

Hypogea 2015

Proceedings of International Congress of Speleology in Artificial Cavities
Italy, Rome, March 11/17 - 2015



EDITORS

Mario Parise

Carla Galeazzi, Roberto Bixio, Carlo Germani



A NEW STRETCH OF THE *TURRIS LIBISONIS* AQUEDUCT IN PUNTA DI LU CAPPOTTU (PORTO TORRES, SASSARI, SARDINIA): PRELIMINARY CONSIDERATIONS AND RECENT ACKNOWLEDGMENTS

Pier Paolo Dore ¹, Giuseppe Piras ²

¹ Gruppo Speleo Ambientale Sassari - pierpa.dore@hotmail.it

² University of Sassari - inonis@tiscali.it

Abstract

On May 2, 2013, in a site called “Punta di Lu Cappottu”, close to the outskirts of Porto Torres (Sassari, Sardinia), it has been found a new stretch of the roman aqueduct which supplied water to the ancient *colonia* of *Turris Libisonis*. The new stretch is 106 m-long and consists of a vertical inspection shaft (*lumen*), an underground *specus* and an uncovered channel with rectangular settling basin (*piscina limaria*) used to control and clean the water of the sediments. Very recently an unknown stretch starting from the vertical inspection shaft and going to N-NE direction has been investigated. This study summarizes some preliminary results concerning the discovery and proposes new hypothesis about the roman aqueduct’s course.

Keywords: *Turris Libisonis*, Sardinia, Roman aqueduct, *specus*, Porto Torres, Su Crucifissu Mannu, Atrio Metropoli.

Riassunto

Nel maggio 2013, in seguito a sopralluoghi effettuati dalle associazioni culturali ETNOS ed ATENA Trekking per l’organizzazione della 2a edizione dell’«ArcheoBioTrek», è stato individuato nel Comune di Porto Torres (SS) un inedito tratto dell’acquedotto della colonia di *Turris Libisonis*. L’acquedotto trasportava le acque delle sorgenti ubicate in agro di Sassari fino alla colonia romana, fiorente città dotata di rilevanti strutture termali. Il nuovo tratto emerso è lungo in totale circa 180 m ed è costituito da uno *specus* intervallato da un *lumen* e porzioni aeree ancora ben conservate. Dal *lumen* è possibile accedere allo *specus* e proseguire sia in direzione O-NO (attraverso il segmento denominato per comodità “*specus orientale*”) sia verso E-SE (segmento denominato “*specus di monte*”). Il primo segmento è uno stretto cunicolo semirettilineo lungo circa 33 m mentre il secondo, lungo oltre 70 m, presenta in alcuni punti una copertura ad embrici. Procedendo invece dall’esterno verso il centro della struttura è possibile accedere allo “*specus occidentale*”, segmento che prosegue in sotterraneo per oltre 43 m e si conclude con quella che parrebbe essere una *piscina limaria*. Le ricognizioni di superficie svolte nel territorio comunale di Porto Torres hanno altresì evidenziato l’esistenza di altre strutture verosimilmente collegabili all’acquedotto romano. Tali ritrovamenti consentono di modificare il tracciato sino ad oggi ipotizzato dagli studiosi, spostandolo molto più a SE del centro urbano della colonia rispetto a quanto fin qui ritenuto.

Parole chiave: *Turris Libisonis*, Sardegna, acquedotto Romano, *specus*, Porto Torres, Su Crucifissu Mannu, Atrio Metropoli.

Introduction

The discovery of a new aqueduct stretch of the *colonia* of *Turris Libisonis* took place as part of the initiatives put in place for the organization of the 2nd edition of “ArcheoBioTrek”, an event created and promoted by the cultural and local associations ATENA Trekking and ETNOS which provides a trek along the lesser-known archaeological and natural sites of the municipality of Porto Torres (Sassari province, Sardinia, Italy).

Along one of these routes during site inspection and cleaning, in the area called Punta di Lu Cappottu (at the E outskirts of the city), a completely new and unexpected portion of the aqueduct has come to light. The discovery is located precisely at the top of the small plateau¹ that rises about 55 meters above sea

level along the southern side of the pine forest of Abbacurrente and extends for hundreds of meters in a western direction to the place where the *Grutti di maimmaru* open, that is natural cavities adapted by man for agricultural purposes² (Fig. 1).

It is on this plateau, occupied by stations soldiers from the Second World War, which in the bushes and the thick vegetation of the Mediterranean showed the remains of structures at the surface and groundwater relevant to the aqueduct of the colony³.

generally to grain) and forage plants.

2) IGM, *Carta d’Italia*, scale 1:25000, ed. 1^a, F 179 II NE – La Crucca (Long. 4°01’31,9” – Lat. 40°49’37,8”). Also documented with names *Grotta di Maimaru* and *Grotte di lu Maimaru*. Located approximately 400 m SW of the small church of *Santu Bainzu Ischabizzaddu* (or *Balai Lontano*), at the base of a limestone cliff, the cave has a length of 28 m and a development of 34 m. Its first part, up to 12 m from the entrance, is artificial (in MUCEDDA & COSSU, 1984, p. 19 this reconstruction is ascribed hypothetically to Roman times), while the inner part is natural. The cavity is used as a shelter for farms, scrap and agricultural equipment.

3) The opinion given by prof. A. Murziani, a specialist in bunkers

1) IGM, *Carta d’Italia*, scale 1:25000, ed. 1^a, F 179 II NE – La Crucca (Long. 4°01’20,3” – Lat. 40°49’19,5”). The plateau in the local dialect it is called *Salthu di lu cappottu*, microtoponym attributable to the change in elevation of about twenty meters between the ridge and its southern slopes, and traversed by a long gully whose land, currently and in the past (the sources provide oral testimonies that go back to the 20s of the last century), has been designed for growing corn (or more

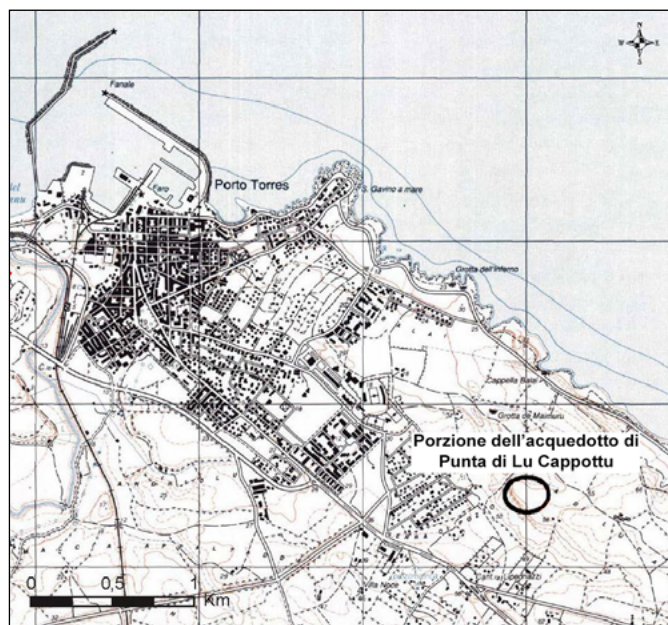


Fig. 1: paper of the survey area.

