Culture and wetlands in the Mediterranean: an evolving story

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Cultural aspects of Mediterranean salinas

Katia Hueso and Theodora Petanidou

Abstract

Besides having been the 'white gold' on a global scale, salt and salt-making in the Mediterranean have been so important that one can refer to salt as a 'cultural molecule'. Salt can be obtained in many ways that are related to its uses and applications; the culturally richest form of salt is the artisanal product. In the Mediterranean, salt has shaped history and given rise to towns, highways and trade routes. It has inspired philosophy and religion, challenged living and eating; sophisticated morals and customs; left behind strong symbolic and spiritual connotations in everyday language in the form of vocabulary, idioms, technical terms and place names. Due to their idiosyncratic salt-making techniques, salinas host a variety of forms of cultural heritage such as tools, engineering devices, buildings and other architectural structures. Today, the Mediterranean salinas are disappearing due to their low competitiveness in a global market, and the artisanal salinas are facing the biggest challenge of all. In addition to their low competitiveness in comparison with other forms of salt manufacturing, artisanal salinas suffer from threats such as changes in their biophysical features, unco-ordinated management and sheer ignorance of their values. There are, however, many reasons why efforts to conserve Mediterranean salinas should continue: they host a unique biodiversity with extraordinary survival mechanisms and population numbers, with their distinctive microscopic flora and fauna, their halophytes and their large bird communities. They are a source of inspiration for material and intellectual creativity, as well as for mere aesthetic contemplation. To conclude, Mediterranean salinas can today serve as poles for local development in the region: they provide perfect settings for educational and cultural activities, attract specialised tourism and offer high quality products for gastronomic, therapeutic, industrial, and biotechnological use. This range of uses is helping to generate new jobs for qualified staff, as well as a reinforced sense of belonging for the stakeholders involved, which in turn strengthens the values of the sites.

Keywords: *Salinas, artisanal salt, cultural heritage, salinas values, biodiversity, local development, Mediterranean*

Physical and cultural geography of Mediterranean salt and salinas

Common salt is the popular name for sodium chloride (NaCl), a rather abundant molecule in nature. Three quarters (77.8%) of its weight is sodium, the

rest chlorine. In nature, it occurs either as rock salt or as brine (salt dissolved in water). Unrefined salt of the sort obtained from artisanal salinas includes many other minerals that, in a sense, make it a 'cultural molecule' as well as the focus of this paper.

Salt is essential for life: without it, we would die. Salt is an important regulator of neurological transmission as well as muscular function. Besides humans, other mammals also need it for survival as they develop 'salt hunger' in its absence (Petanidou, 1997): herbivores obtain it from natural salty sources, and carnivores from raw prey meat.

Salt is the king of spices: it strengthens the natural taste of food and adds a stinging flavour to it. There are many types of salt nowadays, and salt connoisseurs discuss which type best suits different sorts of food, but there is wide agreement that unsalted food is virtually tasteless.

The particular physical and chemical properties of salt give rise to many different uses and applications which are often referred to as 'the 14 000 uses of salt'[25]. The most common ones, which have been well-known since antiquity, include using salt as a preservative for food (from the 'garum' factories on the Mediterranean shore to the cured meats and cheeses further inland), in mummification processes, as an antiseptic, for softening leather and de-icing roads (Petanidou, 1997, 2005a). Nowadays, the industrial uses of salt or its components have hugely proliferated: from detergents to cosmetics, from superconductors to biotechnology, salt is virtually ubiquitous.

Not surprisingly, obtaining salt by any means (extraction, manufacturing) has been a priority for all peoples (Petanidou, 1997). The Mediterranean climate, with its hot and dry summers, has facilitated the natural evaporation of brine, whether at the coast or inland. The salt found inland or underground is mainly from the Triassic and Miocene periods (200 and 5-10 million years ago, respectively) (Petanidou, 1997; Carrasco and Hueso, 2008), when most of the land surrounding today's Mediterranean was covered by sea. The evaporation of these seas created huge salt deposits that appear in the form of brine sources, hypersaline streams, lagoons and underground rock salt beds. Some inland salt is of more contemporary endorheic origin (Montes and Martino, 1987), but such sources are rare.

