6 DEFENSIVE ARCHITECTURE OF THE MEDITERRANEAN
XV to XVIII Centuries

Ángel Benigno GONZÁLEZ AVILÉS (Ed.)

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A multidisciplinary approach to study Sardinian coastal towers. Restoration, conservation and archaeological research

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Abstract

The project of protection and enhancement of Sardinian Coastal Towers began with the restoration of nine monuments which, for their building techniques, condition, environmental features and approachability, have been considered the most representative of the Sardinian coastal heritage. The aim of the project is to define the guidelines for a correct methodology of restoration and exploitation, with the purpose to determine natural and human elements which typify each tower as cultural heritage of Sardinian modern coastal landscape.

The restoration has been considered as first step of knowledge useful to learn more about the *site restoration* processes, in order to apply the same methodology to the whole heritage of coastal towers. At the same time, many promotional activities have been carried out, and both monument's techniques and history have been publicized by a website and throught multimedia panels.

The interdisciplinary methodology allowed to analyze through an archaeological approach their stratigraphy and life since 16th to 20th century. The removal of sediments which covered both structural parts and floors contributed to the knowledge of material culture's elements essential to reconstruct soldiers' lives: food, waste used as levelling under floors and restorations over centuries until their last reuse during II World War.

Keywords: Coastal towers, Sardinia, restoration, stratigraphy

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1. Introduction

The construction of the of coastal towers' system of Sardinia begun in the second half of 16th century.

With the suppression, on 17 September 1842, of the Royal Towers Administration (an institution that since 1583 was involved in the construction and maintenance of coastal towers), most of them have been definitively abandoned and lost their original role as a network of "sea guards" (Rassu, 2005).

The great importance that coastal Towers had for historical and artistic background of Sardinia must be added to the important role which they have in coastal landscapes, as integral part of scenarios and natural environments of great value.

The restoration and conservation works of coastal towers carried out by the Agenzia Conservatoria delle coste involved nine towers owned by the Autonomous Region of Sardinia: Sa Mora, Scal'e Sali and Capo Mannu Towers (Municipality of San Vero Milis), Budello, Capo Malfatano and Porto Scudo Towers (Municipality of Teulada), La Pegna Tower

(Municipality of Alghero), Poetto and Prezzemolo Towers (Municipality of Cagliari).

The intervention on the nine coastal towers can be considered as a valuable moment of knowledge which allows to analyze and examine in depth all aspects related to the issues that such work sites entail, and to define criteria and methodology which is applicable to the entire heritage of Sardinian coastal Towers.

To Share project outcomes and the acquired methodologies, are the basis to defining the design choices of future interventions.

Fig. 1- Panoramic view of Cagliari gulf from Poetto Tower (Elena Cannas, 2014)

Fig. 2- Panoramic view from Malfatano Tower (Elena Cannas, 2014)

2. The multidisciplinary approach

The restoration and preservation of monuments, through the implementation of a systematic set of works (respecting their typological elements and being careful to the surrounding natural areas), allows the enjoyment of the sites in total security.

The key factor of the intervention's success has been the synergy between the involved parties: public administration, operational and technical staff, and contracting company.

The restoration of cultural heritage has been based on an accurate preliminary historical study, and a series of preparatory activities have been made to support the work on each site.

An accurate building survey has been made before and after the interventions, in order to guarantee the preservation of monuments' situation before, during and after restoration.

Firstly, a photographic survey with "bird's-eye view" has been realized, and it allowed to catch the complete visibility of the monument, even

from the inaccessible points. During restoration, a photography shooting of the works was carried out using the time-lapse technique from fixed points. Finally, the photographic survey with "bird's-eye view" has been repeated, accompanied by supervisor's detailed surveys and reports. In addition, final documentation has been produced by the company and the archaeologist who supervised the first part of restoration in each tower.