Fig. 1: carta dell'area di indagine.

Geographical and geological setting of the area

The area on which the archaeological investigations are concentrated is identified as the plain Turritana included in the municipality of Porto Torres.

The area is geographically included in the topographic maps of the Military Geographic Institute, Series 25, 441 Porto Torres and 458 La Crucca.

The aqueduct that supplied water to the *colonia* of *Turris Libisonis* ran along the vast plain of Nurra, whilst Sassari is located in NW Sardinia.

The plain, consisting of a low plateau leveled by the erosive action, extends from the town of Sassari up at the Pond N of Platamona going to close with the peninsula of Stintino in the NW and with the city of Alghero to the E.

The North-West half of the plain borders with the sea. The coastline is characterized by an alternating of pocket beaches, generally composed of pebbles, and steep sea cliffs, the highest of which is Punta Cristallo (300 mt a.s.l.).

In the inner part there are several mountain ranges, oriented N-S and E-W, whose highest peak is represented by Mt. Forte with its 464 m a.s.l.

The Nurra is a region rich in water, has several ponds such as Pond Pilo, Platamona, Casaraccio of Calik and

of WWII, allowed us to reject the initial idea, according to which the channels spotted on the ground – almost completely covered and concealed by the Mediterranean maquis – could be related to the structures of the military post XVI. The evidence that the finds could be associated to the aqueduct of the ancient *Turris Libisonis*, came as soon as the flashes of our cameras enlightened the narrow openings among the rocks, thus revealing the underground tunnels. A detailed report was consequently addressed to the Superintendence of Archaeological Heritage for the provinces of Nuoro and Sassari, which ordered an on the spot inspection, carried out by the staff of the operational headquarter in Porto Torres. Finally, the Superintendence issued us the approval (Prot. n. 8764, September 16th, 2013) to study this site.

the lake of Baratz, as well as several rivers such as the Fiume Santo and the Rio Mannu, the real driving agricultural development of the plain.

The latter is the largest river in the province of Sassari with a circuitous route of about 65 km that begins in the mountains of Ittiri and ends on the beach of Marinella in the municipality of Porto Torres; its catchment area is about 670 square kilometers and it includes several tributaries as the Rio Ertas, the Rio and the Rio Mascari and Rio d'Ottava. The Nurra has a very ancient geological history from Ordovician to the present day. Looking at the rocks that make up this great plain, it can be realized that it took part in many geological events, often very important, which led to the current structure of Sardinia in the middle of the Mediterranean. These events started in the Paleozoic, when Sardinia was joined to Spain and France, in the vicinity of Provence. In the survey area, in the course of the Oligo-Miocene era, a series of tectonic upheavals caused the rotation of the Corsica-Sardinia plate, until it reached the current position in the centre of the Mediterranean sea. As a result of this process Sardinia was affected by extensional and volcanic phenomena that created the "Fossa Sarda", a semi-graben structure stretching from the Gulf of Asinara to the Gulf of Cagliari. Following this period in Sardinia a sedimentary complex developed, to fill the troughs generated by the Oligocene-Miocene tectonic upheavals. This sedimentary sequence of low sea, consisting of sandstone, marl and limestone, was the object of excavation, in order to build the aqueduct and the city of *Turris Libisonis*. The limestone, in particular, extending for almost the whole island, due to its porosity and its easy processing was the most used by the Romans, both in terms of hydraulic engineering than for constructive purposes.

Technical features of the new section of the aqueduct

The portion of the Roman aqueduct discovered has a total length of 179,60 linear meters, currently the longest found in the last 50 years (Fig. 2). The structure detected so far is bounded to the E by a portion of the underground only accessible by a manhole inspections (*lumen*). The underground conduit is divided into two distinct sections (denominated for convenience "eastern *specus*" and "*specus* of mountain"), these two sections have no termination air, the thin layer rocky and the presence of another *lumen* obstructed make the two sections blind.

The second portion includes another part instead of "eastern *specus*", followed by a segment of about 5.30 meters in which the channel, currently without cover and encumbrance of boulders that block almost completely, was in ancient likely be outfitted to ceiling. The "western *specus*" heads instead, keeping the same orientation, to another portion of the surface features of a small rectangular tank that most likely served as a *piscina limaria*⁴.

4) The formula doubtful about a precise assignment of the intended use of the rectangular tank is related to its particular

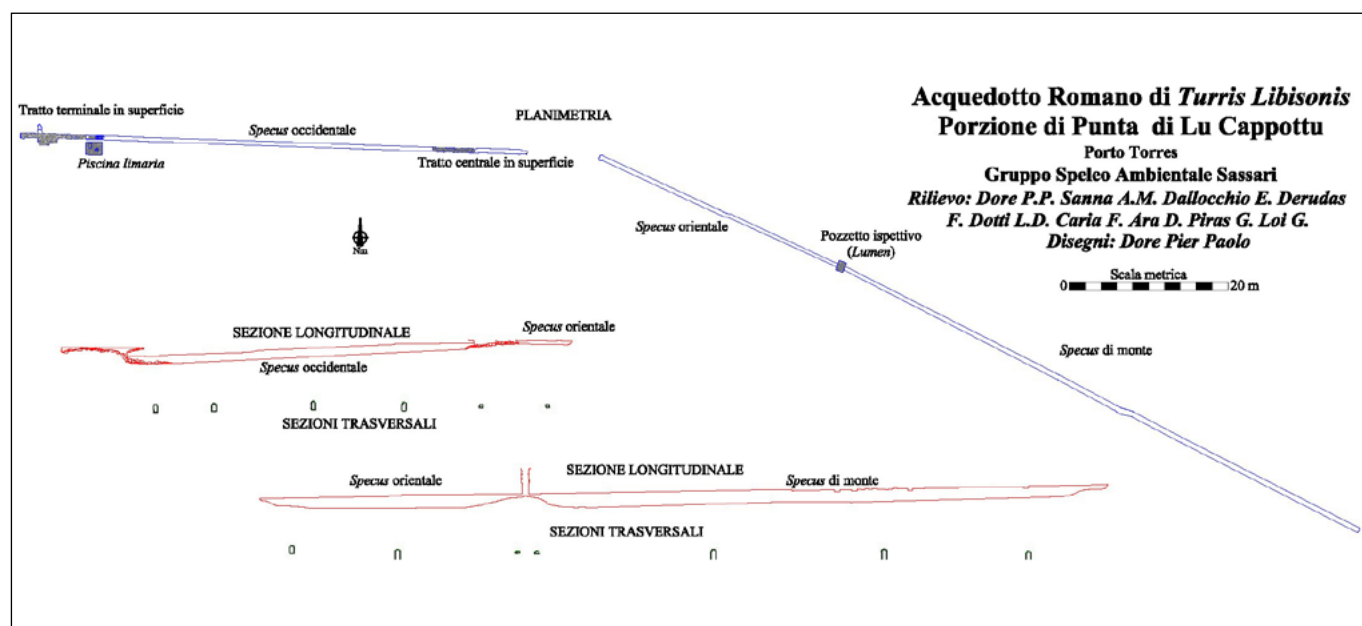


Fig. 2: floor plans of the section of the aqueduct explored.