Thanks to the climate, the most common method of salt production in the Mediterranean region is solar evaporation. Coastal salinas consist of huge flat areas with pools of different sizes and depths into which seawater is pumped by mills, pumps or similar hydraulic devices, or is allowed to flow into deeper and larger pools by force of gravity or even the tides (the latter mainly in the salinas of the Atlantic coast). The seawater then flows by gravity or is led by mechanical de-

25 (http://www.salt.org.il/main.htm, http://www.saltinstitute.org, http:/www.saltworks.us, checked 8 April 2011.)

vices, animal- or even man-power to shallower, smaller pools. In this way, it gains progressively in salt concentration (due to the high evaporation rate) and NaCl purity (due to the differential solubility of other salts contained in the seawater). Finally, the brine enters the smallest pools, also known as crystallisation pools, where salt is formed and collected. These systems can be of industrial size (such as the Camargue in France or Torrevieja in Spain) or artisanal, requiring frequent and labour-intensive maintenance. This, for instance, is the case with salinas found in lagoons, which rest on soft alluvial soils and need an adequate working substrate to be created, such as the 'petola' clay carpet in the Sečovlje salinas (Slovenia). Others can be very simple in design, such as the primitive salinas of Mani in Greece, where the pools were carved out of the bare rock (Petanidou, 2005b; Fig. 3.26). In some cases however, salt is simply collected from the shore using simple or more sophisticated salt-making facilities. Other, less usual methods of salt production in the Mediterranean are rock salt mining, brine mining, vacuum extraction and ebullition or forced evaporation, the last of which has not been used for a long time (Petanidou, 1997).

Fig. 3.26 Primitive salinas carved out of rocks in Koukouri, Greece.

These salinas, unique in their perception and functioning, are carved on a rocky promontory in Mani, S. Peloponnese. The little basins were then coated with successive layers of mortar containing slaked lime and sea sand.

In some inland parts of the Mediterranean (mainly Spain and Turkey), a special type of salina is found which uses natural underground and surface brine sources (e.g. saline lakes, rivers and streams) as its primary material. In the Iberian Penin-

sula alone, over 500 such inland salt-making sites have been reported (Carrasco and Hueso, 2008).

In all the above salt-making sites, specific tools were used for the collection of salt (e.g. spoons, scrapers, shovels or, in some cases, bare hands), as well as its transport and storage (e.g. baskets, bags, wagons and boats). All these devices, instruments, tools and tasks were given local names, leaving an immensely diverse salt lexicon in the region (Petanidou, 1997; Carrasco and Hueso, 2006).

In view of its many uses and applications, salt was a commodity of the utmost strategic importance. The ownership of –or right of use to– salt production facilities was an ambition of the powerful classes, and the source of many conflicts. Taxes were levied on salt in the same way as they are on oil today, making its market price far in excess of its real cost of production. This had enormous implications for the economic, commercial and political relations between the ruling powers at different times in history. For example, the uneven taxation of salt in the different regions of France in the seventeenth century created huge social and economic inequalities that eventually led to the French Revolution (Hocquet, 1985; Multhauf, 1985; Petanidou, 1997; de Person, 1999).

The cultural heritage of salinas

Apart from the ethical obligation to preserve our heritage for future generations (mainly involving non-use values), salinas are associated with a wide variety of other values that justify their conservation. As man-made landscapes, salinas offer a rich material heritage in the form of earthworks, buildings and tools. Yet they are also the cradle of a vast intangible heritage composed of traditions, beliefs, language and art (Petanidou, 1997; Cultural and Technological Foundation of ETBA, 2001; Viñals, 2002). Some of these aspects are discussed below.

Salt-making has shaped history in many ways at the local, but also at the global level. The production, storage and trade of salt in the Mediterranean has defined shipping routes and given rise to important ports, or, in the case of inland salt, created drovers' roads –considered in some cases the precursors of today's highways– and market towns in the middle of arid steppe areas, where salt was exchanged for agricultural and other farm produce. Historically this had implications for economies at every level. Many Mediterranean cities owe their rich heritage (buildings, art, wealth) to salt, with Venice being perhaps the best example (Hocquet, 1982).

