

# CHANGES IN THE BENTHIC COMMUNITIES OF HARD AND SOFT BOTTOMS AT THE HYDROGRAPHIC BOUNDARIES IN THE VENICE LAGOON

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## Abstract

In the central sub-basin of the lagoon of Venice hard and soft bottom communities have been investigated in four stations, from March 1994 to March 1995. A surprising concordance of the ecological picture has been pointed out. The Sette Morti station at the southern boundary of the central sub-basin showed its own peculiarities, sustained by both a favourable hydrodynamism and the high lagoon trophism. At the opposite extreme the station near the Poveglia island is similar from the hydrodynamic point of view, but differs for its ecological features, being negatively influenced by the proximity of Venice and Marghera industrial pole.

**Key-words:** zoobenthos, brackish water, Adriatic Sea

## Introduction

From an hydrological point of view, the lagoon of Venice is divided into three sub-basins, each corresponding to a lagoon mouth. Our ecological investigations in the middle basin of the Venetian lagoon are part of a national research programme of the former "Ministero della Marina Mercantile", which includes analogous investigations in other five brackish water basins spread on the Italian territory: the Valli of Comacchio (Emilia-Romagna), the lagoon of Orbetello (Toscana), the Lago di Sabaudia (Campania), the Lago di Marsala (Sicilia) and the Stagno di Casaraccio (Sardegna). The research programme was co-ordinated by Prof. Cognetti of the University of Pisa [1].

Here soft and hard bottom communities are compared as environmental indicators of boundary conditions existing at the limits of tidal influence of the waters entering through the central mouth.

## Methods and material

Samples were collected at nearly 90 days interval from March 1994 to March 1995 in four sites (fig. 1). The Malamocco Port (MA), the Valgrande Channel (VG) and the Valle dei Sette Morti (SM) are distributed along a vivification gradient induced by tidal influence, from the sea to the inner part of the basin towards the southern limit of the central sub-basin. This area is largely used for sea food production exploiting its natural conditions, as far as possible. On the contrary, the Poveglia Island (PO) is located at the opposite extreme of the central sub-basin closed to its northern boundary, towards the urban centre of Venice and the industrial area of Marghera.

Hard bottom biological associations were scraped from the wooden piles, marking the navigable canals, with a handled metal-framed net (0.5 mm mesh size) just below the intertidal zone, on a surface of about 25x50 cm. Soft bottom communities were sampled with an Ekman-Birge grab of 225 cm<sup>2</sup> area; three replicates were collected at each site. All samples were fixed with formalin 4%.



Fig. 1 - The collecting sites in the central sub-basin of the lagoon of Venice. SM = Valle dei Sette Morti; VG = Valgrande Channel; MA = Malamocco Port; PO = Poveglia Island

In our laboratory the specimens were sorted, identified at a specific level and counted. The structure of the communities were investigated by means of biotic indexes: the species richness, Shannon diversity and Simpson dominance. The cluster analysis was also applied on similarity indexes by Sørensen and Kulczynski [2].

## Results and discussion

On hard substrata 37 species of Peracarid Crustaceans (27 Amphipods, 8 Isopods, 2 Tanaids) and other 54 species of sessile macrobenthos (13 Bryozoans, 8 Hydrozoans, 6 Sponges, 6 Bivalves, 6 Serpulids, 6 Ascidians and 1 Entoproct) were collected. For soft bottoms 62 Polychets, 26 Molluscs (22 Bivalves and 4 Gastropods) and 21 Peracarids (16 Amphipods, 3 Isopods, 1 Tanaid) were found.

Two species are new for the Mediterranean Sea: the Amphipod *Caprella scaura* Templeton, well diversified from the other caprellids of the Venetian lagoon for its macroscopic differences at a morphological level, and the Bryozoan *Celleporella carolinensis* Ryland [3].

The stations are not different in terms of diversity and dominance; seasonality also is not remarkable, except for a few species.

On the contrary, clustering of the stations is very similar irrespective of the three investigated communities [4], despite the different methods to estimate the abundances of the species. Quantitative data are available only for soft bottom communities; qualitative methods were used for hard substrata, for the difficulty to obtain a really quantitative sample. Although data were heterogeneous, a coherent environmental picture emerges, indicating that Sette Morti area (SM) is clearly separated from the other three (fig. 2).

This finding is strongly indicative of a remarkable ecological originality of this area, located near the southern watershed boundary. Sette Morti is remote from direct anthropic influence and enjoys a relatively good exchange with the Adriatic Sea. In fact, as a consequence of the gredging of the deep Malamocco-Marghera Channel the central basin became enlarged at the expense of the other sub-basins; the watershed boundaries among them were shifted towards Venice on one side and towards Chioggia on the other.

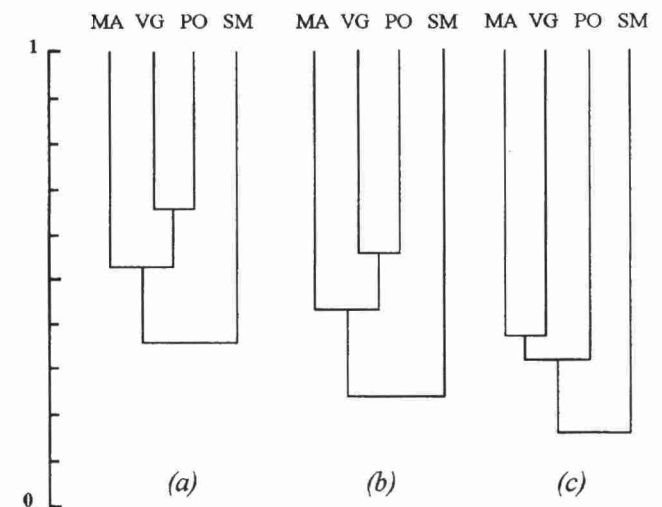


Fig. 2 - Cluster analysis by Kulczynski's index of similarity: sessile (a) and peracarid (b) communities on hard bottoms; soft bottom communities (c).

## Conclusions

The uniqueness of the Sette Morti station (SM) corresponds to a clear-cut ecological situation, encompassing the advantages of the high lagoon trophic state and of the still active vivification from the sea.

The Malamocco station (MA) shows a high hydrodynamism, that can become a limitant factor for the biotic community, having largely marine features. For instance, as regards Peracarids, Malamocco and Sette Morti show a similar temporal pattern, although based on different values of density, the inner populations being more abundant [5].

At the opposite extreme of the central sub-basin, the Poveglia Island (PO) has hydrodynamic conditions similar to the Sette Morti area. But here the biotic community is very different; the proximity of the urban centre of Venice and the industrial area of Marghera operate a severe selection, resulting in a poor and trivial community.