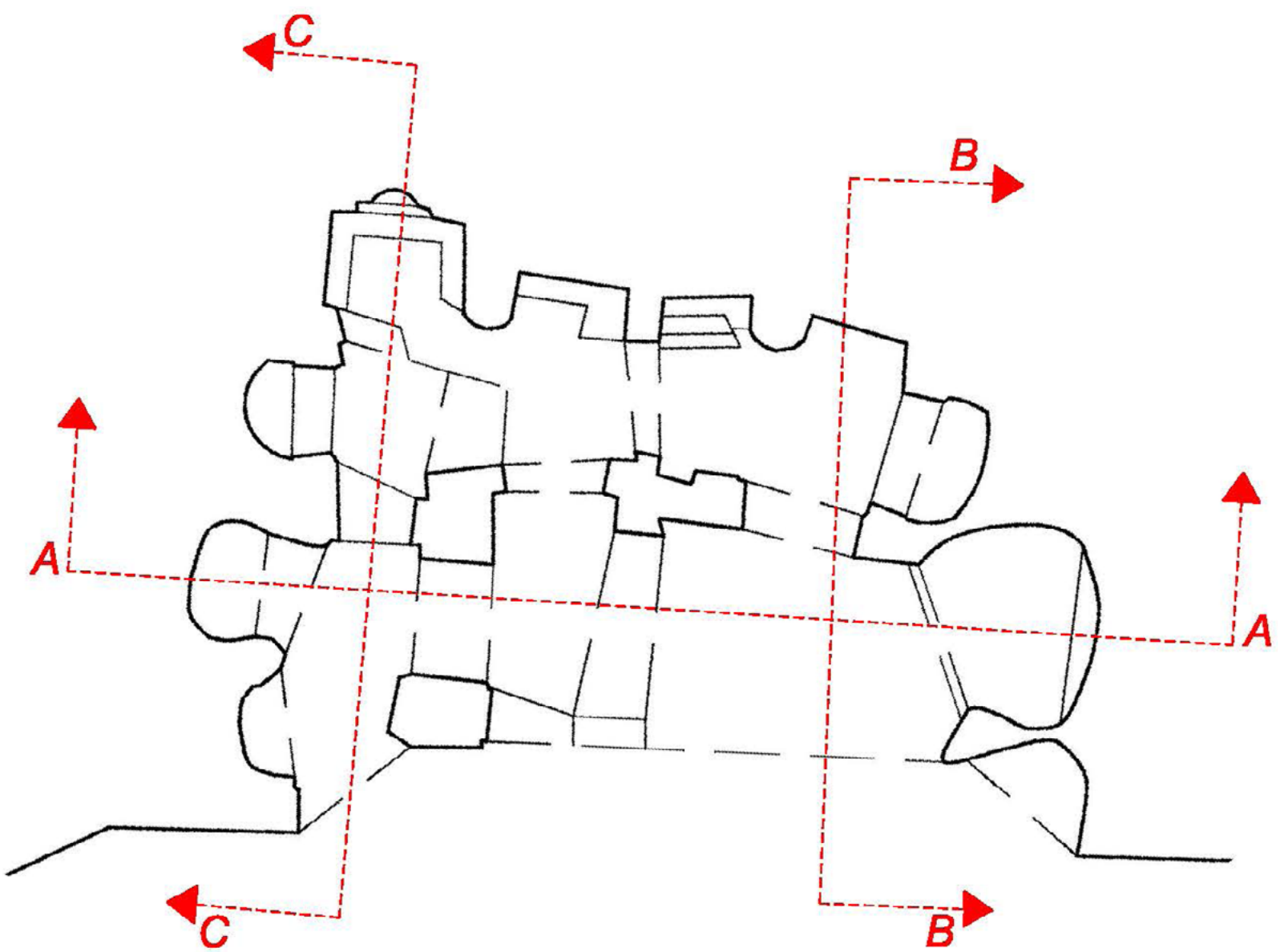


Fig. 2 - Matera, Madonna delle Tre Porte, plan (provided by Maurizio Lazzari)

by the terminations with two triapsidal groups on the short sides, a circumstance that makes the plan an *unicum* in the panorama of Matera and beyond; however, the hypothesis that one of the two short sides was remodelled by excavation after the original

is not to be entirely dismissed. The uniqueness of the planimetric scheme and the impairment caused with the collapse also make it impossible to reliably interpret the function of several areas: Diehl, for example, spoke of a «long, narrow portico, ending into two small apses» (Diehl, 1894, p. 157), referring to the first and long room that is now closed by grates. The presence of a 'portico' might make us reflect on the role (of narthex?) of this space; but there is little evidence of this and it is perhaps more appropriate to think simply in descriptive and not functional terms. The same problem rises with the scholar's mention of an ambo leaning against the wall in the last apse at the far right (Diehl, 1894, p. 157).

Instead, the frescoes that are preserved inside the Tre Porte give rise to more in-depth reflection: a total of five groups of paintings can be identified, some of which can be associated in terms of chronology. In topographical order from the entrance, there are: the Deesis (Fig. 3) and the *Virgin with Child* (*Glykophilousa*, i.e. "sweet-kissing") in the central apse on the right (Fig. 4); from this point, entering the inner bay, one



Fig. 3 - Matera, Madonna delle Tre Porte, apse decoration, Deesis (photo: Maurizio Lazzari)

can find: a *Crucifixion* on the wall where the minor apse opens (Fig. 5), and next to it



Fig. 5 - Matera, Madonna delle Tre Porte, Crucifixion (photo: Maurizio Lazzari)



Fig. 4 - Matera, Madonna delle Tre Porte, apse decoration, Deesis (photo: Maurizio Lazzari)

flanked on the left by an *Annunciation* (Fig. 6). The paintings of the Madonna delle Tre Porte are certainly among the best known, both for the critical



Fig. 6 - Matera, Madonna delle Tre Porte, Annunciation and Virgin with Child (Kyriotissa) (photo: Maurizio Lazzari)

– on the side wall, exactly opposite the archway – an *Enthroned Virgin and Child*,
fortune that, from the end of the 19th century, has kept the academic interest constant, and – unfortunately – for the ruinous effects of a nefarious, as well as the ‘academic vandalism’ of almost fifty years ago. This is the well-

known theft by Rudolf Kubesch of several fragments of wall paintings in some cave-churches in Matera: it was April 1962 (De Giorgi, 2019, p. 228-230 and note 69). The story of these thefts is famous and it is now also told in interesting documentaries-videos – even historical ones, from the Teche RAI (<https://vimeo.com/42486767>) – which testify to the great outcry the affair provoked, also internationally. The fragments, partly recovered at different times, they have never been relocated in situ and they are now kept at the *Museo a Palazzo Lanfranchi* in the city. It is about seven pieces (six of which exhibited in a room of the museum), especially faces and groups of hands, which can be traced back to different decorative phases of the crypt currently discussed.

Speaking of decorative ‘phases’, it should be made clear that the literature has perfectly placed the chronology of the frescoes of the Tre Porte from the very first contributions. Thinking above all of Diehl, Cappelli e Rizzi (Diehl, 1894, p. 157-158; Cappelli, 1954, p. 252-257; Rizzi, 1973 [2007], p. 186), up to the most recent literature.

In the *Virgin with Child* on the side wall (Fig. 6), the most ancient witness of all the surviving pictorial decoration is recognized: the iconographic typology of *Kyriotissa* (after the Constantinopolitan monastery of the *Theotokos ta Kyrou*) shows that the first painter was perfectly updated to the Marian iconographies of

Byzantine origin, local and non-local, finding in the *Virgin with Child* in the apse of the Madonna Delle Croci cave-church his most immediate contact.

The possibility of directly comparing the two images is, unfortunately, affected by the lack of integrity of the pictorial layer at the Tre Porte:



Fig. 7 – Matera, Museo Nazionale dell’Arte Medievale e Moderna Della Basilicata, detached fresco of Virgin with Child (Glykophilousa) from Madonna delle Tre Porte, detail: face of Mary (photo: Manuela de Giorgi)



Fig. 7 – Matera, Museo Nazionale dell'Arte Medievale e Moderna Della Basilicata, detached fresco of Virgin with Child (Glykophilousa) from Madonna delle Tre Porte, detail: face of Christ (photo: Manuela de Giorgi)

the two faces were among those stolen by Kubesch and now to the museum (Figs. 7 and 8). However, some style elements, such as the many decorations which are found in the halo of Virgin decorated with a spiral motif, in the

structure of the throne and in the fabric that covers it, indicate the intervention of a different master – I think – from the painter working at the Madonna delle Croci, contrary to Villani's hypothesis (Villani, 2000, p. 49); the former certainly familiar with Byzantine models, but more aligned with Western ways.

At the same consideration also induces an evaluation of the flesh tones: soft and with gradual tonal transitions in the Madonna delle Croci decoration, more schematic – see the use of orange to emphasize cheeks, chin and neck in Mary – here at the Tre Porte. This fully justifies, in my opinion, a later chronology for the piece in question to the second-third decade of the 13th century (Rizzi, 1973 [2007], p. 186; Pace, 1994, p. 281; Falla Castelfranchi, 2006, p. 767-768; Castelluccio, 2010, p. 33).

The importance of the oldest witness also relates to the fact that, at least until a little over a hundred years ago, here the only epigraphic evidence was kept inside the cave-church, now disappeared but fortunately documented by Diehl and recorded in his monumental work: MEMENTO D(OMI)NE FAMULI TUI SIMEONIS ET UXORIS EJUS (“Remember God of your servant Simeon and of his wife”) (Diehl, 1894, p. 158). A supplication which, on the one hand, clarifies the votive value of the panel and, probably, a private or semi-private destination of the church; on the other hand, the use of the Latin (as in Taranto and

differently in Salento, the latter with a more distinctly Hellenophone vocation) confirms the coexistence of oriental figurative stylistic elements and Latin culture in some Medieval paintings in Basilicata (Heissenbüttel, 2004).

To the left of the ancient *Kyriotissa*, there is a later *Annunciation*, to be considered with two other panels mentioned above: the *Deesis* and the *Virgin Glykophilousa*, both of late-Gothic culture (Figs. 3, 4 and 6). There is no doubt that the scene of the Annunciation has more problems in the interpretation of the anonymous painter's stylistic trend, because it is the most ruined between them (Grelle Iusco, 1981 [2001²], Villani, 2000, p. 130-132). Also in this case, in fact, the panel has been heavily impoverished by fraudulent removals (two fragments of the Archangel, the face and hands are in the museum), as well as a progressive decay of the pictorial layer, and in addition the continue vandalism that has particularly affected the upper part of the figure of Mary. This is demonstrated from photographic documentation of the 1980s kept at the *Soprintendenza* in Matera, and from the photos published by Antonella Cucciniello in her recent catalogue entry (Cucciniello, 2002, p. 53). The contribution of the scholar is also important because she inserts, for the first time, the activity of the author of these paintings in the workshop of Giovanni di Francia, due to affinities that "verge on overlapping" (Cucciniello, 2002, p. 50-54; Gelao, 2006, p. 832-833 and notes 29 and 30; Castelluccio, 2010, p. 40). A fil rouge, in fact, directly links the sinuous movements of the figures of the *Annunciation* with the delicacy of the Virgin, both in the side panel of the *Glykophilousa*, and of the *Deesis* (to the left of the enthroned Christ, holding the open Gospel with the usual verse of John - Jn. 8.12 -, in Latin; St. John the Baptist on the right is, unfortunately, acephalous). The cold chromatism of the Archangel's clothing (both in the tunic still *in situ*, and in the two fragments in the museum) gives way to a warmer palette in the two panels of the main apse, without affecting the unity of the style. Furthermore,



aside stylistic references traced down in this church, some of them open up to comparison, for example, with the contemporary frescoes in Santa Barbara cave-church – the ones depicted the eponymous saint and the *Virgin with Child* – and, deriving from the latter, with those of Santa Catherine of Galatina workshop. In the series inside the Madonna delle Tre Porte, the 15th-century painter's syntactic-formal homogeneity can be seen in the sequence of the faces of three Mary: from the oval shape to the arching of the eyebrows, from the motif of the halos to the tonal variations of skin color, the three versions overlap (to use Cucciniello's words) perfectly, as well as the pattern of the garments' highlights. A softened brushstroke, that can also be seen in the almost-feminine face of the Baptist now in the museum, inserts the decoration of the cave-church in a wider Matera-Salento and Adriatic context (Fig. 9).



Fig. 9 - Matera, Museo Nazionale dell'Arte Medievale e Moderna Della Basilicata, detached fresco of Deesis from Madonna delle Tre Porte, detail: face of the Baptist (photo: Manuela de Giorgi)

In the second half of the 14th century, should be also dated the *Crucifixion* depicted, probably, by a local artist, as it seems to suggest the more cursive language in the treatment of Christ's anatomy, the clumsy postures of the two mourners, the evident disproportion of the three figures, and the marked flattening of the drapery (Heissenbüttel, 2000, p. 135). Beside the figure of Mary there is the *titulus* MAT(ER) D(OMI)NI ("Mather of God"). To complete the survey of the painted evidences in the cave-church, one should mention a small decorative panel with an almost-Greek-shaped cross, red colored on white field, defined by a three-lines frame; in the lower part of the cross there is a vegetal motif (Fig.10).

Madonna delle Croci

Beyond the valley facing the Madonna delle Tre Porte, is located the second Mary-devoted cave-church of the Murgia Timone. The name “Madonna delle



Fig. 10 - Matera, Madonna delle Tre Porte, painted cross (photo: Maurizio Lazzari)

Croci”, or “della Croce” (Gabrieli, 1936, p. 51; Cappelli, 1957, p. 254; La Scaletta, 1966, p. 246-247; Venditti, 1967, p. 332, 336, 340; Rotili, 1980, p. 86-87 and 158; La Scaletta, 1995, p. 105-106; Althaus, 1997, no. 41; Heissenbüttel, 2000, p. 136; *I luoghi di Culto*, 2010, p. 72; Heissenbüttel, 2011, p. 177) finds a double reason: both in the several engraved crosses (of different shape and size) that can be found on all walls of the cave-church, and in the two large relief crosses within a kind of clypeus designing the ceiling of the first bay, according to a plastic-architectural

decoration imitating the space of the dome – in fact, they are known as ‘fake domes’ –, as simple as it is effective from an aesthetic point of view, and that finds a correspondence in other cave-churches in the Matera area, but also in Taranto context and in Salento (Dell’Aquila – Messina, 1998, p. 82 and 206-207). Fully excavated in the calcarenite rock bank (Laviano, 1992), the church plant has a longitudinal development characterized by a pair of quadrangular bays aligned with the apse, which opens onto the back wall (Figs. 11-12); the rectangular entrance opens on the rock



Fig. 11 – Matera, Madonna delle Croci (or della Croce), interior (Common Wikipedia)

monumentalization of the entrance itself anciently, by means of an arch whose intrados can still be seen in the upper part and completed *ab antiquo*, perhaps, by two columns in the lower part, like the side corbels would seem suggest .

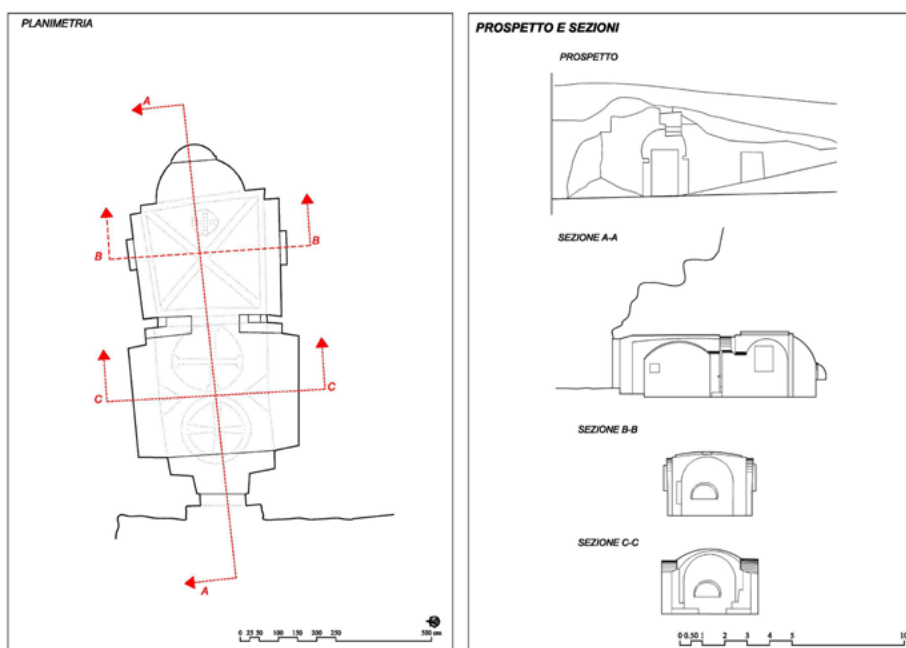


Fig. 12 – Matera, Madonna delle Croci (or della Croce), plan, elevation and sections (provided by Maurizio Lazzari)

which produced a narrowing of the passage to the innermost bay. The latter has a rib vault, whose panel on the apse - as in the western bay - has a Greek cross within a clypeus, much smaller than the two already mentioned.

The three carved crosses show different endings from each other: with widening-ending arms the first cross at the entrance; with arm endings on semi-circular motif the second one - a typology defined as “*martellata*” (i.e. “hammered”) (Gabellone - Limoncelli 2011, p. 412); decorated with a small stud motif the inner cross, the latter painted with an unlikely rubrication

bank of the slope; entrance’s profile is underlined, on the outside, by a pronounced curvature overlooking the lintel which allows to speculate about a kind of

The space inside is perfectly separated by a low wall, now largely made up of well-squared, limestone blocks of the modern period, overlapping on the foundation of the medieval stone wall still visible and



Fig. 13 – Matera, Madonna delle Croci (or della Croce), detail: cross vault of the eastern bay (photo: Maurizio Lazzari)

in light blue (Fig. 13). Long the side walls of both bays, blind arches of different width and depth open, giving dynamism to the inner space. Although the medieval conformation of the cave-church was not distorted and it still remains the original space form, however some changes of the modern period are evident, though it is not possible to date them. Of particular interest is the Medieval decoration which is preserved inside the church, today kept only in the apse; it is to be excluded, in my opinion, that in former times there were other paintings, both for the

presence of many engraved crosses, some of which seem antiquated, and because the stone surface shows no traces elsewhere, not even minimal ones, of preparation layers and/or painted plaster. As said so far does not involve later decorations which I think should be dated from the 1500s, with racemes and vegetal motifs that are located on the passing-arch between the two bays, on the triangle portions of wall on both sides of the apse, and in a excavated niche, at the rear, in the lower part of it, whose cap shows in a more evident way traces in ocher color referring to a spiral motif turning from the center and developing sinuously to fill the curved surface.

It is undoubtedly the monumental group of the apse to significantly attract attention, for the conservation

state and for the fresco chronology (La Scaletta, 1966, p. 80, 95-96, 246-247 and fig. 4; Rizzi, 1969, fig. 24; Grelle Iusco, 1981 [20012], p. 29-31 and figs. 51 and 52; Pace, 1994, p. 279-281; La Scaletta, 1995, p. 105-106 and pl. VII; Rossi – Rovetta, 1995, p. 23; Marcato, 1996, p. 279; Heissenbüttel, 2000, p. 136; Falla Castelfranchi, 2006, p. 766-767 and fig. 6; Castelluccio, 2010, p. 33). As for the first, the recent and accurate mapping of the state of decay (*Elab. Mappatura del Degrado - R.7.04*) [see the contribution by Grano M.G.], in addition to the lacunae especially in the right side, has highlighted limited areas with alteration of color (in the left figure) and localized traces of whitewashing; however, despite the widespread surface deposit layer, the overall state of conservation can be considered satisfactory.

The iconographical reading of the artwork is not compromised at all; it shows a monumental *Enthroned Virgin with Child* of the *Kyriotissa* type in the middle, flanked by two angels, both with thurible and crucified globe in their hands, and depicted in an adoring attitude (Fig. 14). The perfectly axial position of the Mother-Son group dictated the rhythm of the composition that, despite the soft movements of the tunics drapery of the angels on the sides and certain formal details, is characterized by a stillness and a two-dimensional construction, time by time mitigated by solutions involving the extreme portions of the composition



Fig. 14 – Matera, Madonna delle Croci (or della Croce), decoration of the apse, Deesis (photo: Maurizio Lazzari)

(Heissenbüttel, 2000, p. 136). A red tunic and a blue *maphorion* (the second one quite faded) wrap the Virgin, whose face, marked by thick lines to define its physiognomic features, is framed by a halo with a dense sequence of pearls. Blessing Christ with a little roll in the left hand, stands out wearing an unusual white *chiton*, though His red-orange *himation* is more traditional; the halo is of the crucified type. Much more elaborate is the throne, characterized by a good decorative taste in the backrest with rhombuses and triangles white motifs, in the pillow with beaded red gems, and in the suppedaneum: all features related to a stylistic distinctive code of a painter that Grelle Iusco identifies with the conventional name of Maestro della Madonna della Croce (Grelle Iusco, 1981¹ [2001²], p. 29; Villani, 2000, p. 49); an indistinct figure of painter despite the scholar's efforts to build up his artistic path from Brindisi to Matera. There are also some exegetical inscriptions (Fig. 15): the usual monogram in Greek ΜΡ ΘΥ (Μητηρ Θεου, "Mother of God") and two *tituli* to identify two angels, Gabriel or Michael (Marcato, 1996, p. 279 and note 11) on the left (it is important to consider that from this side, no trace of the angel's name is still preserved, nor is Cappelli's proposal accompanied by a photo) and Raffaele on the right: A(n)GELUS GABPIEL e A(n)GELUS PAFAEL (Cappelli, 1957, p. 254; Marcato, 1996, p. 279 and nota 10). The iconographic typology of the *Virgin and Child between two Angels* (Zanichelli,



Fig. 15 - Matera, Madonna delle Croci (or della Croce), decoration of the apse, detail: Virgin Kyriotissa with Child and the Archangel Rafael (photo: Maurizio Lazzari)

2019, p. 163-165), with reference both to the Madonna delle Croci and to the Madonna delle Tre Porte, is sometimes improperly labeled in literature such as *Panagia Angheloktisos* (a non-codified iconography), alluding to the famous Byzantine mosaic of the Cypriot church of Panagia tis Angeloktistis in Kiti, in the district of Larnaca (6th century), which, however, in the fresco at delle Croci is contaminated by presence of the thurible (instead of the processional cross); this is an iconographic element that underlines the liturgical value of space. In the case of Matera and Puglia's cave-churches – which Marcato refers in order to make iconographic and chronological comparisons (Marcato, 1996) –, the iconography must be simply referred to an *Enthroned Madonna and Child* (of the type of *Kyriotissa*, with respect to the more common *Hodegitria*) *between adoring Angels*.

Instead, there is a convergence between scholars regarding dating of the artwork, including Valentino Pace, who was the first to promptly caught the Byzantine painting details of the late-Comnenian period (end of the 12th century): the fresco of the Madonna delle Croci's apse follows – especially in the two figures of angels – the dynamism and chromatism of that painting style that reached Italy from the East and that one can see in several examples dated between the last two decades of the 12th century and the first fourth of the next one: I quote, just to mention an example: the apse of the cave-church of Santa Maria di Poggiardo (LE), in addition to the oldest phase of the Madonna delle Tre Porte (Rizzi, 1972 [2007], p. 180; Rizzi, 1973 [2007], p. 210; Pace, 1994, p. 279; Marcato, 1996, p. 289; Castelluccio, 2010, p. 33). An intricate net of comparisons in which the *Kyriotissa* of Matera plays a key role, pictorial evidence to be dated to the first two decades of 1200, between the late-Comnenian Byzantine koine and the new trends of Medieval painting between Puglia and Basilicata.



San Biagio Vecchio/San Vito alla Murgia

The cave-church which is today known as San Vito is located a short distance from San Falcione (Cappelli, 1957, p. 268; La Scaletta, 1966, p. 242; Rotili, 1980, p. 80; La Scaletta, 1995, p. 99-100; Dell'Aquila – Messina, 1998, p. 194; *I luoghi di culto*, 2010, p. 69), although it is proven by an eighteenth-century source the original title to San Biagio (ASM 1714, Archivio di Stato di Matera, Protocolli originali dei Notai, Notaio Montemurro Oronzo of Matera, N. 39, coll. 278, c. 269r): nearby places not only physically, but also for the architectural typology. The significant collapse that has affected the front part of the excavated space (Fig. 16) does not prevent from reading clearly the iconography originating from the '*a ventaglio*' ('fan-shaped') plan (Fig. 17), that is a quadrangular hall in front, marked or not on the sides by more or less deep niches, which ends, passing through a double fornix (Fig. 18), in the area of the *bema* (sanctuary) (Dell'Aquila – Messina, 1998, p. 70, 104).

Compared to nearby San Falcione, the plan scheme of San Vito shows a scalar motion of the two apses (the one on the right is deeper due to the presence of a subsidiary square space), both of the '*a cameretta*' ('bedroom type') (Dell'Aquila – Messina, 1998, p. 70, 110).