Salt-making leaves unique and often fragile marks on the landscape. The substrate upon which the pools and other structures lie is usually built from materials found on site. The construction of trackways, channels and dykes is subtly complex, requiring technical knowledge and experience, and when left abandoned, these structures decay quickly. Salinas were designed in the light of the local topogra-

phy and locally available materials, and were built according to the salt-making know-how of the time, giving rise to an enormous diversity of salt-making sites in the region (Fig. 3.27). Indeed, no two salinas are alike (Réault-Mille, 2006).

Fig. 3.27 Aerial view of the salina of Imón in Guadalajara, Spain, taken from a hot air balloon.

Although the salina is abandoned, the pools at the right side are still temporarily inundated as a result of substrate percolation. The three large storage buildings in the centre of the photograph are visibly damaged.

Important visible landmarks in these 'saltscapes' include the buildings used to store and process salt and to house the salters. Most of these buildings have been built according to local standards, and they are often very large and sturdy, which make them stand out in the usually flat landscape. Storage buildings are usually large and sometimes tall, necessitating buttresses to sustain their weight even when empty (Fig. 3.28). From the architectural point of view, these salt warehouses were the precursors of certain types of industrial buildings. Salters' houses, on the other hand, many of which still stand in the vastness of the surrounding 'saltscape', were modest in many ways, being simply designed for temporary living and basically equipped for the summer using local materials. Other interesting constructions include the structures built to protect the waterwheels that pumped the brine to the surface in several inland salinas in central Spain (e.g. Imón, La Olmeda, Rienda, Medinaceli and Armallá). Other structures usually to be found near salinas –such as guard houses, fortresses, and surveillance towers– reflect the power struggles which arose from the salt trade. Yet a large number of monasteries, churches or even cathedrals are known to have been involved in the local salt business (Petanidou, 1997). In the cathedral of Sigüenza (Castilla-La Mancha, Spain), there is a plaque describing the use of salt as a payment for religious favours.

Fig. 3.28 Remnants of the salt hangar and transport wagons in the abandoned saltworks of Samos, NE Aegean, Greece.

Salt hangars of this type reinforced with counterforts are rare in the Eastern Mediterranean, where salt piles were usually covered by tiles if at all. Neither the salt hangar nor the wagons once used to transport salt during the harvest have received any care since the abandonment of the saltworks in 1965.

Salt production techniques left a more humble visible heritage. By being so diverse, however, they have left behind a plethora of mills, pumps, harvesting and repair tools, hydraulic devices and other pre-industrial engineering solutions. Some of them are still in use in several types of industrial processes, with many of them dating from, or based on, those used in ancient times. Some of the technical solutions for salt-making are universal and can be found anywhere in the Mediterranean, others were adapted to local conditions. For example, in the Salado River valley in central Spain, over a dozen former salt-making sites occur in a single 20-kilometre stretch, but the trackway and pools pavement design in the crystallisation pools is unique to each, depending on the materials available and the local craftsmen concerned (Fig. 3.29). Also important from this point of view were intangible aspects such as the organisation of labour (related to the size and ownership of the salina and/or the period of history in which it was exploited), salt-making craftsmanship and the transmission of this knowledge to the salters. Other important aspects of heritage include the types and qualities of salt produced on the site, the trade networks arising from each site, as well as the artisanal and other uses to which local salt was put.

Fig. 3.29 Pavements of different salinas of the Salado Valley, Castilla-La Mancha, Spain.

The Salado valley is a 20 km stretch of saline ground hosting a dozen former salt-making sites. Despite being so close to each other, each salina is endowed with architectural and technical peculiarities. The photo shows the different paved bottoms of the crystallisation pools in six of these salinas. Although paved with the same material available throughout the valley, the differences in style and craftsmanship is apparent. They are: (a) Bujalcayado, (b) Rienda, (c) La Olmeda, (d) Paredes de Sigüenza, (e) Torre de Valdealmendras, (f) Imón.