Fig. 2: planimetrie del tratto di acquedotto esplorato.

The lumen

The first part of the aqueduct to be identified and investigated was that relating to the *lumen* (or *puteus*, *spiraculum*), a cockpit inspection rectangular section (90x120 cm) dug for the realization of *specus* and to allow for aeration and for carrying all activities necessary for its subsequent maintenance⁵ (Fig.3). The opening of the *lumen*, placed at the level of today ground surface, appeared before the cleanup completely obliterated by Mediterranean shrubs and by a large plant of dwarf palm.

The rectangular access appears in some points leveled with well-squared stones and mortar coarse that make it rather homogeneous. The connection with the underground conduit, not previously appreciated, returned visible at a depth of 3.20 meters from the ground following the washout caused by the intense precipitations of the 2013 winter; rains that have made possible the liberation of the natural tunnel by an accumulation of debris (the product of the work of stone clearance of agricultural land use in the surrounding area) that had formed in the course of time, a stony bottom inside of the cockpit.

On the four walls of the lumen, at 1.20 mt from the same depth, a few centimeters wide indentation was

position with respect to the decentralized *specus* with which it seems not to submit, following the remarks made so far, no connection point that puts them in connection. It should nevertheless emphasize the character of preliminaries of this statement, given the existence of a deep layer of underground from which the tank should be free to bring to light the floor level and of course, first and foremost, the simultaneous absence of archaeological investigations that in the future may find that point of connection. On the other hand, the fragments of the coating of hydraulic mortar that still remain on the walls of the tank (see. Infra, in the text), militate for its use just like a *piscina limaria*.

5) The indication of the existence of the well has been provided to the writer by brothers Romano and Mario Chessa.

created. At its corners two small niches were probably carved in order to supply light to the well annulus. Sculpting the soft limestone counter, the walls of the two long sides were spared a series of *pedarole*⁶, partially worn by erosion weathering and damage caused by the falling of the lithic material discharged into the *lumen*. The plant palm has also conveyed its roots with a considerable amount of water that has generated over the years a concretion of calcium carbonate in close proximity of *pedarole* (W side).

At about half of the S wall appears finally a graffiti that plays a M with rods rather wide apart, preceded by a long vertical stretch, leaning to the right, ending in the upper margin with a curl⁷.

6) The *pedarole* discernible are five in number to the side and are placed at a distance of about 40 cm from each other.

7) The sizes, ideal of the elements that make up the graffiti are the following: the vertical measuring 4.7 cm while the M has a width. max of 3.5 cm and a maximum height of 3.2 cm.



Fig. 3: entrance of the lumen.

Fig. 3: ingresso del lumen.



Fig. 4: specus of the mountain.
Fig. 4: *specus di monte*.

As concerns the graffiti, the current state of research is likely to be related generally to post-medieval age. At about 2 feet from the NW access to the lumen, not far from the plant of dwarf palm, a large quantity of fragments of mica schist (some of considerable size beds a few centimeters deep to the floor) is visible in the ground, perhaps relevant to the coverage of the cockpit⁸.

Upstream *specus*

From inside the *lumen* can be accessed with a little commitment within the portion called "*specus* of the mountain". The narrow entrance widens after a few metres, stone deposits, formed from fields tillage during thousands of years, obstruct the *lumen* entrance for 6-7 metres forwards.

Inside the *specus* enlarges (55-60 cm wide) and it becomes easier to walk along its rectilinear corridor (Fig. 4). The barrel vault is well-excavated and the bottom is covered with mud. At about twenty meters from the entrance on the right wall a common part buffered by mortar mixed with small pebbles shows signs of a probably metallic tool: the signs are little

8) Inside the *puteus* among the debris that formed the background of pebbles, was found a slab of the same lithotype, a little less than 30 cm in length.



Fig. 5: signs within the specus of the mountain.
Fig. 5: *segni all'interno dello specus di monte*.

circles with a diameter of 27 mm diameter and two millimeters thick, and a few mm deep impression (Fig. 5). The signs are two, a few cm away from each other, in the range recognize signs of fingers that are etched in the mortar.

Continuing along the *specus*, after a few meters, about 40 cm above the ground, you can see the signs on the opposite side of a pointed chisel square.

Further on, the *specus* makes a slight curve to the left and after a few meters the organogenic limestone is dug, and the aqueduct becomes more cavernous. The structure is reinforced with two blocks⁹ red brick seat wedge and placed on blocks to handle the weight.

After about two meters there is another set of blocks placed for the protection of the vault; the wall at these points is often enriched with mortar, bricks and stones composed mainly of rounded river stones and other stones that do not seem local¹⁰.

Along the succeeding segments, the vault becomes irregular and several metres of fully decayed vault, characterized by fossil compounds, corals and remains of echinoids, come into light. Six metres forward, another series of segments appear more stable and it is possible to go further through almost unimpaired walls, until arriving at about 10 metres from the bottom.

The entire stretch is 70.70 metres long, is straight and its direction turns to N 117°; in many areas completely rebuilt with mortar and pebbles is provided at the bottom of a coating of hydraulic mortar which rises on the walls to a foot, and within a few meters of each other at different heights are perches for your lamps.

The eastern *specus*

Always accessing the *lumen* you can head towards the valley entering a narrow passage to the *specus* that was the natural continuation of the aqueduct. The portion

9) The segments have dimensions of 37 cm to 34 cm and are 5 cm thick, are composed mainly of clay with some matrix including rounded quartz with dimensions of less than 2mm.

10) The pebbles vary in size, often ten centimeters, are quartz pebbles and composition of metamorphic, not typical of the Turritan area are typically rounded and slightly flattened and fluvial origin.

is directed opposite to the first following the N 295° direction.

