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50019 Sesto Fiorentino (Florence- Italy)
Phone +390555226551, e-mail: segr.org@ibimet.cnr.it

Scientific Secretariat:
CNR-IBIMET Area di Ricerca di Firenze Via Madonna del Piano 10,
50019 Sesto Fiorentino (Florence - Italy)
Phone +390555226552 +390555226030, e-mail: simposio@ibimet.cnr.it

THE COASTAL SIGHT TOWERS, A DISTINCTIVE ANTHROPIC ELEMENT OF THE ANCIENT COASTAL LANDSCAPE: THE RISK OF RESTORATION WORKS WITH EXAMPLES FROM THE TUSCAN COAST (ITALY)

Fabio Fratini[1], Emma Cantisani[2], Elena Pecchioni[3], Daniela Pittaluga[4]
[1]CNR–Istituto Conservazione Valorizzazione dei Beni Culturali, via Madonna del Piano n.10 50019 Sesto Fiorentino (FI), tel. 0555225414, fax 0555225408, e-mail: f.fratini@icvbc.cnr.it
[2]CNR–Istituto Conservazione Valorizzazione dei Beni Culturali, e.cantisani@icvbc.cnr.it
[3]Dipartimento Scienze della Terra, Università di Firenze, elena.pecchioni@unifi.it
[4]Dipartimento DAD, Università di Genova-ISCUM, daniela.pittaluga@arch.unige.it

Abstract – The coastal sight towers and the defensive fortresses were in the past distinctive elements of the coastal landscape. They were distributed in particular along the northern coast of the Mediterranean and were built precisely for sighting purposes from the XVI century against the raids of barbarian pirates who had their bases in the Maghreb coast. At present, some towers have been destroyed, others have lost their visibility because embedded in disordered urban growth or in housing estates, others are in the state of ruins and some have been restored or recovered and reused. The towers still existing in isolated positions continue to strongly characterize the coastal landscape and certainly contribute to give value and charm to the territories because they recall a past in which history and legends are mingled. This contribution examines the case of the towers of Capraia island and two towers on Argentario taking into account the building materials and giving indications for restoration works that are actually conservative (and in this sense also difficult), presuming to preserve the signs of time on the surfaces, a feature that in our opinion strongly improve the value of the same artefacts.

Riassunto – *Le torri di avvistamento costiero e le fortezze difensive erano nel passato un elemento antropico distintivo del paesaggio. Si trovavano distribuite in particolare lungo la costa settentrionale del Mediterraneo e furono costruite appunto a scopo di avvistamento a partire dal XVI secolo contro le scorrerie dei pirati barbareschi che avevano le loro basi nella costa del Maghreb. Attualmente, alcune torri sono state distrutte, altre hanno perso la loro visibilità perché inglobate nella crescita urbana e nelle lottizzazioni che hanno interessato la costa, altre si trovano allo stato di rudere ed alcune sono state restaurate o recuperate e riutilizzate. Le torri tuttora esistenti in posizione isolata continuano a caratterizzare fortemente il paesaggio costiero e sicuramente contribuiscono a dare valore e fascino ai territori perché richiamano ad un passato in cui storia e leggende si confondono. Il presente contributo prende in esame il caso delle torri dell'isola di Capraia e di due torri del promontorio dell'Argentario esaminando i materiali costitutivi e fornendo indicazioni per interventi di restauro che siano effettivamente conservativi, premettendo di preservare i segni del tempo sulle superfici, ciò che dà valore agli stessi manufatti.*

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Introduction

Since the beginning of the IX century, the growing threat exerted by the Saracens who, from the occupied Sicily, began to plunder the coasts of Puglia, Calabria and then Campania and Lazio, led to the creation of a first network of coastal towers, called "semaphores" [1], to facilitate the sighting of the enemies and to signal the approach. Such defensive system was subjected to a radical reorganization starting from the XVI century following an exceptional recrudescence of piracy along the Mediterranean coasts. The Italian States committed themselves to strengthen the defence of the coasts both "updating the possibilities of defence of the existing towers according to the needs of resistance imposed by new weapons" [2] and building new towers, fortified walls, harbours, etc.