Regardless of its origin, whether industrial or artisanal, salt has had a variety of uses. From the gastronomic point of view, many recipes –such as the classic fish baked in a crust of salt– use salt or brine as a basic ingredient. As a food preservative, salt allowed the storage of and trade in perishable foodstuffs such as meat, fish and vegetables which would otherwise be inedible within a few days of production, permitting a highly enriching gastronomic cultural exchange within and beyond the Mediterranean down the centuries (Gallart et al., 2005). In fact, many dishes require a specific type of salt (fine or coarse-grained, fleur de sel, inland or sea salt, etc.) for best results.

Perhaps the most interesting cultural aspects of salt-making are those that leave no visible traces at all. The symbolic values of salt are very deeply rooted in Mediterranean societies, and references to salt are frequent in the holy texts of major religions. Salt is present in most Mediterranean languages in straightforward vocabulary (such as salad, salary, salami, sauce) as well as in idioms (to take something with a pinch of salt, to eat someone's salt, to share the salt and the beans) and in local place names, deriving from the Greek 'álas' (Hallein, Halle), the Roman 'sale' (Salinas, Salsomaggiore, Salzburg), the Turkish 'tuz' (Tuzla, Tuz Gölü) and the Arabic 'al-melah' (Armallá, La Malahá).

Saltscapes are also a powerful source of inspiration for material and intellectual creativity. From modest ceramic salt cellars to renowned paintings, artists and craftsmen have used references to salt in their work. Salt has inspired musical compositions and music-making: to be 'salty' is an essential condition for good Flamenco musicians. It has inspired writers and poets: the poems 'Salinero' by Rafael Alberti and 'Oda a la Sal' by Pablo Neruda are well-known. These landscapes are usually open, free and wild; remote and yet accessible; quiet but full of life: a place so basic, pristine and primitive in some ways that it cannot fail to excite an emotional response from the viewer. Its sheer contemplation is one of its most important values.

Fig. 3.30 Cultural tourism at Salinas de Añana, Basque country, Spain.

Within the context of the site's master plan, the local authorities of Salinas de Añana have started a guided tour programme while restoration works are still in progress. Visitors enjoy the cultural values of the site and have the opportunity to see it changing.

However, we should not forget the natural values of saltscapes, too. Saline wetlands constitute special ecosystems with rare and fragile biota. The living conditions imposed by the presence of salt in the water and soil makes it a hard environment for flora and fauna, in which only halophylic (i.e. salt-tolerant) plants and animals survive. Many of the species capable of thriving in these environments are microscopic, such as hypersaline bacteria and algae, some of which form microbial mats whose diversity is still being discovered (Guerrero and de Wit, 1992; Hueso and Carrasco, 2009a, b). Halophylic biota and communities are very site-specific and include many endemics, especially in inland saltscapes which are isolated from each other. Saline wetlands are also important stopover

sites for migratory birds, as well as essential breeding and wintering grounds for both colonial (such as the greater flamingo *Phoenicopterus ruber)* and migratory birds (e.g. the avocet, *Recurvirostra avosetta*; and the black-winged-stilt *Himantopus himantopus*). The biological diversity of saline wetlands is also associated with their cultural products, as it is the basis for the provision of food and other materials for domestic use among the human inhabitants of the area, for themselves and their livestock. To illustrate this, a herder in the area of Imón, an important inland salina in central Spain, used to argue that his sheep tasted better because they fed on halophytes (K. Hueso, personal communication).

The aesthetic and natural values of saltscapes are key to their value as a tourist destination. Ornithologists in particular, but also botanists, geologists and members of the public with an interest in natural history have traditionally been fascinated by these flat areas. Saltscapes have also begun to attract a new type of visitor with an interest in cultural heritage (Fig. 3.30). This type of tourism is continuing to develop in salinas and offers, as will be discussed below, an alternative form of development.

