

RESEARCH ARTICLE

## Temporal evolution of the area of Capo Peloro (Sicily, Italy) from pristine site into urbanized area

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### Abstract

- 1 - The area of Capo Peloro was examined as a natural system subjected to an increasing anthropogenic pressure, resulting in alteration of its ecological characteristics. According to the hypothesis of Barrier (1995), Capo Peloro was originated by tectonic movements along the Straits of Messina during the Pliocene and the Pleistocene times. Two different models of littoral barrier construction, were suggested by Bottari & Carveni (2009) and by Chillemi (1995). Both of them have lead to the formation of brackish lagoons along the coastline similar to those existing now.
- 2 - Historical evidence of Greek and Roman times, supports the existence of a bay able to accommodate vessels up to the I century B.C. The evolution into brackish lagoons appears accomplished in the V century A.D., as documented in 1864 by Solino. The salt marsh along with the two adjacent lakes, formed a complex ecosystem able to support local hunting and fishing. At the same time, swordfish fishing in the Straits of Messina became a fashionable leisure for the Elders of the city and their famous guests.
- 3 - A series of channels linking the lakes to each other and to the neighbouring sea can be found at the beginning of XIX century A.D., during the British occupation; they were focused to protect the Bourbons from possible invasions of Sicily made by the French. A marshland between the two lakes was claimed due to the achievement of military fortresses built along the coast from Messina to Capo Peloro. During the same period, the Bourbons gave permission to clean up the area to create a fishing reserve in the Ganzirri lake.
- 4 - Gradually, in the second half of the XIX century, the drained marshy area was used as farmland. In the two lakes, the harvesting of clams from spontaneous became shellfish farming. The rearing process involved the tampering of the lake bottom to create the "mounds" in which to enter the clams for their growth. In addition to local species, the introduction of allochthonous species (oysters, mussels ...) is mentioned in some documents of the late XIX century.
- 5 - The intensification of shellfish farming has led to significant influences also on autotrophic biomass. Legal disputes also arose as to the rights of property resulting from the division into parcels granted to individual owners. The violent impairment of the territory has developed over the last 50 years through the intense urbanization extended to all the area of Capo Peloro.

**Keywords:** : Eastern Sicily, Capo Peloro, brackish lakes, geological history, anthropogenic impact

## Introduction

There are places on earth where life is a sporadic, occasional, presence. Others have witnessed the events from the beginning of human history and even before. The area of Capo Peloro is one of them. The Strait of Messina is the obligatory passage from the Tyrrhenian to the Ionian Sea to move from south-western coasts of Europe to the Eastern Mediterranean, as an alternative to the Strait of Sicily.

Currently, Capo Peloro and the adjacent brackish lakes are a natural and ethnographic reserve. However, no effort has been made to benefit the small groups of migratory waterbirds to earn this ambitious title. That area should be preserved as wetland that stretches around the lakes. But already during the last two centuries, human intervention has changed substantially the structure of the natural lakes.

Interventions have become progressively heavier, from the construction of channels to the drainage of much of the wetland. Initially the purpose was to gain agricultural land around the small settlements of Torre Faro

and Ganzirri. In the past fifty years, the urban settlements have wiped off the specific and typical crops.

The urban sprawl of the city of Messina, squeezed between the hills and the sea, has swept to the north and south, in the name of massive urbanization and in honor of the tourism industry.

By going back over this progression and considering the environmental changes that occurred under the effect of increasing human impact, this paper is aimed to discuss about the temporal evolution of Capo Peloro. A thorough search of grey literature and scientific publications on the area of Capo Peloro was conducted. Over 200 publications were examined and classified, increasing the knowledge on the environment of the area of Capo Peloro.

## Study area

The area of Capo Peloro (Eastern Sicily;  $38^{\circ}15'57''N$ ;  $15^{\circ}37'50''E$ ) (Figure 1) is located in the north-easternmost part of Sicily, between the Tyrrhenian and the Ionian Sea.