As for the coastal towers, their dislocation was studied "in an organic way so that it was possible to create a network of safe sighting (in a position free from any obstacle) and secure visual connection with smoke (day), fires (night) and sound (bell) " [2]. The construction of the entire system of towers was never completed. Since the threats of pirates and Saracens have disappeared, many towers have been abandoned and have been totally or partially destroyed due to the action of atmospheric agents and local populations that, have reused the building materials. Those that were recovered for other purposes or incorporated into other structures are better preserved. Used as a sanitary cordon during the plague of 1656, the towers have found use both in the control of smuggling and as military posts during the two world wars [2].

These towers are testimonies of the history and culture of our country and those still existing in isolated positions continue to strongly characterize the coastal landscape and certainly contribute to give value and charm to the territories because they recall a past in which history and legends are mingled. In particular, towers in the state of ruin have a highly evocative appearance with their surface marked by the action of atmospheric agents. Their safeguard postulates a thorough knowledge and a use in respect of their specific architectural and material peculiarities, as well as of the territory in which they are sited [3]. This contribution examines the case of the towers of Capraia island and two towers on Argentario taking into account the building materials and the conservation conditions and giving indications for really conservative restoration works presuming to preserve the signs of time on the surfaces, a feature that strongly improve the value of the same artefacts.

The towers: history, conservation

The towers of Capraia

The island of Capraia belonged to the Republic of Genoa from the XIV century to the end of the XVIII century. During the Genoese rule, after the destruction perpetrated by the Ottoman corsair Dragut in 1540, the Banco di San Giorgio supported the renovation and expansion of the fortress built by the Pisans (St. George fortress) and the construction of two towers, of Porto (1541) to defend the bay and of Zenòbito (1545) in the southern tip of the island. Later on the tower of Barbìci was built in the northern tip (1699) with the function to watch toward the Tuscan coast.

The Zenòbito tower with its striking shape still dominate the landscape (Fig. 1). It consists of a truncated cone base which continues with a cylindrical body topped by corbels that sustained a wooden balcony. At present, the tower shows important residues of the original rendering still characterized by good adhesion to the masonry which is realized according to a core structure, with the outer wall made of irregular roughly shaped volcanic rock blocks placed with quite a lot of bedding mortar. This masonry shows a good cohesion, even if the mortar joints are deeply eroded. Therefore the tower has a surface deeply marked by the time, which shows, for those who are able to decode it, a multitude of signs and information [4, 5] (Fig. 2). Nevertheless two conservation problems are present: the portion exposed southeast, where the outer wall fell down uncovering the inner core of the masonry and the deeply eroded corbels that supported the balcony.

The tower of Porto (Fig. 3), sited on the promontory east of the harbour, shows an aspect similar to that of Zenòbito, but with a smaller diameter. It has been recently restored.

The tower of Barbìci, (Fig. 4) has a square base and was realized according to a core structure, made of roughly shaped volcanic rock blocks placed with a lot of mortar. The eastern side shows little residues of the original rendering but in the complex the masonry is deeply eroded and in the southern side the outer wall has completely collapsed.

Figure 1 – Tower of Zenòbito, Capraia.

Figure 2 – Tower of Zenòbito: rock basement and residues of plaster.

Figure 3 – Tower of Porto, Capraia.

Figure 4 – Tower of Barbìci, Capraia.