Fig. 3- Malfatano Tower *ante operam* (Gianni Alvito - Teravista, 2014)

Fig. 4- Malfatano Tower *post operam* (Gianni Alvito - Teravista, 2016)

The digital model of all towers (both before and after intervention) can be achieved using the high quality aerial photographs. In particular, the 3D relief with laser scanner technology has been realized for Scal'e Sali Tower before the beginning of the work and, as a result, the cliff under the tower shows clear signs of instability. In fact, not long after this analysis, the cliff collapsed dragging with it a part of the tower. Fortunately, the digital model of the monument allows its virtual reconstruction.

The activity of documentation and data collection was accompanied by several activities. The promotion of the coastal towers heritage as an unique network system for territorial diffusion, historical value and landscape significance, is able to convey the elements of historical and naturalistic value of Sardinian coasts, in which towers represent landmarks of coastal landscape areas that must be preserved and valorized.

Moreover, the material and immaterial used tools, allow the virtual access inside towers' rooms, which are not physically accessible.

In addition, the visual identity of the project has been defined, and it includes the editing of all products (according to a logo and a standard), and a website creation (http://www.sardegnatorri.eu/), with the aim to promote the knowledge of the coastal towers network (for instance, historical information), and to collect and show the important restoration work (restoration project, images, time-lapse shooting photographs of works).

At the end of the project, all data information will be available to be distributed to local schools, with the aim to improve the knowledge of the sites and to support the visits.

A book of scientific reports is now being completed, and collects all information about project and works.

3. The Intervention of Restoration

In spite of the presence of ruins in each tower, the restoration and consolidation executed shared several criteria and methods of intervention.

Fig. 5- Sa Mora Tower *ante operam* (Gianni Alvito - Teravista, 2014)

It was possible to preserve building materials, by acting them *in situ* or localizing new replacements as minimal entity substitutions, always respecting their original techniques and technologies.

A partial replacement and reconstruction was carried out, but exclusively for static reasons, avoiding unnecessary and unjustified alterations.

Fig. 6- Sa Mora Tower *post operam* (Gianni Alvito - Teravista, 2016)

The remedies of the masonry has been made discreetly legible and distinguishable from the original USM. For this reason, the new built walling has an undercut of 10 cm compared to the existing one.

Stones used in restoration were identical or similar to the existing ones, both in shape and layout of rows.

Each tower was managed with particular regard to its specific characteristics and distinctive features, especially those due to the unique places in which monument arise. The biggest problem found in restoration of each monument was undoubtedly the accessibility to the sites. This originated many difficulties in reaching those areas, especially during the preparation of worksite, the material acquisition and the scaffold mounting.

In the case of some towers, to reach the area was the greatest complexity. To access the areas immediately surrounding the Torre of Poetto (located in Cagliari), for instance, it was necessary to examine and verify the location, along with the Security Coordinator. The most appropriate, safe and easy path has been identify, in order to move by hand all the equipment, materials and preparations. In Alghero (SS), in the case of Della Pegna Tower (which is located at an altitude of 271 m s.l.m), to reach the surrounding areas it was necessary the use of an helicopter, thanks to which it was possible to catch materials, equipment, and to transport the workers and the staff.

Another difficulty was represented by the preparation of sites.

In the case of Capo Mannu Tower, in the municipality of San Vero Milis (OR), scaffolding service for workers has been cantilevered over the sea.

In other cases, the specificity which characterized the progress of work was represented by the findings and discoveries linked to the life of monuments over centuries. This has been possible thanks to the support of a professional archaeologist that carefully carried out investigations. Such discoveries aroused astonishment and great interest, as well as they produced new historical information to study.

Fig. 7- Internal view of Sa Mora Tower (Elena Cannas, 2014)

Fig. 8- Internal view of Porto Scudo Tower (Elena Cannas, 2014)

4. Archaeological Research

During restoration it has been possible to analyze both outside and inside the coastal tower. Eight towers have been restored, but only four of them are important from an archaeological point of view: Sa Mora and Capo Mannu in San Vero Milis (OR) and Porto Scudo and Capo Malfatano in Teulada (CA).