Fig. 16 – Matera, San Biagio Vecchio/San Vito alla Murgia, view from outside (© Chiese rupestri; Photo: Vito Borneo)



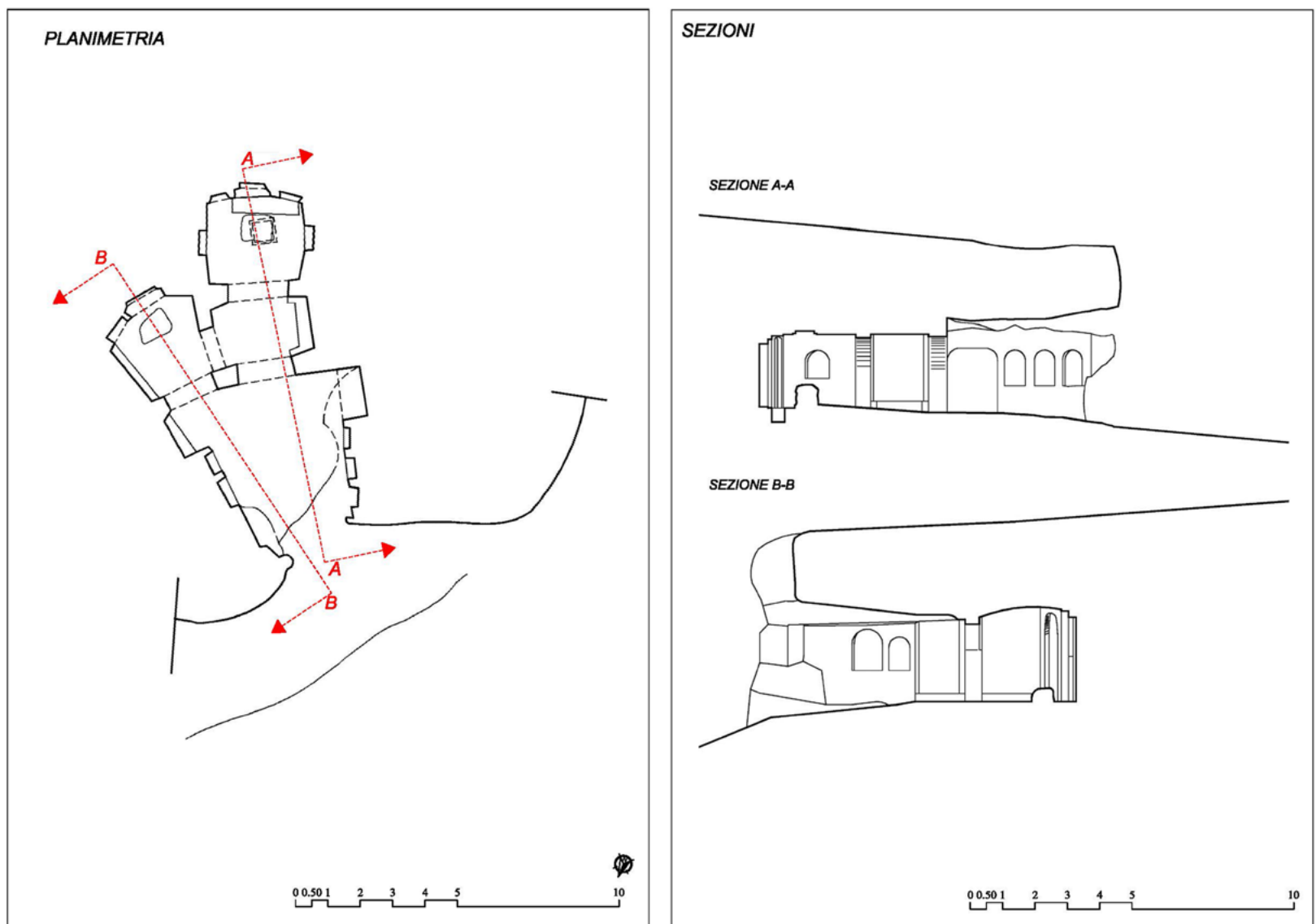


Fig. 17 - Matera, San Biagio Vecchio/San Vito alla Murgia, plan and sections (provided by Maurizio Lazzari)

In the two sanctuary spaces, the original excavated altars are preserved as well as the decoration of the inner walls where, instead of the usual semi-circular layout of the apses, there are shallow blind arches, with simple or double arching, such as, for example,



Fig. 18 - Matera, San Biagio Vecchio/San Vito alla Murgia, passing arcades between the hall and the bema ((© Chiese rupestri; photo: Vito Borneo)



in the central niche of the right apse (Fig. 19). The motif of the double apse is not new to the panorama of the excavated architecture in Basilicata, to be found also in the Cappuccino Vecchio (Rizzi, 1969, fig. 22), in San Nicola dell'Annunziata and others. The ceilings of the hall at the entrance are flat, and the two internal compartments are marked, once again, by the system of already mentioned 'fake domes', with just concentric rings (Dell'Aquila - Messina, 1998, p. 82). To a specific Matera tradition (or 'trade mark'), it is possible to lead back also the simple sculptural decoration of the frame in the junction with the ceiling, made of a double 'sawtooth' motif (Fig. 19), «trade mark motif of Matera workshops» (Dell'Aquila - Messina, 1998, p. 192). Based on the architectural typology, the church is dated to the 10th-11th century (Rotili, 1980, p. 80; Dell'Aquila - Messina, 1998, p. 194). Some fresco fragments that are still visible both at the right fornix of the passing arches, and in the three niches of the right apse, confirm that the church was decorated in the past. Near the arch there are traces of a red frame, a decoration of small rhombuses with red and yellow gems at the bottom and, perhaps, the shadow of a free-standing figure; each of the three niches houses one standing figure: from left to right, a holy monk; a bishop

Fig. 19 - Matera, San Biagio Vecchio/ San Vito alla Murgia, apse wall on the right, (© Chiese rupestri; photo: Vito Borneo)



in Latin clothes, with a white beard and a trace of an S, the only epigraphic testimony; and a military saint, the latter – according to what could have been glimpsed decades ago – with the date 1651 (La Scaletta, 1966, p. 242; La Scaletta, 1995, p. 100). It is difficult to say whether there are fragments from medieval times. Interesting is the late title to the Sicilian martyr (Amore, 1969), whose *bios* (life account) links him to Basilicata region. The images of the saint are quite common in the Medieval wall painting, for example, the depiction in the cave-church of Santa Margherita in Melfi (Silvestro, 2002, p. 37); and the less-mentioned one preserved in Santa Maria della Valle; and most-known in the Madonna degli Angeli and in Santa Lucia alle Malve (Grelle Iusco, 1981¹[2001²], fig. 417).



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2.2 Cards of the rupestrian churches of San Falcione, Sant'Agnese and San Pietro in Principibus

by Marina Falla Castelfranchi

The rupestrian church of San Falcione

The rupestrian church is located in one of the *lame* of the Murgia Timone. The church, currently under restoration, shows a plan with two naves ending in as many differently shaped apses (Figs.1-3) - a typology widely diffused in the Mediterranean, as well as sub-dial churches and a large quadrangular hall, covered by a flat ceiling, where a niche opens on the right wall with a sort of altar, which is certainly not an ambo, as we sometimes read: a central pillar rises in front of the narrow *bema*, the presbytery of Byzantine churches. After all, the remains of the frescoes refer, mainly by iconographic choice, to the pictorial tradition of Byzantine trend. There is a standing figure of a saint holding a book in his hand and another half-length

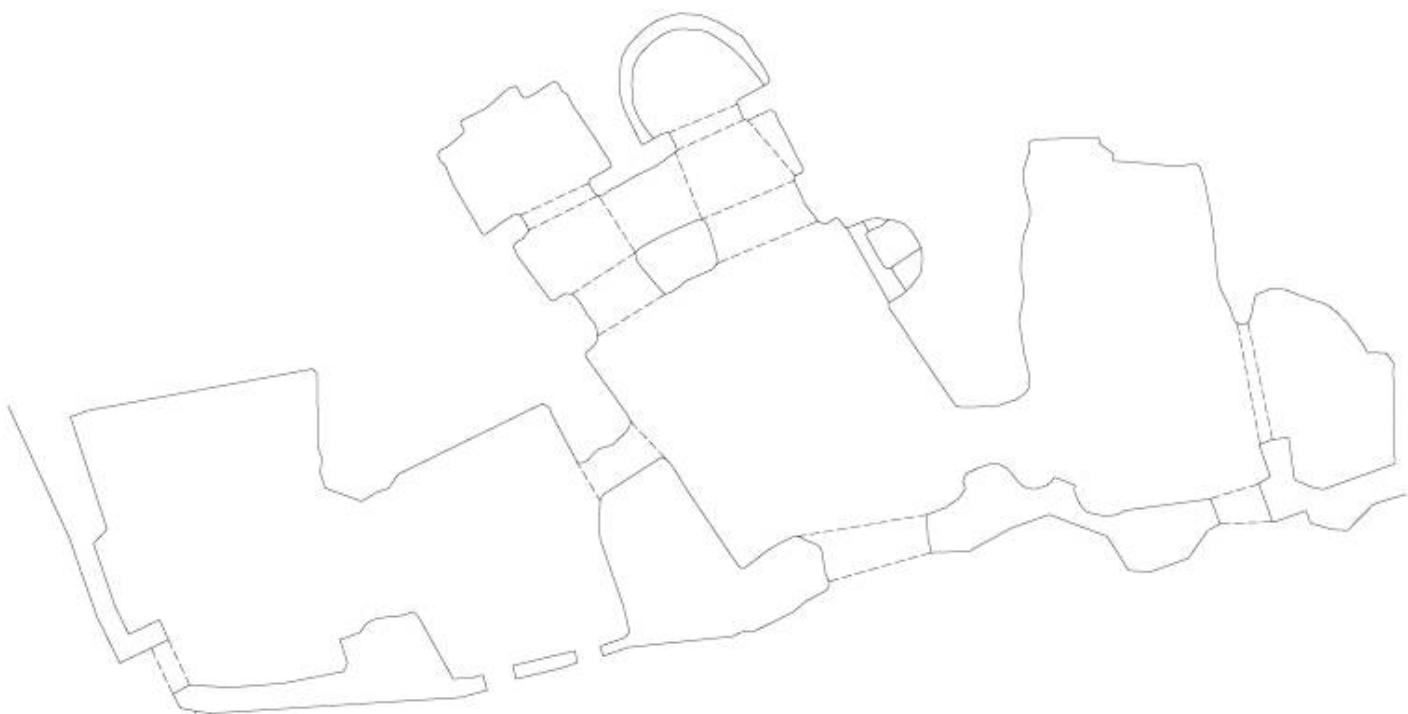


Fig.1 - Matera, rupestrian church of San Falcione, plan (survey from park project)



Fig. 2 - Matera, San Falcione, exterior



Fig. 3 - Matera, San Falcione, interior



Fig. 4 - Matera, San Falcione, interior, north wall, saint

figure (Fig.4).

Above, in the niche, there is the scene of the *Presentazione di Gesù al Tempio* (Fig.5), divided, as usual, into five characters: on the far right, there is the figure of the prophetess Anne holding a scroll whose text, taken from the Gospel of Luke (Lk.II, 23-38), is in Greek, a rare case in the rupestrian churches of Matera, another case is found in San Nicola dei Greci, in a

context where Latin prevails, with many figures of saints, above all from the West.



Fig. 5 - Matera, east apse, Presentazione of Jesus at the Temple

This scene fully respects the Byzantine model and it is part of the cycle of the *Dodici Feste*, the Dodekaorton, one of the most important Byzantine liturgical feasts. In the Eastern and Byzantine context, the feast is celebrated on 14 February and, from the late 9th century, its canonical iconography is attested. Its location in the apse or, more generally, in the area of the presbytery, seems to be peculiar to the Cappadocian

tradition and according to Catherine Jolivet Lèvy, it alludes to the Eucharistic offering. The *Presentazione di Gesù al Tempio* prefigures his Crucifixion and it should be read as a sacrificial scene, underlined by the offering of doves by Saint Joseph.

In the *Presentazione di Gesù al Tempio* in the rupestrian church, the so called church of Candlemas, in Massafra (13th century), I myself perceived this hidden essence of it, with only figures of the Virgin handing Jesus to the High Priest, on an altar that is actually a Roman altar (*ara romana*), in the same gesture that predicts the Crucifixion. In the other Presentation in Salento, in the church of San Mauro near Gallipoli (late 13th century), the composition is canonical, as in San Falcione, and it ends with the figure of the prophetess Anna who holds a scroll with the same text in Greek. In the painting, which is not very well preserved, the pictorial film of the lower part of the figures has partly fallen off, but the faces are legible and well characterised: the garments are without volume, crossed by thin vertical lines, and the pigments used appear to be organic. For especially stylistic reasons, they should be placed chronologically in the 14th century. The presence of tombs both inside and outside the basin would seem to be related to the funerary and private dimension of

many rupestrian churches, as indicated by the several cases in the Terrad'Otranto. A The other wall painting, not very well preserved, depicting St Nicholas (Fig.6) which is located on the external face of the central pillar, also refers to Byzantine style. The face of the saint is partially destroyed, but one can still see part of the figure in bishop's robes, with the stole marked with the cross crossed over the pallium.



Figura 6 - Matera, san Falcione, pilastro centrale, san Nicola

St Nicholas is highly venerated in the region, and in particular in the churches of Matera; he was a bishop of Myra, in Lycia (Asia Minor), who lived at the time



Fig. 7 - Matera, San Falcione, detail of figure 6.

of Constantine the Great (324-37) and took part in the Council of Nicaea in 325. In the panel under examination, the dense brushstrokes and the rendering of some details - for example the hand in the foreground (Fig.7) - would seem to indicate that at least one other painter was working in the modest painting site that decorated the crypt.

Recent archaeological investigations conducted by Francesca Sogliani

(University of Basilicata), for a French-Italian project that she was also leading it, financed by Galileo programme on the digitisation of the Matera's rupestrian churches and the transformations of the urban centre of Matera, they have brought to light a large number of ceramic finds: the study analyzed in particular the medieval and post medieval pottery of different shapes and mixtures.

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The rupestrian church of Sant'Agnese

The rupestrian church of Sant'Agnese and San Lupo/so called Asceterio di Sant'Agnese stand in Murgia Timone, a short distance from each other. The layout of the crypt of modest size with a flat cover, has a sort of vestibule covered by a small dome, which leads into the rectangular hall ending to a deep apsidal cavity, also rectangular, with an irregular design; a large niche opens in the northern wall of the basin, and several small niches shape the opposite walls. The function of the so-called asceterio is unclear. Usually, in fact, rupestrian settlements have a funerary function, as indicated by the rare images of monks and hermits in crypts.

There is only one wall painting in the apse. It is probably the image of Santa Agnese portrayed half-length within an arched frame; in the lower part of the panel there are traces of repainting: most likely to be dated within the 16th century. Particular attention should be paid to the dedication of the rupestrian church to a Roman martyred woman who was particularly venerated in the city. In this context, the dedication to Santa Agnese certainly appears obsolete. The choice should probably be to a local client who was particularly devoted to the Roman martyred woman.

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The rupestrian church of San Pietro in Principibus

In Matera, under the same title, there are two distinct rupestrian churches, San Pietro in Principibus and San Pietro de Principibus. The latter, of which few evidence has been preserved, is located in the Sasso Barisano, under the cathedral wall¹. The remains of the crypt of San Pietro in Principibus, on the other hand, are located in the Murgia Timone, at km 585 of the via Appia, towards Laterza². These precise indications coincide with the description of San Nicola church on the via Appia³, which cannot be visited today. This rupestrian church, which the front part has collapsed, has a Greek cross plan inscribed in a square with three apses ending which open two rooms with a rectangular plan, added in a later period⁴. This typology, widely attested in Basilicata and Apulia, and not only for the Basilicata and Apulia rupestrian churches, was tested at Bisanzio around the end of the 9th century⁵.

To the right of the church there is a rupestrian complex with small caves interconnected by steps and internal corridors, decorated with crosses and doves graffiti, which refer to ancient iconographies of early PaleoChristian tradition.

1 Chiese e asceteri rupestri di Matera, M. Padula, C. Motta and G. Lionetti, Roma 1995, n° 123 at p. 163.

2 Le chiese rupestri di Matera, R. de Ruggieri, Roma 1966, pp. 239-40.

3 Cfr. above, note 1.

4 Le chiese rupestri di Matera, cit. in footnote 2, plant a p. 98.

5 R. Ousterhout, Master Builders of Byzantium Princeton , pp. 89



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[TORNA ALL'INDICE](#)

1. Architecture and rupestrian civilization in the Human History Park

by Maria Giovanna Grano

The Murgia of Matera is a wide limestone plateau with deep erosive channel (the typical *lame*), which represents the western end of the Apulian sub-region and it is considered a unicum landscaped thanks to its admirably uncontaminated profile.

This territory, which has preserved its mainly wild natural configuration, with bare rocks and steep ravines, it was however always inhabited and transformed by man, who since ancient times has been able to adapt it to his needs.

Inside the characteristic Sassi, located on the western side of the Gravina di Matera, form the most valuable example in the world of urban rupestrian; while the eastern side reveals, in a complementary way, the rural and spiritual environment character, lonely and silent compared to the density and grandeur that it faces.

Here, despite a rough and apparently inhospitable orography, there are several evidence attesting the anthropogenic presence: Paleolithic caves, Bronze Age necropolis, ancient agro-pastoral settlements, ingenious systems plumbing formed with channels for conveying the rainwater, wells, cisterns, and especially dozens of underground rooms and ancient rupestrian medieval churches.

The latter are evidence of the so-called negative architecture, a skilful constructive technique which, operating by subtraction, through the excavation of the rocky volume of the Murgia, allowed the creation of particular, suggestive interior living spaces.

An “introverted” way of building, which did not impact on the naturalistic value of the Murgia landscape but, indeed, it enriched that with history, art and hidden treasures that invite to discover, moving between terraces and steep paths, looking for original landscapes, hidden settlements, farms (*masserie*), *pecchiare*, *neviere*, cellars, cattle shelters, *jazzi* (a



typical sheepfold) and wonderful frescoed crypts. The huge architectural and landscape heritage we enjoy today it is the result of an ancient, dynamic and fruitful relationship between individuals and their environment, between the natural ecosystem shaped by time and the wisdom of man, able to settle there and respecting it, in order to meet their existential and housing needs.

1.1 Archetypo house

The delicate relationship established between nature and culture made the landscape of the Murgia of Matera one of the first, spontaneous and exemplary models of “landscape architecture”: an anthropized housing system but influenced by the environmental characteristics of the place and inspired by the continuous dialogue with it.

From prehistoric times, in fact, human presence has harmonized with the context, thanks to the particular morphology of the territory, the mild climate, the presence of water and the characteristics of shelter and defense. Although hypogeum structures can appear as “natural” elements characterizing the landscape, they are in fact artificial works, obtained by exploiting the temperate and homogeneous consistency of calcarenite, in order to model its conformation. In many cases it was the same rock, with its compactness, its own loops, its cuts of various thickness, to offer ideas and incentives for excavations, a prelude to construction of the first forms of rupestrian architecture, starting from the housing archetype of the cave.

As well as the water of the Gravina stream which, with an erosive action it scratched deeply the tuff forming the first caves, ancient man made use of the experience of the excavation and perfected it over time.

The rocks were excavated using a complex technique that started from an initial leveling of the front, to obtain a vertical wall to be hollowed out, and then continuing inwards, until making some habitable environments, variously configured, depending on



the different functions.

The first architects, of the negative architecture, understood that the realization of the hypogeum space was facilitated by the cliffs or vertical walls and through a progression of the excavation horizontally, they could gain advantage in the extraction of the material and in the speed of work.

The shape of the first hollowed cavities was like a bell, typical of the Neolithic cistern. The following typological phases demonstrate the evolution of the cavities in more advanced architectural modules, in which part of the leftover material was used to close the entrance of the cave, dabbing it, until the insertion of composite environments and overlapping layers, with similar elements to the above ground architectural tradition (vaults, pilasters, niches, etc.).

In some cases, especially in urban areas, the cave was enlarged with a single compartment, called “*lamione*”, extended towards the outside (Laureano, 2012). The resulting model does not only concern the housing size, but also social, symbolic and spiritual. Organization and development of this housing modus are guaranteed, in fact, by the delivery and transmission of traditions and techniques local, such as “water collection; soil protection; living in a cave; natural architecture; passive geothermal and the type of urban structure. Practices and useful solutions, nowadays, for the most advanced searches of Bio Architecture, sustainable city, green economy, rebirth and protection of the territory” (Laureano, 2018).

1.2 Continuity of living in cave

It is difficult to determine a specific chronology or life cycles, of abandonment and subsequent reuse of the rupestrian structures, however several sources and archaeological studies confirm that their use was almost continuous during the course of the centuries. A first re-presentation of the rupestrian settlements of prehistoric origin it occurred around the 5th-6th



century AD, in conjunction with the common passages of invading armies and with the dissolution of Roman urban centres; shepherds and herdsmen started using again the loops of the Murgia, transforming the tuff according to housing and the cattle shelter needs (Fonseca, 2006).

At the same time, the wild scenery of the Murgia also began to favor the primitive settlements of hermits and religious communities in search of a isolated environment, suited to the rigor of life and ascetic practice.

New population dynamics occurred after the eremitic phase, starting from the 7th century, with the development of village with an agricultural and pastoral vocation, characterized by an exchange economy.

A subsequent and consistent reuse of the hypogeum structures can traced back to the early Middle Ages (10th- 13th century), when the Lucanian territory, in that moment disputed by the Byzantines and Lombards - as a crossroads between the Adriatic and Ionian and Tirreno - became a natural point of exchange between the western and eastern civilizations.

The lack of documentary sources does not allow, until the mid- 12th century, to rebuild in detail the events of the new population within the articulated suburban territory of Matera, and the issue is still under the attention of scholars, archaeologists and historians.

However, it is possible to see that since the 13th century the house in the hypogeum sites, begun to assume a social differentiation, which was then strengthened until it becomes a sign of discrimination and, gradually, led to the emptying and to the degradation of the rupestrian crypts reduced only to pastoral shelters (Fonseca, 1987).

Finally, in the middle of the last century, the Sassi, defined as a “national shame” according to the rigid aesthetic, economic and cultural values system of modernity, were completely abandoned following a Special Law, n.619/1952, that displaced almost 20,000 inhabitants.



This abandonment, however, was only an ephemeral stage and not the epilogue of a millenary history which, in a few decades, saw the recognition of the Sassi and the Park of the rupestrian churches as places of culture on an international scale, a heritage to know, re-evaluate, live in and to attend.

1.3 Sacred rupestrian architecture

Within the panorama of hypogeum structure of the Murgia plateau, very important are those with a sacred vocation, built by religious communities that have taken turns here, by first adopting the settlement method autochthonous of excavation and, then, drawing inspiration from the different cultural and liturgical traditions they belong to: Greek Orthodox and Latin.

For the several and varied monastic settlements, dating back to the early Middle Ages, it is not easy to trace a precise and univocal dating, also due to the alternation and the coexistence of the two traditions, Latin and Byzantine, which favored the approximation and integration of typical elements of both of them, with mutual gradual contamination.

Before the Norman conquest of Southern Italy (between the 10th and 11th centuries) it is possible to find mainly typological signs of the Byzantine cult, and, from the 12th century, the Latin presence began to appear, whose influences are evident in the tendency to reproduce the forms of sacred architecture *sub divo*, and in the choice of figurative and typological elements, such as pilasters, vaults, crosses or false domes, with only a “mimetic” functional and not structural one, a circumstance that makes it more difficult to date accurately (Demetrio, 2009).

As for their function, the religious crypts sub-urban can be distinguished in real rupestrian churches, ascetics, *laure* and cenobies. It is appropriate to describe, at least in summary, the main identifying features.

Rupestrian churches usually have a single hall plan, or formed from aisles (sometimes excavated at a later date) marked by strong pillars. The main environments



that characterise them are the following:

- The narthex represents the access hall or porch from outside, formed by parabolic arch openings.
- The oratory is the hall intended for worship, marked from side docks and decorated with paintings, graffiti crosses, niches and hanging arches; inside it, a simple parallelepiped, often surmounted by a lenticular cavity enlivened by a fresco, is the ambo for the proclamation of the Word.
- The iconostasis in Greek-style structures has the function to divide the hall from the area reserved for celebrants only; it can be decorated with paintings too.
- The presbytery is the most sacred area, to officiate the liturgy; it ends with an apsidal space, often decorated with frescoes, which it contains the plinth of the altar (tusiastèrion) sometimes surmounted by the trace of a dome made in concentric circles. On both sides it can be equipped with two rooms for the liturgical service, called diàconicon and pròthesis. (Demetrius, ibidem).

The asceters were hermitages, that have the function of hosting the anchorites dedicated to contemplation and ascetic practices. They differ from rupestrian churches for the entrance narrow, the most difficult location to access, the floor plan often irregular and the interiors, bare or decorated only soberly. They are only provided with a deposit dug into the rock and a few niches for storing essential objects to daily life and worship.

Laure intended to encourage the alternation between solitary experience and community life, were formed from a set of several independent caves (one of these was intended for a single monk), neighboring to each other, related and grouped around to a church, which was the only point meeting of the religious community. The cenobies housed the religious communities, who lived by a common rule. These structures, more complex and articulated, often developed on pre-existing settlements, suitable for community life. They



had different rooms for prayer, lodging and communal dining, as well as a storage oven and a cistern.

Monuments of sacred rupestrian architecture, despite the great variety depending on their typology, destination and site-specific conditions (morphological and geological) they seem to be linked by polychrome painting cycles, made up of sacred images created in the medieval period with the fresco technique. The frescoes are the work of largely anonymous masters who enriched an architectural heritage already relevant, handing down the first testimonies of sacred art in southern Italy.

Chromatic brightness of rupestrian frescoes and their careful refinement, appear, inside the gloomy and severe environments of the caves, as a metaphor for human life: an invitation to look towards the spiritual dimension of existence, hidden and indispensable.

