MARINELLO COASTAL SYSTEM, NORTH-EASTERN SICILY - ITALY

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The Marinello coastal system is a small littoral area located in the Patti Gulf (Messina, Italy), behind the Tindari Cliff (38,13°N – 15,05°E), that currently includes five little deep ponds whose shape, number and dimensions are continuously changed by the rapid evolution of coastal morphology. At present, the system covers an area of approximately 697,000 m^2 (Fig.1).

Figure 1: Marinello coastal system

Direct urban discharges are completely absent, and only in summer a low human pressure interests the forefront bay. Each basin is interested by different kinds of water inflows. The outermost ponds are mainly influenced by sea water inflows, through infiltration mechanisms or direct contribution during storms.

Conversely, the most important input to the three inner ponds is surface run-off carrying dissolved and particulate matter from the surrounding lands (often used for pasture or agricultural exploitation).

The space-time heterogeneity of allochthonous inputs and inorganic enrichment (Azzaro, 1995; Leonardi et al., 2000) induces very different trophic levels and salinity values on the ponds.
In this investigation we compare two very different ponds of this ecosystem: Fondo Porto and Verde.

Fondo Porto pond features an area of 13,000 m^2, a volume of 19,500 m^3 and a mean depth of about 1.5 m. Fondo Porto is a typical coastal pond with high salinity and low nutrient concentrations, its water balance being strongly conditioned by sea waters.

Verde pond exhibits an area of 17,000 m^2, a volume of 27,200 m^3 and a mean depth of 1.6 m. It is characterized by lower salinity and an higher nutrient loads carried by continental and meteoric waters, which become enriched of organic and inorganic compounds due to their passage on the overhanging cliff, heavily colonized by sea-gulls. This loading scenario combined to particular climatic conditions (e.g. high summer temperatures) has occasionally resulted in distrophic crises with anoxiae and fish mortality.

The water budget was calculated on two periods: the dry one from the April 1997 to the September 1997 and the wet one from October 1997 to March 1998, using a single box-single layer model. The budgetary analysis was performed according to LOICZ biogeochemical Budgeting Guidelines (Gordon *et al*., 1996).

The examined ponds don't receive direct fluvial inputs and runoff inputs constitute the greatest inflow contribution.

Concerning the nutrient balance, the ponds are net exporter of DIP towards the sea in both periods. They seem to act as net sinks for dissolved inorganic phosphorous. The DIN presents high values in both ponds during wet season with

concentrations four-to-five times higher with respect to dry season.

The system is a net producer of organic matter; this applies to both periods and particularly to Verde pond. Nitrogen removal is generally balanced by nitrogen storage processes during summer, while fixation prevails in wet season.
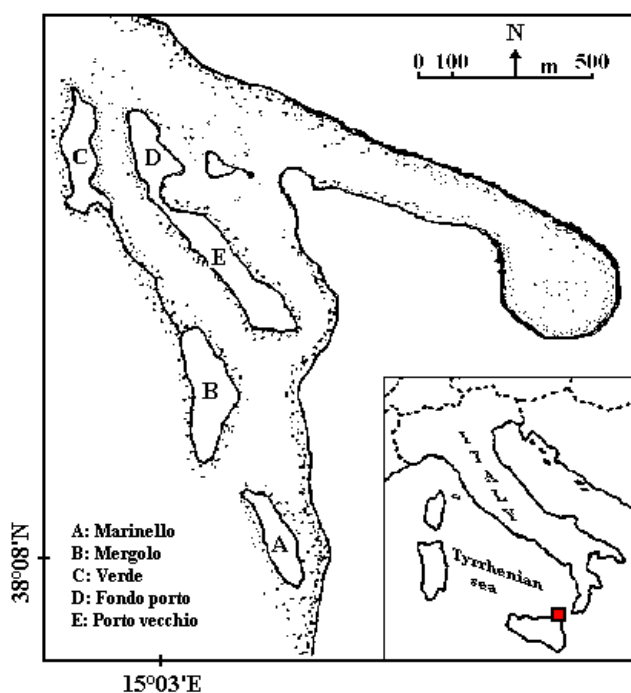

Fig. 2: Marinello system map

LaguNet (http://www.dsa.unipr.it/lagunet/) is a scientific observational network studying the fluxes of nutrients and other contaminants from lagoon catchments to the near coastal environment. The objectives of LaguNet are to support and encourage co-operation of research groups studying lagoons, wetlands and saltmash systems situated along the Italian coast and to evaluate the application of the LOICZ (Land Ocean Interactions in Coastal Zones, a core project of IGBP) biogeochemical flux model and typology classification to such sites.

The methodology has been applied by LOICZ to approximately 170 coastal environments worldwide; it is based on a mass balance approach and provides important information on the flux of nutrients and ecosystem functions; the approach used is applicable to a majority of coastal ecosystems with data that are normally available from conventional monitoring campaigns. In this way it is possible to compare and to group aquatic

systems having different characteristics based on properties related to biogeochemical cycles and to the ecosystem functions that result from these processes.

Figure 3: LaguNet sites around the Italian peninsular

On the basis of this experience and considering the paucity of LOICZ sites in the Mediterranean and Southern Europe it was decided to apply this methodology to a series of Italian coastal environments where sufficient data are available.

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