

Salt Pans⁽³⁾

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Introduction

“Salt is born of the purest parents: the sun and the sea,” Pythagoras (495 BC) once said, capturing the simplicity of salt’s natural creation. Yet, for centuries on the Maltese Islands, salt has been nurtured by two additional parents: the coast and the people. Salt pans, carved out of limestone shores, harnessed the sun and sea, producing salt through an enduring tradition.

The salt pans on the Maltese coast, also referred to as salinas, bear witness to the cultural and environmental heritage present on the archipelago and which have been an integral part of the local economy and identity for centuries. It is among the first ‘products of excellence’ that Malta began producing at a proto-industrial level from the 17th century onward.

This chapter explores the geoheritage value of Maltese salt pans by examining their unique geographical and geological setting, the physical evolution of low sloping coasts and shore platforms that crafted the ideal space for salt panning, and, the traditional artisanal methods of salt harvesting. Special attention will be devoted to three locations where salt production remains active. Despite the pressures of modernity and the intense competition from imported salt, a small number of salt workers remain steadfast, embracing their millenary artisanal craft along the coast. Salt pans contribute to Malta’s cultural legacy, while continuing to attract visitors who seek to experience an enduring fusion of geoheritage and traditional craftsmanship.

Geography of Maltese salt pans

The interplay between the Mediterranean climate, islands' geomorphology and limestone geology has shaped an ideal coastal landscape for salt production on the Maltese Islands. Malta's climate is highly favourable for salt production, with hot, dry summers that accelerate the evaporation process and mild, wet winters that provide periodic rains.

The Maltese coastline stretches for 272 km, with rocky coasts comprising 90.5% of its length. The coastal landscape is largely shaped by tectonic activity and exposed geological layers, resulting in an uplifted fault block and a north-eastern tilt of about 4°. This structure creates distinct coastal features: the southern and south-western coasts are marked by steep, plunging cliffs, while the northern coastlines slope gradually to form low cliffs and gently sloping rocky shores. On the island of Gozo, an easterly dip gives rise to high cliffs on the western coast and gently sloping shorelines along the northeastern and eastern coastlines.

This unique geomorphological setting, combined with the limestone geology of Globigerina Limestone, have shaped the low-sloping rocky coasts and sub-horizontal shore platforms along the northern and north-eastern coasts of the islands. These formations are the most prevalent coastal landforms, covering nearly 37% of Malta's coastline. However, not all salt pans were hewn out of Globigerina Limestone. Those at Blata tal-Melħ (Baħrija) were hewn on Lower Coralline Limestone, the densest and hardest of all rock formations on the Islands.

Shore platforms are gently sloping rock surfaces (0°-5°) that formed from horizontal or slightly inclined geological outcrops at sea level. Shaped by marine processes, such as wave erosion and weathering actions, these platforms are typically backed by retreating soft cliffs and terminate in abrupt low cliff lines

with deeply carved notches at mean sea level. On the Maltese Islands, shore platforms can be found between 5 and 10 metres above sea level and are seldom submerged due to Malta's microtidal conditions. They developed around 6,000 years ago when sea levels reached their present height.

As a result of natural salt weathering processes and wave erosion, these platforms often manifest a honeycomb-like surface with naturally occurring shallow pools with flat bottoms. The presence of these pools encouraged the creation of the earliest forms of human-made pans, as these natural pools were widened and enlarged for salt production. These rocky shore platforms provided the foundation for Malta's distinctive salt landscapes, where human interventions built upon and extended natural processes to produce salt.

Not all salt pans were born out of small natural pools, however. Industrial efforts in the 20th century, supported by state financial aid, led to the creation of extensive salt pans in areas such as Xrobb l-Għagin in Malta, Ir-Reqqa Point and Għar il-Qamħ in Gozo. The latter two projects were abandoned, leaving permanent scars on the coast as reminders of unrealized ambitions.

Salt pans are concentrated along the coastal areas of Malta and Gozo where shore platforms, sloping coasts and salt marshes lie at low elevations above sea level. Active sites which are still in operation today - such as in Xwejini Bay in Gozo, Salina Bay, and Delimara Point - illustrate such a geographical disposition, as they are located on accessible rocky or sheltered embayed coasts that allowed for the natural accumulation and evaporation of seawater to produce salt. Their strategic location, close to both natural bays and inlets, and the earliest towns and villages, made these coastal zones ideal for the labour-intensive process of artisanal salt harvesting.