Cluttered with earth and stones (some of which of great dimension), for over 7 mt, the passage turns into a rectilinear tunnel with an average high of 1.5 metres and a width ranging from 55 to 60 cm.

Continuing towards the central part there is a slight bend to the right; *specus* is entirely covered with hydraulic mortar which rises on the walls to 25-30 cm. The ceiling and walls are not decayed, and there was no evidence or traces of mortar, the only details known are an interlayer weakly decayed typical of local limestone and the presence of evident perches for lamps¹¹ that almost every meter of distance were positioned at various heights from the ground to allow the lighting during the excavation of the tunnel.

It goes straight to the bottom that is completely blocked by a landslide, and ends at 33 metres from the entrance.

Leaving the *specus* and then later from the *lumen* we head towards the open portion that first was observed. In this section you can see the underground access to the western branch that is the natural continuation of the tunnel described above.

This stretch was only measured from the entrance, too narrow to allow the passage to man, but not enough to not be able to observe.

The observable portion of *specus* is measurable for only 6.50 metres, to the point where the canal once again closes inexorably due to a landslide, thus preventing the further investigation in view.

The central section

The air segment currently is completely filled with stones of large size and ground. It has a length of about 5.30 metres and an average width of 50 cm. The maximum depth is visible just over 1 meter. The stretch should perform, probably to the function of the control point of the water, similar to that of the *lumen*, which flowed along the duct. The presence of a groove, and shallow engraved along the top edge of the channel, does suggest the existence in the former of a cover.

The western *specus*

On the W side of the segment is opened, which is also partially occluded by boulders and earth, the mouth of the *specus* underground that continues for more than 43.5 metres with a direction this time turned decidedly to the W by 272° in azimuth and continues underground in the direction of the stretch in surface equipped with a probable *piscina limaria* (Fig. 6). The entrance of the underground channel, made of clay and quite narrow, enlarges after few metres, passing from an average high of 80-90 cm, until reaching 110 cm towards its centre, thus allowing to proceed in a more comfortable posture. While exploring, one cannot but notice its perfect state of conservation, which calcite crust sediments witness the flowing of water. As stated previously, the property



Fig. 6: western *specus*.

Fig. 6: *specus occidentale*.

is accessible only by crawling an entrance 40 cm large and 35 cm high, and is gradually spreading with a maximum cross section of 50 cm; *specus* is viable on knees for the first stretch and then slightly bowed down to the bottom. The gallery high up to one meter is naturally full of plant and animal material, as well as cobwebs and typical troglophile insects. On the walls dug into the limestone, sometimes very compact, signs of chippings left by the workmen who built the conduit are still clearly visible. Also present are faint traces of hydraulic mortar along the 30 cm from the bottom of the tunnel. Along the floor, in the free parts of the calcite crust that covers it, appear in certain points of the small holes, signs of subsidence.

Along the straight path, which briefly bents on itself towards the centre, it is possible to observe the perches for the lamps positioned at about 1 meter from each other. This stretch of *specus* shows a trend with a slight downhill slope¹² and height that progressively tends to shrink to the point that, in order to carry out the exploration you are forced to advance by crawling for more than 5 metres.

The stretch in the pool area with the probable *piscina limaria*

This portion, over 8 metres long, was another open air sector of the aqueduct, used to inspect the duct in order to examine and filter the water from debris gathered along its course (Fig. 7). After a first rectilinear¹³ channel it widens on the S side assuming an irregular shape due to the presence of numerous and sometimes deep steps practiced in the wall of *specus*¹⁴. Near the S side of the duct between the air and the underground stretch, it was made what could be a small *piscina*

12) The slope is estimated at about 1.5 degrees

13) Straight section of length of about 2 metres.

14) On a purely hypothetical, this would seem to refer to a removal of lithic material determined by the reuse of the channel as a function of open pit, function paid over a period not framed in terms of chronological but obviously refers to a later stage to abandonment of the structure.

11) All perches for the lamps are wide between 10 and 15 cm high and about half 5-6 cm always profound, often the bottom is reinforced with mortar to make it more stable for the lamps.

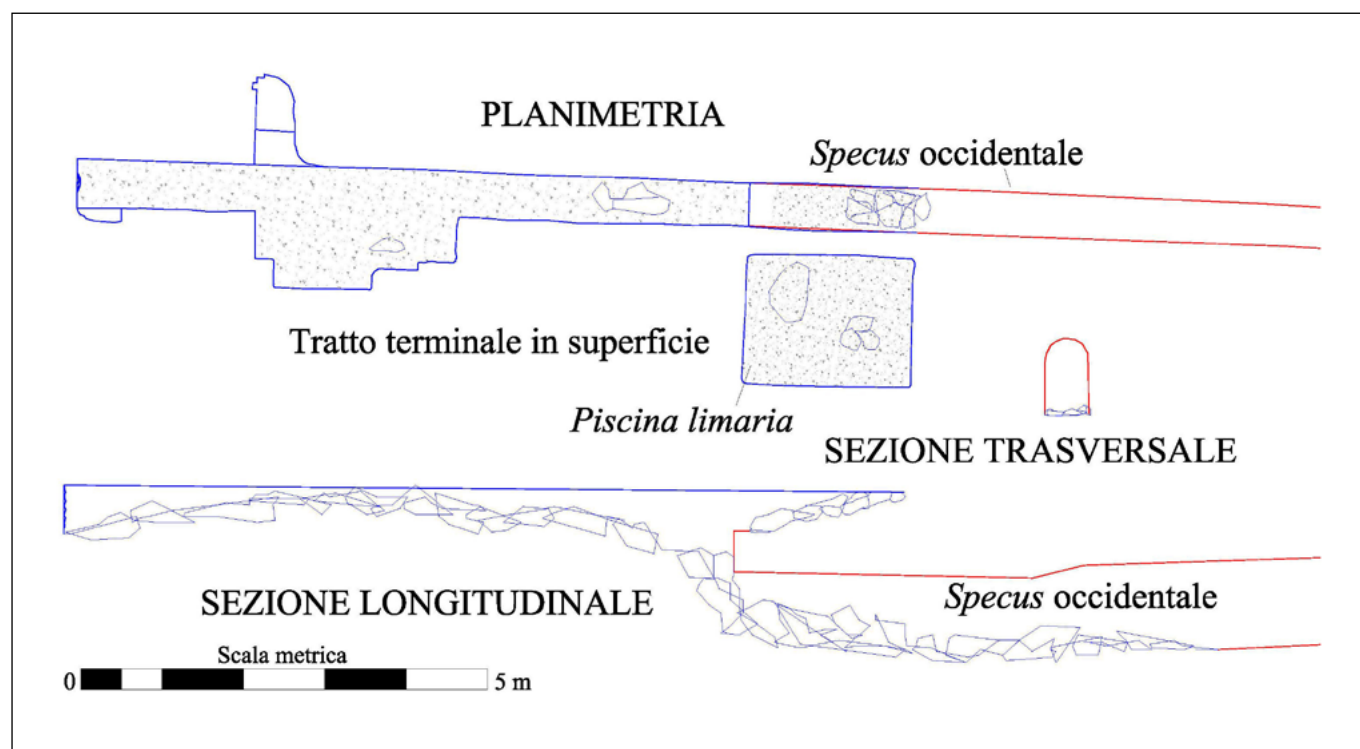


Fig. 7: plan of the piscina limaria.