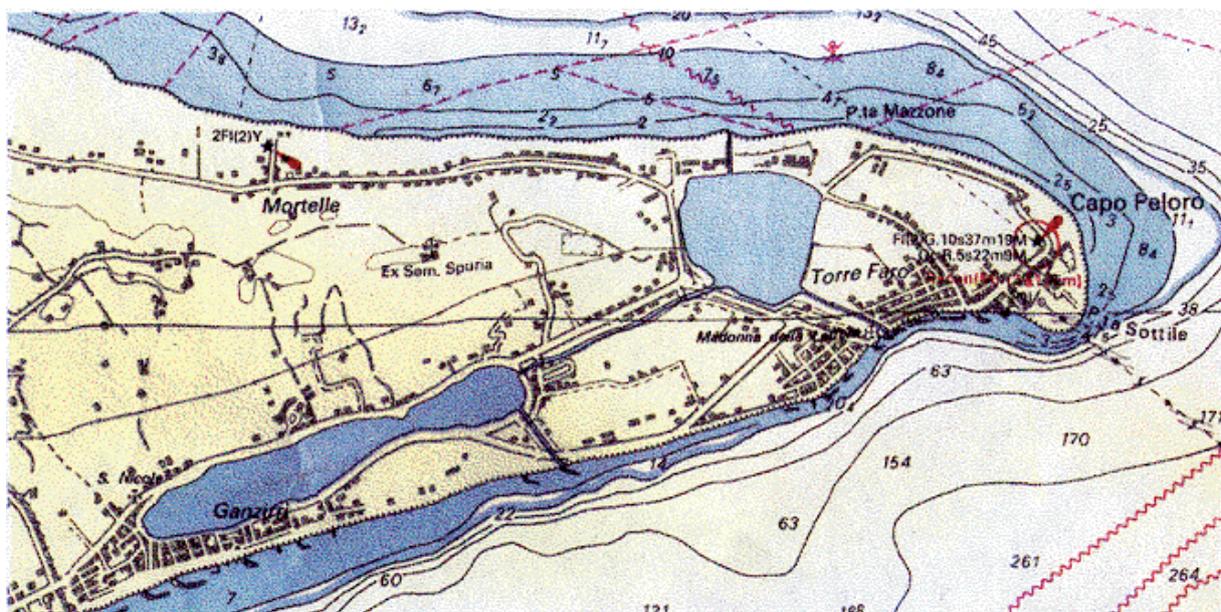


Figure 1. Map of Capo Peloro area.

The Capo Peloro Peninsula is composed of three main physiographic units: 1. the hills; 2. Faro and Ganzirri lakes, that includes the ancient Margi swamp 3. Capo Peloro sand tongue (Antonioli *et al.*, 2004).

Channels connect the lakes to each other and to the sea. Indeed small exchanges with the waters of the Straits of Messina do occur through the channels, under the impetus of the tide.

The hills are a front for collecting rainwater that is conveyed in both surface and underground waters of the lagoon area. An aquifer that is fed by the foothills of Peloritani extends to the lagoon area and is involved in water balance of lakes. In fact, the salinity of the water of the marshes is the result of the interaction between the groundwater and marine waters.

Ganzirri is a brackish coastal lake; it covers a 34 ha area (maximum depth: 7 m; water volume: 106 m<sup>3</sup>). It communicates with the Straits of Messina through Carmine Channel and with Faro lake through Margi Channel. It has the appearance of a long (1,670 m) and narrow (on average ~200 m) stream tube parallel to the coast.

Faro is a small meromictic coastal lake. It covers a 26 ha area and has a nearly circular shape with a ~500 m diameter. Its depth in the central part reaches 30 m, whereas its mean depth ranges from 0.5 to 5 m. It communicates with the Tyrrhenian Sea through an artificial channel (English Channel) that is open only sporadically during summer, and continuously with the Straits of Messina through the Faro Channel. Capo Peloro sand tongue developed during Late Holocene, by a concentric multiphase accumulation of littoral and Aeolian sand around the eastern border of Faro lake. Its shoreline has changed over time for the action of currents and wave (Antonioli *et al.*, 2004).

## Discussion

### *The origin and mythology*

Pelorus comes from the greek word Pelor (Πελωρ), meaning something monstrous or portentous, and it was once linked to the frightening phenomenon of localized vortices and eddies in the Straits of Messina. These phenomena were represented by the monsters Scylla (“the one who slays”) and Charybdis (“the one who sucks”). But Capo Peloro may have taken its name also from the Goddess Peloria, a nymph who appears in the coinage of the ancient city of Messina to attest to a cult that spread from the VIII century B.C. (Figure 2).