Historical development

The distinct physical geography and climate, combined with Malta's limited natural resources, have historically positioned salt as a valuable local commodity, essential for food preservation and other practical uses such as skin tanning. The origins of Maltese salt pans date back to at least the medieval period, though it is likely that small-scale salt extraction from naturally forming rock pools occurred even earlier. The local manufacture of salt became a royal monopoly under the Norman rule (1194–1530), reflecting its value as a commodity for local consumption as well as for trade and revenue generation.

Later, during the rule of the Knights of St. John (1530–1798), salt production was actively managed and expanded as a strategic resource. Historical documents illustrate how the place name *Mellieħa* (semitic word for 'salt pan') sprang around the island during this period, such as '*Mellieħa taż-Żonqor*' (1509), '*Mellieħa ta' Bengħisa*' (1557) and *Mellieħa ta' Ras il-Ħobż* (1746). Maps also offer tantalizing hints of a former 'salty' identity for tourist bays like Għadira Bay. In Antonio Francesco Lucini's 1631 map, the bay is labelled *Porto delle Saline Vecchie* (Port of the Old Salt Pans), while its hinterland, the saline marshland of Għadira Bay, is described as a *pianura*, suggesting it was once a salt flat.

And if Għadira Bay had 'old' salt pans, where were the 'new' ones located? To ensure a steady supply, the Knights established large salt pans at Salina Bay, near the mouth of the Burmarrad ria valley. This site was developed into a state-funded *salina*, with extensive basins and a system for seawater collection and evaporation, allowing the Knights to control production and distribution. They imposed a monopoly, fixed prices, and enforced penalties for unauthorized salt production, ensuring that salt remained an

important and profitable resource. The local population began to engage in artisanal salt harvesting along the coasts, often under strict regulatory oversight by the ruling authorities.

During the 18th century, Malta managed to feature in the European salt trade routes. Production was an all-time high on the Salina salt pans, reaching around three million kilos of salt per year. The 19th century saw continued growth in salt production during British rule, with significant improvements to infrastructure that facilitated larger yields. In 1867, for example, Malta's *salinas* produced around four million kilos of coarse salt annually, with the bulk exported. However, as industrialisation transformed global salt production, Malta's traditional methods faced economic challenges. With increased mechanisation and the expansion of industrial-scale saltworks elsewhere, Malta's smaller-scale operations struggled to compete, and many salt pans fell into disuse.

By the mid-20th century, demand for artisanal salt had declined considerably due to the growth of imported, mass-produced salt. Many traditional salt pans were abandoned or repurposed. Others, such as those at Salina Bay have secured European Union funds and have been restored into a Salina family park, with a dedicated interpretation centre about salt harvesting. A resurgence of interest in local, artisanal products in recent decades has breathed new life into Malta's salt pans. Today, the few remaining active salt pans, such as those in Xwejini Bay on Gozo and Delimara Point on Malta, are primarily operated by families who have passed down salt-harvesting techniques through generations. These families maintain the traditional methods and seasonal rhythm of salt production.

The process of salt harvesting

The process of salt harvesting from Maltese salt pans is a carefully orchestrated practice, involving multiple stages of evaporation and collection. It starts from the month of July, when the limestone is sufficiently warmed during the longer days of summer, and the weather is dry and stable. This artisanal process, which has remained largely unchanged for centuries, showcases the dedication and skill of local salt workers who are intimately connected to their saltscapes. The steps in the traditional salt-making process are generally as follows:

a. Pan preparation: The pan bottom is allowed to form a protective duricrust by the weathering process and by the salt itself, in order to be fully functional. Edges of pans may also require repair following any storm-derived damages during the winter months.

b. Reservoir collection: In early summer, seawater starts being pumped into a series of large reservoirs, strategically positioned near the shoreline or on elevated parts of the platform, to facilitate seawater by gravity flow to the smaller pans. These large reservoirs serve as the main source of cold sea water that is then distributed to another set of smaller and shallower reservoirs known as warming pans.

c. Brine generation in warming pans – These smaller reservoirs are found in all sizes, shapes and depths. Though shallower depths facilitate rapid warming, these reservoirs have to occupy a volume seven times the surface area of the crystallizer pans they are meant to supply. Eight days of warm, dry weather turns the seawater of these reservoirs into hypersaline brine.

