
COASTAL SYSTEM OF LIGURIAN SEA - ITALY

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The Ligurian–Provençal Basin, together with the Gulf of Lions and the Catalan Sea, forms the North-western Mediterranean Basin. This region is characterized by a general cyclonic circulation fed by two distinct fluxes, one from the Tyrrhenian Sea through the Corsica Channel and the other from the northwestern side of Corsica. The two fluxes merge north of the island generating a very stable current that closely follows the sea bottom bathymetry along the Italian coast. A marked front, recognizable both in temperature and salinity, separates the coastal waters from the colder and saltier waters of the basin interior (Gasparini *et al.* 1999).



Figure 1: Study area location

Unfortunately, less is known about the coastal circulation of the Ligurian Sea, which appeared to be associated with the general one characterised by a cyclonic vortex. Clearly, the morphology, meteorology and hydrodynamics of the area can modify the sub-basin scale circulation features (Manzella *et al.*, 1982).

The waters of the Ligurian Sea are characterized by a relative lack of nutrient salts and this is an impediment to greater productivity of the basin. The highest concentrations of nutrients were found near the coastline or in particular geographical areas such as river estuaries, ports and inlets; nevertheless high concentrations were also found in the open sea in relation to the upwelling of the

deep waters, rich in nutrient salts (Dagnino *et al.* 1990).

The study area (44.35-44.45 N, 8.70-9.16 E) (Fig.1), located in the Gulf of Genoa, is delimited northward by the coastline between Genoa and the Promontory of Portofino, and southward by the 50 meters isobath. The area was defined according to the sampling strategies for environmental monitoring of coastal areas (Italian law, D.L.vo 152/99). It has a surface area of 52 km² and a mean water depth of 28 m.

The shoreline is largely urbanized (c.a. 800.000 inhabitants), with intense industrial and harbour activity in the central-western part. Therefore, terrestrial sources of nutrients from sewage treatment waters and torrent-like rivers bring significant supply of nitrogen and phosphorus to the study area.



Figure 2: Central part of the study area

In the eastern part, instead, prevails tourism activities.

A study about the environmental quality evaluation of ligurian sea coastal waters (Rivaró *et al.*, 2000), reports a classification of the area regarding their position on a scale of quality, using quality indices.

On the basis of this classification, Genoa central-western area ranked as the worst area as to its water characteristics, while the eastern part presented better waters quality. Nevertheless, the inhabitants increase, during summer, due to tourism activities, can cause a local worsening of waters quality in the eastern part too.



Figure 3: Eastern part of the study area

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 saltmarsh 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 4: 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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