Or even from the name of the ship's pilot of Hannibal, the famous Carthaginian general; while the Carthaginians sailed toward the Strait, Hannibal had to execute the pilot, misled by the apparent continuity of the coastline of Sicily and Calabria, and convinced of the treachery of Pelorus. Hannibal, to immortalize the true pilot unjustly killed, called the promontory as Pelorus.

However, we like the name origin from Greek Peloris, place outside of normal. In this magical place, at the time of Orion, the mythical founder of the city of Messina, were forming marshes that even today, we can observe.

### *Geological formation*

According to the hypothesis of Barrier (1995), Capo Peloro was originated by tectonic movements in the Straits of Messina during Pliocene and Pleistocene. Antonioli *et al.* (2004) documented the relative sea-level change, using data by geomorphological and stratigraphical surveys, radiocarbon dating, paleontological and sedimentological analysis. Also previous archeological findings (Biddittu *et al.*, 1979) support the hypothesis that human settlement took place from 5000 B.P. on the littoral dune, when the Ganzirri lagoon area was setting up and the



Figure 2. Ancient coin depicting the Goddess Peloria (<http://pheraimon.blogspot.com/2007/11/peloro-e-laninfa-pelorias.html>).

continental sand was at the initial stage of accumulation.

Two different models of littoral barrier construction were suggested by Chillemi (1995) and by Bottari and Carveni (2009) (Figure 3a e 3b).

Both of them have led to the formation of brackish lakes along the coastline similar to those existing now.

Historical evidence of Greek and Roman times supports the existence of a natural harbour up to the I century B.C. The evolution into brackish lakes appears accomplished in the V century A.D., as documented by Solino (1864) in his description of the area of Capo Peloro. A careful analysis was conducted on historical documents from Aricò (1999) and Buceti (2004).

The salt marsh and the lakes formed a complex ecosystem where hunting and fishing become attractive for the locals. In addition, the swordfish fishing started in the XVI century as a fashion fun for the local aristocracy (Figure 4).

However, the most powerful intervention on the structure of the lakes was the construction

of channels connecting the lakes to each other and to the sea. They were constructed partly for military purposes, during the British occupation in defense of the Bourbons, but also to restore the area and create a fishing reserve in the Ganzirri lake. These changes occurred in the late XVIII century and early decades of the XIX century and led to a direct exchange of water and organisms between the lagoon and the sea.

#### *From the XIX century to today*

At the early XIX century, the English settled in Capo Peloro and established their headquarters in the hunting lodge of the Marquis Palermo (now Villa Pomara) (Figure 5). In the last years of the XIX century and at the beginning of the XX century we find the first empirical data on salinity, temperature and oxygen of the two lakes (Ficalbi, 1898; Terni, 1901; Sanzo, 1904); but only with Scordia (1927) we have certainly got the first data. Then, Mazzarelli (1938), Lo Giudice (1940) and Dulzetto (1942) have further reported accurate data. Only in 1952 the pioneering studies from Abruzzese and Genovese

