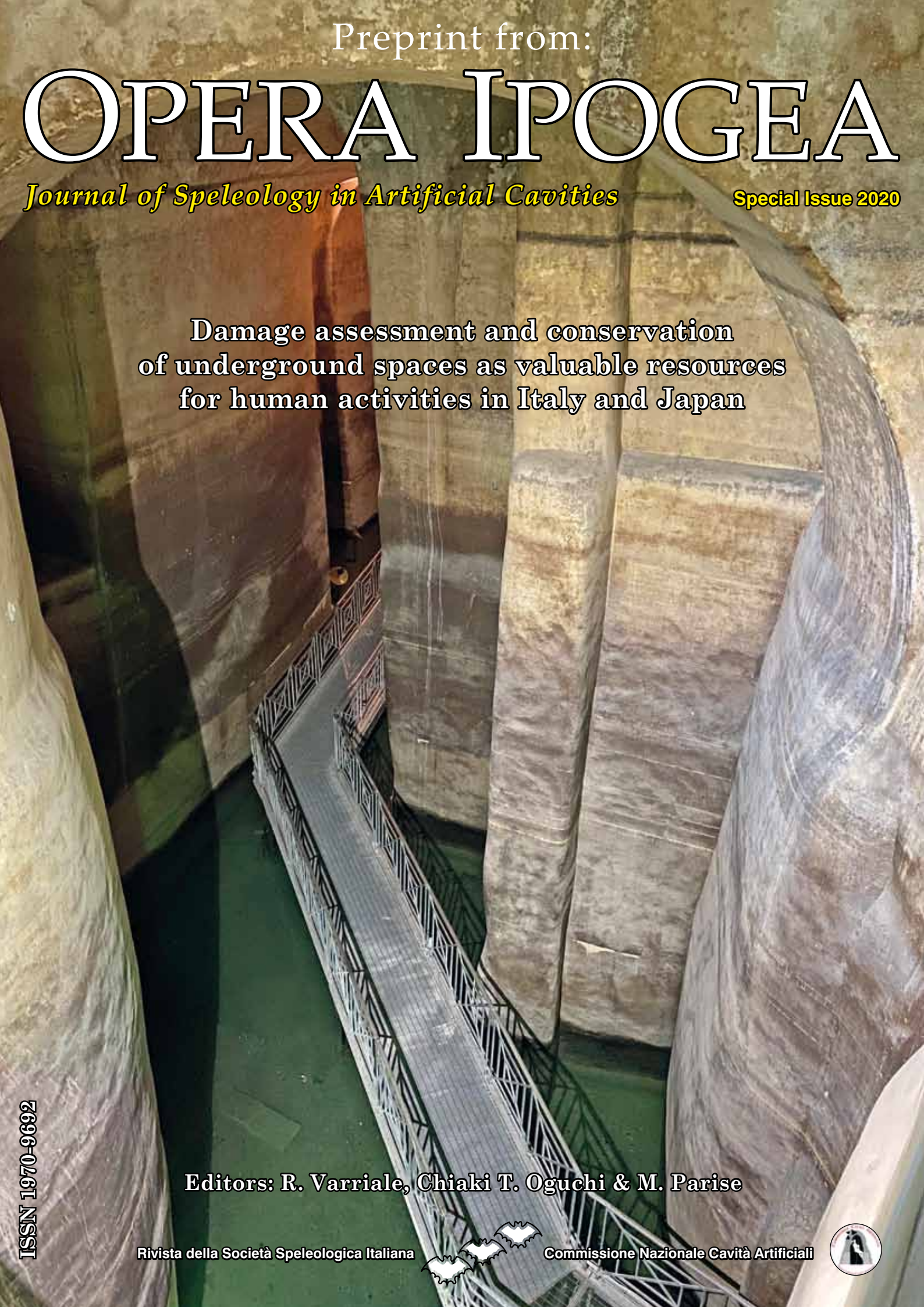
Preprint from:

Opera Ipogea

Journal of Speleology in Artificial Cavities

Special Issue 2020



Damage assessment and conservation of underground spaces as valuable resources for human activities in Italy and Japan