Fig. 7: planimetria dell'area della piscina limaria.

*limaria*¹⁵. It is a rectangular tank (205x160 cm) that had to be connected to the *specus* underground and serve as a settling basin to facilitate the deposit of impurities in the water by reducing the speed of flow (Fig. 8). The inner walls of the tank, covered with earth to a great extent and still cluttered with boulders and stones, were sealed by a coating of hydraulic mortar of which are preserved in situ four fragments of small size at the corners of the wall time to the N and in the central part of the same¹⁶.

The W end of the air duct ends with another wall, little concreted, which almost certainly gives access to another short section in the basement, still unexplored. In the terminal point of the *specus*, on the S wall, the rocky bank was clad with rectangular blocks of limestone tied together with a thick layer of mortar (two residual rows remain at the top) that formed the inner face.

The final stretch of unexplored underground had to join with another portion of the surface, this time almost certainly placed on arches through which the aqueduct crossing the gully immediately below the area of the discovery of Punta di Lu Cappottu (the difference

between the share of the rise and that the valley is, as mentioned, a little less than twenty metres) and then continue in the direction of the hill overlooking where is the private residence of the family Altobelli (locally known as “the house of the Countess”) and, returning in the basement, connect with the trait came to light in 1988 in the neighborhood of Serra li Pozzi¹⁷.

The centuries-old stone clearance operations and deep plowing conducted along the gully was not possible to identify, in the surface surveys carried out so far, the slightest archaeological evidence of the presence of the arches; on the contrary three broad areas used in ancient times as open quarries have been identified, which may have provided the limestone material used for the construction of the aqueduct¹⁸.

17) On the stretch in the neighborhood of Serra Li Pozzi. See SATTÀ, 2000, pp. 117-8.

18) The first open pit is located approximately 15 meters south of the central section of the aqueduct and covers an entire wall of limestone semicircular shape which reaches a length of about 30 metres. Are evident on the stone surface traces of extraction, with the marks left by the tools used for quarrying of materials and the shapes of the stones extracted. The other two quarries are located instead on the opposite side of the valley, distant as the crow flies, respectively, by the Roman aqueduct about 255 metres and 270 metres. The station is located along the slope below the ground of the private family Altobelli and exploited the natural terracing of the rock wall while the other, located a short distance further north, was opened at the center of a basin and it follows the conformation in amplitude reaching a maximum diameter of just over 25 metres. Here, in addition to the signs of quarrying along the edge of the wall, were left even of the segments already extracted and shaped, ready for transportation to the place of destination.

15) On doubts about its intended use see. *supra*, note 8.

16) These are the size of the fragments of the lining of hydraulic mortar in the wall per masti time in the north:

- NO fragment angle (w. residual max 7.43 cm; h max remaining 13.28 cm);
- Lacerto upper central wall (w. residual max 5.79 cm; h max remaining 6.66 cm);
- Lacerto lower central wall (w. residual max 9.94 cm; h max remaining 10.73 cm);
- NE corner fragment (w. residual max 13.05 cm; h max remaining 21.45 cm).



Fig. 8: piscina limaria.

Fig. 8: piscina limaria.

Structures related to the water found during the researches

After the discovery of this important section of the aqueduct a series of surveys aimed at looking for the possible presence of other structures connected to the water were carried out, to allow us a better understanding on the progress of this important route of water supply. At this regard, even on old reports from users of the land, they found two major surface structures.

The first discovery was made upstream of the new section, on the SW side of the gully in fact, has been reported the existence of an artificial cavity carved into the rock wall¹⁹. The following survey has allowed us to detect the cavity, due to its location; it would be compatible with an entrance to the underground section of the aqueduct of the colony (the one that goes under the present-day neighborhood of Serra Li Pozzi), who was to join with stretch the portion of arches that spanned the gully. The cavity looks like a trench, inverted trapezoidal shape and tapered at the ends, about 6 metres long and about 1.6 metres wide. Oral sources attest that the cavity had access to a long tunnel used during the World War II, as a bomb shelter of luck from the 456th Battery of 90/53 mm cannons stationed just in Punta di Lu Cappottu²⁰.

As a result, the tunnel was used as a storeroom for agricultural commodities by the owners of the surrounding land, while in the period between the 70s and 90s of the last century, the cavity unfortunately became the site of an illegal dump and it was completely filled with glassy waste that today even prevent access²¹. Upstream of the structure important evidence of the passage of the aqueduct passed unnoticed in the

various years of archaeological excavations that have marked these soils.

This structure above the ground is at the center of an archaeological site is very important from the archaeological point of view, the area of Su Crucifissu Mannu; site on which it came to light in 1956, by chance, a prehistoric necropolis explored by Prof. Maria Luisa Ferrarese Ceruti in the years 1972-1980²². Burials of the Nuragic and Roman periods were also found²³. To the Roman period must also be attributed the chariot wheel ruts, with N-S and W-N directions, which deeply plough the calcareous plateau where the necropolis was excavated²⁴.

In the slab of rock, a short distance from the grave XII a rectangular well (160x120 cm) opens, almost completely littered with boulders and stones. The currently visible portion has a depth of only 50 cm, sufficient to allow the detection of the two long sides of the cockpit (N-S oriented) of the niches carved into the walls that seem to be real *pedarole*²⁵.

The shape and dimensions of the cockpit, that at a careful analysis is totally dissimilar in structure to a domus de Janas or other burial of prehistoric or protohistoric, combined with the presence of *pedarole* in the walls, should favor an identification with *lumen* relevant Roman aqueduct. Desirable future archaeological investigations will allow to confirm or deny this conjecture.

The cistern of Atrio Metropoli

The amount of bibliographic data collected together with the various field studies and testimonies of people who have lived in periods prior to the urbanization of the suburbs started in the 70s has allowed us to record a series of data that has been inserted in a GIS.