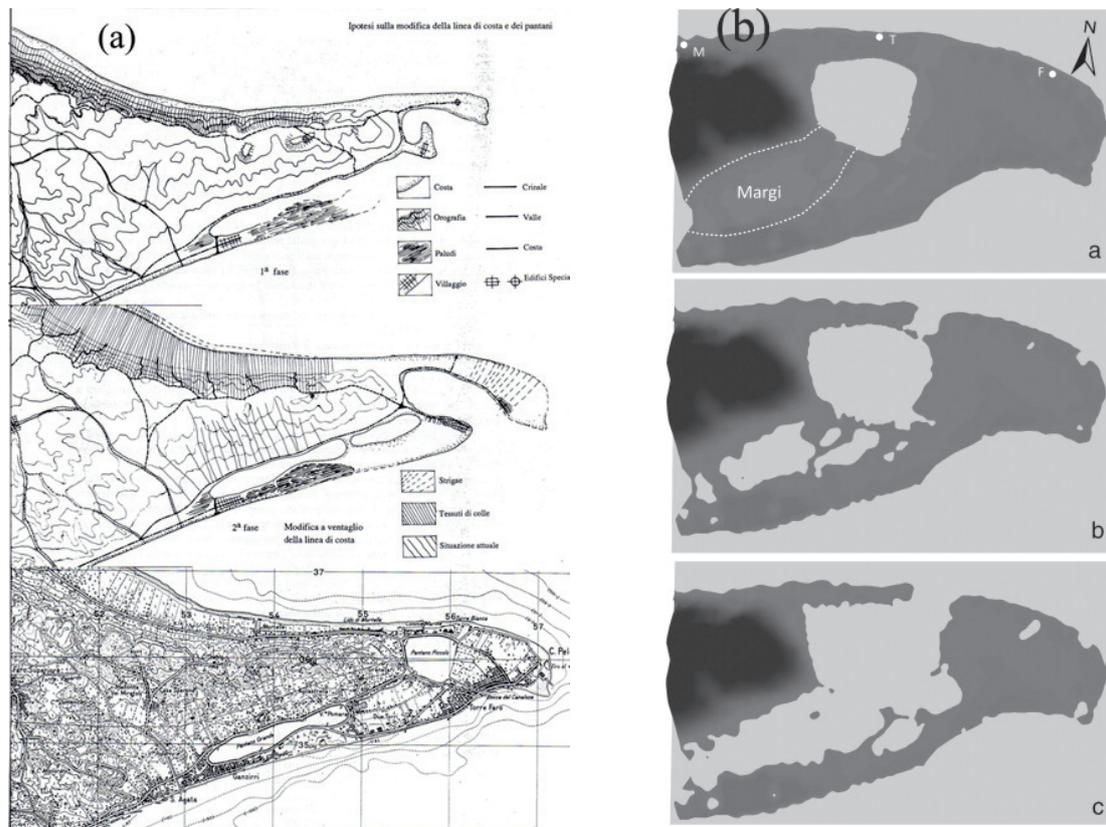


Figure 3. Evolution of Capo Peloro area according to (a) Chillemi (1995) and to (b) Bottari and Carveni (2009).

(1952), Crisafi (1954) and Cavaliere (1963) on the two brackish environments are a comprehensive documentation, and their data are still comparable to the most recent ones (Bruni *et al.*, 1976; Cortese *et al.*, 2000; Sanfilippo, 2000; Manganaro *et al.*, 2009; Mazzola *et al.*, 2010).

The first papers on the shellfish culture in Capo Peloro lagoon are due to Ficalbi (1898). News about poor sanitation of Ganzirri pond are found over the years, as early as 1898, when Prof. Terni, Director of the Health Office of Messina Town, determining bacteria in Ganzirri water, found high numbers (2-3 millions/cm<sup>3</sup>) of “germs”. In 1901, Caselli and Borzì made proposals to improve sanitation of Ganzirri and Faro lakes. Sanzo (1904) refers of “murky water with repulsive smell that indicates unsanitary water and

concern for the health of the surrounding population”. Gamberini (1920) refers of threat to public health and “infectious fever” for Ganzirri lake in 1906; in 1908 The Magazine *Germinal* wrote “Is a fact that the poisoned water of the lakes pollutes the air and shellfish, producing infectious diseases” (Gamberini, 1920). More recently, the occurrence of *Vibrio parahaemolyticus* and *V. alginolyticus* was detected in the brackish lake of Ganzirri (Alonzo *et al.*, 1979), and also the occurrence of halophilic vibrios was detected in mussels (Alonzo *et al.*, 1981) and in water (Bisignano *et al.*, 1981).

The shellfish farming continued over time until 1981, when the activity was prohibited by a Regional decree of “foreclosure” due to heavy pollution and contamination by pathogenic prokaryotes (Regional Decree June 2, 1981).



Figure 4. A. Casembrot (1644), *A view of the Straits of Messina*, oil on canvas. Naples, National Museum of S. Martino.



Figure 5. View Villa Pomara - postcard from the early 1900.