Editors: R. Varriale, Chiaki T. Oguchi & M. Parise

ISSN 1970-9692

Rivista della Società Speleologica Italiana

Commissione Nazionale Cavità Artificiali

Indice

OPERA IPOGEA

Memorie della Commissione Nazionale Cavità Artificiali
www.operaipogea.it

Semestrale della Società Speleologica Italiana
Semi-annual of the Italian Speleological Society

Anno / ***Year 22*** **– Numero Speciale /** ***Special Issue 2020***
Autorizzazione del Tribunale di Bologna n. 7702 dell'11 ottobre 2006
Authorization of the Court of Bologna n. 7702 of 11th October 2006

Proprietario / ***Owner***
Società Speleologica Italiana

Direttore Responsabile / ***Editor in chief***
Stefano Saj

Direttore Editoriale / ***Editorial Director***
Andrea De Pascale

Sede della Redazione / ***Editorial office***
c/o Andrea De Pascale - Corso Magenta, 29/2 - 16125 Genova, Italia
andreadepascale@libero.it

Composizione e impaginazione / ***Composition and layout***
Fausto Bianchi, Enrico Maria Sacchi

Copertina / ***Cover***
Cisterna il Palombaro Lungo a Matera, Basilicata, Italia (foto: Archivio Antros – Matera)
Palombaro Lungo water tank in Matera, Basilicata, Italy (photo: Antros Archive – Matera)

Quarta di copertina / ***Back cover***
Chiesa K4c a Göreme, Cappadocia, Turchia (foto: Archivio Centro Studi Sotterranei – Genova)
K4c church in Göreme, Cappadocia, Turkey (photo: Centre for Underground Study Archive – Genoa)

Prezzo di copertina / ***Cover price***
Euro 25,00

Tipografia / ***Print***
A.G.E. s.r.l. – Via della Stazione, 41 - 61029 Urbino (PU) - Italia - Tel. +39 0722 328756

The underground cisterns of Cisternone at Formia and Palombaro at Matera: places of identity between safeguard, fruition and enhancement

Le cisterne sotterranee del Cisternone di Formia e del Palombaro di Matera: luoghi identitari fra salvaguardia, fruizione e valorizzazione

Tiziana Vitolo[1]

Abstract

This paper, as already experienced through other research activities on cultural heritage in the Mediterranean area focusing on the *sense of place*, will use the social, historical and economic reconstruction to generate and manage the knowledge of the places selected in order to facilitate their use and contribute to their development. The methodology adopted aims to highlight the cultural vitality and the identity of these places for the benefit of tourists and citizens. The case studies were identified by their nature and on the basis of the substantial continuity of the documents starting from the Greek and Roman ages up to modern times. Further, their position in the historical center of the cities, makes them veritable hubs, still poorly understood, used and valued, and that can be subject to systemic research aimed to enrich the available documentation. Methodologically, a preliminary analysis will be carried out to identify the characteristics and the functions of these places. In a second phase, a diachronic historical reconstruction of the sites studied and of the surrounding areas will be carried out to provide an articulated knowledge of the sites and of their secular stratifications that are still recognizable today.

Key word: artificial cavity, cisterns, community, society, identity, territory.

Riassunto

Il contributo, come già sperimentato nell'ambito delle attività di ricerca condotte ed inerenti il patrimonio culturale su scala mediterranea, focalizzandosi sul "senso del luogo", adopererà la ricostruzione sociale, storica ed economica per generare e gestire la conoscenza dei luoghi prescelti per l'analisi al fine di agevolarne la fruizione e contribuire alla valorizzazione. La metodologia adottata ha lo scopo di mettere in risalto la vitalità culturale e l'identità di questi luoghi a vantaggio dei turisti e dei cittadini. I casi studio sono stati identificati per le loro caratteristiche ed in quanto raccontano una sostanziale continuità documentale dall'età greco-romana ai tempi moderni. Inoltre, la loro posizione nel centro antico delle città, li rende veri e propri *hub* ancora poco conosciuti, fruiti e valorizzati, e possono essere oggetto di ricerche sistemiche tese ad arricchire la documentazione disponibile. Metodologicamente verrà condotta in via preliminare un'analisi tesa ad individuare le caratteristiche e le funzioni di questi luoghi e contestualmente si procederà ad una ricostruzione storica diacronica dei siti oggetto di studio e delle aree circostanti, finalizzata a fornire un'articolata conoscenza dei siti e delle stratificazioni secolari che tuttora vi si riconoscono.