1.4 Park churches

Among the more than 150 urban and suburban churches in Matera, seven are included in the path of the new Park of rupestrian civilisation, listed below. They, all attributable to the period of the early Middle Ages, do not represent isolated architectural realities, but they are part of larger settlement complexes, including other hypogeum structures used, as appropriate, as a cattle shelter for animals, cisterns or for the production of wax and honey - that contextually integrate the sacred, social and community dimension:

1. Church of San Canio / San Falcione
2. Church of San Biagio Vecchio/San Vito alla murgia
3. Church of San Iupo/cd. asceterio di Sant'Agnese
4. Church of Sant'agnese
5. Church of Madonna delle tre porte
6. Church of San Nicola alla via appia
7. Church of Madonna della croce

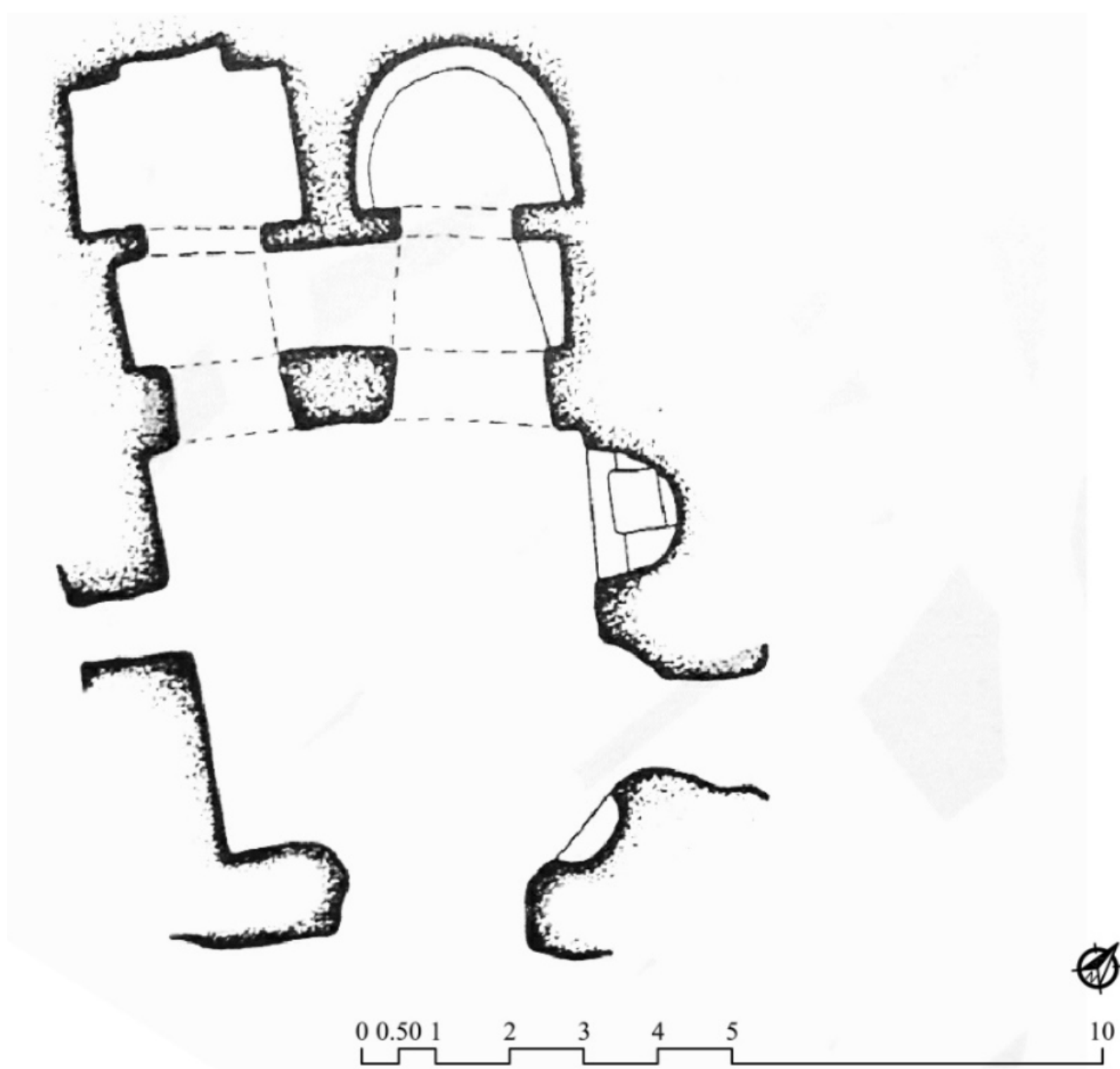


1.4.1. San Canio/San Falcione

Location: Contrada Murgia Timone, Matera (MT)

On the panoramic route that leads to the viewpoint of Murgia Timone it is possible to see, on the right, lying in a typical lama, one of the oldest rupestrian churches in Matera dating back to the 8th -9th century, attributable to the first Italian-Greek monastic communities settled in the area.

The structure, obtained from the calcarenitic rock, is characterized by a square-shaped liturgical hall, with frontal iconostasis formed by two rounded arches supported by a central pillar, of typically Byzantine origin. From the iconostasis it is possible access the internal crypt where there are two presbyters: the one on the right is circular and the one on the left is quadrangular, perhaps as evidence of the coexistence of both the Eastern cult and that Latin.



Plan of the Church of San Canio / San Falcione





Exterior Church of San Canio / San Falcione

The church dedicated to San Falcione (although in some notarial deeds appears with the name of San Canione) was probably the centre of popular devotion of the

Candlemas, the celebration of the Presentation in the Temple that is celebrated on 2nd February, as it can be deduced from the fresco placed in the lenticular cavity to the right of the hall which shows St. Joseph in the act of offering two doves, the Madonna, with her purple-red maphorion mantle holds Jesus, St. Simeon and the prophetess Anna bearing a cartouche with the inscription in Greek: “τοῦτο Βρέφος τόν ουρανόν και τήν (γῆν) εδημιουργήσε” (“this Child created the heaven and earth”).



Interno Chiesa di San Canio / San Falcione



Two other frescoes are also recognizable: one of a holy Bishop (perhaps the owner of the church) on the entrance pillar, and the other of St. Nicholas on the pillar which divides the two arches.

In the 17th century, the original ground level was lowered in order to obtain blocks of tuff for the construction of new walls and the perimeter wall protecting the site, to make a large rectangular sheep shelter and goats space, counts Gattini's estate.

Until recently, the whole complex was used as a sheepfold, equipped with feeders and drinkers, as the traditional passage to count the sheep, as a room for the processing of milk (with the fire) and the opening for the escape of the fire smoke.

Other traces of the original monastic life are all around: numerous sepulchers for the burial of monks, *pecchiare*, narrow and deep niches where the beehives were placed for the production of honey and especially wax to make candles that were blessed on Candlemas.

1.4.2. *San Biagio vecchio/San Vito alla Murgia*

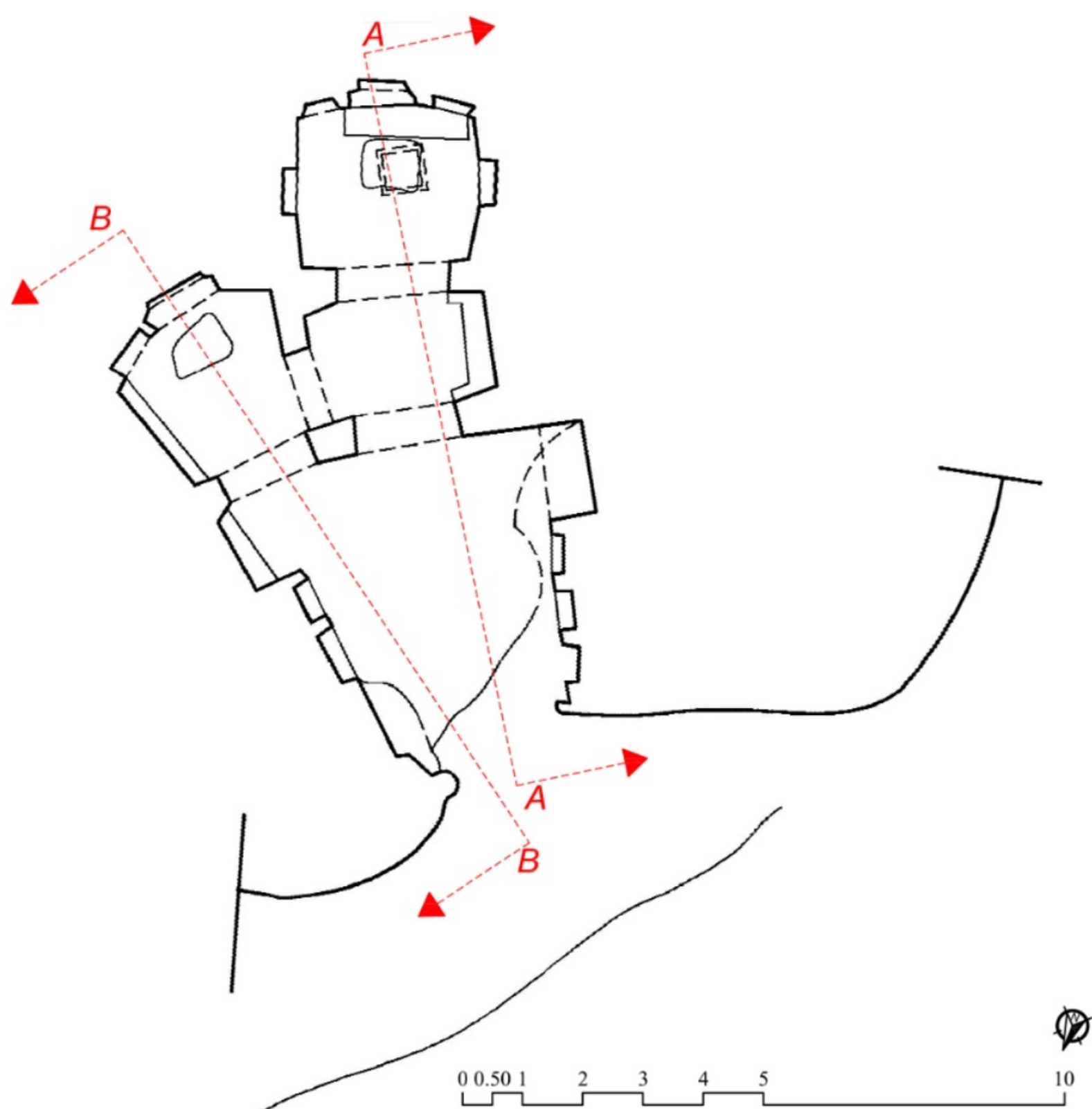
Location: Contrada Murgia Timone, Matera (MT)

PStarting from San Falcione complex and continuing in a northerly direction along the open panoramic path on the suggestive valley of the Female, there are some pastoral caves. So after a few dozen of meters it is possible to reach the rupestrian church of San Biagio vecchio (also known as San Vito alla Murgia) carved into the rock and overlooking a splendid view of the Gravina.

The church heavily damaged over time from vandalism and atmospheric phenomena, so much so that its architectural and artistic elements begin to fuse with the signs left by nature and time. Today of the original vestibule and liturgical hall, in largely collapsed, only the side walls remain with votive niches: three on the right and two on the left.



The structure was built with a single nave of irregular shape, with the classic Byzantine iconostasis formed by two round arches supported by a huge central pillar, which has traces of ancient frescoes.



Church plan of San Biagio vecchio / San Vito alla Murgia

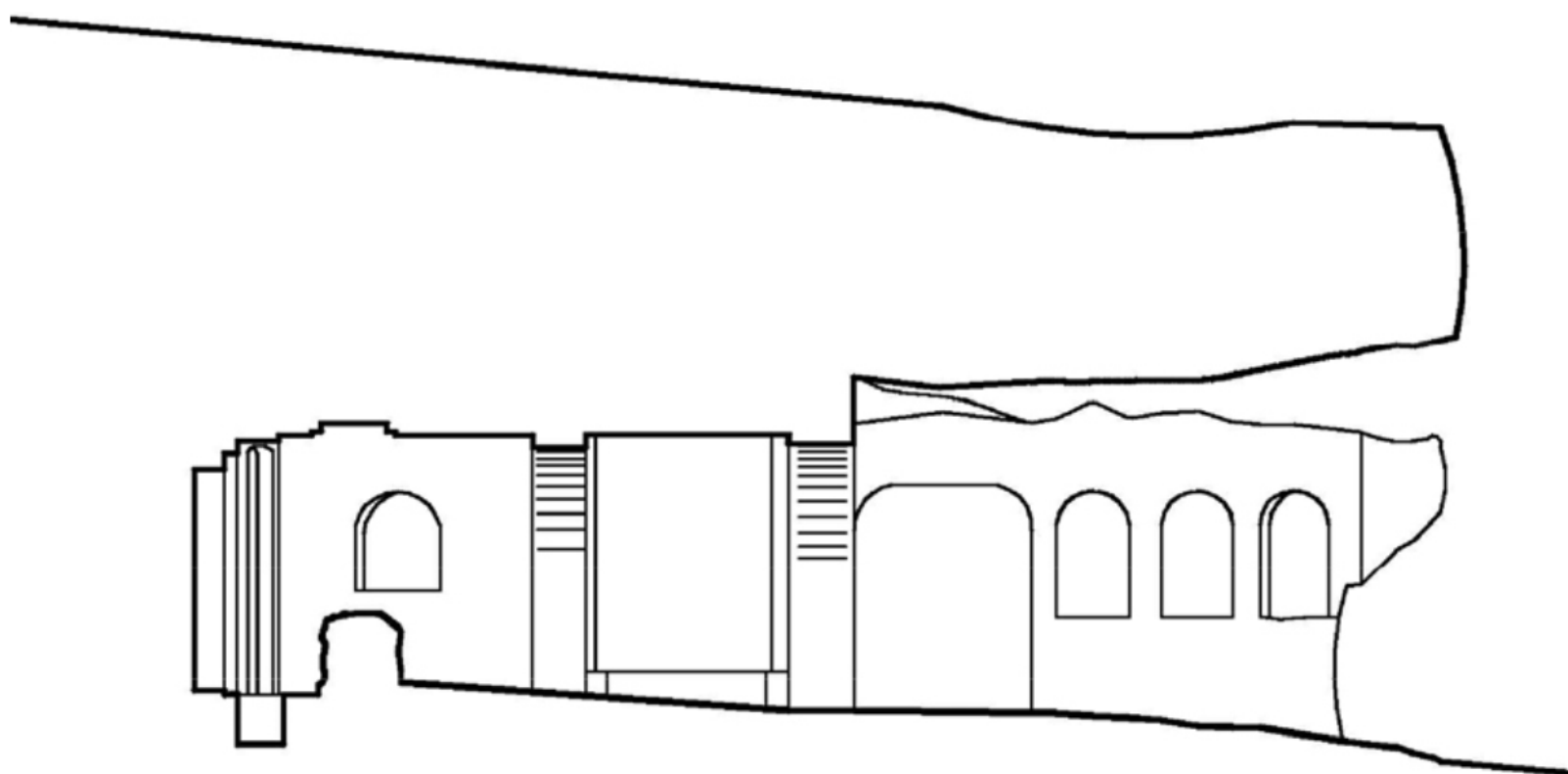
The hall leads to two distinct presbyteral areas of different depths.

The presbytery on the right is longer and more articulated, adorned at the top with the sculpted form of an armillary dome, with several concentric rings, and on the walls with a ledge decorated with teeth of saw. Behind the altar, detached from the wall, there is a sepulchral pit. The environment is enriched on the side walls by two niches excavated symmetrically, and on the bottom by three apsidal niches equipped with 16th century frescoes, today very hard to read, in which a saint monk, a holy Bishop and San Rocco



representations are recognized.

Also the left presbytery room, communicating with the first one has its own altar and apsidioles carved into the rock; it is at a lower level and appears slightly rotated in relation to the main axis of the church.



Section of the church of San Biagio vecchio / San Vito alla Murgia

This church is part of a bigger complex of several pastoral caves, used as shelter for animals and some wells that were used for water supply. Between these structures the ancient cistern is very important, so-called *Pietra cava* - located on the left of the crypt



Entrance to the Church of San Biagio vecchio / San Vito alla Murgia



and topped by a shelter dome carved into the rock - which was chosen in 1964 by Pier Paolo Pasolini for the representation of the tomb of Christ in the film “Il Vangelo secondo Matteo”, contributing to the first nationwide launch of rupestrian architecture of Matera.



Interior Church of San Biagio vecchio / San Vito alla Murgia

1.4.3. San Lupo/Cd.Asceterio S.Agnese

Location: Contrada Casalnuovo, Matera (MT)

Within a deep hall dug into the tuff of the Contrada Casalnuova there is the crypt of San Lupo, one of the rupestrian structures which all configuration is almost unchanged, this testify the hard hermit life conducted within these accommodation obtained in the rock.

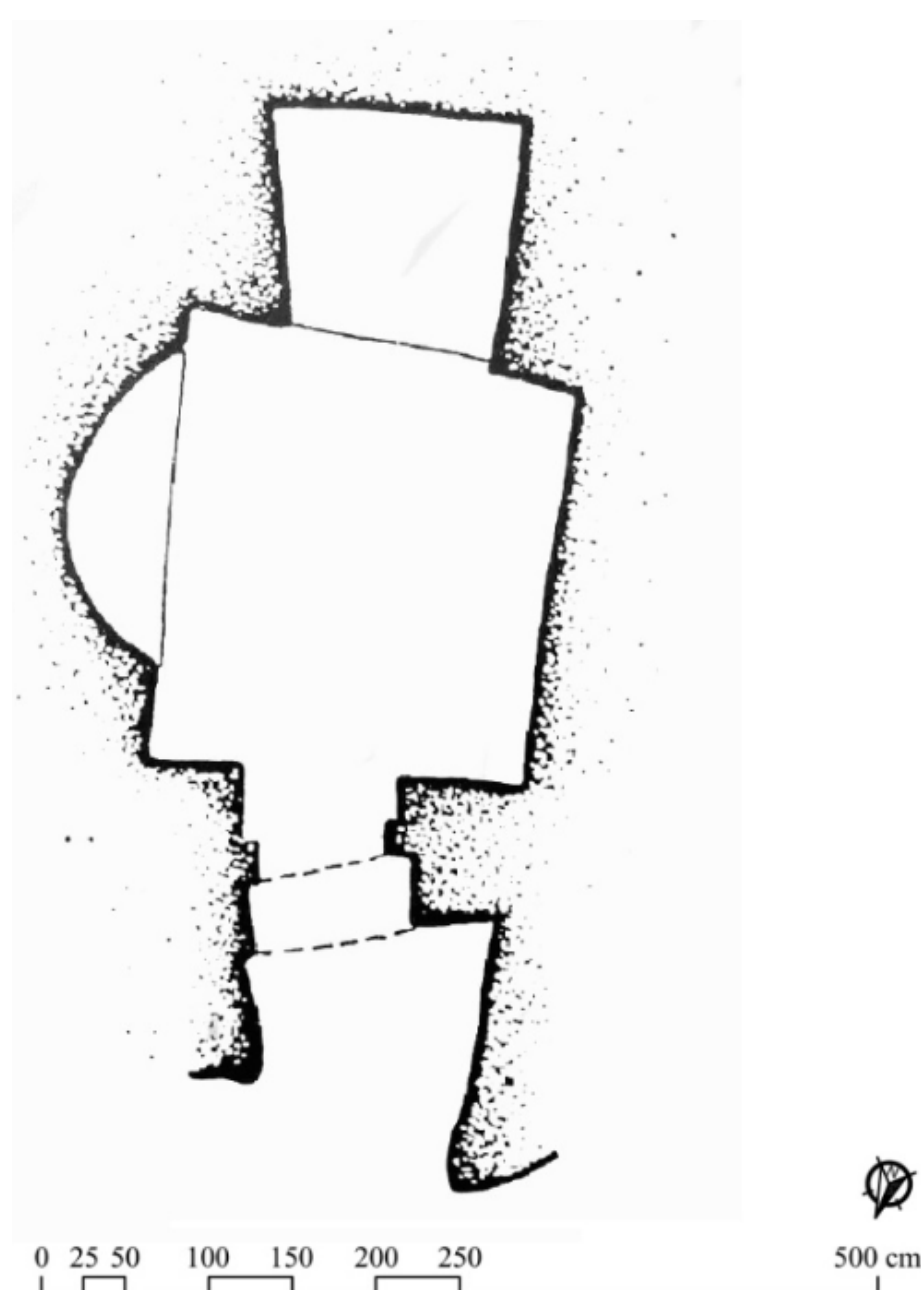
The structure is wrongly known as asceterio dedicated to Santa Agnese; however, its correct name is due to a floor plan of the area attached to the Stallone of 1543-1544 where they are marked from North to South “San Lupo, Santa Agnese, Santa Maria dell’Arco”, which allows to identify what in 1966 was called “asceterio di Santa Agnese”, such as the crypt dedicated to San Lupo bishop.

Through a parabolic arch entrance hidden in the rock, it is possible to access to a small square cell, marked along the entire perimeter by one dock.

The interior is characterized by essential elements, but some traces of wall painting show the original frescoes presence, no longer visible, due to the theft carried out by the German professor Rudolph Kubesch in 1962. In

particular, terminal niche had to be decorated with a fresco of modest size, now no longer recognizable, probably with the holy bishop Lupo depiction. A small rectangular compartment raised, obtained in the bottom niche, served as couch.

The crypt shows forms of decay today, especially in the lower part of the cell, caused by bioclimatic conditions



Plan of San Lupo / so-called Asceterio of Santa Agnese



Exterior of San Lupo / so-called Asceterio of Santa Agnese



of the hypogeum that do not allow the circulation of air, and also because of human intervention. Over the centuries, after its abandonment, the cave was in fact reused as a shelter for animals, and the smoke of the fire lit by the shepherds, who found shelter there, caused black concretions on the walls.



Exterior of San Lupo / so-called Asceterio of Santa Agnese

1.4.4. Sant'Agnese

Location: Contrada Casalnuovo, Matera (MT)

Along the trail from the crypt of San Lupo to the church of Madonna delle Tre Porte there is the rupestrian church of Santa Agnese. The structure, of the 10th century, is altogether legible although there were several uses and reworking in the cave, especially on the frescoes and decorations. Also it is evident the external collision of the entrance, with blocks of square stone and metal gate.

The chapel, entirely excavated on the edge of the ravine, is of modest size, it has a configuration as rectangular plan and there are two rooms - the hall and the presbytery - communicating through a round arch not perfectly aligned, with frame.

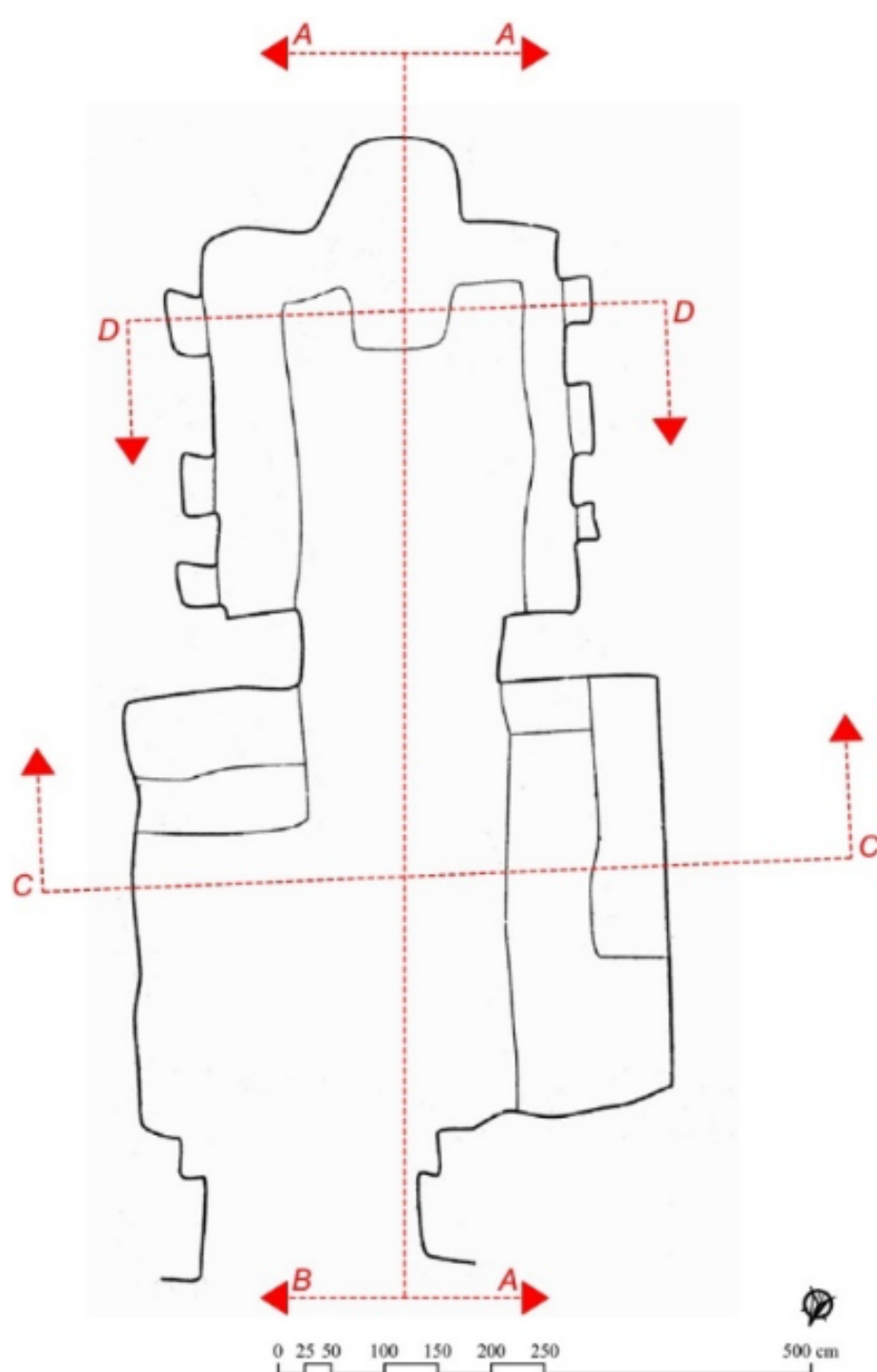
The hall is bordered by docks and big steps strongly

deteriorated and there are traces of frescoes not clearly distinguishable.

The presbytery is decorated with small and irregular niches raised on the side walls (three on the right and three on the left) to hold statues or other devotional objects, also it is decorated by the sytrone (seat for the clergy during the celebrations) and with a niche apsidal frescoed with the depiction of Santa Agnese, represented with the lamb and with a palm along the body, symbols of her martyrdom, not perfectly recognizable.

The altar, leaning against the back wall, is decorated on the front by a cross with trefoil terminations and the ceiling is softened at the altar by an *antepedium* with a carved and frescoed equilateral cross on the introdos, to indicate the sacred space of the celebration inside of the hall.