d. Evaporation and crystallisation: The hypersaline brine is transferred by gravity channels from the warming pans to a sequence of smaller shallower basins that will serve to crystallise the salt, hence referred in this work as crystallizers. This controlled environment

facilitates fractional crystallization, where calcium salts precipitate first, followed by sodium chloride (common salt) in the final basins. Once the hypersaline brine reaches a critical concentration, salt crystals begin to form.

e. Salt collection: At this point, the salt is manually harvested from the shallow pans by scraping it into small piles to drain and dry. This labour-intensive process is carried out with soft brushes and spades to ensure that the salt remains pure. The harvested salt is then collected into larger piles, where it undergoes further drying before being transported to store for further drying and final packaging for sale.

This artisanal method, passed down through generations, requires skill and patience, as salt workers must monitor the evaporation process closely to ensure optimal conditions for salt crystallisation. The knowledge associated with managing salt pans is largely experiential, acquired through years of practice and adaptation to changing environmental conditions.

Xwejni Salt Pans, Gozo

Located along the rugged northern coast of Gozo, the Xwejni salt pans near Marsalforn stretch across some two kilometres, forming one of islands' most picturesque and historically significant salina sites. Managed by the Cini family for over a century, the Xwejni salt pans are arranged in a network of evaporation basins and crystallizers meticulously carved out of the Lower Globigerina Limestone covered in lower phosphatic conglomerate bed (Figure 1). The hard conglomerate allowed the expansion of a sub-horizontal shore platform backed by Middle Globigerina Limestone cliffs.

At Xwejni, salt harvesting is a family affair, with generations passing down traditional techniques and knowledge. Emanuel Cini of Xwejni, the current salt worker, described the earliest works done on the natural pools by people who crossed over from Sicily. Salt used to be harvested from these pools and traded to other ports in the Mediterranean. The delicate nature of the limestone requires regular maintenance, especially after winter storms, which often erode parts of the salt pans. Mr Cini, and his enterprising daughter Josephine, use both traditional and modern methods to manage the salt pans, including pumps to raise seawater into the basins and manual tools to clear debris and maintain the pan structure.

Most of the large warming pans are denoted by Maltese names to distinguish them from others. For example, they have named the basins mostly for their physical characteristics, such as *Il-Baxx* (meaning the shallow one), *Tas-Salib* (meaning the one with the cross), *It-Twil* (meaning the long one), or *Tal-Kantun* (meaning the one with a slab of rock).

The Xwejni salt pans have become a popular destination for tourists, students and locals, where visitors can observe or participate in the salt-harvesting process.