Parole chiave: cavità artificiali, cisterne, comunità, società, identità, territorio.

Introduction

In recent years, knowledge dissemination activities have been increasingly focusing on the definition of methodologies for the reconstruction of the evolution of historical centers, and for the recovery of significant information on material and immaterial cultural heritage, with particular emphasis on the related archaeological heritage and artistic history. Historical centers are approached as vital organisms, with a unique and revealing history through which it is possible to analyze the signs left by each successive generation. In this sense, they constitute a living archive of our past and, at the same time, a constant reference for the present on which to build the future; this because, in addition to the visible characteristics of a territory,

[1] Institute of Studies on the Mediterranean (ISMed), National Research Council of Italy (CNR), Naples, Italy – tiziana.vitolo@ismed.cnr.it

the historical centers contain strongly interconnected relations between them.
They also reveal the nature of the relationships between the human activities and the surrounding environment, the evolution over time and space, the identity that distinguishes and differentiates them from all others, identifies local cultures, uses and customs, traditions and collective memory as sets of physical, biological, anthropic, social, cultural, historical, economic, testimonial and aesthetic elements.
One of the objectives of the study focuses on the transmission of the essence of the city. To this aim, studies related to the knowledge, management, use and enhancement of cultural heritage are increasingly carried out with a holistic approach, which includes the protection of cultural identity. Raising awareness and improving knowledge, increases in creativity and leads to more effective actions by administrators and politicians, as well as by citizens and social partners. Urbanist Nan Ellin, in her book *Integral Urbanism* (Ellin, 2006), states that currently, once the old patterns are overcome, it is necessary to identify and propose new models aimed at improving the quality of urban life according to an "integral", fundamentally ecological, approach.
The work to be conducted should be aimed at the reintegration of urban environments, considering places as aspects of wider sites and environments which boundaries are less rigid. Therefore, it is a matter of connecting spaces within the city, but also of activities, objectives and subjects united by the *sense of place* that, as claimed by geographers Doreen Massey, Patt Jess and Gillian Rose, is closely connected with the development of the sense of belonging and, therefore, of active transformation of the space in general, but also of the urban one. As Rose claims, *«[...] as much as the sense of place can be very personal, it is not entirely the result of one's feelings and meanings; rather, such feelings and meanings are formed largely by the social, cultural and economic circumstances in which individuals find themselves»* (Rose, 2001).
On the other hand, as pointed out by Rachele Borghi, the *sense of place* is *"the result of a dialectic between different discourses that obviously do not have the same strength and legitimacy in the debate"* and it is for this *"in some way inextricably linked to relations of social power"* (Borghi, 2007). Precisely for this reason, therefore, enhancing and making accessible a place full of history by stimulating curiosity, awareness, knowledge and, consequently, the love of the place, is a commitment that finds positive feedback in public administrators, citizens and visitors. In this perspective, the *sense of place* translates into a strengthening of identity, awareness of the past and a desire to share common values for the construction of a better future.