The towers of Argentario

In the period of the Sienese Republic (XV- XVI centuries), the first systematic fortification of the peninsula, against the barbarian invasions was realized. In 1557, following a military defeat, all the territories of the Sienese Republic passed under the rule of Cosimo I de' Medici allied with the Spanish crown. In the agreements of this alliance, Filippo II, successor of Carlos V, reserved for himself a small coastal strip comprising Orbetello, Talamone, Argentario, Capalbio and subsequently part of the Elba island, that formed the State of Presidi. Filippo II, under the impulse of the Spanish viceroy of Naples Pedro Afàn de Ribera, from 1563 to 1571 upgraded the network of existing coastal towers and built numerous fortresses. The Spanish rule ended in 1707, leaving deep urban and architectural traces [6, 7]. At present some of the towers are completely restored and placed in private property, others are in ruins. Our research regards the towers of Capodomo and Calamoresca.

The tower of Capodomo is a square tower which had probably three floors. At present only the basement and the first floor are still standing (Fig.5). Externally the tower is characterized by a buttress that runs along its entire perimeter ending with a cornice marking the position of the flooring of the first floor. The building technique can be classified as a coursed square rubble masonry [8], characterized by the use of roughly dressed stones, well cut corner stones and thick layers of bedding mortars. This buttress differs from the upper masonry for some specific architectonic elements like the corner stones, the cornice, the windows and doors frames. In such cases the stones are well dressed with a finished surface. Inside, the tower is constituted by a ground floor where a tank is located topped by a barrel vault, sustained by another adjoining room, also vaulted. Above, a well preserved two-layers mortar flooring (two distinct construction phases) is visible.

The Calamoresca tower is a square tower, composed of a single constructive phase and characterized by a masonry realized with stones, split and put in place on uneven rows (uncoursed square rubble masonry) and well cut corner stones (Fig. 6). The tower is characterized by a buttress that runs along its entire perimeter ending with a cornice marking the height of the flooring of the first floor.

Figure 5 – Tower of Capodomo, Argentario.

Figure 6 – Tower of Calamoresca, Argentario.

As for the state of conservation, we have already mentioned that the two towers look like ruins. The stones of the masonry are in good condition because they are made of compact, highly durable rocks. The most delicate part of the masonry is constituted by the bedding mortars. In fact, the mortar joints, while presenting good cohesion, are eroded and this has caused the enucleation and separation of stone blocks, especially on the unprotected wall crests.

Methods

Stone ashlars and raw materials used for the realization of bedding mortars, plasters and floors were investigated with mineralogical and petrographic methodologies [9, 10]. Powders obtained from each typology were analysed with a PANalytical diffractometer X'PertPRO with radiation CuK $\alpha 1$ = 1,545ÈÅ, operating at 40 kV, 30 mA, investigated range 2 θ 3÷70°, equipped with X' Celerator multirevelatory and High Score data acquisition and interpretation software so as to determine the mineralogical composition; optical microscopy in transmitted light was performed on thin sections (30 microns thickness) with a polarised light microscope (ZEISS Axioscope.A1) equipped with a camera (resolution 5 megapixel) and dedicated image analysis software (AxioVision) for evaluating the microstructural parameters.

Results

Concerning the building materials of Capraia towers, there are volcanic stone blocks, lime and sand for the mortars, beams for ceilings and for carpentry. In particular the stone blocks were extracted on site, There are andesitic-riodacitic products (7.5÷6.9 My) in the centre-north of the island, from which the ashlars for Porto and Barbìci towers were realized, and trachibasalts-shoshonitic rocks (4.6 My) in the Zenòbito area [11, 12] used in the homonymous tower. As for the lime, considering that Capraia is a completely volcanic island, it could not provide the raw material for the production of lime (carbonate rocks). The petrographic and mineralogical analyses carried out on the mortars of the three towers point out that the lime is an air hardening magnesian lime characteristic of the Genoese production [13]. Actually magnesian lime was traditionally produced in Liguria, since the XII century. The main producing areas were close to the coast west of Genoa and in Vado Ligure, near Savona [14]. Therefore it was easy and cost-effectively to carry the lime by sea, even in distant sites. However, the study of the composition of the aggregate shows, beside the prevailing presence of fragments of volcanic rocks, pyroxenes, feldspars and biotite, also the sporadic presence of fragments of calc-schists, quartzites and phyllites characteristic of regional or high pressure/low temperature metamorphism, in any case of low grade conditions (mica schists, quartzites). The prevailing presence of fragments of vulcanic rocks is in accord with the composition of the sandy sediments of the bay where the port of Capraia is sited while the presence of fragments of metamorphic rocks is problematic because of the absence of outcrops of this type of rocks in the island. Indeed similar materials can be found in the Ligurian Piedmontese metamorphic units (Schistes Lustrés), which closest outcrops are in north-eastern Corsica and in Gorgona island but