Pressures and threats

The Mediterranean coast used to be dotted with salinas, from Cádiz in Spain to the Middle East. In addition, there was an immense richness of inland salinas, especially in Turkey and Spain. Unfortunately, salt is losing some of its value as a commodity (e.g. as a food preservative), and it can be obtained in larger and less labour-intensive ways elsewhere in the world. As a result, the immense salt-making heritage of the Mediterranean continues to disappear, and this is evident throughout the Basin (Petanidou and Dalaka, 2009).

Mediterranean salinas are facing both site-specific and general threats (Hueso and Carrasco, 2009b). The first include changes in the biophysical features of the wetlands and their natural infrastructure. Most threatening to the cultural values of salinas are land use changes in favour of intensive agri/aquacultural developments and urbanisation, the latter being perhaps the most damaging factor in the case of coastal salinas. Other important threats are the destruction, decay or loss of buildings, tools and hydraulic devices due to weathering, vandalism or theft (Casado and Montes, 1991; Williams, 2002; Hueso and Carrasco, 2009a, b).

Less visible are the general threats. This is related to the fact that wetlands are usually managed by several administrations at different levels (local, regional, national) and in different sectors (coastal zone management, defence, agriculture and others) or even by a mixture of public and private bodies. This makes integrated approaches to wetland management extremely challenging. Catchment management planning, on the other hand, usually gives priority to the availability of drinking water and pays little attention to saline wetlands (let alone saline aquifers). Overall, however, the key threat is the abandonment of salt-making

activities due to globalisation in the world market and sheer ignorance about the existence of salinas and their values.

The abandonment of traditional salt-making has had its strongest impact on the human dimensions of the activity, because most of the knowledge about traditional salt-making used to be transmitted orally. When the activity is abandoned, the traditions, legends and beliefs related to salt are slowly lost, along with the tools, devices and infrastructure that are left behind. Consisting, as they do, of very modest materials and fabrication techniques (timber and stones to cope with the corrosive salt) these objects present little interest to collectors or antique hunters who might otherwise play a role in their preservation. Perhaps most damaging of all is the sheer ignorance of the values of salinas, and this may be the fundamental reason why the pressures on salinas and the threats to their existence continue to grow and multiply. Only greater awareness can help policy-makers, landowners, public administrators and the public to appreciate the cultural values of salinas and stimulate the will to protect and revive them.

Salinas' cultural and other heritage as a basis for local development

The particular combination of the cultural and natural, tangible and intangible values of salinas make them a perfect educational setting in which one can teach (and learn) about history, geography, economy, architecture, religion, ethnology, botany, zoology, ecology and geology. These areas are a powerful open-air classroom for all ages, and should be looked after for future generations.

Salt is markedly present in our daily lives, but little is generally known about its origins and wider significance. The possibility of watching it being produced, or just seeing the landscape it derives from, can be hugely exciting. Even if one ignores the salt itself, saltscapes have much to offer, from architecture to ornithology and their aesthetic values (Petanidou et al., 2002; Petanidou and Vayanni, 2002; Vayanni, 2002). Thanks to recent trends like the rehabilitation of our cultural and industrial heritage, the fragmentation of vacation periods into shorter trips, the diversification and specialisation of tourism products and destinations and the proliferation of museums on craftsmanship, 'salt tourism' is starting to take shape. Salt museums are springing up everywhere: it is estimated that there are now over forty in the Mediterranean region alone (Neves et al. 2005; Sala Aniorte, 2007). Also, in line with the general trend, 'salt events' are appearing everywhere in the Basin, ranging from plain fresh produce markets in which salt is present to art festivals, conferences, guided tours around salinas, etc. or combinations of these. Examples of such events include the Heste de la Saü in Salies de Béarn, France, the Festa de la Sal i de la Anxova in L'Escala, Spain, and the Festival Sapore di Sale in Cervia, Italy. In some cases where salt-making is no longer viable, the traces of the activity can be used as a background for other cultural purposes, giving new life to

buildings or infrastructures. The master plan for the Salinas de Añana (Spain) converts part of the saltpans into an open-air theatre in which plays, concerts and other shows are provided for the public (Lasagabaster et al., 2003).