The case study of the Cisternone in Formia

The progressive expansion of the urban fabric of Rome mainly resulted from the increase in population, due by the emigration fluxes from other provinces and from the countryside, of people in search of work within the vast province. In principle, the province coincides with the current Latium, excluding the northern area of Rieti and the southern area of Gaeta and Formia, still characterized by traditional productive structures and by the consolidated social pyramid. Here, the problems of the territory appeared urgent, but actually they began to show unequivocal signs of change even in traditionally stable provinces.
Formia is an Italian town, located in the province of Latina (Latium region) and derives its name from the Greek *Hormiae, Ὁρμιαι*, a peaceful landing sheltered from the opposite gulf. Thanks to its position on the sea, protected from Gaeta to the west and from the hills behind it, Formia has enviable climatic conditions, which makes it a popular tourist destination. It was founded in the Greek era by the Laconi (in Greek Ορμίαι Hormai).
In Roman times it was called Formiae (called Hormia or Ormiai for the excellent landing). Through here passed the Appian way, also famous as "The Queen of Roads" (*regina viarum*).
Located right in the middle of the Gulf of Gaeta, Formia has origins that are lost in the myth and are linked to the legend of Troy and to Ulysses' wandering on their way back from his expeditions. Formia was a very popular tourist resort in Roman times, as evidenced by the numerous remains of villas, among which were those of Mamurra and Mecenate.
On this stretch of the gulf, Cicero built one of his favorite country houses, the Castellone. Unfortunately, he was killed right there, in one of its favorite places, by Antonio in December 43 BC while he was trying to escape the proscriptions.
After the fall of the Western Roman Empire, Formia was sacked and, after the fall of the barbarians and the Greek-Gothic war, its inhabitants fled to the nearby hills, depopulating the town and then dividing into two separated settlements, which later became the suburbs of Gaeta. The maritime locality of Mola di Gaeta took its name from the mills near which Charles II of Anjou erected a fortification at the end of the 13th century. The other locality is the hilly area of Castellone. The name Castellone derives from the castle (Castel Leone, Castel Lione and, finally, Castellone) built by Onorato I Caetani, count of Fondi, around the second half of the 14th century.
The Roman Cistern, starting from the 1st century BC on, became one of the places to be seen in the Municipality of Formia (fig. 2). It is a hypogeum hydraulic structure, perfectly preserved, built in the 1st century BC for collecting the waters that flowed from the hills above Santa Maria La Noce and for the water supply of the city through a high engineering system. The Roman Cisternone is a large tank (65m by 25m), with an irregular plan characterized by four naves and covered with 6m thick cross vaults supported by sixty 6.5m high columns. Its total area reaches 1200 square meters and has a maximum capacity of 7000 cubic meters.
Recently, an important and complex restoration work was carried out, which lasted five years, to free the

Fig. 1 – The octagonal tower of the “Castellone” in Formia (photo: T. Vitolo).

Fig. 1 – La Torre ottagonale di Castellone a Formia (photo: T. Vitolo).

Fig. 2 – Cisternone in Formia (photo: T. Vitolo).
Fig. 2 – Cisternone di Formia (foto: T. Vitolo).

place from the mud that had settled on the bottom, and thus open this important testimony of the Roman era to the public. This Roman urban cistern has been, for more than a century, the largest in the world and is one of the largest remaining Roman hydraulic structures with an underground irregular plan.
It was most likely built when the expansion of the city and the construction of public buildings required an aqueduct, as often happened in past times (Ashby, 1935; Judson & Kahane, 1963; Hodge, 1992; Parise *et al.*, 2009). It was located on the top of the Arce, today Castellone district, along the inner side of the primitive fortification wall and served as the center for the collection of water from the hills above S. Maria la Noce from where it was redistributed through an ingenious water network.
The grandeur of the hydraulic structure is confirmed by its impressive numbers: area of 1,200 square meters, height 7.5 meters, 7,000 m^3 capacity, longer side 64,90 meters, max width 25 meters, 53 central pillars for three naves, plus 36 more pillars leaning against the perimeter walls. It worked until the mid-1800s and allegedly also served to feed a smaller Bourbon cistern in Piazza S. Teresa with an area of approximately 250 square meters. The fact that this structure was designed underground stems from a technical motivation. Indeed, due to their very characteristics, underground cisterns are obviously better suited to withstand the lateral thrusts of a large body of water (Laureano, 2001).
A comparison is often made between this structure and two other similar ones. It is believed that this Cistern is the oldest and the third in the world, with reference to the size, after that of Yerbatan in Istanbul and the Piscina Mirabile of Bacoli, Miseno (fig. 3).
The comparison is due more to the constructive characteristics than to the population served, not comparable given that Formia is a small town while the one built in Istanbul served most of the western world at that time.
The Roman Cistern of Formia worked thanks to two bronze valves that regulated the flow and to an ingenious water network that distributed the collected waters to the city.
Thanks to all the above mentioned elements, the Cisternone is worldwide known as the Roman "underground basilica".
Its restoration consisted in a long and complex process, due to its hypogean location, with the extraction of 6000 m^3 of mud that had formed a thin and permeable sediment, difficult to dig due to its density, which caused the machinery to sink. Furthermore, the urban