which widely crop out west of Genoa [15, 16]. Considering that these materials cannot be sandy sediments transported by sea currents since the island is separated from the closest Corsica and Gorgona by fairly deep sea crossings (i.e. Corsica channel), the most probable hypothesis is that of stone ballast taken from the beaches of Cogoleto and Sestri Ponente (characterized by the presence of pebbles coming from the Schistes Lustrés) where the Genoese shipping vessels loaded the quicklime, later abandoned on the Capraia harbour. During loading, sandy/gravelly debris could also unintentionally transported aboard.

Concerning the building materials of Capodomo tower in Argentario, the dressed stones of the masonry are made of calcitic grey marble with traces of dolomite belonging to the Unit of Cala Piatti (Middle-Upper Trias), outcropping nearby the tower, while the cornice and the corner stones are made of a brownish Cavernous Limestone (Upper Trias) belonging to the same Unit. The bedding mortars of the wall nucleus are quite fat with a calcic magnesian binder and an heterogeneous aggregate constituted mainly by carbonatic rock fragments (micro and macro crystalline), quartz, lumps and presence of earth residues. The plasters show always a calcic magnesian binder (as indicated also by the presence of hydromagnesite and brucite, evidenced through XRD analysis). The aggregate is heterogeneous with the presence of carbonatic rock fragments (dolomite from XRD data), quartz, lumps, sometimes shale and silicatic rock fragments, crushed ceramics, earth residues. The mix is fatter with respect to the bedding mortars.

As for the building materials of Calamoresca tower, the dressed stones are made of dark grey dolomite with calcitic white veins belonging to the Unit of Cala Piatti (Upper Trias) outcropping nearby the tower, the cornice is made of Cavernous Limestone similar to that of Capodomo and the corner stones are made with a dark grey porous limestone. Both mortars (bedding mortar and plaster) are quite fat with a calcic magnesian binder (XRD data) and an heterogeneous aggregate constituted by carbonatic rocks (the same of the dressed stones), earth residues, quartz, and rare metamorphic rock fragments.

Discussion

The results of the study of the constituent materials of the towers and in particular of the mortars allow us to understand how many historical and technological information can be obtained: e.g. for the towers of Capraia the origin of the lime from Liguria, for the two Argentario towers the selection of dolomite rocks for the production of the lime. Therefore, the building materials that can be closely related to the territory (Argentario) or related to historical events like the Genoese domination in Capraia. A restoration must therefore guarantee that these material testimonies are maintained and not lost because of the restoration itself. Moreover, almost all the examined towers are in a state of ruin, a condition in which nature has re-appropriated the work of man in a process that has led to weld even more deeply the link between tower and landscape. This has been a slow process, starting from their abandonment (more than 250 years ago) that often led the artefacts to *quasi-equilibrium* conditions with the surrounding environment [17, 18], conditions that must be recognized because this would allow to minimize the extent of restoration interventions ensuring the originality of the surfaces (materials and signs of time). In this way, the visual perception of the artefacts could remain unchanged and highly evocative. This line of thought sustaining that a surface showings the patina of time is of

great interest, worthy of "maintenance", was expressed by the great masters of the restoration of the XIX century and also recently by some restoration theorists [19].

Taking into account these considerations, the restoration of the tower of Porto, although it might seem a good intervention to the normal not aware persons, unfortunately has not been able to keep on the surface the track of time, completely removing the remains of the original plaster and sealing with a new mortar the joints of the original bedding mortar (Fig. 7, 8).