Preserving the cultural heritage of salinas is an expensive business. Different well-managed European-funded projects have contributed to this goal (e.g. ALAS[26], SAL[27], Ecosal Atlantis[28]) with investments in the order of millions of euros, and with differing degrees of long-term success. The heritage of salt can probably not be effectively preserved in the long run solely with public funding. Private initiative has proven to be essential in some cases (for example at Sečovlje in Slovenia), but great care should be taken to approach heritage conservation on the basis of scientific –as well as monetary– criteria. Traditional guided tours and school visits are two well-trodden paths to the respectful exploitation of the Mediterranean's salt heritage, although both are hardly profitable by themselves and are thus, as things now stand, unsustainable from a strictly economic point of view. Salinas may provide some products that are compatible with the protection of the associated heritage. Examples include the different salts that can be obtained by traditional methods and sold as gourmet products, and which can be very diverse in chemical and organoleptic properties. Indeed, artisanal manufacturing lends an added value to common salt. To this end, strategies such as the association of salt-making operations into lobby groups and certification under well-known gastronomic quality labels such as 'label rouge', 'slow food', etc. may help to acknowledge this added value (Viñals et al., 2005). Salt can also be mixed with other spices, herbs, colorants or scents to create other edible or bath salts. It can also be used as an ingredient in other foodstuffs –such as chocolate or sweets with fleur de sel– or in cosmetics such as exfoliating creams. The briny residue ('eau mère' or 'mother lay') resulting from the crystallisation of salt, which used to be discarded, also has cosmetic and therapeutic values (Grozeva and Turk, 2005), as does the mud underlying saltpans and saline lagoons. Some salinas have become spas, where the public can partake in mud-baths, follow professional health treatments or just spend a relaxing day. Well-known salinas which now function as spas include the Dead Sea, Pomorie in Bulgaria and Mar Menor in Spain. Small-scale salt baths have opened in other areas, too, such as the inland salt lakes of Aragón, Spain, where the remnants of the early twentieth century bath houses can still be seen on the shores of the lakes, such as the large one at Bujaraloz in Saragoza, Spain.

Although not strictly related to the cultural heritage of salinas, it is worth mentioning that salinas are also rich in biological by-products which have numerous applications. Plants growing in hypersaline soils can be eaten (such as *Salicornia europaea*) or transformed into cosmetics (*Salsola soda, Suaeda maritima*). The ever-present crustacean *Artemia sp.* is a popular food for aquarium fish, although large quantities are required to make this a profitable business. Perhaps

26 http://www.aegean.gr/alas/, checked 8 April 2011.

27 http://www.sal-atlantic.net/, checked 8 April 2011.

28 http://ecosal-atlantis.ua.pt/, checked 8 April 2011.

most promising of all are the industrial and biotechnological applications of microalgae and hypersaline bacteria (e.g. *Halobacterium* sp.) which are currently being developed. These microscopic organisms can be added to food supplements, cosmetics, electrical conductors and biofuels. An environmentally sustainable use of these resources can help maintain a salina's ecological balance by respecting the life cycle of the biota involved, and therefore preserving the ecosystem's values.

An overall advantage of the multi-purpose production of salt and its by-products is the creation and maintenance of employment. A combination of traditional salt-making and high technology can guarantee the preservation of the intangible cultural heritage, while offering higher level jobs and providing a higher quality of life for employees and for those more indirectly associated with the process. Socio-economically, the recovery of a saltscape and its associated salt-making activity reinforces the identity of the site and its inhabitants' sense of belonging, thereby potentially strengthening its attractiveness to visitors, policymakers, investors and other stakeholders.

With a sound management plan, all these uses of salinas may be compatible with the preservation of their cultural heritage. Most importantly of all, their continued use will be sustainable from an economic, social and environmental point of view. We agree with Jean Pierre Corlay's axiom (2006) that salinas should be saved by people since they are made by people. This will be a great task for environmental education in the years to come (Fig. 3.31).

Fig. 3.31 A Mediterranean saltscape seen through the eyes of a 10 year-old child, Iliana Apostolopoulou, Lesvos, Greece.

This is a painting drawn in the context of the ALAS project (All About Salt; http://www.aegean.gr/alas/, checked 8 April 2011).

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