Overlapping of these themes with modern cartography resulted in showing a number of possible correlations that we have tried to refute. An important aid was provided by an old drawing of the underground stretch of the aqueduct discovered in street of Fontana Vecchia²⁶, explored and recorded by engineer Dr. Sotgia Rovelli in 1923²⁷ and no longer totally visitable because

22) The complex includes 22 ipogeico Domus de Janas of multicellular type and with access to cockpit (except for the tombs VIII, XII and XIII) whose structure dates largely to the Culture of Ozieri. They are, however, also documented burials dating to the later cultures, up to that of Bonuighinu, a period that marks the last moments of the use of domus. Cfr., among others, MAETZKE, 1960, p. 733; CONTU, 1970, p. 436; CONTU, 1972, pp. 473-4; FERRARESE CERUTI, 1976; FERRARESE CERUTI, 1989 and FERRARESE CERUTI, 1992, pp. 17-8.

23) DEMARTIS, 1998, pp. 16-7.

24) DEMARTIS, 1998, p. 16: "It is probable traces of the shipping maybe done with 'hangers' rudimentary building material quarried near the city of Turris Libisonis in Roman times".

25) The *pedarole* that is able to detect, starting from the bottom current, are two for both sides. Have a width of about 20 cm deep and between 8 and 10 cm, spaced approximately 50 cm and placed slightly staggered with respect to the reference axis.

26) SATTÀ, 2000, pp. 133-4 (with extensive bibliography).

27) SATTÀ, 2000, p. 135.

19) The report was made by our friend Romano Chessa.

20) The headquarters of the company was located in the ground where the house is owned by the family Altobelli, in which you can still see the bases that housed anti-aircraft guns and anti-aircraft Ansaldo from 90/53 mm as well as air-raid shelters intended for officers of the Company.

21) Any type of investigation and relief vent can not therefore matter a final remediation of illegal dump. For this purpose, a specific request has been submitted to the competent authorities.

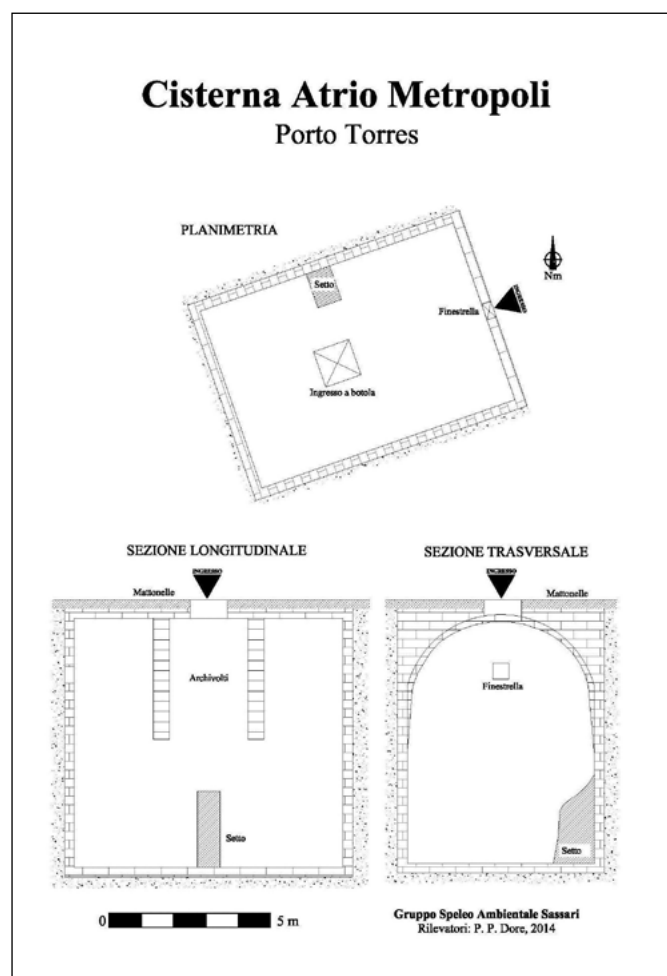


Fig. 9: plans of the tank Atrio Metropoli.

Fig. 9: planimetrie della cisterna di Atrio Metropoli.

of the collapse, which showed that there is an interesting alignment between the offshoot of that portion of the aqueduct and the huge cistern excavated on the hill of Monte Agellu (Fig. 9) as a result of the excavations carried out in its SW area, below the square called Atrio Metropoli (a few metres from the body of the Romanesque basilica).

The excavations carried out between 1989 and 2003 by Prof. Letizia Pani Ermini, as well as those made subsequently by the Superintendence for Archaeological Heritage²⁸, have made it possible to identify and investigate in a rectangular tank by sizeable²⁹ presenting a half of the N side of a small septum. The tank is about 8 metres deep and has a cover with a barrel vault with belts, well-squared blocks of limestone, in which some holes for the supply of rainwater open³⁰. Access to the bottom is covered with *opus signinum*, the interior walls are covered with plaster, while the lunettes are visible in rags made of varying sizes; in the centre of the North-West trap door a rectangular gap opened, subsequently plugged in modern times³¹.

The analysis and possible exploration of this opening,

28) PANI ERMINI, 2006, p. 32, nota 112.

29) About 8,2x5,7 metres.

30) MANCONI, 2001, p. 48.

31) MARCHETTI, 2006b, p. 151.

oriented in the direction of its *specus* street of Fontana Vecchia, could be crucial in order to understand if the alignment shown by the maps corresponds to an actual connection between the two structures. It is necessary, however, that “the reading of the entire archaeological complex of Monte Agellu at the end of the investigation of excavation” has allowed us to ascribe the tank to the early Middle Ages³².

In spite of this date, however, it seems useful to point out here the reference provided in the work’s most famous Islands of the World, printed in Venice in 1590³³, in which the author Thomas Porcacchi, taking part in the Fara³⁴, puts the Basilica of San Gavino as the terminal point of a Roman aqueduct from Sassari.

The delineation of the aqueduct according to new findings.

The discovery of the new stretch of Punta di Lu Cappottu increases significantly the amount of information available to reconstruct the path of the aqueduct in the immediate vicinity of *Turris Libisonis* and at the same time allows to change the path so far suggested moving it more to the SE the urban center of the *colonia* than hitherto believed. The comprehensive study of the monument, published in 2000 by Dr. Maria Chiara Satta³⁵, along with the research conducted by Gian Filippo Orlandi³⁶, have provided a rather detailed

32) PANI ERMINI, 2006, p. 32 e MARCHETTI, 2006a, p. 90. In MANCONI-PANI ERMINI, 2002, p. 292 hypothesis over the High Middle Ages, the chronological fork has been expanded to embrace the eleventh century, in the context of the construction of the basilica.