Later, monitoring has been made on the hygienic conditions of the lakes of Faro and Ganzirri (Ciaccio, 1983; Delia *et al.*, 1984; Giacobbe *et al.*, 1996), on spread of Hepatitis A (Di Pietro *et al.*, 1987) and on environmental quality (Cortese *et al.*, 2000; Bergamasco *et al.*, 2005; Mazzola *et al.*, 2010). Faro lake, however, is still largely exploited for bivalve cultivation (mainly *Mytilus* sp.; Giacobbe *et al.*, 1996, Canestri Trotti *et al.*, 1998; Licata *et al.*, 2003; Licata *et al.*, 2004), with an estimated mean annual cultivated biomass of ~300 t.

To date, unlike Faro, in Ganzirri lake farming of mollusks is absolutely forbidden. As a result of public sanitation, the health conditions of Ganzirri are now much improved, despite the occasional presence

of the toxic dinoflagellate *Coolia monotis* (Gangemi, 2001). So, it would be desirable to test the opportunity to reintroduce clam farming (Manganaro *et al.*, 2009).

### Conclusions

Cape Peloro lagoon is now a Natural Reserve, established by the Sicilian Region in 2001, a Site of Community Importance under the Directive 92/43/EEC and a Special Protection Area under the Directive 79/409/EEC in the Water Project of 1972. It is also a site of ethno-anthropological interest (order declaratory 1342/88) for traditional manufacturing-related work activities and shellfish (mussels and clams) culture.

The current situation of the two lakes has worsened in terms of human impact, especially in the Ganzirri area. It should be noted however that, just after World War II and more and more in the last four decades, the result of the reckless overbuilding and uncontrolled speculation has largely erased, with accretions building and urban expansion, the natural landscape (Fig. 6a). Especially the beautiful hillside overlooking the Ganzirri lake was attacked by one of the most savage operations of speculation (Fig. 6b). In this regard, Chillemi (1995) stated: "The sweet hill was flooded with houses and all fields have disappeared under a sheet of uncivilized homes. A landscape of giants attacked and devoured by a swarm of ravenous ants".

Peloris, place outside the normal, territory of extraordinary natural and cultural richness, would have merited, as it still deserves, a better fate. What is certain is that Capo Peloro and the Straits of Messina (Fig. 7) are a priceless heritage that belongs not only to Messina, but to the whole Mediterranean and to the human civilization, that together with Odysseus had chased their own myth. This is our daily interaction with the gods to which we must be accountable: "What have you done with our house? ". They ask us to

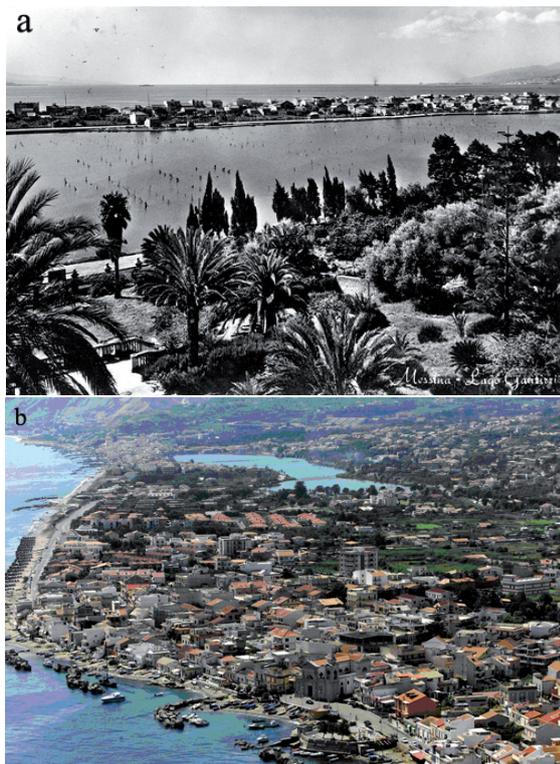


Figure 6. Ganzirri area before (a) and after (b) wild speculation.

account for this sharp prow, mocking beak of this "beast" who always sail, the blue, sometimes peaceful, Thalassa, the "Mare Nostrum", between the roar of Scylla, and the mighty bellowing of Charybdis (Chillemi, 1995).

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Figure 7. John Curtis (1812), View of the Straits of Messina, Aquatint. Rome, Private Collection.

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