Outside it is possible to see several other caves used for the shelter of animals and a water system consisting of a cistern with channel and a basin carved out of the rock, used to carry and filter rainwater, taking advantage of the height difference of the pianoro superiore.



Plan of Santa Agnese

1.4.5. *Madonna delle Tre porte*

Location: Contrada Murgia Timone, Matera (MT)

It is one of the most precious hypogeum monuments for the particular architectural configuration and for the frescoes of considerable value, made between the 11th and 16th centuries. A large number of several shapes crosses engraved on the supporting columns, on the walls rocky and inside the niches suggests that the characterization of this site, also known in the past as the Grotta delle Croci, was a pastoral sanctuary attended by the faithful Eastern and Latin .

The plan has a pseudo-rectangular shape, originally divided into three naves: one on the outside, one in the middle and one more inside the cave, placed transversely to the entrance. Each of the naves is characterized by symmetrically opposed apsidal cavities at either end.

The collapse of the outermost load-bearing structures made the system of the “three doors” that gave the church its name, it is no longer recognizable and, in fact, erased the first of its three original naves.

The level ceiling is supported by thick parabolic arches and the interior space appears to be marked by four massive pillars, of which the two anterior ones failed due to erosion caused by exposure to weathering. The pillar to the right of the entrance front was completely destroyed, the pillar to the left, however, retains the top trace, and the ground connection is completely missing.

The central nave is enriched in the bottom apse by two admirable frescoes attributed to the Master of Miglionico and dating back to the second half of the 14th century: a Deesis (Byzantine iconographic theme) which depicts Christ enthroned with the Virgin and St. John kneeling on its sides and a depiction of the Madonna del melograno.

The innermost nave has a chapel with a niche (characterized by the engraving of a Latin cross) and a terminal apse, on the frame there is a depiction of the Crucifixion scene by 12th century, much remodeled.



Along the side wall there is a 14th century Annunciation and a visible Byzantine Kyriotissa (Virgin and Child enthroned) from the 12th century.

Due to the abandonment and neglect of the church, later used as a pastoral shelter, many of the frescoes were vandalised and parts of the painted film were detached; as documented in the press review of the years 1963-64 kept at the visitor centre of Jazzo Gattini, the manager of the removal of substantial parts of the frescoes was a German art history professor, Rudolf Kubesh, with two of his students.

The precious fragments stolen from the Kyriotissa and the Deesis were then recovered and restored using an original manual and digital reset technique; it was not possible to relocate them on site, they are kept in the Lanfranchi palace, and their splendor can also be appreciated through the copies exhibited at the Jazzo Gattini Visitor Center. Similarly to other religious rupestrian structures of the area, also near this church are found the remains of a *pecchiara*, or beehive, for the production of honey and wax.

1.4.6. *San Nicola alla via Appia/San Pietro in Principibus*

Location: Contrada Murgia Timone, Matera (MT)

The church, wrongly known as San Pietro in Principibus, was actually in ancient times called “*Avucchiarola*” with a church dedicated to glorious San Michele Arcangelo - it was therefore a productive structure linked to beekeeping and to production of wax and honey. In the 70s, this church received the new attribution of “San Nicola alla via Appia”, to avoid some confusion with another rupestrian church known as “San Pietro in Principibus”, which is at the Civita, near the Cathedral.

The complex, which is probably part of a *laura*, is located within the rupestrian agglomeration and agro-pastoral in the area known as Tre Ponti, where there are visible some settlement traces of a Neolithic village.



Little remains of the original 8th-9th century configuration, due to several collapses. As in the case of the Madonna delle Tre Porte, the front part of the church - the entrance and the liturgical hall - collapsed completely due to its exposure to the weathering. The current conformation of the site however suggests that the church was originally a square plan with three apsed aisles; however, it is still possible to appreciate the accuracy manufacture of its round arches sustained by four solid supports, which formed the ancient iconostasis, and the three well-finished apses at the bottom.

The wall of the left aisle is enlivened by two niches marked by elegant hanging arches, while in the three apsidal cavities there are some docks in choir function. After its abandonment, the cave was extensively remodelled for pastoral use: a manger and a ceiling drain were inserted into the interior, while the central nave apse were broken in order to obtain, more deeply, a new one rectangular room covered with a barrel vault, on the walls were engraved different popular graffiti figures that recall birds, quadrupeds and human figures.

1.4.7. Madonna della Croce

Location: Contrada Murgia Acito, Matera (MT)

The church of the Madonna della Croce is located in overhanging the Gravina stream, in an isolated area compared to the other hypogeum structures and it has a privileged view of the opposite valley.

The chapel carved into the rock has a plant rectangular, and it is lightened on the right and left by large blind arches; the single nave is divided in two rooms with a transverse arch and a balustrade in squared stone ashlar, a trace of the original iconostasis.

The entrance span is dominated by the majestic dome where it is carved an equilateral Greek cross, which gives the church its name.

The presbytery roof is instead vaulted with a ribbed



cruise and has two circular cavities decorated, and another small Greek cross in relief. Also on the internal perimeter walls, marked by large blind arches, numerous graffiti crosses are visible, probably of votive origin.

The environment, as a whole, shows an advanced state of decay and the lower part of the walls is affected by blackish encrustations and patinas due to the humidity and water infiltrations.

Instead, the fresco to the second half of the 12th century is well preserved and of excellent workmanship which embellishes the apsidal conch and portrays the Madonna (*Kyriotissa*) seated on the throne with the blessing Child, between two angels. It represents one of the best expressions of local art of Byzantine inspiration.

1.5. Worship places and rupestrian civilization

The undeniable driving function carried out in the Middle Ages by religious communities must be understood in a more complete interpretation of the dynamics settlement of these places, considering the widest social context in which they are inserted.

For too long, in fact, the rupestrian phenomenon was exclusively associated with the role of Basilian monasticism, neglecting the activity carried out by local population in the growth process of the territory and assimilation of new construction techniques that they affected the pre-existing rural agglomerations.

Only an overall re-reading of the area can contribute to the authentic interpretation of the multifaceted landscape of Matera, characterised by close integration between religious structures and local housing or production systems. The creation of the rupestrian civilization Park, which expressly proposes to extend its interest not only to the religious aspect of rupestrian churches but also to the settlement and social one, therefore represents an opportunity to give back new light to a variegated, complex and layered world of the Murgia. As archive documents attest, dating



back to the 11th and 12th centuries, the cave in Matera was used and recognized not only for its own cultural function, but also for the daily one of “functional asset integrated in the context, intended for both residential and industrial use, as a food storage and stable “(Dalena, 1990).

There is no lack of sources providing information on this , which also indicate the precise name of the environments obtained from the rock: “the *palmentum*, for pressing grapes and mashing; the *cellarium*, for the conservation of wine; the *fovea*, for the storage of cereals; the *furnum* for bread making; the *trappetum* for the milling of olives; and the animal stable” (Colonna; Fiore, 2014).

Moreover, the context of the churches analysed confirms that the location of the places of worship was not isolated, as if they were single architectural episodes, but was instead inserted inside a rich and fruitful system of relationships.

In all cases analysed for the purposes of this summary, the micro-settlement and productive structures located near the rupestrian churches attest to the important link between the local population, dedicated to activities agro-pastoral, and the communities of monastic life.

In addition, a study of the territory clearly reveals a dense network of paths, trails and sheep tracks, which shows that the Murgia has always been a homogeneous area with well-integrated links in the territorial context, “in a stratification of interventions based on the harmonious management of space” (Laureano, 2012). Its terraces, streets and water channels form a still identifiable matrix on which the rocky fabric developed, accompanying the birth of the rural settlement and its civil and cheap development. The so-called rupestrian civilization was ultimately founded thanks to the correlation between different elements, all necessary for human life: the basic need for shelter, the need for sustenance, the yearning for transcendental values, and through a progressive evolution of skills technologies, with the transmission



of knowledge and experiences.

1.6 Conclusions

In the case of Matera and its surroundings, the fruitful exchange between civil, cultural and spiritual values, it gave rise to a highly original way of thinking about space and life, helping to build a unique territory in the world. Even today all elements that make up the city - architecture, infrastructures, nature and traditions - form an iconic landscape, of great historical-naturalistic value and great identity value.

Human History Park and rupestrian civilization, in addition to the preservation and enhancement of the rupestrian habitat, also poses the challenge of a dynamic conservation of indigenous anthropological values, with a popular and original character, layered over time, which has characterized the image of the city with particular reference to rural settlements.

Starting from the protection and knowledge of all elements of the city's settlement history, none excluded, and in an organic vision of events that have influenced its development, it will be possible to locate the "real" of the Park of the rupestrian churches, already identified, with the Sassi, as precious and inexhaustible heritage of humanity. The crypts analyzed, with many and several examples of sacred rupestrian architecture in the Murgia, do not represent exclusively elements of excellence in a substantially anonymous and residual context, but emerge as voices of quality, within a rich and complex territorial polyphony.



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2. Structural diagnostics and direct and indirect geognostic investigations

by Maurizio Lazzari

The project for the enhancement and safely tourist fruition of Murgia Timone could not ignore the prevision and realisation of restoration and consolidation of those rupestrian or archaeological contexts more vulnerable than the geostructural conditions along the visit route of the Human History Park.

In correspondence with the 7 rupestrian churches, several cognitive diagnostic investigation were carried out in order to define possible areas of structural weakness, seismic classification, rainwater infiltration and concentration of wetlands, of greater physical-chemical degradation of the frescoes and mortars, and to define the mineralogical and petrographic, microstratigraphic and chemical composition of the natural and artificial stone materials making up the artefact and degradation products, as well as the identification of stratigraphy, with particular attention to the type of mortars and pigments used in the paintings belonging to the various rupestrian churches.

With regard to the cognitive investigations of the general geostructural contexts and of the individual contexts, which can be summarised in the following activities:

1. Structural analyses of the rock mass and of the individual hypogeum contexts to valorise (7 rupestrian churches)
2. Analysis of the geomorphological contexts (slope processes along the fruition route)
3. Non-destructive geophysucal analyses.



2.1 Geostructural analysis of calcarenites

The geostructural analysis carried out in correspondence with the rupestrian churches on the orographic left of the Torrente Gravina highlighted a recent fragile deformation defined by two series of subvertical joints in the Gravina calcarenite well defined and corresponding to N 30°-50° and N 110°-120° (Fig. 1).



Fig. 1- Belvedere area measuring station, fractures trend in Gravina calcarenite highlighted by the rose diagram.

In order to highlight the relationships between the stratigraphic and structural order of the study site, a line drawing was carried out (Fig. 2) of the whole front crossed by the tourist route (in dashed yellow), where the following elements were highlighted:

- landslide detachment zones (red line with dentation);
- landslide calcarenite blocks (in red)
- main cavities and rupestrian caves (purple arches)
- main fractures transversal to the stratification trend (continuous red lines)
- calcarenites and Altamura limestones stratification trends (continuous black lines).

The field survey highlighted some critical conditions related to the stability of the rocky masses, which at some points along the route (Fig. 2) are affected by collapses and fractures (Fig. 3), which could determine future sliding planes of calcarenite blocks.

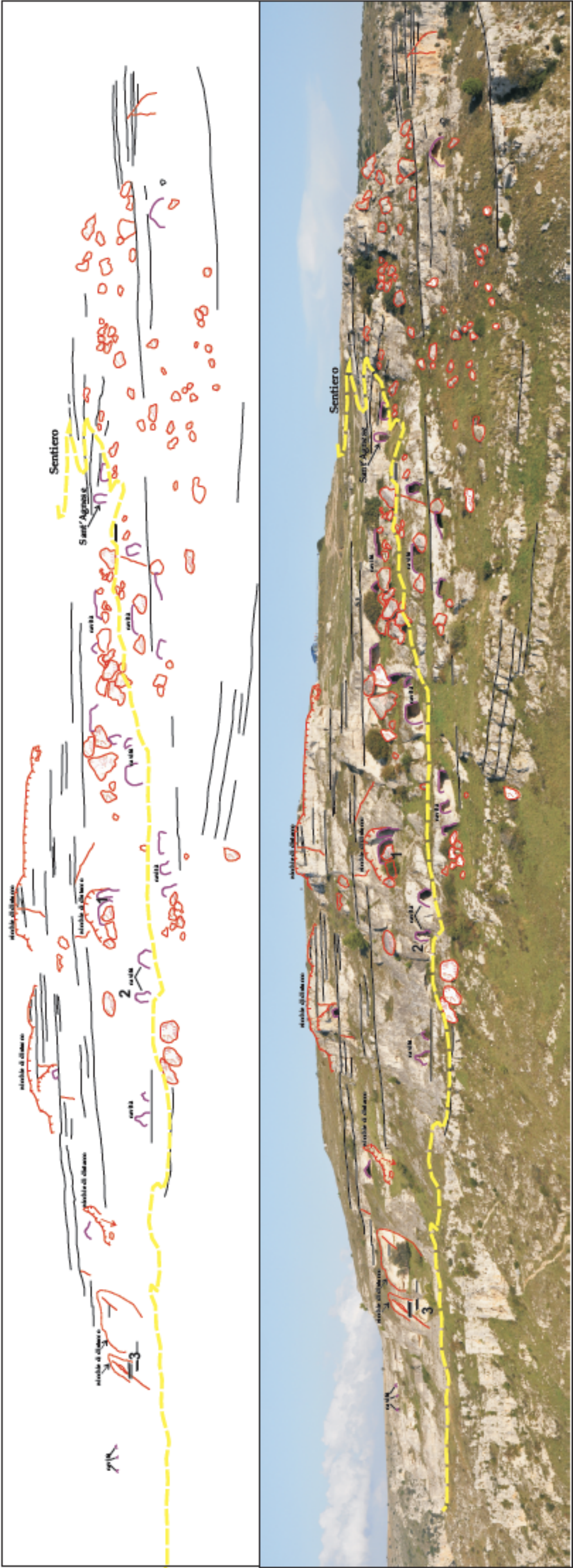


Fig. 2 - Representation of the main stratigraphic and structural elements intercepted by the path of use (yellow dashed line)



2.2 Structural weakness conditions of rupestrian churches

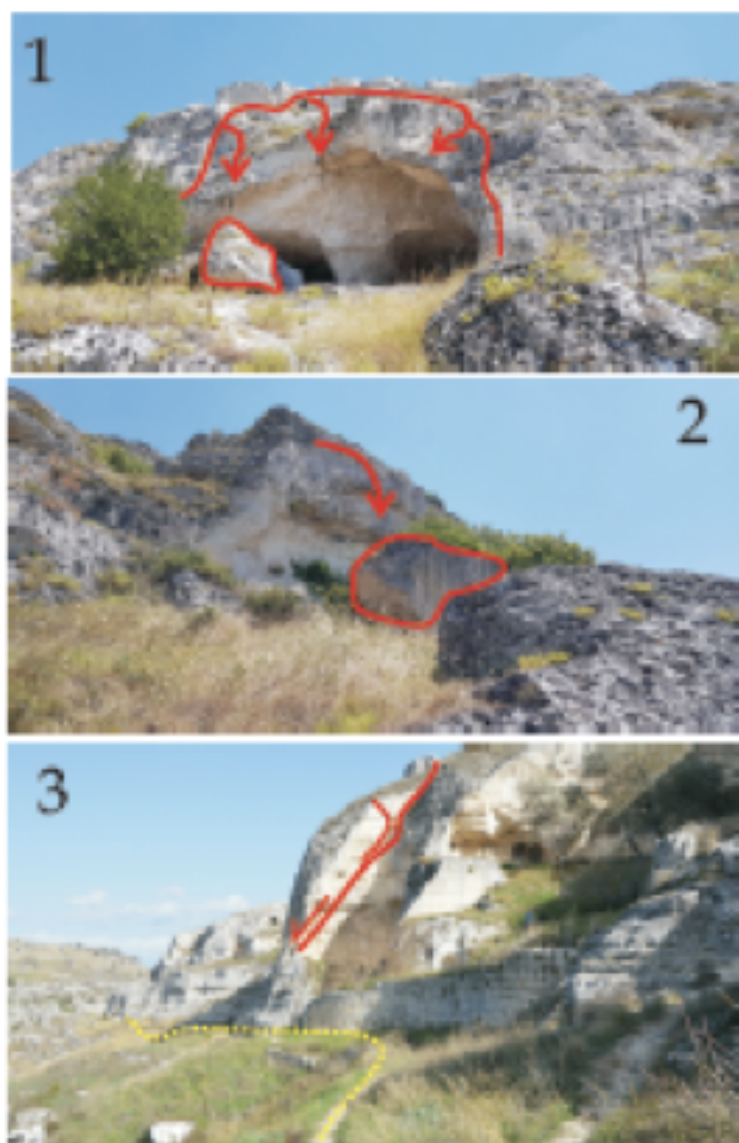


Fig. 3 - The photos show three specific cases, refereed to figure 2, where the collapse and detachments phenomena preceding the consolidation interventions are evident.

In order to detail the single structural conditions for each rupestrian churches, surveys of the state of fracturing and degradation carried out both along the entrance and inside the caves themselves, as briefly described below.

2.2.1 Church of Madonna delle Tre Porte

The rupestrian church of Madonna delle Tre Porte is the first stop on a visit to the rupestrian caves near the Belvedere (Fig. 4).

It was excavated inside the Gravina Calcarenites (GRA),

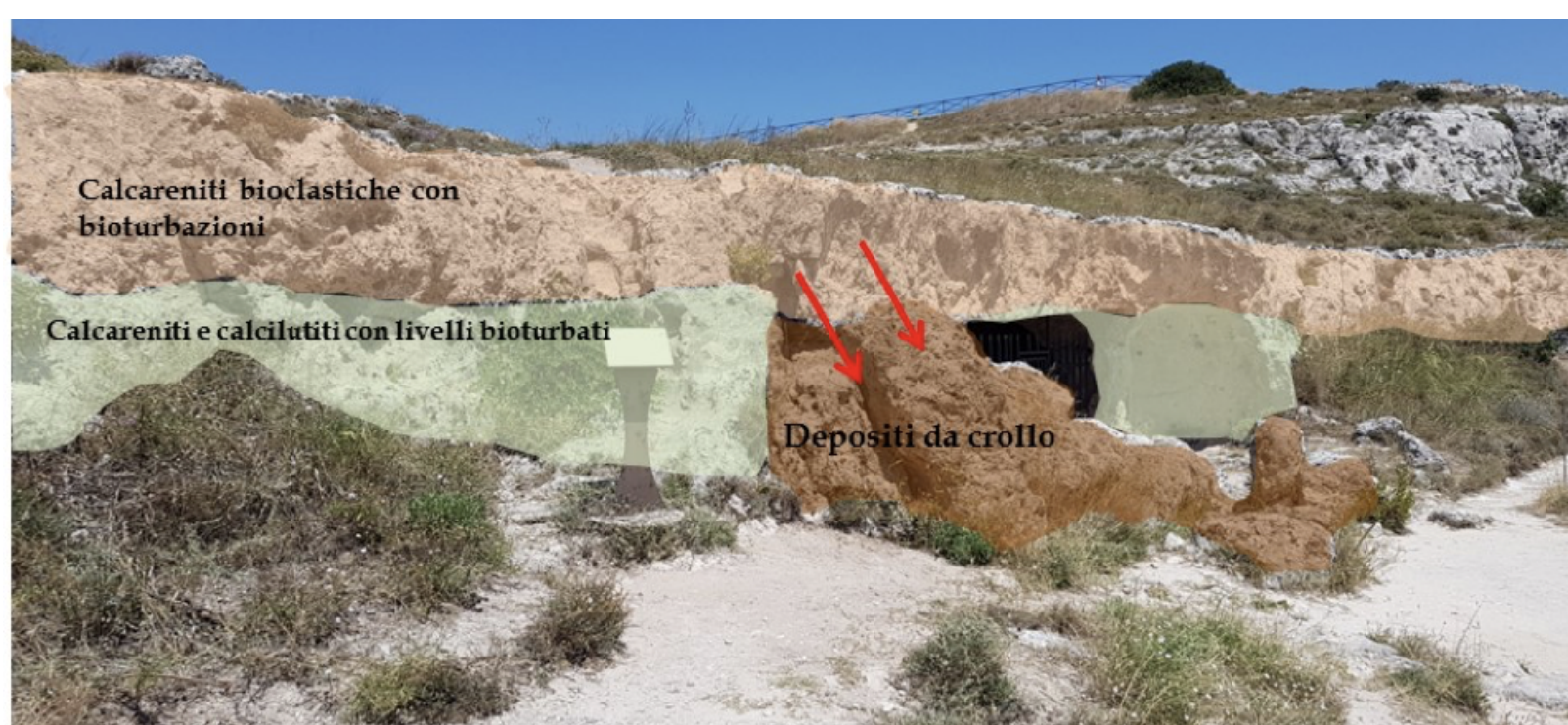


Fig. 4 - Entrance to the rupestrian Church of Tre Porte with evidence of the two calcarenitic lithofacies and past collpases that have affected some vaults of the church in its outermost portion.

at an interface of two distinct lithofacies, the upper is more compact and cemented, made up mainly of highly cemented and bioturbated fossiliferous bioclastic calcarenites (high energy environment), while the lower one is made up of calcarenitic deposits and fine calcilutiti that are more easily eroded (low-energy depositional energy environment), especially in correspondence with bioturbated levels at the base of the inner pillars.

The fractures mainly affect the area of the entrances to the church and inner parts located in correspondence of the more compact and rigid lithofacies, where there are families of fractures with direction N° 60-70 subparallel to the entrance. These fractures, in some points intersect each other (Fig. 5 and 6), determining



Fig. 5 - External fractures with definition of rocky polyhedra susceptible to collapse.

the formation of calcarenitic polyhedra that tend to be ejected by effects of geomechanical deterioration (friction angle tending to zero) and chemical alteration of the

calcarenites, produced by the action of water and the root systems of spontaneous vegetation.



Fig. 6 - Another example of external fractures with the definition of rocky polyhedra susceptible to collapse

Inside the Church of Madonna delle Tre Porte there are no significant fractures, except in the case of a pillar, that shows a top fracture due to extensional detachment, caused by erosion at the bottom of the pillar, due to morphoselective erosion of the different calcarenitic facies. As it can be seen from the photo, the bioturbated calcarenite facies and underlying portion have been affected by different erosion rates

(it is possible to see them by the dashed red lines) that have given an irregular and thinned profile at the bottom of the pillar (Fig. 7).

2.2.2 Church of San Biagio Vecchio / San Vito alla Murgia

The rupestrian church of San Vito was excavated within the Gravina Calcarenites (GRA) in correspondence of an interface of two distinct lithofacies (Fig. 8), the upper compact and



Fig. 7 - Example of erosion at bottom of the pillar (bioturbed area) in the rupestrian church of Tre Porte

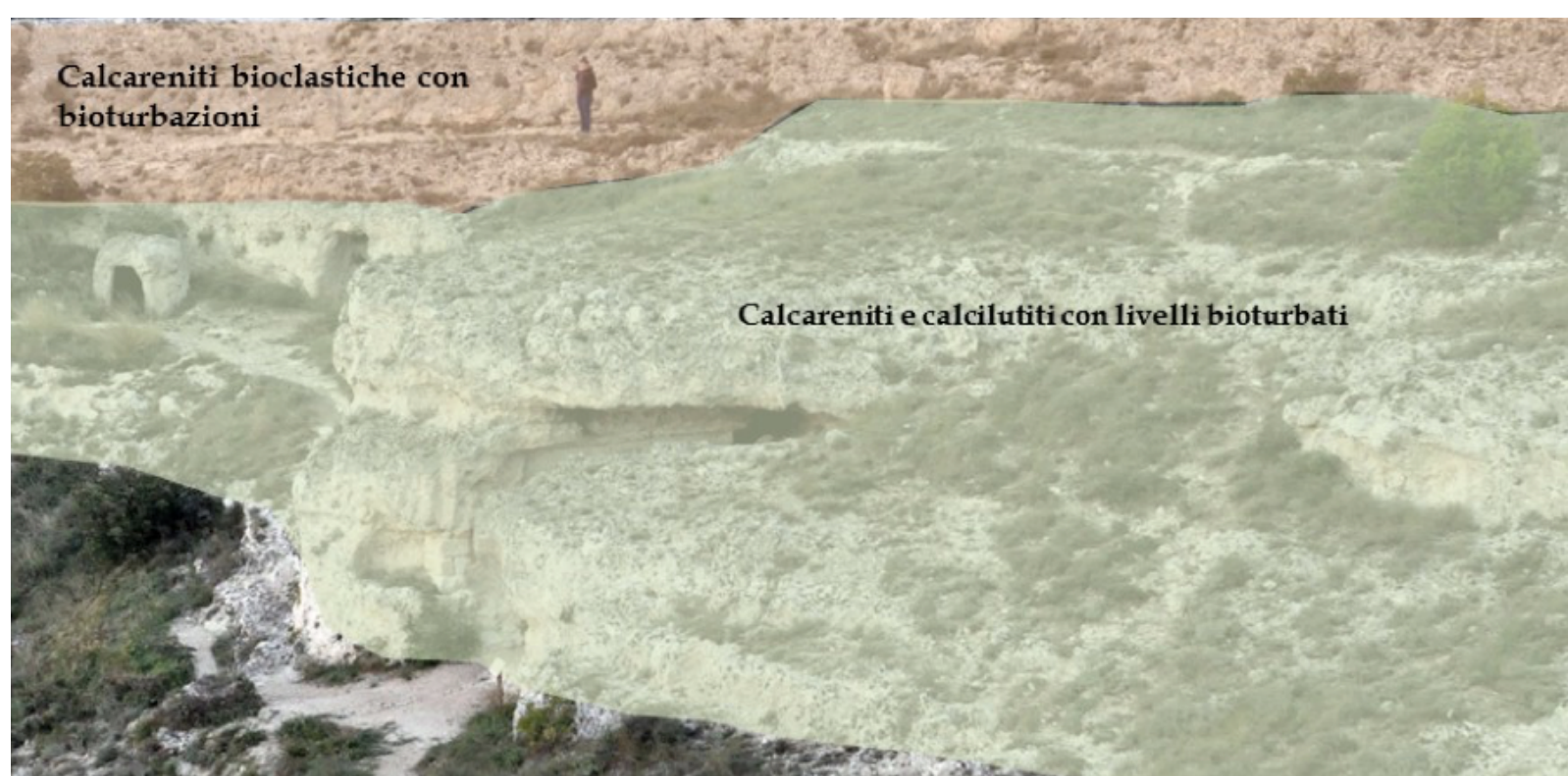


Fig. 8 - Entrance to the church of San Biagio Vecchio/ San Vito alla Murgia with evidence of the two calcarenitic lithofacies

cemented, consisting mainly of bioclastic fossiliferous bioclastic calcarenites, very cemented and bioturbated (high energy environment), the lower one consists of calcarenitic and fine calciluti, more easily eroded calcarenitic and calcilutitic deposits erodible (low energy depositional environment). The rupestrian church of San Vito, excavated in the Gravina calcarenite, does not present any fractures, except in the entrance area, where a desquamation phenomenon is evident (red dashed area) due to the detachment of planar septa (Fig. 9). This phenomenon is also found in the internal vaults (Fig. 10). As in other cases, the entrance pillar and other



Fig. 9 - External fracturing and desquamation (entrance). On the right the plan of the rupestrian church.

internal pillars are affected by erosion at the bottom in correspondence with fine, bioturbated facies (Fig. 10).