33) PORCACCHI, 1590, p. 50: “Eravi Torre, ò torrita città Colonia dè Romani, chiamata Turris Libissonis da Tolomeo, vicina al mare da tramontana, & se ne veggono hoggi le ruine à Porto Torre. Evvi poi Sassari città, dove ha principio un’acquedotto d’altezza di forse diciotto palmi, & di lunghezza di dodici miglia fino al tempio di San Gavino; & fu fatto con grande & nobile artificio”. PORCACCHI, 1590, p. 50: “Eravi Torre, ò torrita città Colonia dè Romani, chiamata Turris Libissonis da Tolomeo, vicina al mare da tramontana, & se ne veggono hoggi le ruine à Porto Torre. Evvi poi Sassari città, dove ha principio un’acquedotto d’altezza di forse diciotto palmi, & di lunghezza di dodici miglia fino al tempio di San Gavino; & fu fatto con grande & nobile artificio”. So also SCOTTI, 1650, p. 512.

34) FARA, 1580, 3, *De rebus Sardois*, I, p. 144: “...et aquaeductus altitudinis sex cubitorum et longitudinis 12 millia passuum, per quem fons Aquae Clarae a valle Sancti Martini usque ad urbem Turrium deducebatur, fuit tunc constructus et illius pulcherrimae partes et maximae hucusque extant” e 1, *In Sardiniae Chorographiam*, p. 162: “...fuit multis et amplissimis aedificiis exornata, perenni dapsilique fonte decorata, qui ex Aquis Claris vallis S. ti Martini, insigni 12 m. pass. aquaeducto opere arcuato affabre elaborato, cuius reliquiae adhuc cernuntur, deducebatur”.

35) SATTA, 2000, work which, for reasons of space, here we have chosen to postpone with regard to the detailed description of the individual sectors of manufacturing techniques and documentary sources relating to it.

36) ORLANDI, 1985, pp. 22-33. A job meticulous and precise thanks to intensive reconnaissance of the territory held by the author to whom we owe, among other things, the first mention of the town of Punta di Lu Cappottu among those who were in ancient have been crossed from the aqueduct (p. 27). Orlandi

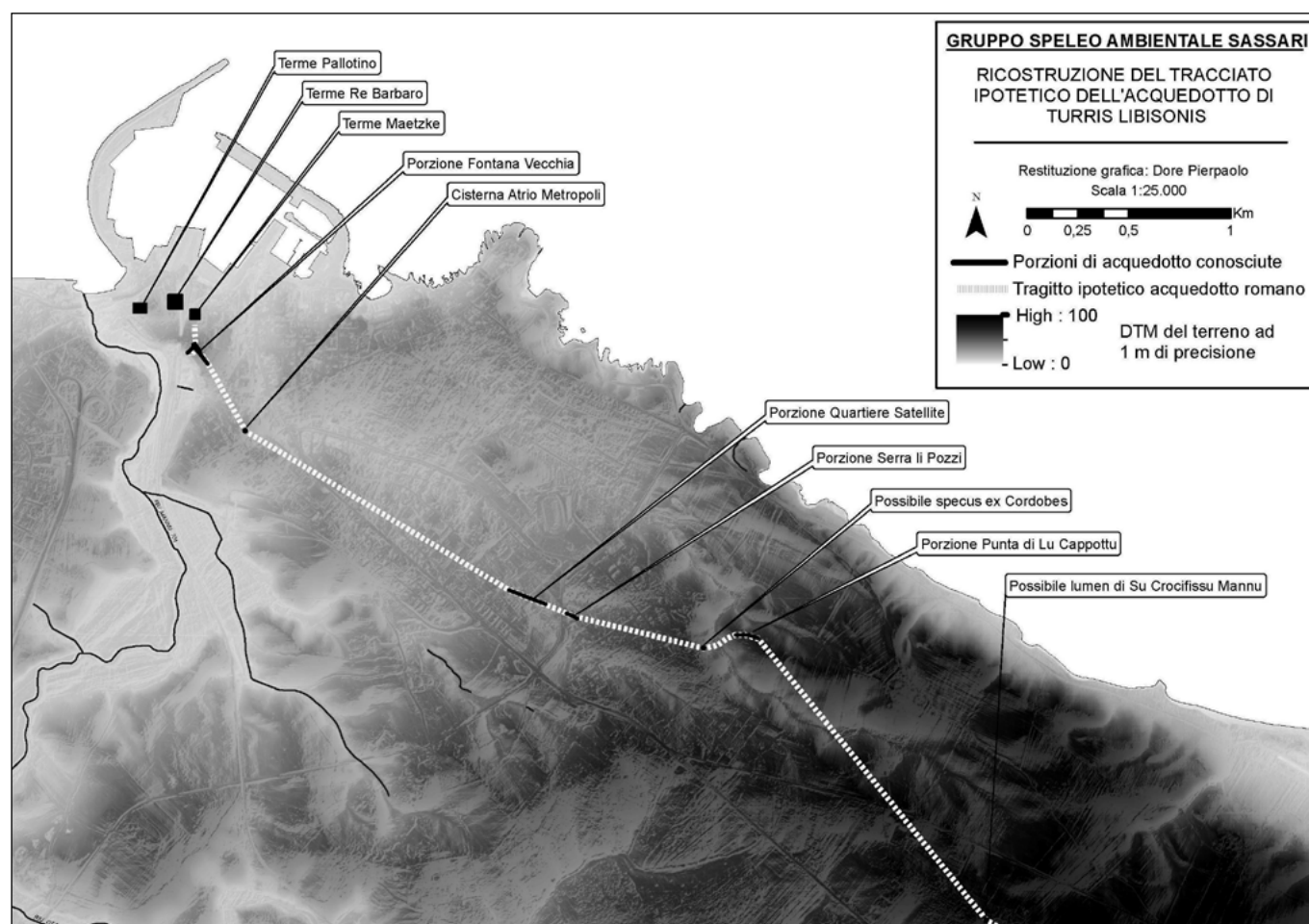


Fig. 10: plant of the finds and the new route of the aqueduct.

Fig. 10: pianta dei ritrovamenti e del nuovo tracciato dell'acquedotto.

picture of the aqueduct.

Currently the aqueduct on the basis of the estimates made on the findings overall length of 26.850 kilometers with 21,660 kilometers of main shaft.

Starting from the power source located in the area surrounding the modern city of Sassari (it is not excluded, however, that there were other contributions of sours along the way)³⁷, from an altitude of about 330 metres a.s.l., the structure seems to follow a trend mostly straight with SE-NW direction, adapting to the morphology of the territory. The only exceptions attested so far, represented by deviations, exist in the sections between the towns of Ottava³⁸ and Pultigali-C. Dore³⁹ and that of the underground section of Serra Li Pozzi⁴⁰.

had traced the origin of this name to the strange interpretation that would give their farmers or travelers of the ruins of the aqueduct survived and are still visible on the ground; ORLANDI, 1985, p. 33.