Outside the monument of Sa Mora tower we made an archaeological investigation before mounting the scaffold. The dug of eolian and sandy sediments has allowed to unearth the base of the tower and, in correspondence of the raised entrance, to find the US 7 which were composed by organic waste (animal bones, ashes, coals, cooking pottery, shells), probably referred to the last use of the tower during piedmontese government in 18th century.

Fig. 9 – Sa Mora tower, US 7 (Maily Serra, 2014).

Inside the monument, the dug of eolian sediment and the layer composed by plaster's disintegration unearthed two different floors, one composed by square tiles (US 14) and the other by river pebbles (US 13); this last realized with geometric patterns. A similar floor covers the parade ground.

In Capo Mannu tower the removal of eolian and sandy sediments unearth a straight wall (USM 2) which has been built integrating the circular profile of the tower. It has been realized in different techniques of rows, composed by almost regular squared blocks instead of irregular polygonal stones. The dug allowed also to find a masonry staircase (USM 5) which were covered by a collapse and has been built inside the wall, probably during 18th century, when it was no longer necessary to defend the raised entrance from foreign attacks.

The raised room inside Porto Scudo tower were full of sediments which were dug by hand unearthing a central column base, the ruin which

supported the vault, and three different floors. The first (US 13) is composed by big squared stone tiles, the second (US 11) by brick tiles and the last, called US 14, by rectangular bricks. This one is the more recent layer and covers half tower (the so-called "mezzaluna"). Very important are the stratigraphies called US 2, which documents the contemporary military use of the monument during II World War, (represented by war relic), and the US 3, composed by waste of American troops (peanut butter, soluble coffee and small bottle of Cordiale).

The most important result in archaeological investigations is given by the dug of Capo Malfatano tower, which represents the biggest monument restored in this project. It is at 65 meters s.l.m. and has an outside diameter of 14 meters and an height of 16; thanks to the large size, it can be cataloged in the typology of *torre de armas*. The stratigraphy was very complex, owing to the presence of various floors and tracts of masonry which were covered by sandy and eolian sediments, called US 1. A thick layer of dark organic soil has been used as level above which putting the floor mortar and finally the tiles (UUSS 10 and 14).

Fig. 10 – An example of stratigraphy inside Capo Malfatano tower (Maily Serra, 2014).

This sequence can be related to the division of round room into two halves, to separate the living room from the sleeping area, one covered by tiled tiles, and the second by stone ones, (these replaced a previous floor during restoration in 1831).

Fig. 11 – Capo Malfatano tower, USM and US into the round room (Maily Serra, 2014).

In each of the two halves a little pit has been created into floors, and one of them was probably the housing of a large ceramic container for oil or wheat, as a lot of pottery sherds on floor (called US 15) allows to hypothesize.

Thank to the dug, it has been possible to document more than one level of use, as the stratigraphy of several floor showed, the oldest of which was at a very low point and was related to the first use of the tower during 16th century.

5. Conclusion

The intervention on Sardinian coastal towers aimed to reconstruct the network of physical, historical and cultural relations that characterized the entire coastal defense system by the use of new technologies.

With the precious support of the Italian National Research Council, the Agenzia Conservatoria delle coste, in collaboration with the Municipality of Domus de Maria, realized a project which aimed to reopen Chia Tower, by recovering the ancient function of the monument as part of a connection network between sea and land. The project, named "Multimedia Towers", allowed the reuse of building as element of dissemination of knowledge through the presence of four multimedia installations. These elements allow the visitor to interact with local culture, to know the territory and monument's history, and to realize their relation with coastal defense network through a tactile, sonorous and olfactory sensory experience.

The virtual representation of project results, in some of the nine restored towers, according to the methodology applied in "Multimedia Towers" project, will allow to share with the public the results of the restoration, conservation and archaeological project.

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