Fig. 10 - Desquamation of the vaults and erosion at the bottom of the pillars, also caused by the subsequent reuse of these environments as a shelter for animals which, moving, could produce lateral friction along the walls and the lower parts of the pillars.

2.2.3 Church of San Pietro in Principus or San Nicola sulla Via Appia

The church of San Pietro in Principus is carved in the calcarenites of Gravina along the layer interface that which distinguishes the two facies previously described. The entrance, in the area above the arches, but in general along the whole slope, is affected by collapses with consequent retreat of the external face (Fig. 11 and 12),

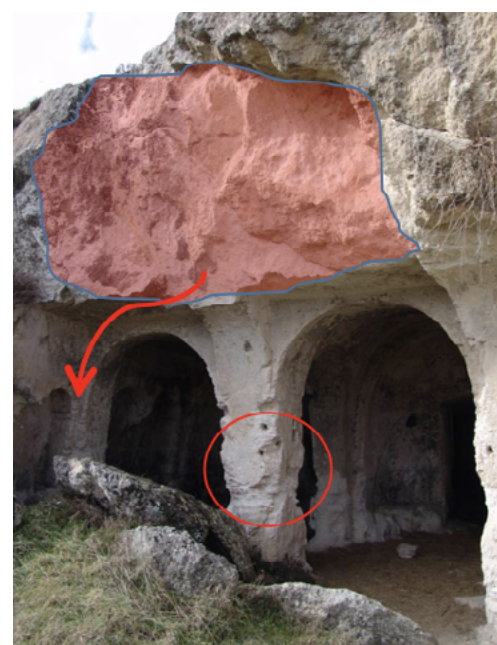


Fig. 11 - Entrance to the rupestrian church of San Pietro in P. with evidence of the collapses and erosions at the bottom of the pillars.

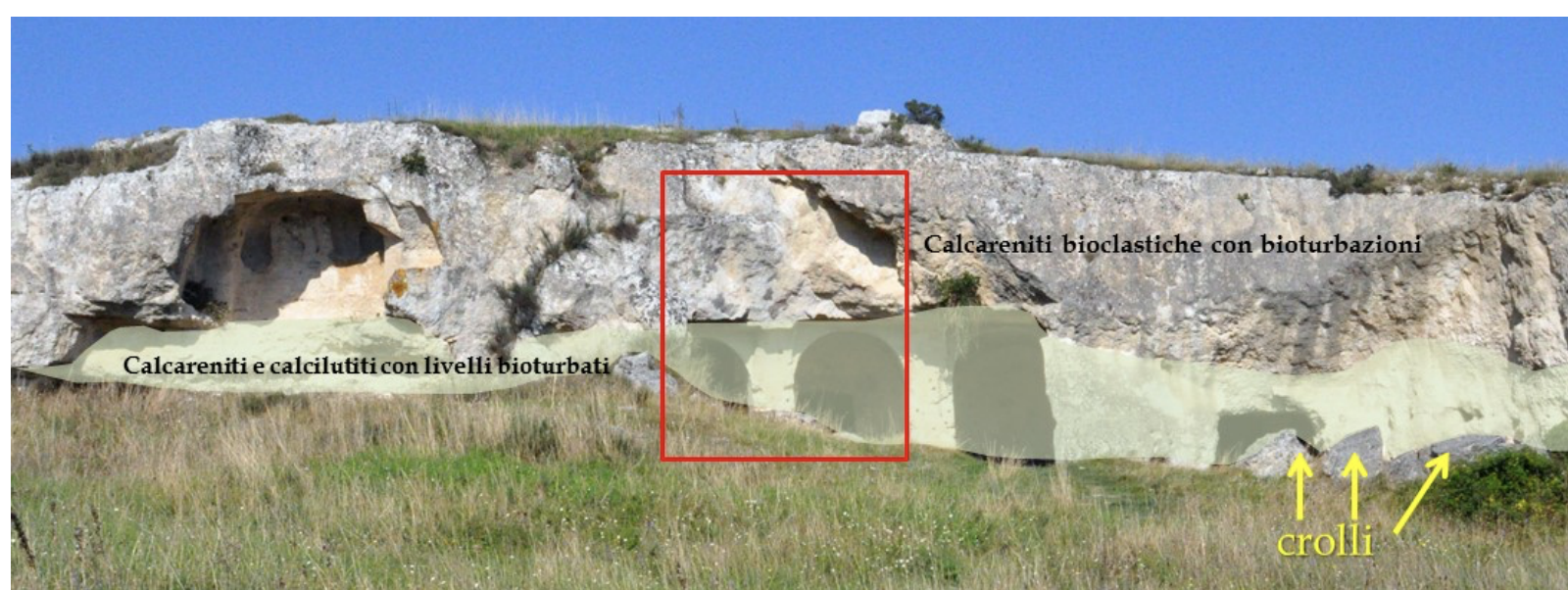


Fig. 12 - Entrance to the rupestrian church of San Pietro in P. with evidence of the collapses and the two calcarenitic litofacies. The red box indicates the detail shown in fig. 11.

while the internal pillars are subject to alveolization and mechanical (eolic) and chemical (by the action of rainwater and infiltration from above) erosion, in correspondence with the finer lithotypes (calcilutites). The Church of San Pietro has a widespread fracturing framework of calcarenites, affecting both the entrance of the hypogeum and the internal rooms. In particular there are areas of extension stress with fractures arranged in an *en echelon* pattern (Fig. 13, bottom right), that means with non-coaxial stress, with a tendency to produce vault displacement and possible collapses of parts of them. The directions of these fractures are consistent with the preferential directions found in the Belvedere sector. As for the other rupestrian churches analysed, the pillars are characterised by an erosive phase in the finer pelitic facies located between the bottom and the middle of the structures (see black arrows). The entrance to the hypogeum, it is possible to see the intersections between layer surfaces and fracturing (Fig. 13).



Fig. 13 - Evidence of the state of internal fracturing and of San Pietro in Principus church pillars erosion.



The entrance to the rupestrian church of San Pietro is characterised by a curved fractures system (red lines), which can also be seen inside the hypogeum (Fig. 14 and 15). The fractures, reaching a minimum level of adherence between the two portions of the layer and intersecting each other, tend to translate downwards, giving rise to collapses and overturns, such as the one of the block at the entrance to the hypogeum (Fig. 11 and 14, dashed yellow polygon). In Fig. 16, curved fractures are evident, such as maximum curvature of the vault, which are continuous from the upper part of the vault to the outside. The extensional tensional system has been carefully considered for the final consolidation.



Fig. 14 - Fractures detail of the entrance to the rupestrian church.

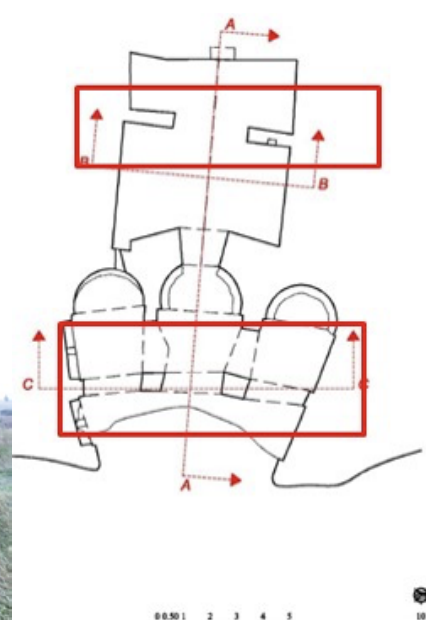
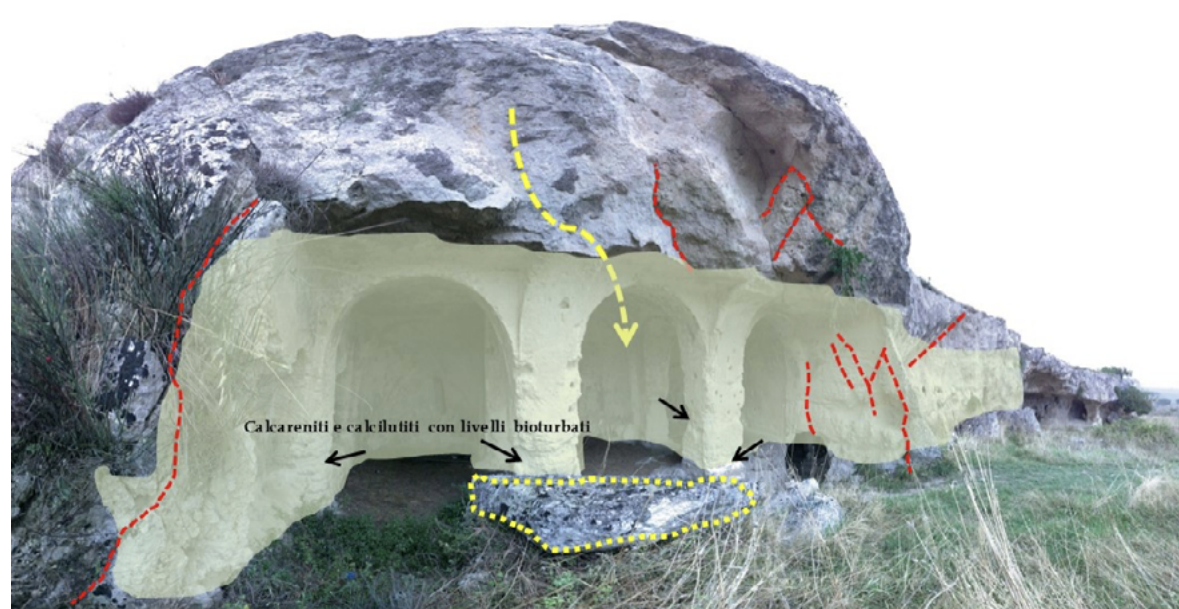


Fig. 15 - Entrance to the rupestrian church of San Pietro in P. with evidence of the bioturbated calcarenitic lithofacies and of the collapse phenomena that occurred in the past and are still witnessed by the overturned blocks on the place. On the right is the plan of the rupestrian church and the two sections analyzed (internal fig. 13 and 15 red rectangle above and external fig. 11, 12 and 14 red rectangle below).

2.2.4 Church of Madonna della Croce

The rupestrian church of Madonna della Croce is carved in the Gravina calcarenite (bioturbated calcilutite facies) and does not present any particular criticality from a geostructural point of view, except for the entrance (Fig. 17), where subvertical and oblique fracture planes (in red) also intersect with the layering



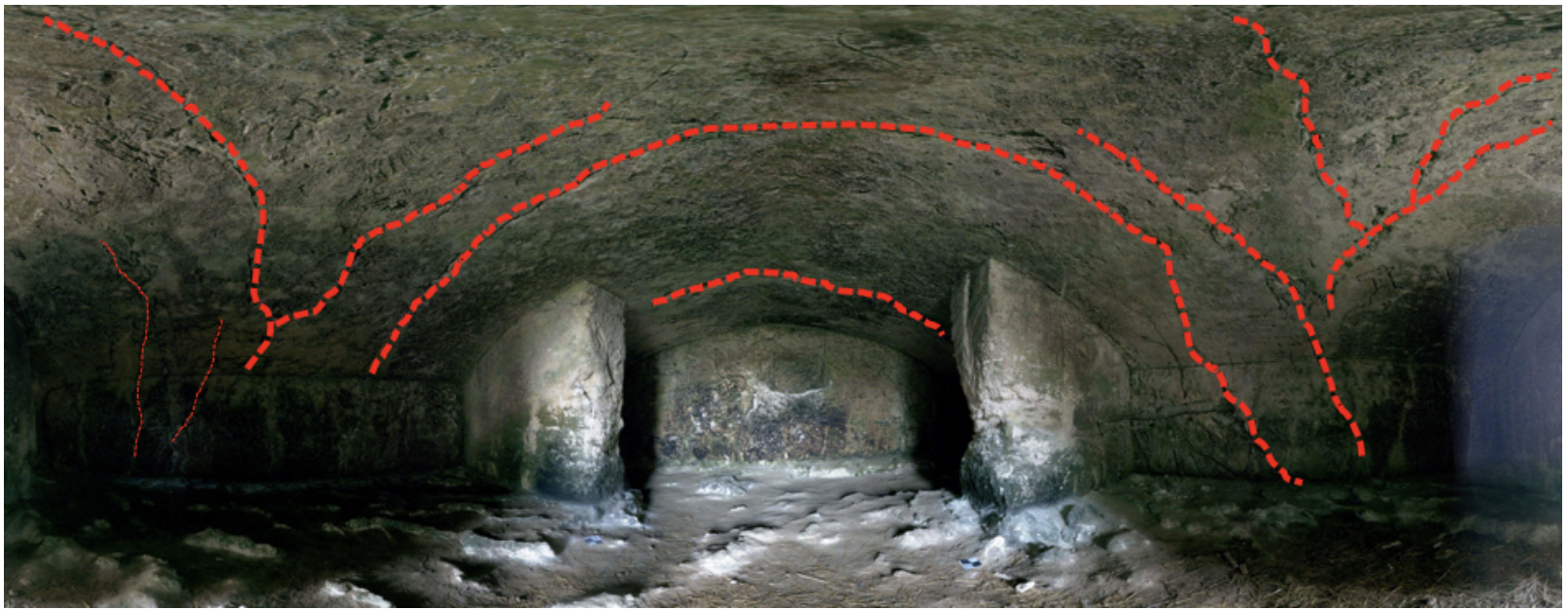


Fig. 16 - Evidence of fractures along the vaults of the church

planes, causing the formation of polyhedral blocks, and the area of the frescoed apse at the bottom of the hypogeum. The apse has a well-defined vertical fracture with a tendency to open up, which affects the entire extent of the fresco from top to bottom. Another smaller vertical fracture is in an almost symmetrical position compared to the vertical axis of the fresco and the larger fracture (Fig. 18).

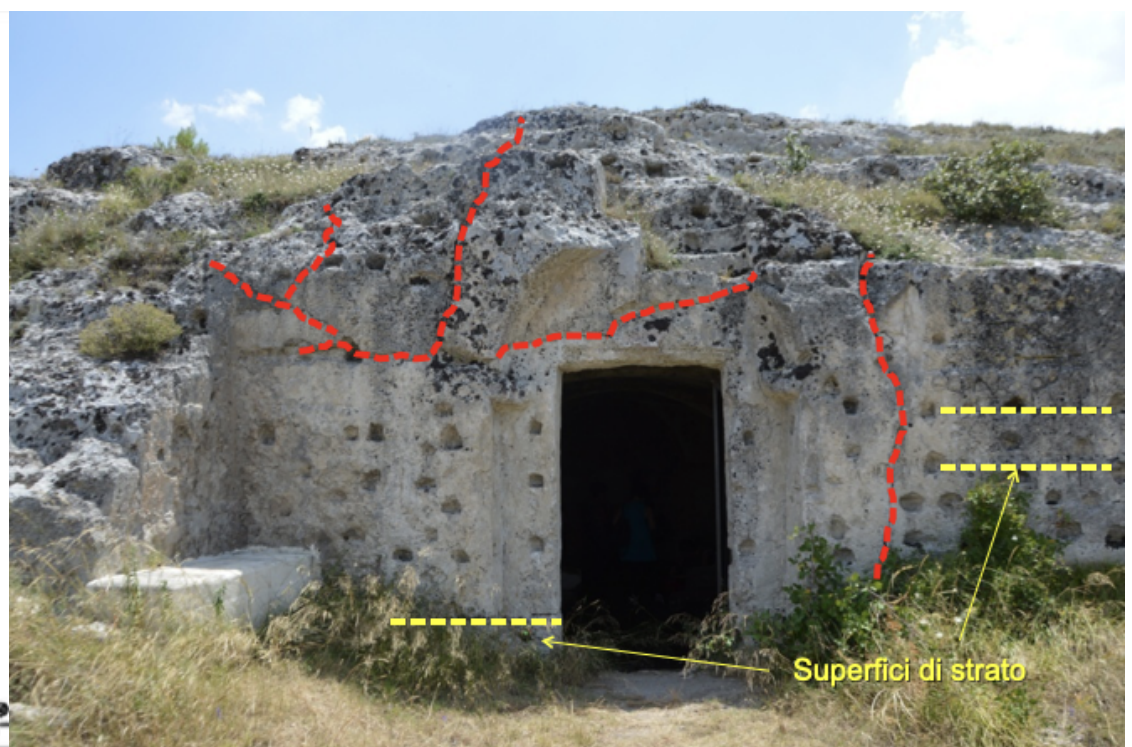
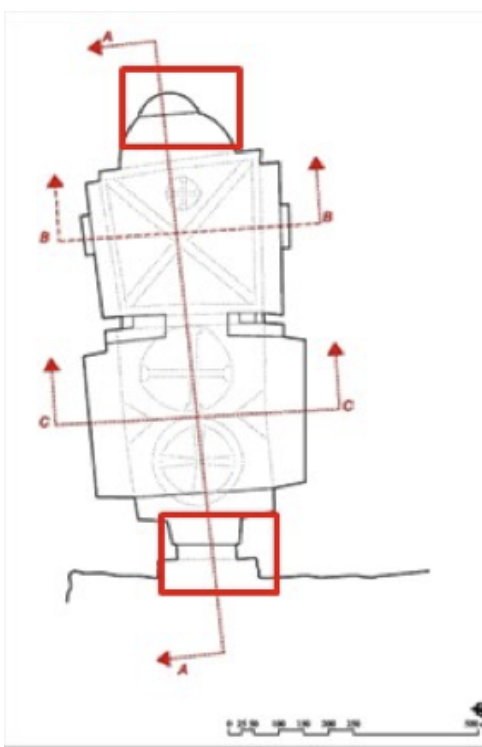


Fig. 17 - Entrance to the rupestrian church of Madonna della Croce



Fig. 18 - Frescoes apse of the rupestrian church of Madonna della Croce, where vertical fractures are evident (dashed lines in red).

2.2.5 San Canio / San Falcione

The rupestrian church of San Falcione is built on the Gravina calcarenites and it is characterised by the absence of vertical fractures, except for a few minor ones. From a structural point of view, the horizontal stratification dominates, marking the sectors where differential erosion is more



accentuated (Fig. 19).

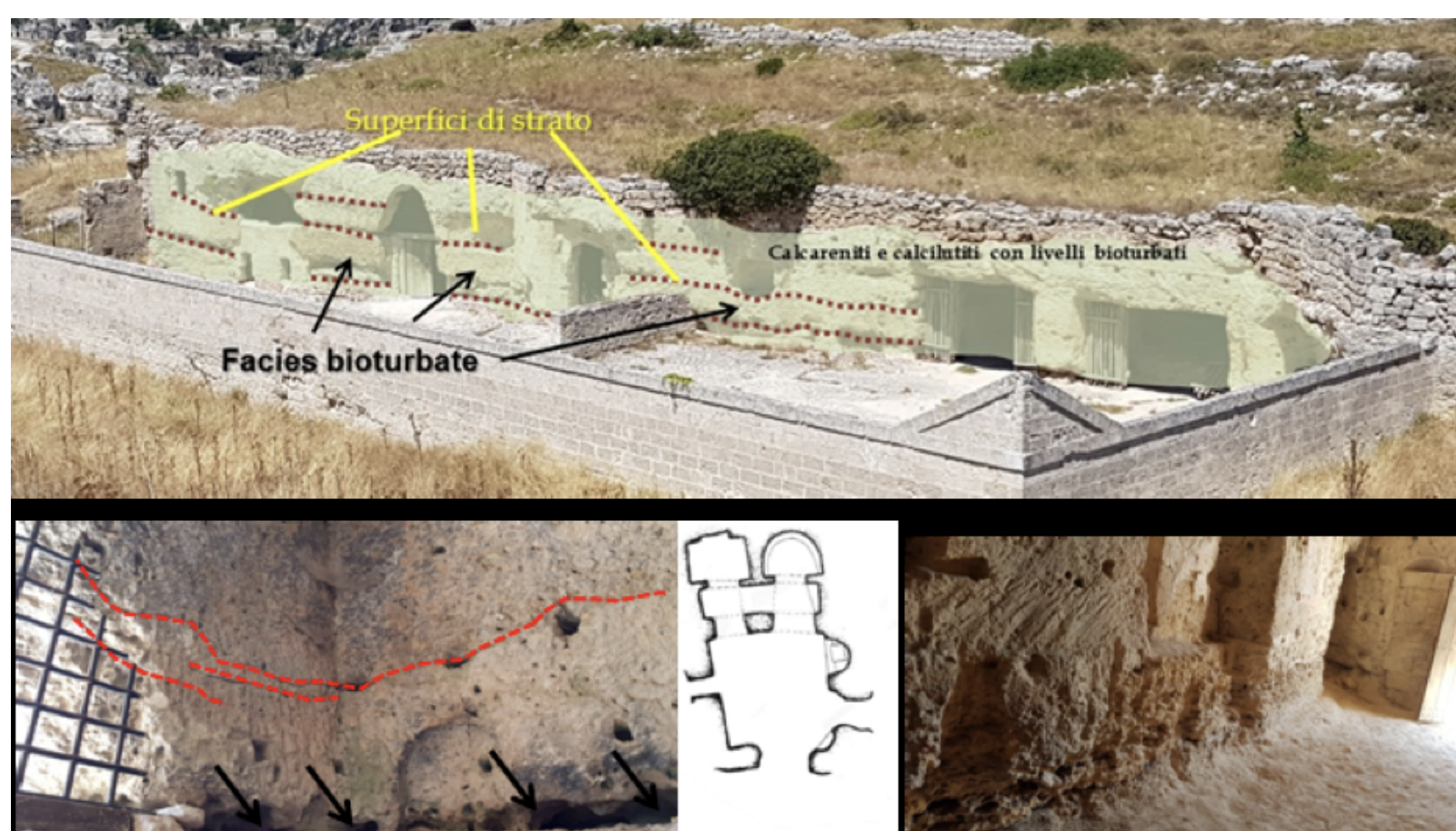


Fig. 19 - Panoramic view of the front entrance to the San Canio/San Falcione rupestrian church. Bottom left, the photo highlights horizontal fractures and erosive cavities at the bottom of the layers. It is possible that the areas with cavities originally housed something else, but the sector became a preferential and accelerated erosion site that has accentuated its size. On the lower right, the bioturbated sandy-calcareous facies are shown, more exposed to accelerated erosion than the other layers of the calcarenite sequence.

The differential erosion phenomena between the finer and coarser layers cause the formation of cavities, which can determine the onset extensional tensional states in the upper layers, which in turn, over time, can also trigger collapses.

2.2.6 Church of Sant'Agnese

The rupestrian church of Sant'Agnese is carved in the Gravina calcarenites between the two facies described above and does not have particular criticality from a geostuctural point of view, except for the entrance, where phenomena of differential erosion are evident, which produce different retreating of the finer calcarenitic strata compared to the coarser ones (Fig. 20, red arrows and arch).

The church of Sant'Agnese, as well as the neighbouring San Lupo / so called Asceterio di Sant'Agnese, although to be considered in the general structural context illustrated in Figure 2, are not affected by important fracture systems at the entrance and inside. The most evident phenomena are those related to

the erosive action of water and wind, which tend to chemically and physically erode the calcarenites, causing some characteristic hollow forms with smooth walls (Fig. 20, black arrows), of the “*tafoni*” type.