Fig. 3. Cisternone in Formia (photo: T. Vitolo).
Fig. 3. Cisternone di Formia (foto: T. Vitolo).

morphology of the Castellone area does not facilitate crossing of the means of transport for waste disposal. Fortunately, thanks to the sediment the structure was preserved virtually intact. The major work, following the excavation, consisted mostly in a thorough cleaning and the arrangement for access to the public.

The case study of the Palombaro Lungo

The Palombaro Lungo is a cathedral-shaped cistern, among the most impressive in Italy. It is one of the main attractions of the Sassi of Matera (fig. 4).
The pipes used to supply the fountains and the baths were covered with lead and the person who supervised the operations was the *plumbarius*, a term that derives from the Latin and used to define also the water collection well, hence the origin of the name Palombaro. The water works included the beautiful Ferdinandea fountain, which more than an aesthetic feature had the function to satisfy the water demand.
The Palombaro Lungo is situated in the central place of the city of Matera, under the main square of the city. Inside there are arches dug into the existing rock and, until a few decades ago, being the largest water tank in the city, guaranteed the supply of water to

Fig. 4 – Palombaro Lungo at Matera, inside view (photo: N. Colucci, after Giordano, 2015).
Fig. 4 – Palombaro Lungo in Matera, interno (foto: N. Colucci, tratta da Giordano, 2015).

Fig. 5 – Entrance to the Palombaro Lungo at Matera (photo: T. Vitolo).
Fig. 5 – Ingresso del Palombaro Lungo a Matera (foto: T. Vitolo)

the citizens of Matera (fig. 5). The peculiarity of this large water reserve also lies in its central location in the city, in the oldest and most hidden part, the most secret and rich in suggestion, able to tell and explain the true nature of this unique urban settlement to the world (Varriale, 2019).
In the background of the cistern stands the rupestrian church of the Holy Spirit which occupies the area that extends under the square to the even more impressive palace of the Annunziata, once the seat of a convent. Thanks to its size, the Palombaro cistern had long supplied the houses of the 18th century city known as "Piano". It is about 15 meters high and can reach a capacity of about 5 million liters of water.
As a result of the increase in population, the expansion of the city and the growing demand for water, the original cistern has undergone numerous changes over time to obtain greater capacity. Towards the 7-8th centuries, following the urbanization of the historic center called Piano, the building typology changed its characteristics, compared to the traditional one of the historical Rione Sassi. In fact, originally these ancient districts consisted of small housing units equipped with single rain and spring water collection tanks, through a system of communicating vessels, *canaletti* and gutters (Laureano, 1993; Parise & Sammarco, 2015).
The water of the natural aquifer, despite the deviations suffered over the centuries, continues today to feed the Palombaro. It flows in an adjacent room and after being absorbed by the rock, it flows through the walls and to the bottom. The urbanization process, and consequently the need for a public tank, began towards the end of the 16th century. Incredibly, this work was obtained solely through manual labor during a time span of almost 300 years. A detail that consecrates it as a true masterpiece of hydraulic engineering, as well as one of the largest cisterns in the world; not by chance it is also referred to as *"Duomo d'acqua"* and "Cathedral of water".
The new construction of multi-story buildings and the increase in the resident population made a greater water supply necessary, and for this reason a public water system was built. Over the centuries, however, due to the increase in population, some cisterns were transformed into dwellings, and consequently the supply problems became urgent. To meet this need, an actual urban water storage system was created to serve the population at the end of the 16th century. Work on the system began in the area of the old *fondaco di mezzo* (currently Piazza Vittorio Veneto), with the aim of building the so-called *"Palombari"* (water reserves). It occurred in this way that the original construction, consisting of a single large tank, was completed in 1848. Later on, it underwent several expansions, the last of which was documented in 1870.