37) The sources of supply aqueduct identified to date are those from Monte Bianchinu and from the heights of Filigheddu brought water to the valleys of Rosello and San Martino (now known as San Quirico-Eba Ciara) as well as those of Conce-Lu Regnu. Cfr., Among others, SATTÀ GINESU, 1989, pp. 124-5 and CASTELLACCIO, 1996, p. 40.

38) SATTÀ, 2000, pp. 95-105.

39) SATTÀ, 2000, pp. 107 e 109-13

40) Cfr. SATTÀ, 2000, pp. 117-8 and MANCONI, 2001, pp. 33

The structure of water finally ends at 6 metres a.s.l. with a hypothetical hydraulic gradient of 0.015%, within the archaeological *Turris Libisonis* where you can see the remains of some ducts direct to spa facilities that distinguished the Roman landscape (Fig. 10).

The location of some diverticulum and other structures from the Roman era, as well as other identified portions of the aqueduct, had led to believe that the entire structure would "be parallel and at a very short distance from the route of the old road, which is of considerable importance to facilitate the monitoring, maintenance and the work of strengthening and restoration of the aqueduct, when necessary"⁴¹.

This observation is now being questioned in light of the discovery of Punta di Lu Cappottu because of the change in direction from the hypothetical path in *a Turre Karalis* road (in that specific segment roughly corresponds to the current SS 131 "Carlo Felice")⁴² is very significant, as well as means negligible turns out to be the distance determined by the deviation of the route of the aqueduct in the NW direction⁴³.

41) Into SATTÀ, 2000, p. 26; and into SATTÀ GINESU, 1989, p. 125.

42) Sulla *via a Turre* cfr. MASTINO, 2005, pp. 355-369 (with extensive bibliography).

43) The distance as the crow flies between the roadway of the S 131 'Carlo Felice' and the section of the aqueduct place on the plateau of *Salthu di Lu Cappottu* be quantified in approximately 710 metres.

The causes of this deviation from the guideline followed by the ancient road, cannot be inferred from the orography of the area, changes in the significantly more regular in the vicinity of a *Turre Karalis*, but may perhaps be sought in a probable presence at the site of Punta di Lu Cappottu and those surrounding it, a greater solidity of the rocks in which to dig the underground structure or even productive agricultural settlements or villas in which it was necessary to ensure a constant water supply.

References

- CASTELLACCIO A., 1996, *Sassari medioevale*, 1, Sassari.
- CONTU E., 1970, *Notiziario. Su Crucifissu Mannu (Porto Torres)*, «Rivista di Scienze Preistoriche», XXV, p. 436.
- CONTU E., 1972, *Notiziario. Su Crucifissu Mannu (Porto Torres)*, «Rivista di Scienze Preistoriche», XXVII, pp. 473-474.
- DEMARTIS G.M., 1998, *Tomba V di Montalè-Sassari. Necropoli di Su Crucifissu Mannu-Porto Torres*, Collana *Il triangolo della Nurra*, 2-4, Viterbo.
- FARA I.F., 1580, *Opera*, a cura di E. CADONI, vol. 1: *In Sardiniae Chorographiam; Bibliotheca*; vol. 2: *De rebus Sardois*, libri I-II; vol. 3: *De rebus Sardois*, libri III-IV, Sassari 1992.
- FERRARESE CERUTI M.L., 1976, *La tomba XVI di Su Crucifissu Mannu e la Cultura di Bonnanaro*, «Bullettino di Paleontologia Italiana», XXIII, n.s., 81 (1972-1974), pp. 113-210.
- FERRARESE CERUTI M.L., 1989, *Le necropoli di Su Crucifissu Mannu-Porto Torres e di Ponte Secco-Sassari*, in AA.VV., *La Cultura di Ozieri. Problematiche e nuove acquisizioni. Atti del I Convegno di studio (Ozieri, gennaio 1986-aprile 1987)*, Ozieri, pp. 37-47.
- FERRARESE CERUTI M.L., 1992, *La necropoli a domus de janias nel territorio di Monte d'Accoddi*, in *Monte d'Accoddi. 10 anni di nuovi scavi*, Istituto Italiano Archeologia Sperimentale, Genova, pp. 10-20.
- MAETZKE G., 1960, *Scavi e scoperte nelle province di Sassari e Nuoro*, «Studi Sardi» XVI (1958-59), pp. 732-740.
- MANCONI F., 2001, *L'Antiquarium Statale di Porto Torres*, Piedimonte Matese (CE).
- MANCONI F., PANI ERMINI L., 2002, *Nuove ricerche nel complesso archeologico di San Gavino di Turrus Libisonis*, in P.G. SPANU (a cura di), *Insulae Christi. Il cristianesimo primitivo in Sardegna, Corsica e Baleari*, Oristano, pp. 289-314.
- MARCHETTI M.I., 2006a, *La sequenza crono-topografica. Periodo II. La necropoli e gli edifici di culto di età paleocristiana (IV-prima metà VI secolo). Atrio Metropoli*, in AA.VV., *Indagini archeologiche nel complesso di S. Gavino a Porto Torres. Scavi 1989-2003*, Roma, pp. 66-90.
- MARCHETTI M.I., 2006b, *La sequenza crono-topografica. Periodo VI. Le cumbessias e gli interventi di età moderna (XVI-XVII secolo). Atrio Metropoli* in AA.VV., *Indagini archeologiche nel complesso di S. Gavino a Porto Torres. Scavi 1989-2003*, Roma, pp. 151-155.
- MASTINO A., 2005, *Storia della Sardegna antica*, Nuoro, pp. 333-392.
- MUCEDDA M., COSSU S., 1984, *Le grotte costiere di Porto Torres*, «Speleologia Sarda», 49, pp. 19-20 (estratto).
- ORLANDI G.F., 1985, *Thathari pietra su pietra. La città di Sassari dalle origini al XIII secolo*, Sassari, pp. 22-33.
- PANI ERMINI L., 2006, *Turrus Libisonis dalla tarda antichità al medioevo*, in AA.VV., *Indagini archeologiche nel complesso di S. Gavino a Porto Torres. Scavi 1989-2003*, Roma, pp. 7-33.
- PORCACCHI T., 1590, *L'Isole più famose del Mondo descritte da Thomaso Porcacchi da Castiglione arretino e intagliate da Girolamo Porro padovano con l'aggiunta di molte Isole*, Venezia.
- SATTA M.C., 2000, *L'Acquedotto Romano della colonia di Turrus Libisonis*, Piedimonte Matese (CE).
- SATTA GINESU M.C., 1989, *L'età romana*, in AA.VV., *Sassari. Le origini*, Sassari, pp. 109-126.
- SCOTTI F., 1650, *Itinerario ovvero Nuova descrizione de viaggi principali d'Italia*, Roma.