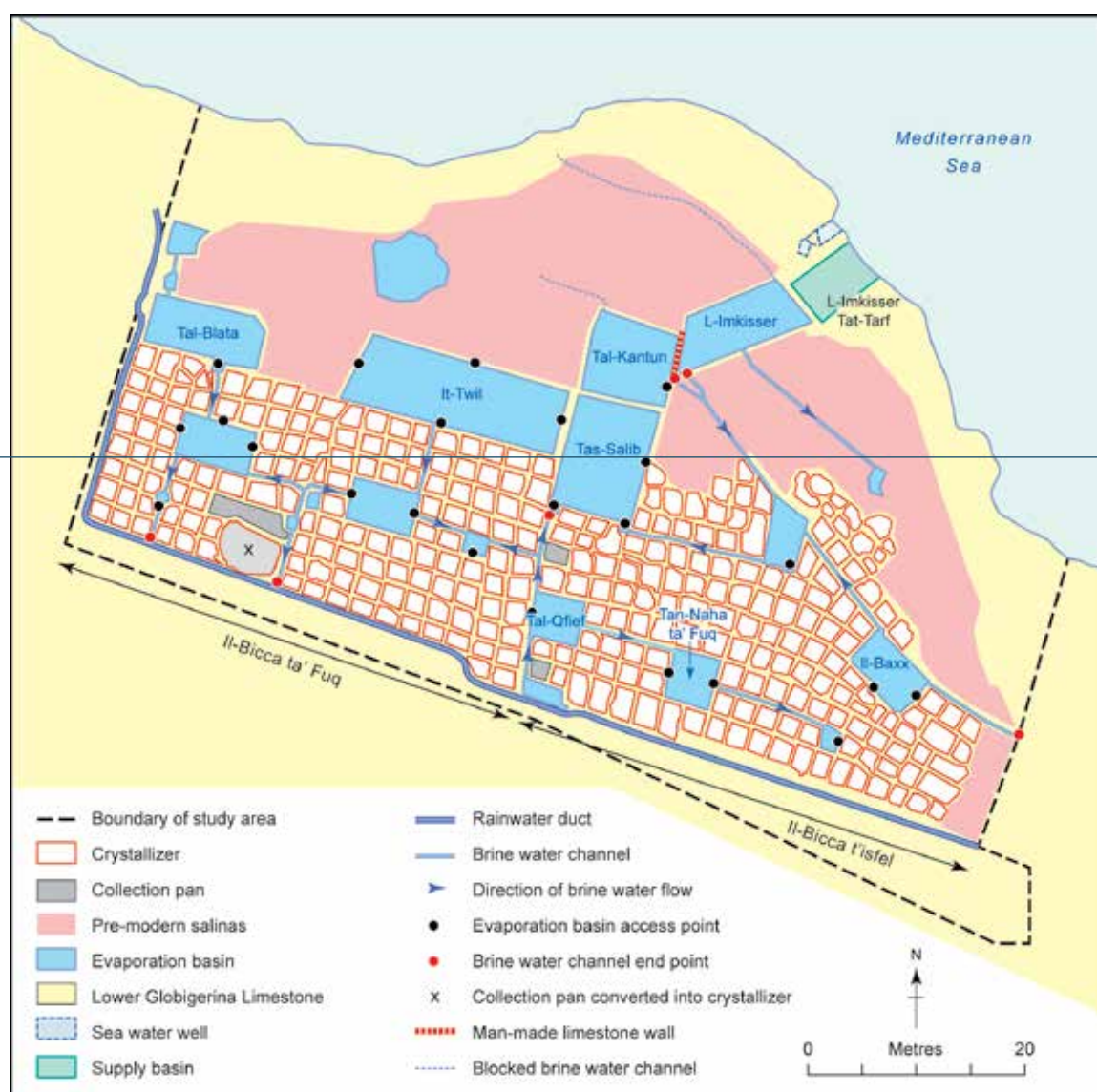


Figure 1: Spatial representation of the traditional salt harvesting system managed by the Ċini family at Xwejni Bay, Gozo. Evaporation basins are referred as warming pans in the text. (Source: Gauci et al. 2017, licenced for reproduction under Creative Commons Attribution 3.0 License).