The cistern was completed in 1882, based on a project by Ing. Rosi, linking two levels of caves under the square, also incorporating pre-existing cisterns: 15m high, this structure is able to contain 5,000,000 liters of water. The excess water, which came from the Lapillo or Castello hill, was conveyed by the monumental Ferdinand fountain, and then absorbed by the rocky walls and gushed inward through the bottom. Carved entirely by hand during a period of almost three hundred years, the Palombaro was waterproofed by covering the walls with a particular plaster called *"coccio pesto*.

Under the square, there is another similar structure and the water was collected by lowering buckets into holes present on the square floor (Fig. 7).

Abandoned after the construction of the Apulian Aqueduct, it was accidentally re-discovered in the 1990s during the redevelopment works of the square. Today it represents one of the most visited attractions of the city of Matera. The Palombaro constitutes a hydraulic work of inestimable value that demonstrates the results of human adaptation, through intelligence, to the environmental difficulties.

The extraordinary uniqueness of this mechanism of preservation and conservation of a primary good such as water was one of the aspects that contributed most to the inclusion of the Sassi as an urban ecosystem among UNESCO World Heritage Sites.

Subsequently, with the construction of the aqueduct during the fascist period in 1926-27, the Palombaro Lungo became obsolete, and in time forgotten along with the complex system of canals and cisterns that for centuries had contributed to the water supply of the Matera community. As in the best romantic stories, the Palombaro Lungo is today completely full of water. An incredible happy ending that restored to the city of Matera a fundamental piece of its rich and complex history.

Conclusions

In recent years, studies on the history of places have been divided into different extremely broad lines of investigation, thus allowing the choice of the most suitable dimension for restoring the identity of the places studied, in line with one's own perspective of analysis and scientific interest. Through the stimuli coming from methodologies borrowed from the social sciences and anthropology, scholars have conducted studies experimented measuring themselves against with different spaces or "places", physical, geopolitical and anthropic, according to the conception of the French anthropologist Marc Augè (2002), obtaining stimulating and innovative analyzes.

The different methodological and interpretative approaches, however, have favored the political-administrative dimension which, despite some doubts, seems to remain as the easiest option.

The enriched resulting debate, in addition to incorporating new cognitive results, has experimented recent and original highly multi-disciplinary methodological approaches. The very nature of the analyses which have these places as an object of study, in fact, suggested to scholars the comparison between themes of various and different nature.

The political and economic dimension has proved to be absolutely necessary to grasp the relationships between the political-administrative class and the problems and demands of the territory. The social and environmental dimension, on the other hand, is preferable when examining the problems of the territory, conceived as a spatial, natural or built environment in which people live. It is for this reason that scholars of human geography and landscape methodologically focused on long-term analyses, able to provide an effective contribution to outline changes in future scenarios, and integrating elements from research fields traditionally entrusted to political and social historians into their studies.

The context thus configured is not limited only to a historical-political analysis, and is not even determined solely by environmental conditions, but, due to its characteristics, requires a multi-disciplinary approach. In fact, for scholars of historical disciplines it is important to take into account the characteristics of the territory and its natural and anthropological resistance to change; for political scientists, on the other hand, it is essential to understand the socio-political reasons and the economic interests matured over time and placed at the base of the choices of innovation or conservation adopted by public administrators.

Further insight can result also through a mutual collaboration between political and social historians, and geographers and scholars of the environment and the territory. In this perspective the case studies examined were identified for their characteristics, since they represent a substantial documentary and continuity from the Greek-Roman age to modern times. Moreover, their position in the ancient center of the respective cities makes them real hubs even today, so that they could be the object of systemic research aimed at enriching the available documentation.