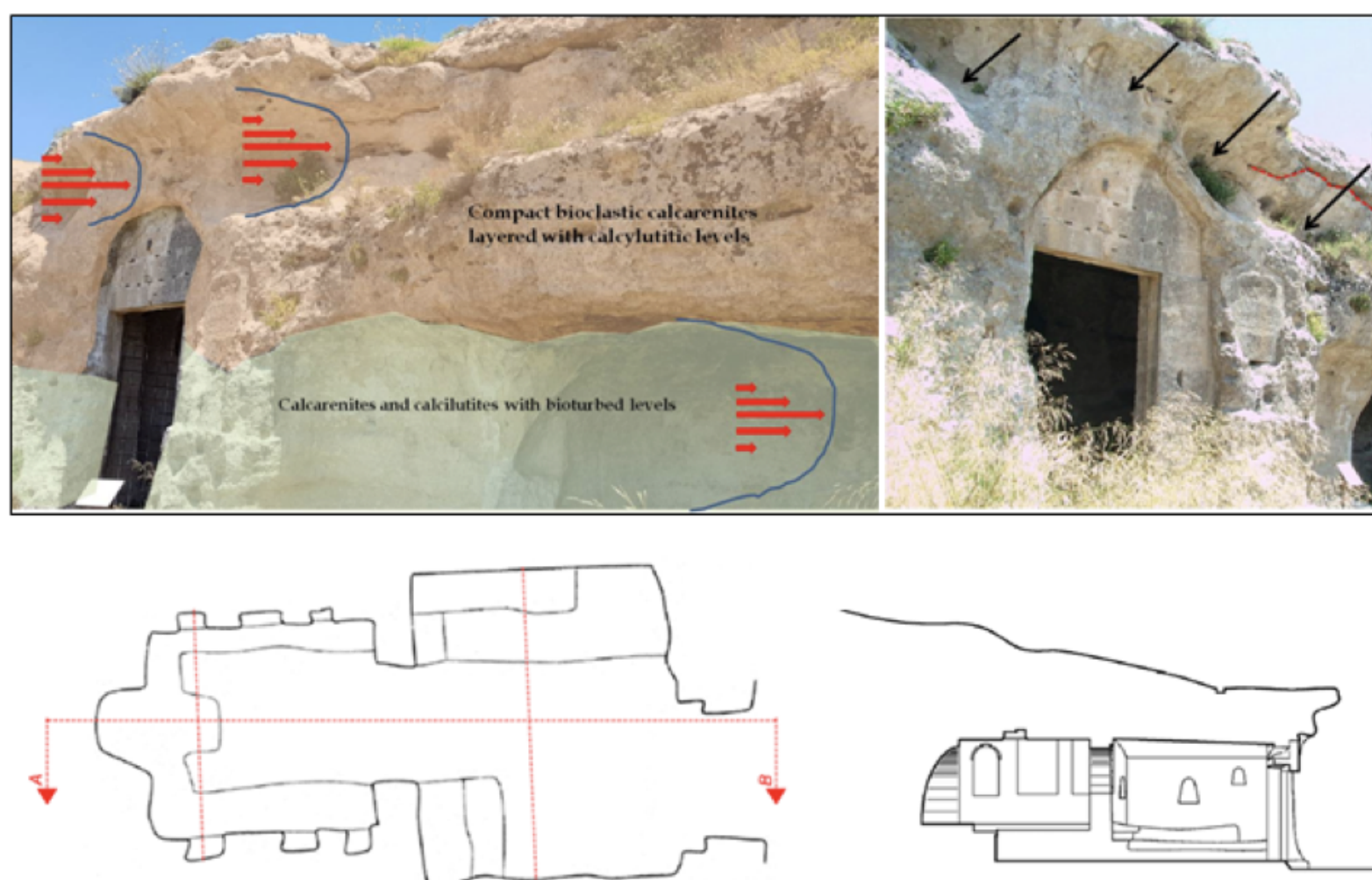


Fig. 20 - Entrance to the church of Santa Agnese with evidence of the calcarenitic lithofacies and the erosion zones (concave blue arch) with the relative retreat speeds (red arrows). Below, the plan of the church and its longitudinal cross section.

These forms tend to retreat towards the inside of the slope, and as they widen, they can produce erosion at the foot of the upper layers with possible future collapses in the entrance area.

2.3 Non-destructive geophysical investigations with GPR

The investigations were carried out using non-destructive methods with equipment supplied to the CNR Applied Geophysics Laboratory of ex Institute of Archaeological and Monumental Heritage in Lecce, today the Institute of Cultural Heritage Sciences, which is meant to verify the existence of fracturing, detachments, the presence of voids, salt accumulation or capillary rise in the frescoes of the rupestrian churches of Madonna delle Tre Porte, Sant’Agnese, Madonna della Croce and San Falcione/San Canio. In particular, some surveys were carried out with an

tool called Ground Penetrating Radar GPR , pulsed Hi Mod (IDS) and equipped with a 2GHz antenna.

In all four churches, the georadar measurements were carried out within a 0.1m pitch grid. All profiles were acquired with 512 samples/track; the other acquisition parameters were optimised on site and kept constant for all profiles of each survey.

The quality of the campaign survey data was decent thanks to a several of measures adopted in the acquisition phase.

2.3.1 Church of Madonna delle Tre Porte

Inside the church there are four frescoes respectively named A, B, C and D. The analysis of the acquired data has highlighted a good signal penetration up to 1.2m depth.

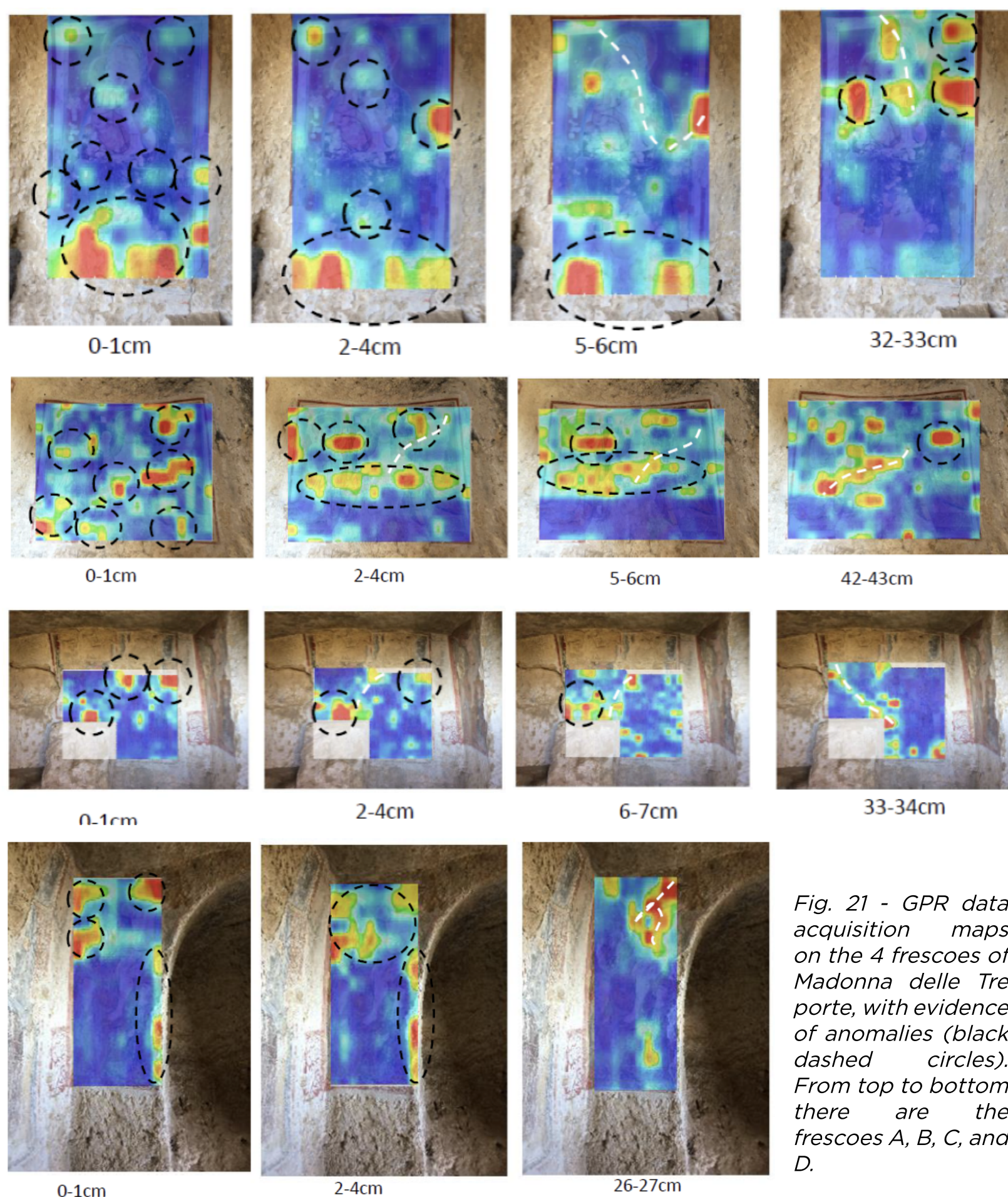
The planimetry of the profiles, acquired at a distance of 0.1m from each other, made it possible to spatially correlate, in 3D, the anomalies on each section using the amplitude analysis of the reflected events within assigned time intervals (time slices). Slices of amplitude were constructed/built at time intervals of 2ns; each slice corresponds to a soil thickness of approximately 0.01m.

Blue colour shows weak amplitude of the reflected signal (subsoil formed by substantially homogeneous material); the colours from light blue to deep red shows variations in the amplitudes of the reflected signal and therefore the presence of significant electromagnetic discontinuities. Variations in amplitude (and therefore in colour) in a same slice are indicative of horizontal variations in the electromagnetic characteristics of the ground. In figure 21 it is possible to see a widespread decay (inside the black dashed circles) and several fractures (white dashed lines). fractures (white dotted lines).

2.3.2 Church of San Falcione / San Canio

Inside the church there are two frescoes named A and B. The analysis of the acquired data with GPR has highlighted a good signal penetration that reaches a





depth of 1.2m.

The planimetry of the profiles, acquired at a distance of 0.1m from each other, made it possible to spatially correlate, in 3D, the anomalies on each section using the amplitude analysis of the reflected events within assigned time intervals (time slices).

In figure 22 it is possible to see a widespread decay (inside the black dotted circles) and several fractures (white dotted lines).

2.3.3 Church of Santa Agnese

There is only one fresco inside the church. The analysis of the acquired data has highlighted a good



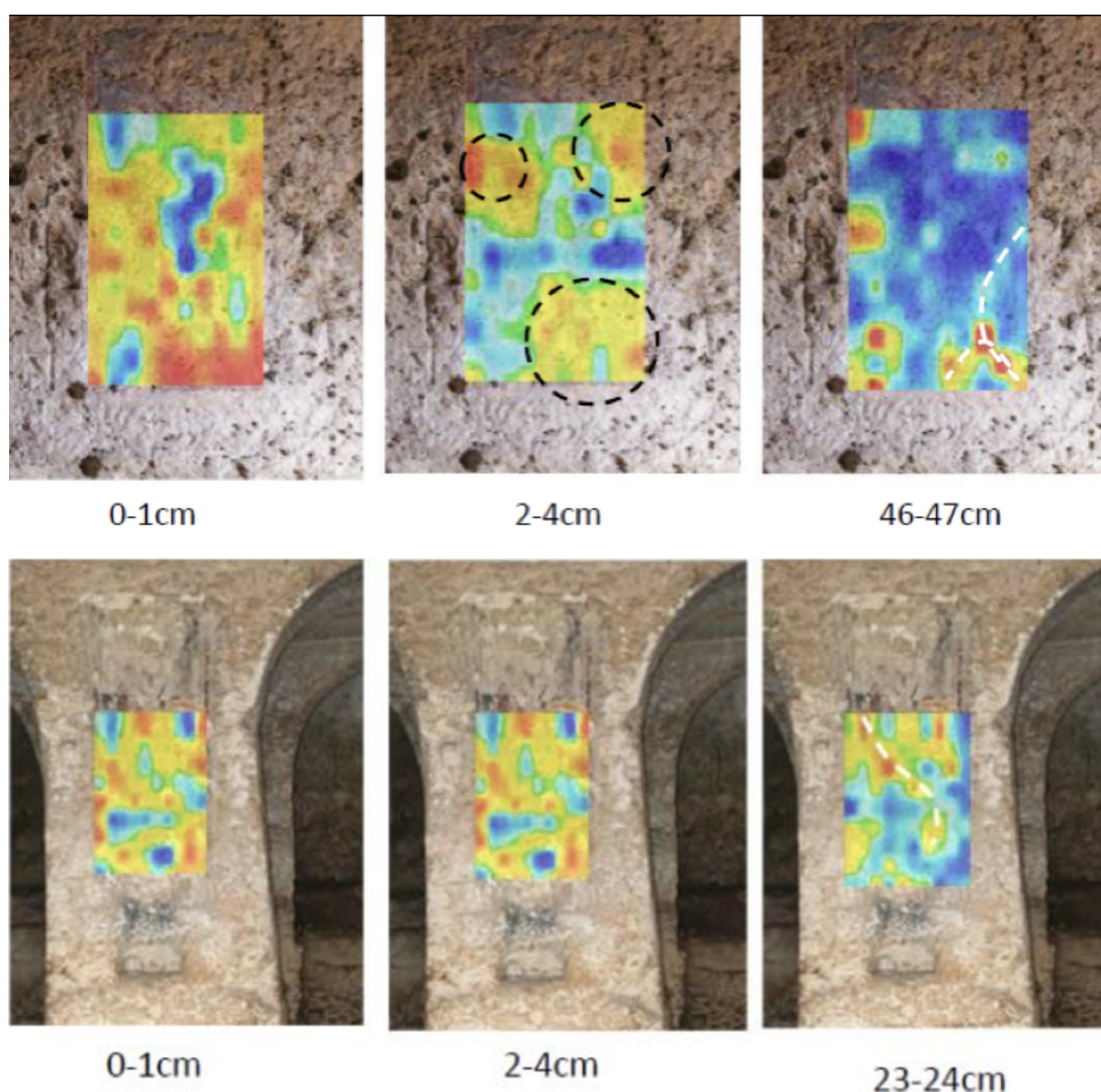


Fig. 22 - GPR data acquisition maps on the 2 frescoes of San Falcione/ San Canio church and, with evidence of anomalies (black dashed circles). From top to bottom frescoes A and B.

signal penetration up to 1.2m depth.

The planimetry of the profiles, acquired at a distance of 0.1m from each other, made it possible to spatially correlate, in 3D, the anomalies on each section using the amplitude analysis of the reflected events within assigned time intervals (time slices).

In Figure 23 it is possible to see a widespread decay (inside the black dashed circles) and several fractures (white dashed lines).

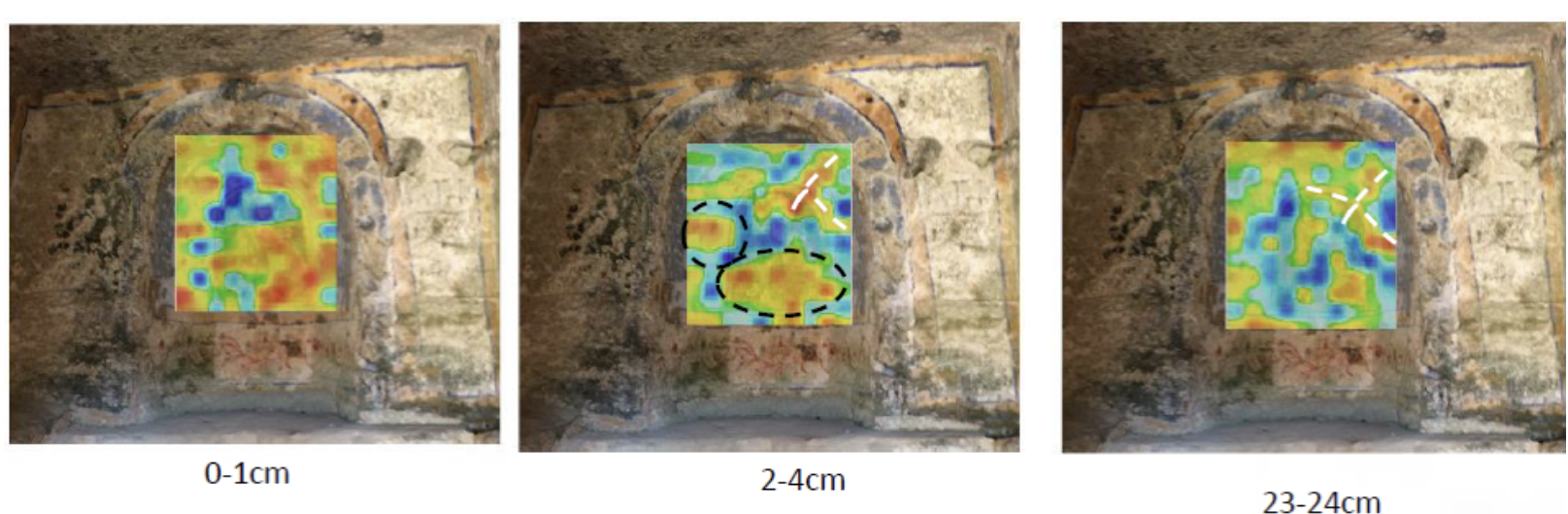


Fig. 23 - GPR data acquisition maps on the fresco in the apse of the church of Santa Agnese, with evidence of anomalies (black dashed circles).

2.3.4 Chiesa della Madonna delle Croci

There is only one fresco inside the church. The analysis of the acquired data has highlighted a good signal penetration that reaches a depth of 1.2m.



The planimetry of the profiles, acquired at a distance of 0.1m from each other, made it possible to spatially correlate, in 3D, the anomalies on each section using the amplitude analysis of the reflected events within assigned time intervals (time slices).

From figure 24 it is possible to see a widespread decay (inside the dashed black circles) and several fractures (dashed white lines).



Fig. 24 - GPR data acquisition maps on the fresco which is at the church of Madonna della Croce, with evidence of anomalies (black dashed circles).

2.3.5 Final considerations

The application of high-resolution impulsive electromagnetic methodology helped to understand the state of conservation of the several frescoes investigated, which will be very useful for the execution of restoration operations.

The geophysical investigation highlighted a series of superficial anomalies (black dashed circles) probably linked to a state of advanced decay (probable presence of salt aggregation). The structures investigated have a series of karst-type discontinuities (fracture voids). The fractures (indicated by the white dotted lines) probably extend to the depth of the investigation. Further details: see De Giorgi's article *et alii* (2019 and 2020).

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De Giorgi L, Lazzari M, Leucci G, Persico R. 2020 - Geomorphological and non-destructive GPR survey for the conservation of frescos in the rupestrian churches of Matera (Basilicata, southern Italy). Archaeological Prospection. 2020, 1-9.

3.3.6 GPR surveys Neolithic village of Murgia Timone

As part of the “Recovery and Enhancement of the Jazzo Gattini Visitor Centre and Neolithic Village of Murgia Timone” project, Geoatlas srl of Altamura carried out a campaign of indirect geophysical surveys with Georadar, useful for defining humidity conditions, cavities or archaeological targets.

In particular, the survey was concentrated in the area to the east of the large moat (Fig. 25).



Fig. 25 - GPR survey areas at the Neolithic village moat.

Georadar or GPR (Ground Penetrating Radar) is an electronic system which helps to investigate soils and



materials very precisely, using the propagation and reflection of electromagnetic waves produced by the system itself. The georadar survey consists of sending very short pulses of electromagnetic energy into the subsoil with a very precise spectral content (usually 35-1000 MHz). Propagation velocity depends on the dielectric constant of the medium they are passing through. In correspondence with abrupt variations in this parameter (e.g. when there is a contact between materials with different compositions), part of the energy is reflected and part continues in depth. The reflected signals are detected on the surface by the transmitting antenna itself or by a suitable receiving antenna. Processing and displaying the signals appropriately, it is possible to rebuilt vertical sections of the subsoil where the trends of the discontinuities are reognized.

Such as all geophysical techniques, even the georadar has methodological limitations. The main ones concern the depth of investigation, the resolution and the type of target to be detected. The depth of investigation can be limited by conductive soils or water; damp soils impede the passage of the electromagnetic wave. About the resolution, to detect small objects it is necessary a dense network of measures and consequently the interpretation of single profiles and/or widely spaced profiles, this can give rise to ambiguity about the place of the anomalous body and the depth.

In the area under consideration, georadar was used with the aim of “mapping” the subsoil of the area of interest in order to identify some buried structures, voids and characterise areas with more or less dense soils. Before the actual survey activities, some calibration tests of the instrument were carried out, both in relation to the horizontal distance (10 m) and the depth of investigation (the depth of a visible object was measured both in the field and along its recorded radargram, in order to correctly set the acquisition parameters and make the two depths coincide).

The survey was focused in two areas named Area



A and Area B. Area A is represented by a 16x20m rectangle with the longest side oriented NE-SW, and the area B is represented by a 30x30m square (Fig. 26).

The geophysical investigations carried out at the site of Murgia Timone have yielded extremely interesting data that allow to enrich the knowledge of the site, especially in relation to the perimeter ditch, which, as far as we know, is characterised by a main oval-shaped circuit connected to a smaller circular circuit. In particular, the most important result comes from the georadar survey carried out in the southern intersection area between the two circuits, which has allowed to identify with absolute certainty a new segment of

ditch that is grafted onto the south side of the small ditch and continues in a south-easterly direction (Fig. 26). This segment is independent of the two already known circuits and it opens up new suggestive possibilities for rebuilding the extension of the entire village.

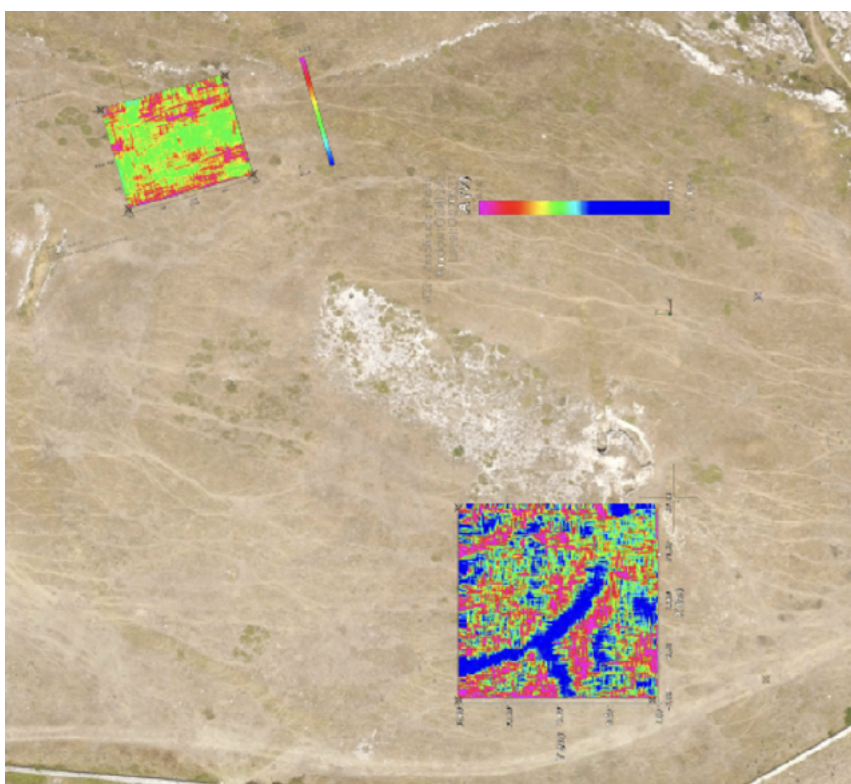


Fig. 26 - Maps with indication of radargrams that clearly highlight the known stretches of the moat (dark blue).

3. Rupestrian churches of Murgia Timone in Matera. From knowledge to planned conservation: diagnostics as a prevention tool

by Maria Carmela Grano

3.1 Introduction

In the history of every restoration site there are always many revelations in the course of the work: by carefully observing the direct or indirect signs of time on the materials, it is easy to find the material traces of past interventions or original layers.

If the most exciting discoveries are those that are unexpected and that carries historical information, no less exciting are the diagnostic researches aimed to answer the open questions that every assets poses to anyone who studies it carefully, art historians, architects and restorers. Diagnostics, in fact, allows to investigate the conservative past of an artifact, looking for traces, that are not visible to the naked eye, which can provide information about the use, the dating or provenance of the materials of which the work is made and the techniques used to make it. The research sources for the diagnostician are a series of data or microsamples, powders or images in false colours whose interpretation can be facilitated by their correlation. Only a careful study of all these material or immaterial sources can lead to a deep knowledge of the artefact's experience, necessary premise for a correct action of conservation.

A restoration site, that generally involves an initial phase of diagnostic analyses, aimed to answer open questions about the conservation history of the asset (to set the interventions correctly), it has the obligation to produce knowledge, method and continuous information, in order to be a guide during the continuation of the work and a positive reference for other restorations.

Only in this way the restoration can truly become the methodological moment of recognition of the work of art¹, in its aesthetic, historical and material consistency; moment of rediscovery of history and



construction techniques.

It can therefore be said that, when Giovanni Urbani translated the concept of restoration, intended as an intervention concluded over time, into the theory of “programmed conservation”, he imagined extending this “methodological moment”, transforming it into a constant and continuous monitoring action, able to always provide new information of the work of art, to be preserved with small actions of daily, to slow down the progress of degradation.

For years Urbani’s theory has been widely criticised because of his proposal to involve the private sector in planned conservation activities, and it has never been taken into consideration in the policies of National Government²; however the public-private synergy found positive confirmation in the following decades, mainly in the management of museums. This demonstrated the importance of long-term planning for the resources organization, financing activities and aimed to protect the heritage³.

The positive collaboration between public and private has also produced great advantages in the protection and promotion of the heritage of the rupestrian churches of Matera, starting from the initial phase of restorations⁴. This is demonstrated by the fact that, nowadays, the only rupestrian churches that have been recovered and made visible are managed by private foundations and private cooperatives that guarantee guided tours, microclimate control and enhancement. Regarding the churches of Murgia Timone the visit is possible by recovering the keys at the Centre for Environmental Education Iazzo Gattini, where it is also possible to observe the digital reconstruction of the fresco of the Madonna delle Tre porte (see par2).

2 Lucchi 2018

3 Lambert, 2014; Lucchi 2018

4 si veda il paragrafo 2



3.2 A brief history of science and technology applied to conservation and the study of the causes of degradation

In the last century, after two disastrous world wars that produced huge damages, began to be developed initiatives for the conservation of the artistic-monumental heritage⁵. In the wake of the recommendations of The Athens Charter (The Athens Charter, 1931, point VI), many museums set up scientific laboratories specialised in conservation diagnostics (National Gallery, British Museum, Berlin Königlichen Museen, Musée du Louvre, Musée de Belgique, Fogg Art Museum at Harvard University, Vatican Museums). Cesare Brandi, the founder, in 1939, and first director of the Central Institute for Restoration, ICR, who speculated the discipline of preventive restoration, which aims to put in place actions to avoid any late and invasive emergency intervention on monuments and on the works of art⁶ by acting on the conservation environment. This often represents a problem to outdoor heritage exposed in the open air, due to the multiplicity of phenomena involved, environmental conditions and the wide variety of materials that make up the heritage.