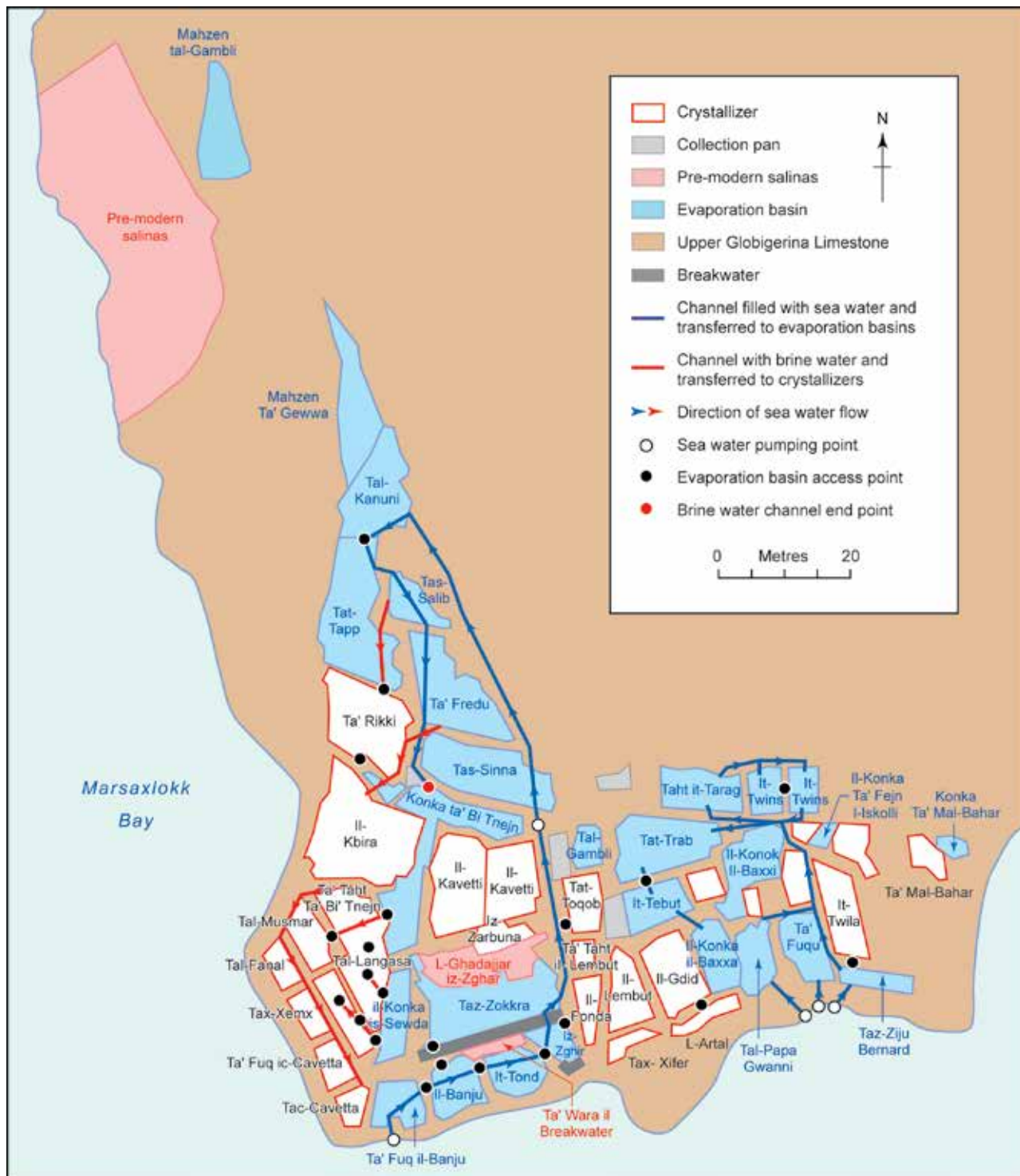


Figure 2: Spatial representation of the traditional salt harvesting system managed by the Mangion family at Delimara, Malta. Evaporation basins are referred as warming pans in the text.
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Delimara Salt Pans, Malta

On Malta's south-eastern coast, the Delimara Peninsula hosts another prominent site for salt production. The Delimara salt pans, managed by the Mangion family, are located on the Delimara Point shore platform, a sub-horizontal limestone surface gently sloping towards the sea (Figure 2). The area is geologically unique, with visible tectonic faults creating slightly uneven terrain that influences the arrangement and layout of the salt pans. The Delimara salt pans are carved into the Upper Globigerina Limestone, which is well-suited to forming shallow pools for salt crystallization due to its low resistance to erosion.

The salt pans lie at the base of a high cliff, accessible only by long ladders set against the cliff face. Over the years, salt worker Charles Mangion expanded the natural pools using hand tools, creating the intricate network visible today. In favourable weather, salt harvesting can occur weekly. Salt deposits are divided into equal squares, and piles of salt are shovelled toward the centre of each square. After draining and drying, the salt is winched up the cliff to reach street level.

Similar to Xwejni, the Delimara salt pans represent more than just nameless rocky saltscapes. Salt pans possess a unique identity, deeply connected with the site-specific features and the people who tend them. Their site features are endowed with names which hold personal memories and familial histories. A number of warming pans are related to their shape or location, for example, It-Twins (meaning, the twins) is the name of two warming pans that are identical in shape and are located next to each other. Tal-Langasa (meaning, of the pear) salt pan owes its name to its pear-shaped form while Iż-Żarbuna (meaning, the shoe) is a salt pan that resembles the shape of a shoe. Il-Lembut refers to its shape as a funnel, whereas Tax-Xifer (meaning, the one at the edge) refers to its position at the edge of the platform.