The analysis carried out on the Cisternone and Palombaro cisterns confirms the close link existing between cultural attractors and the territory to the need to invest more and more in the creative cultural industry so that the strong potential expressed by the historical centers is not lost. The point is that valorisation remains the weak aspect of the predominant system that is struggling to connect protection with valorization, systematically consolidating the integrative aspects of the historic centers.

References

Ashby T., 1935, *The aqueducts of ancient Rome*. Clarendon Press, Oxford.

Augè M., 2012, *Non luoghi, introduzione ad una antropologia della surmodernità*. Eléuthera, Milano.

Bauman Z., 2005, *Globalizzazione e geo-localizzazione*. Armando Editore, Roma.

Bertini A., Caruso I., Vitolo T., 2011, *La pianificazione strategica e il management urbano: il territorio come sistema*. In: Moccia F.D. (ed), Urbanistica e politica. E.S.I., Napoli, pp. 613-620.

Borghi R., 2007, *I post-colonial studies nella geografia contemporanea: ipotesi di ricerca*. I Lunedì della Geografia Cafoscarina, 2007, HAL Id: hal-01482827 https://hal.archives-ouvertes.fr/hal-01482827/document (accessed on 13th December 2019).

Caruso I., Vitolo T., 2009, *Identità collettive e governo del territorio nelle aree urbane. Dinamiche plurali europee e mediterranee*. In: Moccia F.D. (ed.), I valori in urbanistica tra etica ed estetica. E. S. I., Napoli, pp. 223-231.

Ellin N., 2006, *Integral Urbanism*. Routledge, Taylor & Francis Group, New York, London.

Giffinger R., Kraman H., Fertner C., Kalasek R., Pichler-Milanovic N., Meijers E., 2007, *Smart Cities - Ranking of European medium-sized cities*. Centre of Regional Science (SRF), University of Technology, Vienna, Final report Edited by the Centre of Regional Science, Vienna UT www.smart-cities.eu October 2007.

Giordano A. (ed.), 2015, *Matera Cityscape. La città nascosta*. Ediz.Italiana Libria, Melfi.

Hodge A.T., 1992, *Roman aqueducts and water supply*. Bristol Classical Press, London.

Judson S., Kahane A., 1963, *Underground Drainageways in Southern Etruria and Northern Latium.* Papers of the British School at Rome, vol. 31 (1), pp. 74-99.

Laureano P., 1993, *Giardini di pietra.* Bollati Boringhieri, Torino.

Laureano P., 2001, *Water atlas. Traditional knowledge to combat desertification*. Bollati Boringhieri, Torino.

Parise M., Sammarco M., 2015, *The historical use of water resources in karst*. Environmental Earth Sciences, vol. 74, pp. 143-152.

Parise M., Bixio R., Burri E., Caloi V., Del Prete S., Galeazzi C., Germani C., Guglia P., Meneghini M., Sammarco M., 2009, *The map of ancient underground aqueducts: a nation-wide project by the Italian Speleological Society*. Proceedings 15th Int. Congress Speleology, Kerrville (Texas, USA), vol. 3, pp. 2027-2032.

Rose G., 1995, *Place and Identity: a sense of place*. In: D. Massey, P. Jess (eds.) A Place in the World? Places, Cultures and Globalization. Milton Keynes: Open University/Oxford University Press, pp. 88-106.

Spadoni S., Rossi R., Tariffi F., 2014, *Solution for cultural experience in places of elective supermodernity*,
https://www.researchgate.net/publication/262559198_NeoLuoghi_a_Solution_for_Cultural_Experience_in_Places_of_Elective_Super-modernity (accessed on 4th December 2019).

Streitz N.A., 2010, *Smart Future Initiative*. Convegno Fondazione Ugo Bordoni “Smart Hybrid Cities: Designing our Future Urban Environments”, Centro Congressi Palazzo Rospigliosi, Roma 30.09.2010, http://www.smart-future.net (accessed on 11th December 2019).

Varriale R., 2019, *Re-inventing underground space in Matera*. Heritage, vol. 2, pp. 1070-1084.