Subsequently, Giovanni Urbani, art historian and restorer trained at the ICR School and then director (from 1973 to 1983), to show his dissent from traditional restoration interventions that favor the aesthetic goal (considered too subjective and historically conditioned), he established the cornerstones of the discipline, linking them to the safeguarding the authenticity of the materials as a necessary support to the survival of the ideal value of the work⁷. He developed 'programmed conservation', which, starting from the systematic control of the conditions where the conservation environment is, aims at "slowing down the speed of deterioration as much as possible, intervening at the same time, and if necessary, with maintenance

5 Lambert, 2014; Lucchi 2018

6 Brandi, 1963, p. 54

7 Urbani, 2000, p. 51



treatments appropriate to several types of material⁸. As Urbani specified in the “Pilot Plan for the Conservation of Cultural Heritage in Umbria”⁹ practical actions and measurable results of planned conservation must be implemented by professionals capable of promoting the most functional processes for the duration of the heritage through scientific research. This is how the figure of scientific experts for cultural heritage begins to be configured, which since 2014 has been also recognised by the Ministry for Cultural Heritage (art.110/2014) and, for years, it has been active and indispensable in the Research Institutes and in the museums all over the world, known as Conservation Scientific.

Following the 1980 earthquake in Irpinia and Basilicata, and in the wake of Giovanni Urbani’s work, again within the ICR, the project of the “*Mappa del Rischio*” (architectural heritage Risk Map) was born, with the intention to identify priority criteria for intervention on the heritage at greatest risk and the programming of maintenance, conservation, restoration and finally of protection and use in the different Italian regions. This map sets up an organic information system which relates the territorial distribution of heritage and the loss risk intensity of the asset¹⁰, identifying three danger domains¹¹:

1. **static-structural risk** (landslides, earthquakes, floods, instability);
2. **environmental-air risk** (pollution and climate, which cause blackening, physical stress and erosion;
3. **anthropogenic risk** (population density, tourist flow, abandonment, vandalism).

Since the 1980s, many experimental works carried out in Italy by ISAC-CNR, ISPRA and ICR on outdoor and indoor climates aimed at defining the relationship with environmental conditions and the risks to heritage, and

8 Urbani, 2000, p. 104

9 ICR, 1976- Mnemosyne Institute’s trascription

10 MiBAC, 1996; Bonanni et al., 2006

11 Accardo et al., 2002



shown that the artifact-environment interaction causes:

- **physical damage** due to dust, hail, atmospheric precipitation, uneven heating according to the different degrees of surface blackening;
- **biological damage** due to the presence of bacteria, moulds, algae, mosses, insects that lead to aesthetic and structural degradation;
- **chemical damage** due to pollutants generated by energy production processes and vehicular traffic.

For this reason, for the last forty years, restoration work has been preferred, at least in theory, to maintenance actions, not yet fully included in the legislation on heritage conservation, nor in ministerial choices (except for museums and indoor heritage).¹²

Unfortunately, risk maps and restoration maps¹³ have no legal value, nor are there any laws to support planned conservation. At the moment there are only the guidelines of the Regional Research Institute of Lombardy¹⁴ which provide mere recommendations for the drafting of preventive conservation plans¹⁵. To them are added some European researches that financed studies on heritage decay in relation to environmental conditions and climate change, indoors (IMPACT; MASTER), and outdoors (Noah's Ark project - 2002-2006).

Fortunately, all strategies for climate mitigation, energy saving and reduction of greenhouse gas reduction are gaining momentum. The Intergovernmental Panel "On Climate Change (IPCC) founded the basis of this new field of research, which was then developed with the "Climate for Culture" projects (2009-2014) and with the European Network on applied research for the protection of tangible cultural assets (NET-HERITAGE

¹² Unfortunately the cultural outdoors assets continue to be less well cared than those that make up the museum collections which are subjected to fairly widespread climate control strategies (Lucchi 2018) and must respect precise Italian (UNI 10829,1999; UNI 10969, 2002; UNI 10586, 1999) and European norms and standards (CEN EN 15757,2010; EN 15758,2010; EN 15759,2011).

¹³ i.g. Venice, 1964, Krakov, 2000

¹⁴ AA.VV. 2003

¹⁵ Grano 2011 p.14



- 2007/2013), which estimated climate impacts on historical building transformations in Europe, defining simulation and modelling tools for damage assessment able to predict the influence of external climate on historic buildings until 2100. Finally, the recent Project “Identification and Registration for Cultural Heritage: Improving Climate Quality” (AIRCHECQ) also bodes well that advanced tools and methods for preventive conservation, taking into account the sustainability of the environment (2013-2018).

It is therefore clear that the practice of conservation-restoration-enhancement of cultural heritage is in continuous evolution, depending both on new technologies and eco-sustainability objectives, as well as interdisciplinary and synergistic research between chemists, biologists, physicists and geologists, restorers, archaeologists, art historians and architects.

3.3 From the degradation and theft of the rupestrian frescoes to the establishment of the second seat of the ISCR in Matera

In the City of Sassi, which boasts one of the richest and most fragile open-air cultural heritages in the world, cultural and political dynamics found an ever wide echo and a significant acceleration in recent times. Just think that the early 1960s (the same years that marked the starting point for the discipline of planned conservation) were the ones which saw the strong and new awareness of rupestrian heritage hitherto neglected and abandoned.

In 1962, in fact, controversy and popular indignation broke out, supported by the press, for the transfiguration of some frescoes. “I didn’t think anyone was interested in these frescoes : if so, the Italians would not leave them in the garbage and degradation, as I found them”¹⁶. This is how a German archaeologist who, with two students, removed 17 ancient parts of

¹⁶ Grazzini 1964, p.1236



frescoes, including those in the Church of San Lupo (known as Asceterio of sant'Agnese) in Murgia Timone , unfortunately, never received again, and including those in the church of Madonna Delle Tre porte, which instead recovered and kept in the Palazzo Lanfranchi. These fragments are now digitally reintegrated and can be seen in the Environmental education centre of Iazzo Gattini. A decisive role was played by La Scaletta cultural club, founded in 1959 after the discovery of prehistoric remains in Murgia Timone. The cultural club promoted the restoration of the first rupestrian church (Madonna della Virtù), the preservation of San Nicola Dei Greci and Peccato Originale's churches¹⁷ and in 1966 published the volume "Rupestrian Church".

The Superintendency of Basilicata, set up in 1971, immediately faced the problem of protecting the rupestrian churches, which were in a state of deep degradation and abandonment. For example the area of Murgia Timone was only accessible by mule. An impressive work of cataloging was started, facing "for the first time in Basilicata, the problem of conservation in situ of the pictorial or rupestrian heritage"¹⁸ conducted "also between public and private"¹⁹. In 1976, the fresco cycle of San Giovanni in Monterrone and Santa Maria dell'Idris was detached and stored at Palazzo Lanfranchi to save them from irreversible degradation and the restoration of S. Nicola Dei Greci and Santa Lucia alle Malve began²⁰. The careful attention of the Superintendency was the first public signal of attention to the restoration²¹ of such an impressive heritage. In this way, next reconstruction after the 1980 earthquake , gave great impetus, encouraged the arrival of new resources and the development of innovative techniques and finally new professionalism²² in the field of restoration.

17 Fiore 2018, p.3

18 Grelle, 1981, p. 10. 5, Gigliola Gentile 2016, p. 14

19 Grelle, 2016, p. 115

20 Fiore 2018, p.3

21 De Ruggieri 1996 p. 599

22 D'Elia 1980 pp 107-111; 1991 pp. 29-36



Under the direction of Michele D’Elia, the Superintendent of Historical, Artistic and Ethno-anthropological Heritage of Basilicata, started a new important cataloging work on the works at risk that had to be rescued; “a filing operation of the Lucanian heritage, immortalised by photographs of undoubted documentary and symbolic value”²³.

The appointment of D’Elia as Director of the Central Institute for Restoration (ICR) in 1987 was a lucky coincidence; in fact thanks to his will and the support of La Scaletta club and the Zètema Foundation²⁴, it began to talk about a School of Restoration in Matera; a project that could benefit from significant UNESCO recognition of the cultural landscape of the Murgia as a ‘World Heritage Site’.

Between 2002 and 2004 the nine rupestrian churches of Santa Barbara, San Giovanni in Monterrone, San Nicola dei Greci, Santa Maria della Valle, Cristo alla Gravinella, La Palomba, Madonna delle tre Porte, San Falcione²⁵ were restored with a large amount of funding from the Ministry of Culture Heritage²⁶. These restorations included monitoring with thermo-hygrometric controls to measure the degree of daily and seasonal excursion; furthermore, “special protective diaphragms were installed to ensure the regulation of alternatively dry or humid air flows”²⁷. In 2005, the restoration of the Crypt of Peccato Originale was completed, commissioned by the Zètema Foundation under the scientific direction of Michele D’Elia and the advice of a multidisciplinary team of botanical chemists and physicists from ICR and ENEA, under the high supervision of the Superintendence. It is from this first important

23 Fiore 2018, p.4

24 La Scaletta’ club favored and supported the establishment of Zètema, Cwnter for the Enhancement and Management Resources, a center that was established with Regional Law n. 4 of 23.2.1987

25 The church of San Falcione which is one of the oldest rupestrian churches in Matera, in the 19th century it was transformed into a sheepfold, owned by the Gattini counts, was restored in 2004 and protected with fixtures, but the documentation of the restoration was not found (Fiore 2018).

26 Altavilla 2003

27 Altavilla 2003



alliance between the city of Matera and the ICR, that will lead in 2017 to the establishment in Matera of the second seat of ICR²⁸, which in the meantime became the Higher Institute for Conservation and Restoration (ISCR). This branch confirmed the City of the Sassi as a vanguard centre in the field of rupestrian restoration and a “permanent laboratory in the field of safeguarding, valorising and management of historical and environmental resources”²⁹: further strengthened role by the proclamation of Matera as European Capital of Culture in 2019. Moreover, in recent years, research on the rupestrian churches have continued through field inspections and archive searches that have contributed to increasing knowledge of the “rupestrian” phenomenon and feature the different agricultural facies and proto-industrial that characterised the Matera Murgia from the Middle Ages to the 19th century.

3.4 Diagnostic surveys to know ‘in-depth’ the conservative history of churches and predict their evolution

Within the project “Human History Park”, it was decided to use diagnostics to determine the characteristics of the constituent materials of the crypts (supports, pigments, plasters) and the causes of their deterioration. In 2018 investigations were carried out in situ and in the laboratory by Geoatlas and CNR IBAM³⁰ (now ISPC), preliminary to the restoration of the paintings and hypogeum. In order not to alter the state of the monument, in applied diagnostics to cultural heritage, non-destructive analyses are preferred to be carried out in situ, or micro-invasive, by taking samples that are then analysed in the laboratory.

28 The site is named after Michele D’Elia who was very interested in the result with the Zètema foundation and “La Scaletta”

29 De Ruggieri, 1996, p. 599

30 Geoatlas commissioned the CNR IBAM (manager: Dr. Giovanni Quarta, collaborators: Maria Teresa Lettieri, Maurizio Masieri, Davide Melica) to carry out the preliminary diagnostic study for the restoration of the paintings



In the case of micro-destructive analysis, sampling is one of the most delicate and important of the entire diagnostic process. The choice of samples to be studied, especially in the case of invasive samples, must be carefully considered. In order to make the investigation repeatable, as well as to locate the diagnostic information, it is then necessary to describe the characteristics of the sample, photograph it in the sampling macro-area and proceed to the location of the samples on a floor plan.

Performed destructive techniques:

- chemical analyses in ion chromatography to determine the ionic species present in efflorescence or inorganic crusts, on 6 samples taken in correspondence phenomena of pulverisation of the calcarenite rock walls.
- mineral-petrographic analyses to characterise the stone support, plasters and decay materials, with taking of 29 samples in the 7 churches for stereomicroscope observations on samples, observations with a polarizing optical microscope in transmitted light on thin sections (Normal 14/83, UNI 11176/2006); X-ray diffractometry.
- calculation of the weight of the humidity: to check the percentage of water and humidity inside the masonry, taking 21 samples (3 for each church) from a depth of 15-20 cm, using a drill with a Ø 10 mm helical bit. Each pulverized sample is weighed and dried at a temperature of 105 ± 35 °C until mass constancy is reached, using a thermogravimetric scale (UNI 11085/2003)³¹.

Then non-destructive investigations were carried out in situ, which generally less accurate than microinvasive investigations, have the great advantage, after precise photographic documentation of the measuring points, to be repeatable indefinitely to verify the evolution of degradation or the effectiveness of a restoration,

³¹ Taking 3 samples in each church, according to the phenomenologies present in diffused light. The sampling point was marked on a plan, with the addition of the altitude data and the environmental thermohygrometric parameters were also marked at the time of the measurement.



without damaging the materials. In addition, these investigations can add complementary diagnostic elements to define the intensity of a deterioration phenomenon. Non-destructive tests applied on the rupestrian churches of Murgia Timone by Geoatlas technicians in situ without sampling are essentially the following:



Water absorption test at low pressure with a contact sponge: to assess the hygroscopicity of materials. Water absorption is calculated from the difference between the weight of the sponge soaked

in demineralised water and the weight of the sponge itself after placing it in contact with the substrate for up to 5 minutes. A scale with tenth of a gram accuracy is required for materials that are not very absorbent or, with one hundredth of a gram accuracy in the case of reduced absorption (UNI 11432:2011). In photo the test on a fresco in the Church of the Madonna delle Tre Porte.

Thermography: a non-destructive test that makes it possible to visualise with different colours the spatial distribution phenomena of infiltration, capillarity, related to thermal anomalies (UNI 10824-1/2000).



Punctual hygrometric analysis: to check the water content in the first 30-40 mm of

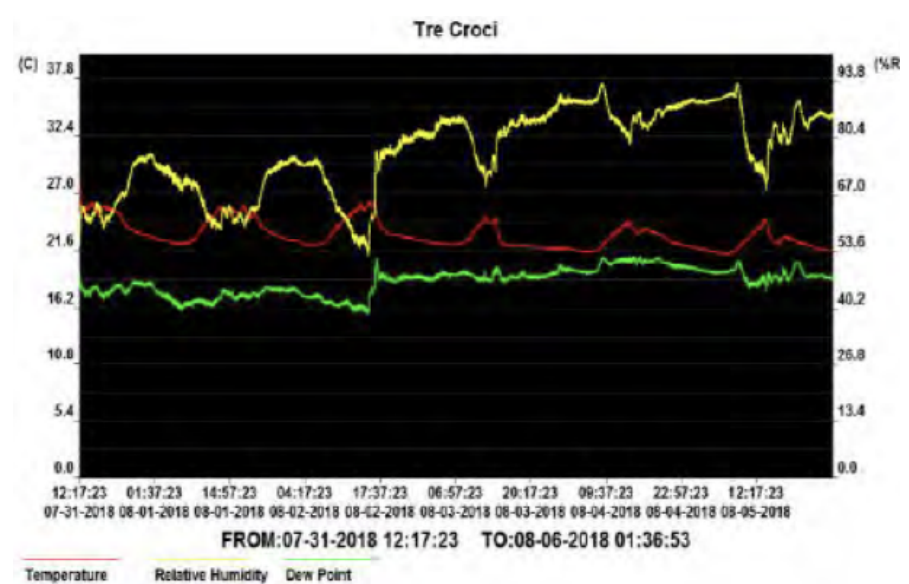
the masonry. An electrical current sensor measures the indicative percentage of humidity in that particular point. Approximately 10



measurements at different heights, according to the visible degradation pathologies. The measurement, complementary to the thermographic data, defines the intensity of the phenomenon in low humidity (U% 1.5 -17%), medium humidity (U% 17 -19.9%) and high humidity (U% 19.9-33%) . In photo the test on a fresco in the Church of the Madonna delle Tre Croci.

Luxometry: measurements of light intensity carried out with instrumentation equipped with a luximetric sensor. Some of the hypogeum are characterised by squaring and undercuts that prevent constant and homogeneous brightness so the measurement was carried out in conditions of maximum external brightness and they were carried out in correspondence with the frescoes and the surfaces attacked by biodeteriogens. The photo shows the test on a fresco in the Church of the Madonna delle Tre Croci.

Micro-climatic monitoring: relative humidity values and temperature were sampled by a datalogger in the different hypogeal environments every 10 minutes from one week to two month, in the environments where the excursions of environmental values were considerable, in order



to reduce mistakes (UNI 10829/1999).
Fig. Micro-climatic monitoring data in the Church of the Madonna delle Tre Croci , on which the RH% values (the ordinate on the right) and the Temperature (on the left) are shown, while the entire sampling time span is shown on the abscissa at intervals of 10 minutes. The trends in temperature (red) , relative humidity (yellow) and the calculation are shown progressive dew point temperature (green) which has a similar trend



Video-endoscopic analysis: pfor the description of the stratigraphy of the plasterwork, masonry and pillars. For the importance of hypogeal sites, it was decided to use, for the

study of the stratigraphy of the limestone bank, the natural holes present in situ, the continuity solutions between the fresco and the support, exploiting the magnification capacity of the video probe, without drilling the structure.

3.5 Diagnostic investigations results

Diagnostic investigations provided information about the materials of the frescoes (plaster mixture and pigments) and on the pathologies of degradation in the churches of Murgia Timone.

3.5.1 *The stone support of the crypts*

The nature of the rock formations ,where the rupestrian churches were obtained, can be traced back to calcarenites, characterized by significant porosity, which is further increased by the processes of alteration and degradation. Observations conducted under a mineralogical microscope show that the stone supports are two different facies of the same rock: rocks deposited in two stratigraphic levels which represent two different environments³².

A sample taken from the church of San Pietro (in photo - sample SP-2 thin-section photomicrograph [transmitted light, N+]) classified as a fine-grained calcarinite, clastic-organic texture,, it is wrongly called calcareous 'tufo'. Porosity is around 40% in volume and it is determined by intergranular voids often with elongated shape, which form a grid. Depending on its compositional characters, textural and microstructural, the rock is classified as an intramicrite³³ or as a packstone³⁴.

The stone support of the Church of the Madonna delle Croci is with different texture, composed of a sedimentary rock and micritic and microsparitic cement with bioclasts of foraminifera and molluscs. The rock is a biocalcarenite, classifiable as a grainstone, with clasts of an average size of 100 microns.

32 Bonomo et al 2019, p.48.

33 Folk, 1959

34 Dunham, 1962



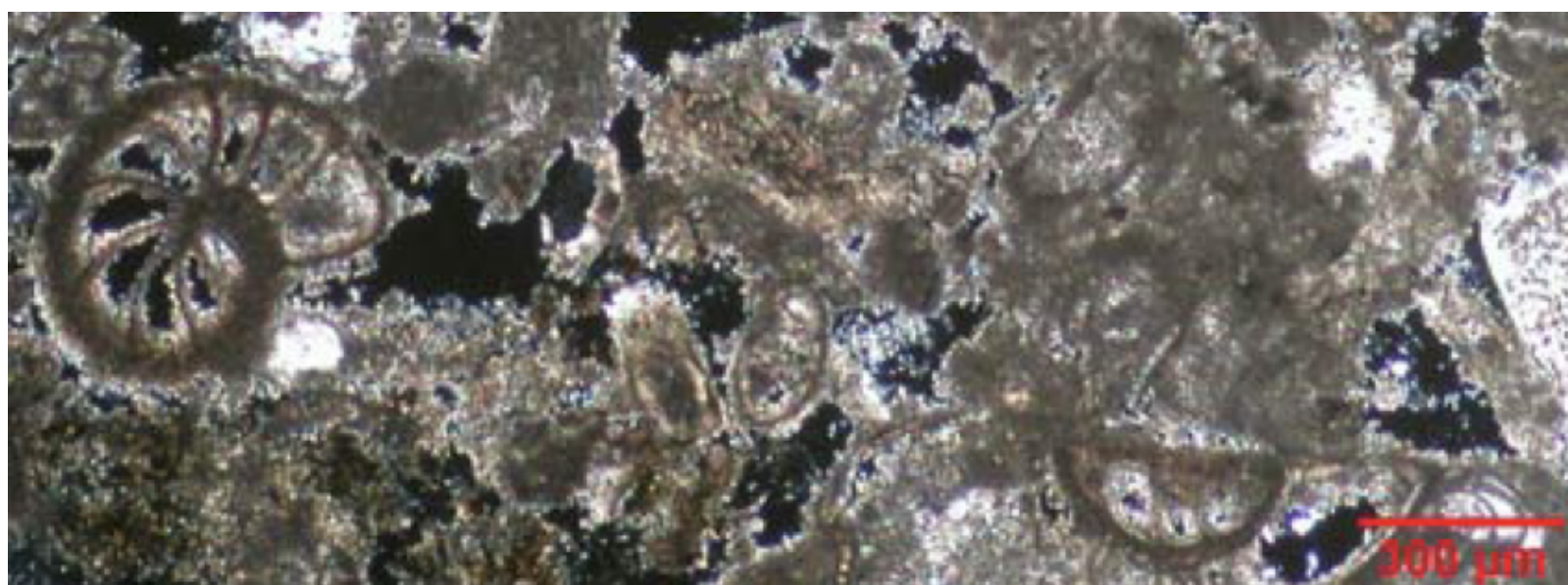


Fig. Sample SV - 2: in thin section photomicrograph (transmitted light, N, +) a material consisting of calcareous granules of different types; mitric, peloid intraclasts and bioclasts are recognized; bioclasts are mainly represented by fossil remain of marine organisms echinoids and benthic foraminifera, but also bivalves and bryozoans. The size of the clasts vary in complex from 60 to 100 Qm.

The porosity, of primary origin, is inter and intra-granular. In the superficial part there is a secondary deposition calcite with a micritic texture and gypsum. In addition, just below the surface layer there is a series of overlapping layers consisting essentially of calcite mixed with soil and gypsum.

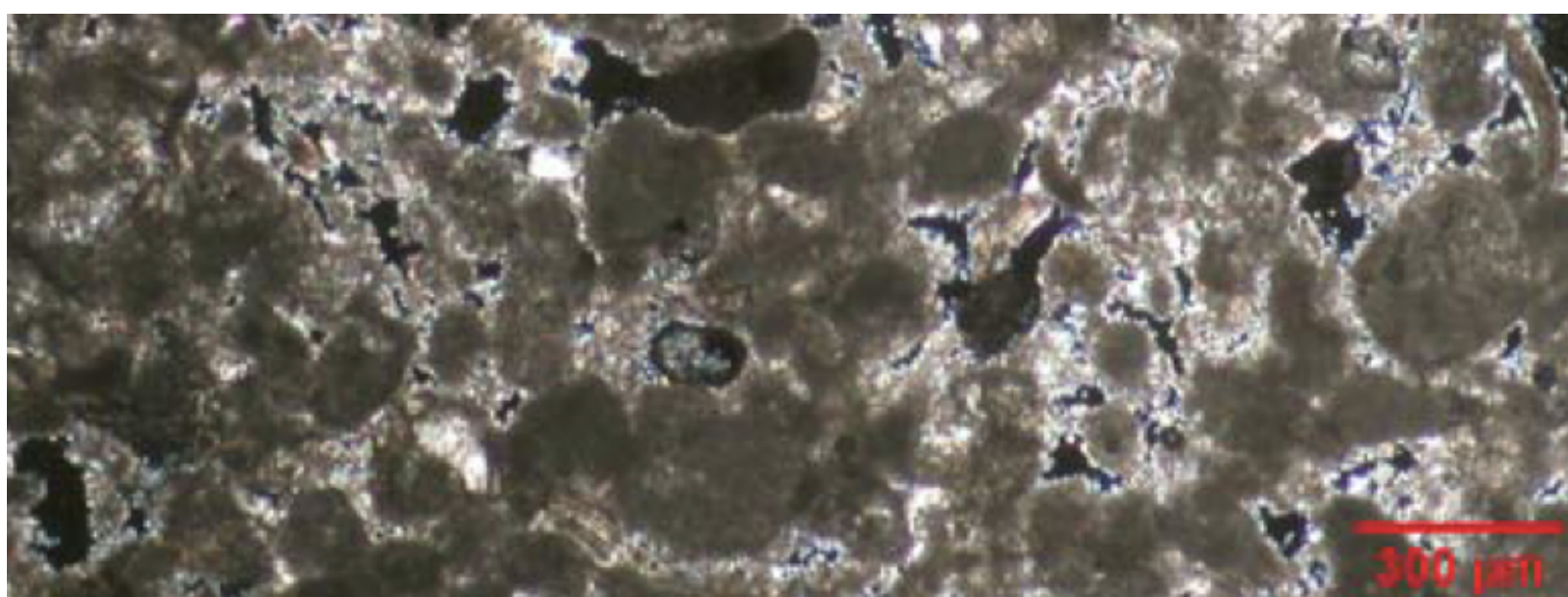


Fig. (sample SP - 2 in the photo - photomicrograph in thin section (transmitted light, N +). The rock is made up from a skeleton given by mitric intraclasts, peloids, fossil shells of foraminifera, remains of bivalves and plates of echinoids; some fragments of spathic calcite are also identified.

3.5.2 Frescoes in the rupestrian churches

Frescoes are an ancient painting technique that is achieved by painting with mineral pigments diluted in water on plaster that is still damp (hence the name “a fresco”): due to a reaction with the air, the colour is completely incorporated into the lime carbonate of the fresco, thus acquiring particular resistance to water and time. This process is called carbonation



and occurs within three hours from the drafting of the plaster, not allowing any second thoughts. In the Crypt of the Peccato Originale³⁵ and in the Church of the Madonna delle Croci³⁶ has been documented a mixed painting technique, where the most meticulous details on the fresco has been applied dry, with tempera technique.

Each fresco is spread on a support of calcarenitic stone, made uniform with a preparatory layer called “arriccio”, a mortar composed of slaked lime or putty, coarser river sand or, in some cases, pozzolan (a volcanic ash) and, if necessary, water, spread in a thickness of about 1 cm. On the top of the “arriccio” is spread the plaster (or “tonachino”), the most important element of the entire fresco, made with fine river sand, marble powder or sifted pozzolan, lime and water. In the Church of the Madonna delle Croci, there is not the “arriccio”, the preparatory layer that was necessary to make the stone uniform, but there is a single layer of plaster which has the dual function of smoothing out the substrate and receiving the colour³⁷.