The Salina Salt Pans, Malta

Salina represents the largest system of salt pans on the archipelago, featuring the most extensive network of irrigation channels and embankments, covering a total area of 99,160 m². It includes ten crystallizers, each approximately 1,600 m² in size. Additionally, the site contains twelve evaporation basins, one semi-warm water reservoir, and one cold-water reservoir. Though it is now part of the Natura 2000 network, the Salina merits consideration for future nomination as a World Heritage Site.

The salt pans are located within a valley delta and a ria harbour, with archaeological evidence indicating that this harbour was a bustling commercial centre during Roman times. Historical maps of the 1565 Great Siege, drawn by Antonio Francesco Lucini and Mattia Perez D'Aleccio, suggest that salt pans already existed in the Burmarrad valley, but they were hewn higher up along the rocky coast rather than within the harbour waters. The current salt pan system at Salina Bay was not carved into land but built on a reclaimed island within the enclosed port, connected to the mainland by bridges.

Over the years, the Salina has undergone several modifications, including a reduction in size when the coastal road was constructed in the mid-20th century. A 1900 survey shows that Pans 1-9 were used as crystallizers (Figure 3). Converting Pan 10 from an evaporation basin to a crystallizer proved challenging, as seawater from the 23 evaporation basins struggled to meet the volume needed to replenish the large crystallizers, which require nine times their volume in water. This large-

scale production at Salina sets it apart from all other artisanal salt pans on the islands. Conservation measures were initiated in 1996 when the Malta Environment and Planning Authority (MEPA) included the Salina salt pans and its environs in the list of scheduled property and declared it as Special Area of Conservation (SAC).

Salt production begins in March with the cleaning and scrubbing of the salt pans. The cold-water and semi-warm water reservoirs are successively filled and left to settle, allowing impurities to separate from the seawater. Warmer water is then directed by gravity to warming pans, and once sufficiently heated, it flows into the crystallizers. There, it gradually crystallizes into salt over several weeks. During this process, the seawater turns pink and thickens, eventually forming floating salt crystals that accumulate in larger deposits (Figure 3). Before harvesting, excess water is drained, and the salt cover is chiselled into uniform squares to facilitate stacking into salt pyramids. The nearby Ximenes Redoubt serves as the final collection and storage point for these dried salts.

The Salina salt pans were rescued from deterioration and partial submersion by the European Agricultural Regional Development Fund (EAFRD). Over the years, they had been left to silt over and to become waterlogged. Retaining walls, embankments, and walkways had to be rebuilt, and silt and clay were cleared from the pan bottoms. The old, heavily deteriorated storage huts were replaced with state-of-the-art wooden sheds, designed to store salt and serve as an interpretation centre.



Figure 3: Site map 1:2500, dated 1900, with the numbering system for each pan (left); Google Earth image of the Salina Bay (right), showing the coloured hues of the saline water in pans during evaporation process. (Source of 1900 map [left] Clarke E.V. and Agius-Vadala M., 1995; Satellite imagery [right] extracted by author, Map data ©2024 Google).



A labour intensive industry: salt panning at Xwejni, limits of Marsalforn, northern Gozo.

Salt pans are worth one's salt as geoheritage

Today, local salt is marketed as a niche, high-quality, gourmet product, often valued for its purity and unique mineral profile, which reflects the Maltese coastal environment. The traditional salt pans are also promoted as part of Malta's geo-cultural heritage, drawing tourists who are keen to observe or participate in salt harvesting. Geo-tourism initiatives, such as guided visits to the salt pans, offer hands-on experiences and a connection to Malta's heritage.

Thus, the salt pans of the Maltese Islands represent more than a means of salt production. While they no longer serve the island's economy, they endure as symbols of its history, culture, and craftsmanship, showcasing a sustainable and artisanal tradition that continues (albeit barely) to enrich our coastal landscape. They embody a heritage that reflects the ingenuity and resilience of the people of these Islands. Their presence on Malta's limestone coasts highlights a symbiotic relationship between natural geology and human craft, where generations of salt workers have shaped, and been shaped by, the coastal landscape.

Preserving this geoheritage requires an understanding of both the physical environment and the traditional knowledge that sustains it. However, this system relies on the skilled, long-term knowledge of local artisans to function effectively. The expertise required to manage the salt pans is rooted in continuous interaction with the coast and the gradual adaptation of traditional methods to evolving environmental conditions. This tacit knowledge, passed down through the hands-on experience of past generations, is essential to preserving Malta's artisanal salt-making practices.