Figure 7 – The tower of Porto, restored.

Figure 8 – Tower of Porto: restored surface.

A conservative intervention should include a "light" structural consolidation eg. through tie hooping, a protection/reconstruction of the wall crests and sealing of the cracks but the extensive grouting of the mortar joints with a new mortar should be avoided unless extremely necessary. Indeed this could result in a complete change of appearance of the masonry, aesthetically incompatible with a conservative intervention. Moreover the complete sealing of the mortar joints would hidden the evidence of such a "precious" material as the original bedding mortar.

With regard to the cleaning operations, these should not remove the natural patinas generated by the slow process of chemical-physical and biological actions of the surface that led to the achievement of a *quasi-equilibrium* of the surface itself with the environment. This condition guarantees its conservation and at the same time determines its peculiarity of historical material with the particular chromatic facies acquired.

In particular, for the Zenòbito tower, the extensive remains of the ancient plaster coating must be preserved, still characterized by a good adhesion to the masonry (Fig. 9), but avoiding covering the rest of the surface where the plaster is missing with a new plaster that would completely distort the appearance of the ruin. Rather, in the portion exposed to the south-east, where the external masonry has fallen exposing the nucleus, an intervention is necessary to stop the progress of decay with the consequent fall of stone elements (Fig.10). Nevertheless, it should be a "not invasive" localized intervention, with: punctual fixing of the blocks which are detaching, additions of bedding mortar in small amount where necessary; punctual application of eco- friendly consolidating products and protectives. The same punctual light intervention should be carried out in the upper part of

the cylindrical body where the corbels that supported the wooden balcony (no longer present) are deeply eroded and in some cases missing [20, 21].

Figure 9 – Tower of Zenòbito: the eroded masonry with the ancient plaster

Figure 10 – Tower of Zenòbito: exposed nucleus of the masonry

We are speaking of minimum intervention but in many cases just the request for a minimum intervention contrasts with the installation of the restoration yard. As a matter of fact often, in the practice of building yards, one of the most common observations, (with the justification of "common sense") is to increase the works, taking into account the expenses undertaken to install the yard. Therefore the question remains: is it possible the economic sustainability of a restoration yard with the practice of minimum intervention?

To conclude, a passage that cannot be disregarded in a restoration/conservation project is also the recognition of the important landscape value of the coastal towers and the awareness of the dense network of relationships that exist between the artefacts and the natural context in which they are harmoniously inserted. Built with local materials, eroded by time, transformed by man, isolated or, in some cases, subsequently aggregated to urban buildings, they represent discrete singularity along the coastline, places of convergence of our looks from the sea and from the mainland. Each building entertains a dialogue with the network of towers, visually relating with the artefacts that precede it and that follow it, but even more, it constructs the landscape. We cannot therefore think of intervening on a single tower without indirectly transforming its context because those landscapes are "architecturally formed". [3].

Conclusions

The coastal sight towers continue to strongly characterize the coastal landscape and contribute to give value and charm to the territories because they recall a past in which history and legends are mingled. Their building materials can be closely related to the territory like in Argentario or to historical events (Genoese domination in Capraia). A restoration must therefore guarantee that these material testimonies are maintained, and not

lost because of the restoration itself. Moreover considering that almost all the examined towers are in a state of ruin, the tower-landscape constraint (both natural and cultural), is an extremely important datum in the restoration project because the transformation in ruins has further tightened the tower-landscape link. This means that we should put maximum attention to the remains of ancient plasters both for their protective function and for their decorative value. Therefore, it is advisable that in the cleaning operations the natural patinas are preserved because they are generated by a slow process of chemical-physical and biological actions that led to the achievement of a *quasi-equilibrium* of the surface with the environment. This condition guarantees its preservation and at the same time determines its peculiarity of historical material with the particular chromatic facies acquired.

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