Data on plastering are only available for the church of San Biagio vecchio/ San Vito alla Murgia and for the church of the Madonna delle Croci, because the other samples taken were not complete with the supporting plaster. According to the CNR IBAM report, ‘the samples taken from the frescoes were not complete with the supporting plaster. For one sample taken as plaster, from the Crypt of the Madonna delle Tre Porte, it turned out to be the rock belonging to the calcarenitic bank.’

The plaster of San Biagio vecchio / San Vito alla Murgia is made up of a mixture of hydrated lime and of a sand obtained by grinding local calcarenite, with a volume ratio of about 1:2. The carbonated lime forms the binding matrix and has a micritic texture and a slightly lumpy structure. The plaster of the Madonna delle Tre Croci has a very reduced thickness and perhaps not representative of

35 Giovagnoli et al. 2005

36 Calia et al. 2009

37 Calia et al. 2009



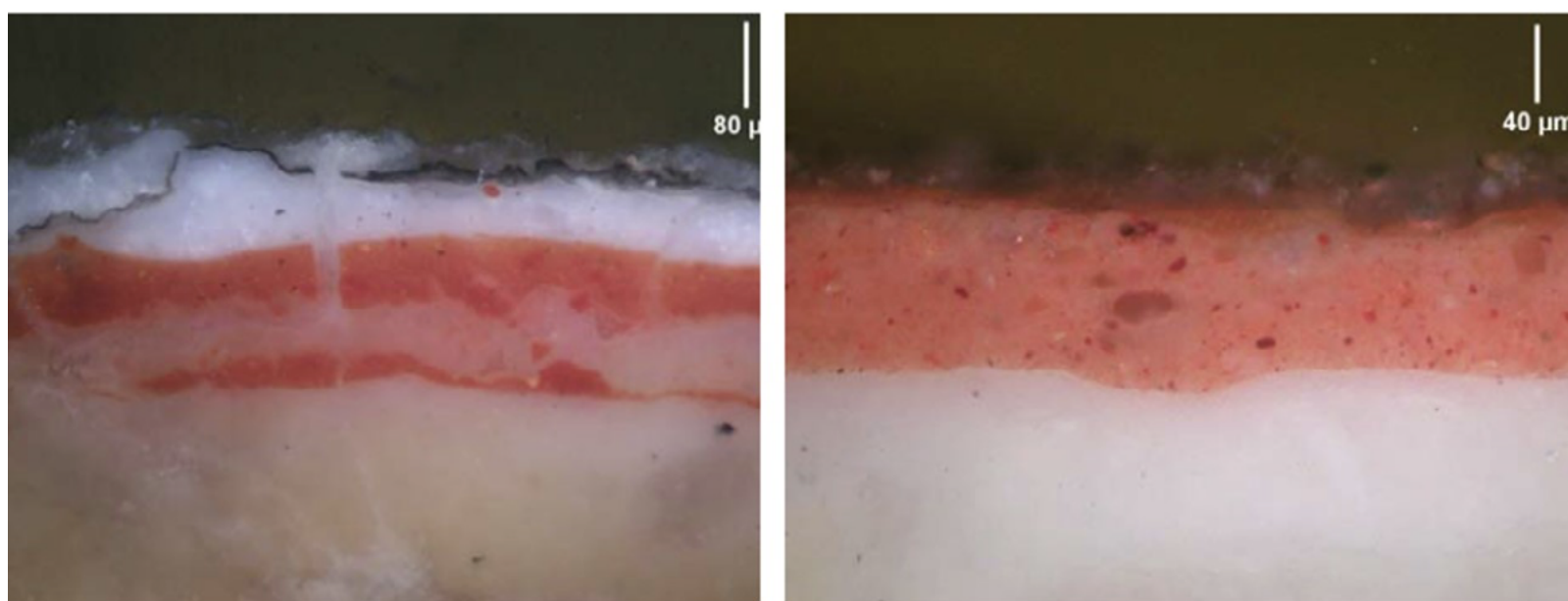
that used for the paintings in the church. It is almost exclusively composed of carbonated lime with a lumpy structure and a colloform-micritic texture;



Inside the vacuoles, neoformation products develop.

3.5.3 *Frescoes pigment*

Several samples of different colours that are in the frescoes of the rupestrian churches of Murgia Timone were sampled and analysed. These are black, red, orange and blue paint layers. The same pigments were used in all the churches but they have different granulometry and different mixing with each other or with the white of lime, depending on the colour choices. The black colour sampled from the apse of San Biagio vecchio/ San Vito alla Murgia is based on carbonated lime, pigmented with vine black and red ochre, both of these pigments appear in fine particles as well as in fragments with a maximum size of 100 Qm. The same pigment was found in the apse of the Madonna delle Tre Porte mixed with white lime (both with particle sizes between 60 and 150 Qm) to give the painting bluish reflections, often used in the backgrounds³⁸.

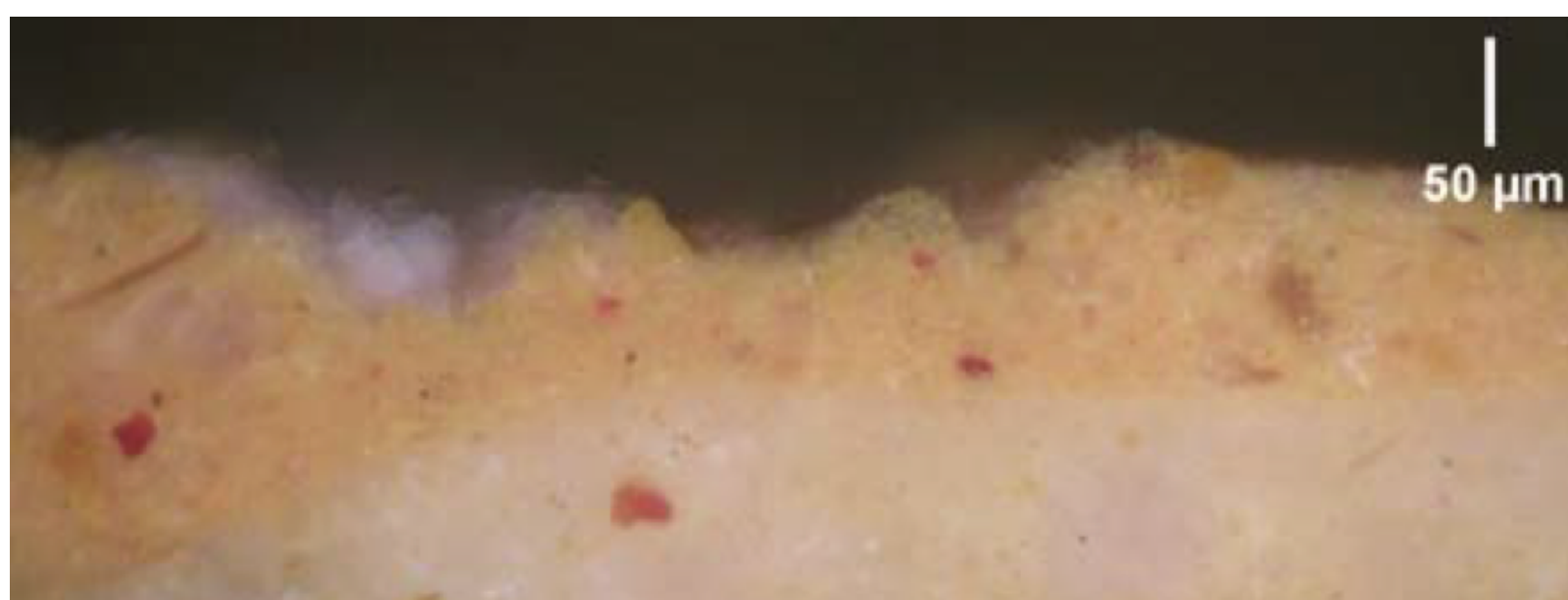


The red-coloured paintings found in the Church of the Madonna delle Tre Croci (2 samples) were made by mixing white lime with very fine red ochre and occasionally with particles of carbon black. In particular, sample (photo on the left), shows a stratigraphy that includes a red paint applied directly on the beige plaster, covered by a whitish layer of carbonate nature (*patina*) and, even more on the surface, a thin layer

³⁸ As already pointed out by Calia, the black pigment is ground more coarsely to obtain a bluish color.



of black smoke. In San Falcione (sample taken in the frescoed area in the lower part where there is a gap) the red paintings were made with a red ochre coarser than that one observed in the Madonna delle Tre Croci, which in some cases, for chromatic needs, it is slightly darker due to the greater presence of carbon black particles (see photo).



The only orange-coloured pictorial layer was sampled in the church of Sant' Agnese. This is a pictorial layer in pale yellow colour, carbonated lime layer, little yellow ochre and traces of red ochre. From the

stratigraphic sequence it is possible to hypothesize a remake of the original yellowish painting [Fig.Camp. E2 - detail in shiny cross section (reflected light)]. A blue-coloured painting has been sampled inside the Church of Sant' Agnese. This blue pictorial layer, 60 to 110 Qm thick, is made of carbonated lime and a blue pigment with very fine granulation, to be ascribed to artificial ultramarine blue, produced from the 19th century and therefore attributable to a makeover. Another blue pictorial layer with a thickness of 75 to 125 Qm, with a rather regular proceeding was sampled from a fragment (see photo) in the Church of the Madonna delle Croci. The paint film is obtained by mixing lime and blue particles in the order of microns, composed of the artificial ultramarine blue pigment, which is more diluted in the lime with a softer colouring

than Saint Agnes blue.

3.5.4 Decay products

An advanced state of degradation is common to all churches, which can be ascribable to problems of humidity (ascending and descending) and rainwater infiltration from the rocky roofs and from free entry in all churches except San Falcione/San Canio. The water in the materials is the main cause of many damaging processes, such as solubilisation and crystallisation of salts, biological development, erosion due to driving rain and crusting in the covered areas, with the detachment of the original layers of colour.

Close to this conditions of reduced microstructural cohesion, there are phenomena of structural degradation which created the lesions, fractures and cracks, and significant collapses in the churches of San Biagio vecchio/ San Vito alla Murgia and Madonna delle Tre Porte.

The morphologies of decay observed are, essentially, due to water infiltration through fractures in the rocky bank, which affect the fresco, as well as the other walls of the cave.

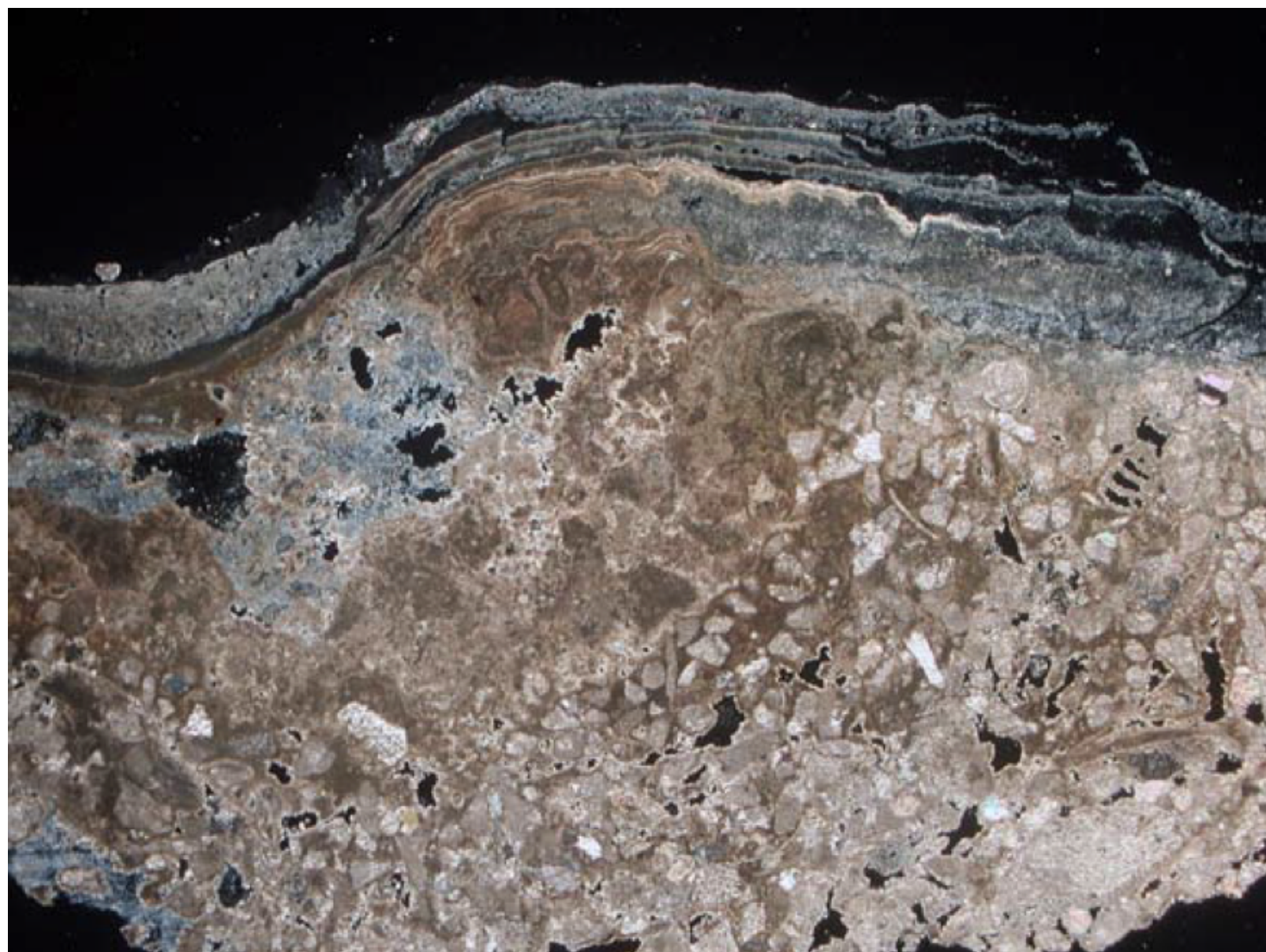
The analysis of the soluble salts of the samples taken from the walls of the six churches (except San Lupo/cd Asceterio) revealed the presence of gypsum (Calcium sulphate), sodium chloride, sodium nitrate and calcium that are not only hygroscopic salts but they can also hydrate themselves with a high number of water molecules and, therefore, they can be particularly dangerous for the conservation of frescoes, especially when they are like sub- efflorescence.

Other information from the study conducted on the church of Madonna delle Croci indicate that in the areas close to the painting there are instead incrustations, often real concretions with a thickness of a few millimetres (Fig., surface incrustation).

In some areas of the painting it is possible to observe a morphology of meandering degradation (as a *flos tectorii*) usually observed on plasterwork, which leads



to the loss of the supporting plaster and the related pictorial layer.



3.6 Correlation between environmental monitoring, degradation of frescoes and stone materials

Limestone materials such as frescoes and calcarenite, are the most attacked by pollutants, which lower the pH of rain and erode the calcium carbonate. The main responsible for lowering the pH in solutions are sulphur and nitrogen oxides that are absorbed by stones of the facades.

Carbon dioxide (CO_2), although a natural component of the atmosphere, is also a pollutant due to the high quantity produced in all combustion processes (both industrial and domestic) and it causes the so-called “karst phenomenon” on carbonate materials: calcium carbonate is solubilised in the areas most affected by the water, and re-precipitated in the form of concretions where the solution evaporates. The first experimental projects, conducted since 2000 by different institutions (APAT, ICR, CNR ISAC of Bologna, CNR IIA in Montelibretti, ENEA, MBAC) quantified

some of the damage factors on stone samples of carbonate composition exposed outdoors, close to the air quality monitoring stations , identifying the main morphologies of decay and functions that allow a mathematical description of the phenomenon.

- the net loss of material known as “erosion”, which occurs mainly in areas exposed to rain action or the formation of black crusts, in areas protected from driving rain;
- blackening caused by the deposition of carbon particles on the surface of the monument and which occurs in areas protected by rain;
- physical stress (caused by climatic and microclimatic factors);
- biological contamination

In addition to these phenomena that could be easily predicted depending on environmental factors, other phenomena occur that lead to typically chemical-physical damage , caused by climatic conditions due to the presence of water (infiltration, capillarity, environmental humidity, biological attacks, crystallisation and dissolution of salts) and to the mineral and petrographic characteristics of calcarenite. Microclimatic monitoring showed that the minimum temperatures on the internal walls of the rupestrian churches are very low and the widespread presence of water in the materials. Thermography allowed to determine that water enters the walls both through capillarity and infiltration. Water flows from the inside to the outside to the masonry, solubilising the salts contained in the materials and moving them towards the surface where they crystallise or on the surface (efflorescence) or in the pores of the material (sub-florescence). Crystal nucleation progressively increase due to the contribution of new salts from inside the masonry, causing micro-cracks and, consequently, the detachment of the most superficial layers and their fall in the form of flakes or materials chalking. The processes linked to the evaporation of water from the surface of the masonry can be seen



thermographically as areas subjected to cooling caused by the evaporation process, where the passage of water from the masonry to the air involves itself from the liquid state to vapour. Fractures and cracks are frequent and caused by the freeze-thaw cycles of the rock. The movement of water within the rock and the widespread presence of salts which crystallize and exerts a disintegrating action on the stone material causing, like that, the phenomenon of alveolization, also found in churches.

In some churches many traces of infiltration and rust spots due to the presence of metal elements (S. Agnese), loss and decohesion of mortar and erosion of the ashlar; blackish concretions probably due to smoke from the fires lit by the shepherds who used the the environment as a shelter.

On the other hand, in the case of detachments or, more generally, continuity case are intercepted by identifying the “hotter air bubble” contained in the detachment compared with the neighbouring “healthy” areas, acting as a thermal insulator.

3.7 Cleaning, consolidation, protection and... programmed conservation of rupestrian churches

Diagnostic investigations carried out by Geoatlas and the CNR IBAM made available for this work, as well as

Thermal image (left) and reference photo (right) in the church of San Vito alla Murgia. Thermal image shows the IR signals that define a form of capillarity (darker in colour) beneath the segment Li1, while superficial exfoliation and detachment phenomena are taking place in correspondence with the rectangle Ar1. Furthermore, a thermal decrease is observed along the perimeter of the bezel, which is induced by the presence of biodeteriogens.



providing information on the construction history, on executive techniques and on the state of conservation, are useful and necessary because they are an important help to take decisions on the methodologies of a conservative intervention, providing precise suggestions for restoration.

The executive project report states that architectural and structural interventions will be aimed at to slow down deterioration processes as much as possible, not only in the churches, but on their relationship with the environment, from which, as described above, the causes of deterioration originate.

In particular, after a first intervention to remove weeds, algae and molds and cyanobacteria, both outside and inside the churches, the extrados consolidation of the rocky bank was carry out, necessary for the protection and conservation of the asset, through the grouting of fractures and cracks, to go on with cleaning of the interior, to remove vegetation and deposits; crusts, patinas, efflorescence and carbon black deposits.

In details there is a description of the restoration work planned on the frescoes, where the diagnostic highlighted a strong state of generalised humidity, which defines the presence of biological patina, efflorescence and detachment.

The first disinfestation action, carried out by applying a biocide by brush to remove the biological patina and weeds, it is followed the pre-consolidation of some fragments of the paint film by injecting Acril 33 into demineralised water after passing water and alcohol to facilitate penetration.

The painting was then cleaned using different methods depending on the surface to be treated and the patinas to be removed:

- a) mechanical cleaning with scalpel and soft wishab over the entire surface.
- b) Cleaning with compresses of gelled ammonium bicarbonate (laponite) over the entire surface and another rinse with demineralised water and thinning of the remaining residues by mechanical tools with scalpels with interchangeable blades.



c) Cleaning with Bisodium-Edta complexes applied with cellulose pulp to remove any patina of oxalate or carbonates.

The last operation of the restoration was consolidation, carried out by:

a) Injections of superfluid grout with hydraulic binder salt-resistant, using a superfluid hydraulic binder (Plm della Cts of Mapei) composed of eco-pozzolan and ultra-fine natural sands. Shaving and grouting with mixed mortars with similar aggregates to the rocky bank.

b) further consolidation through the use of lime mortar without salts was carried out on the pictorial support and on the pictorial films which after the pre-consolidation were still fragile.

In all churches, oxidised layers of paint were removed, attributable to other tweaks to the execution of the original fresco, proceeding with a cleaning in piece, and generally after descialbo completed, a slight pictorial tweak of the the main lines and abrasions were carried out in order to allow a correct reading of the images found³⁹.

In the Church of Sant'Agnese, the decorative band underneath the painting of the altar was the object of a large stratigraphic piece: where a robe and a right foot of a figure "probably from the Byzantine period " were discovered. In addition, the red decorations were removed and a chromatic lowering of the blue and ochre bands on the side walls and on the altar



Photo compresses during the cleaning and discovery of the Byzantine dress of Santa Agnese

³⁹ Information and photo taken from the reports of the inspections for the restoration of painted surface in the rupestrian churches of the Murgia Park. 21 September, 14 October and 2 December signed by the Dr. Impronta of the Superintendency and the restorer Margherita Russo, by the company Forme Srl of Rome.

cross were carried out.

In the Chiesa delle Tre Porte: the frame of the paintings, where it was present, has been retouched to make a better damarcation from the non-coloured walls with compatible colours. A thorough cleaning of the face and hair of Deesis' Christ, the robe of St John and the complexion of the face of the Crucifixion allowed to discover the original features and colours, made legible by a slight chromatic adjustment.

In the Chiesa delle Tre Croci after the cleaning of the old oxidized pictorial restoration works and of the inconsistent grouting ,there was a light watercolour pictorial painting retouch. The stratigraphic tests on the opposite walls revealed a more valuable underneath the light blue floral repaintings, which does not have any artistic stoetic connection with the apse and for this reason were cleaned (descabated. Also on the cross vault, reaserchers highlited the presence of two underlying pictorial layers (black and red-brown) in place of the cross with recent blue decorations, which, in agreement with the superintendence decided to remove it.

In the Church of San Canio/ San Falcione: the paintings were defined with a slight tweaks of the red frame on the two depictions of St Nicholas. A more thorough cleaning of the painting in the niche 'Presentation in the Temple' made the reading more comprehensible.



Photo compresses during the cleaning of the Christ Crucified (Chiesa delle Tre Porte)

3.7.1 Rupestrian churches protection

In order to eliminate the causes of decay, it is important to protect the stone materials both from vandalism and from internal atmospheric agents with



adequate ventilation of the environment, against the proliferation of biodeteriogenic agents.

For this reason, on the basis of microclimatic monitoring, in all churches the installation of reversible and self-supporting frames has been fitted, in self-passivating steel for the protection and safety of the interior spaces and the safeguard of the decorated surface.

Internal microclimatic conditions are little influenced by daily and seasonal climatic variations, while visitors flows are a stress factor, capable of altering the microclimate, with a rise in temperatures and humidity, and an increased emissions of carbon dioxide and biological aerosols.

It is therefore necessary to regulate the influx of visitors to ensure the stabilisation of the climate inside the churches. In order to maintain humidity and temperature parameters within acceptable values, the influx of several visitors at the same time should be between a minimum of 5 people and a maximum of 12, with a maximum visit duration of 15-20 minutes, with an hour's break for the regeneration of the microclimate and not to extend the microbiotic action due to human activity. Correct, but moderate, ventilation can make a decisive contribution to reduce damage due to the spread of biodeteriogens that attack artefacts over time.

Finally, the restoration report foresees the installation of a thermo-hygrometric detection system for monitoring the humidity level inside the churches, for the first two years.

It is interesting that the ancient hydraulic system has been set up for the water flow towards the cistern on the left of the church of Sant'Agnese (with a channel and basin carved into the rock) as well as the drainage of rainwater on the extrados of the rock church of San Falcione. So, the hope is that in addition to the restoration, the cistern can be used, cleaned and maintained constantly in order to assess over time how the humidity values in the walls will change. Humidity, through infiltration and capillarity, is the



main cause of the deterioration of the frescoes: it can be supposed that in the past this problem was not so much considerable, because the water, a precious and rare resource in an arid land like the southern Italy, was regimented in several and widespread ducting systems⁴⁰, as well as the presence of grooves incision in the rock on the Asceterio di Sant'Agnese shows.

3.8 Conclusions and future research developments

*“take care of your monuments
and you won't need to restore them”⁴¹*

Non-destructive and micro-invasive diagnostic carried out on the rupestrian churches of Murgia Timone confirmed the advanced state of degradation, now visible even to the naked eye, which led to the detachment and to the loss of many frescoed surfaces depending on specific environmental variables such as temperature and relative humidity with the intrinsic properties of the material itself, such as porosity and the presence of salts.

The analytical data acquired have, therefore, documented the factors that determine the advancement of degradation of the masonry and of the frescoes, underlining the need for urgent intervention, including environmental conditions, to avoid the total and irreversible loss of the frescoes. The natural, subsequent outcome of the work carried out so far will be the construction of a geodatabase which, on the model of the Heritage Risk Map, catalogues in tabs, methodologically prepared to be implemented and enriched (in the monitoring phase), all information on the conservative past of the rupestrian churches obtained from the several investigations and from the results of new monitoring. A structured database like that would allow the evolution control of the state of conservation and the protective efficacy of the restoration treatment carried out.

Linking the degradation progress of a work of art and

⁴⁰ Grano 2020.

⁴¹ Ruskin, 1849, p. 196.



the intrinsic properties of the material, with atmospheric variables such as temperature, relative humidity, rainfall and chemical data on airborne pollutants could then lead to the construction of predictive models of degradation, in order to implement preventive conservation and mitigation strategies of degradative agents.

In addition, long-term diagnostic campaigns could favour conservative actions that are not too complex, with sustainable costs, on modest damage in the hundreds of rupestrian churches which are in similar conditions, like the experimentation on the church of Peccato Originale carried out by the CNR IBAM, now ISPC, in collaboration with the Lucanian company Digimat.

Finally, a database that summarizes and organizes the several diagnostic data collected over time could also be useful for different needs, such as for example, compare the executive techniques of the frescoes, starting with the composition of the plasterwork, so guide attributions and dating or increase the knowledge of 'rupestrian' painting techniques.



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