PHYSICO-CHEMICAL FEATURES AND NUTRIENTS DISTRIBUTION IN THE MARSALA LAGOON (ITALY)

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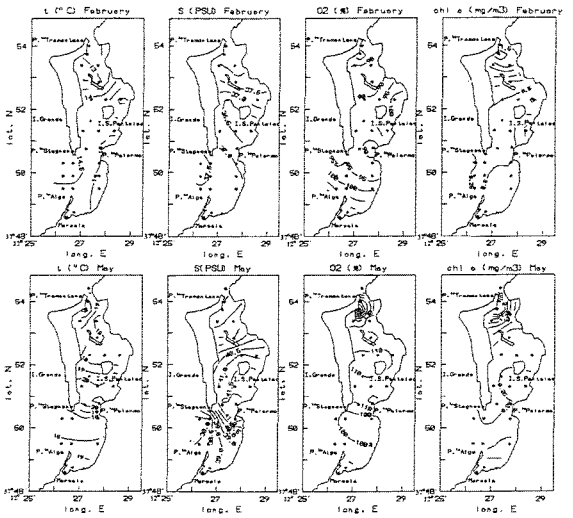
The Marsala lagoon (Stagnone di Marsala) extends over 20 km^2 along the western coast of Sicily. The average depth is about 1 m, the northern part is shallower (< 0.5 m) whereas the southern part reaches depths of more than three meters. Two mouths on the west and northern sides, wide 2.5 km and 0.4 km respectively, connect the lagoon to the sea. No river flows directly into the lagoon, whose waters are saline or hyperaline. Salt production basins are active along the eastern shore of the central part. The biocenosis of the lagoon are mostly those typical of marine environments and present some peculiarities as free-living forms of phyto- and zoobenthic species and sponge gigantism (CORRIERO, 1989). Water circulation driven by winds and tides acts in the north-south direction slowing down in the corridor between the three major islets and Isola Grande favored by the *Posidonia oceanica* mattes (RIGGIO *et al.*, 1983). Two surveys were carried out during May 1991 and February 1992. Temperature and salinity ranged from: 12.51°C and 35.87 PSU in February, to 21.67°C and 41.98 PSU, in May. The formation of a dense water core ($\gamma t > 29$ kg m^{-3}) in the central part of the lagoon during the spring survey was evident. The lagoon can be divided in three different parts on the basis of the temperature and salinity seasonal variations (considering our data and the former studies of CALVO *et al.*, 1986 and of CORRIERO *et al.*, 1989): a southern part with the lowest temperature and salinity variation, due to a high exchange with the sea, a central part where the highest temperature and salinity variations take place, due to a less intense water mass circulation and to the high evaporation during spring and summer and freshwater runoff during rain periods (limited to the east side); and a northern part subject to occasional riverine inputs and exchanges with the sea through the northern mouth. The differences in the physico-chemical features reflects on the biocenosis distributions, *Posidonia oceanica* is absent in the northern and central east part; the sponges which are abundant in the southern and central part are almost absent in the northern part (CEFALI & ANDALORO, 1979). The oligotrophy of the lagoon was confirmed during the February and May surveys but an increase of ammonium and chlorophyll *a* concentrations (up to 2-3 mg m-3) and oxygen oversaturation was observed mainly near the northern mouth of the lagoon (fig. 1). The nutrients concentrations are summarized in table 1. Dissolved inorganic nitrogen (DIN) constitutes about half of total dissolved nitrogen and ammonium constitutes 56% (in February) and 68 % (in May) of DIN. Ammonium concentrations resulted more elevated in February in the northern part near the acquaculture plant water discharges whereas elevated silicates, nitrates and nitrites were found in the central part in connection with minimum salinities values (fig.1). The north-west zone of the lagoon, once colonized by *Cymodocea nodosa* and *Caulerpa prolifera* (CALVO *et al.*, 1980), now is being covered by *Ulva* spp., which is colonizing the southern part of the lagoon near the town of Marsala, too. The distribution of this nitrophilic algae was reported previously in the southern part only (CALVO *et al.*, 1980, 1986). Though the surveys were carried out only during two seasonal periods the signs of a variation in the trophic condition in the northern part of the lagoon was noticed. Water outflows from the acquaculture plant, settled near the northern mouth at the beginning of the eighties, and the progressive burying of the mouth caused by southwards displacement of the Birgi creek mouth (RIGGIO *et al.*, 1983) seem to be the cause of the outspreading of dystrophic conditions which may endanger the Marsala lagoon ecosystems, particularly in the northern and central parts.

Tab. 1. Nutrients (µmol dm^{-3}) and chl *a* (µg dm^{-3}).

	Si(OH)4	NH3	NO3	NO2	Ntot	Chl a
MAY'91						
min.	0,60	0,21	0,04	0,02	2,33	0,01
max.	1,95	3,16	0,93	1,16	10,14	2,88
FEBRUARY '92						
min.	0,46	0,04	0,05	0,19	5,28	< 0,01
max.	3,70	4,38	94,25	2,39	17,15	2,10

Fig. 1. Surficial distribution of temperature, salinity, oxygen (% of saturation), chlorophyll a in February and May.



REFERENCES

CALVO, S., DRAGO D. and SORTINO M. 1980. Winter and summer submersed vegetation maps of the Stagnone. (Western coast of Sicily). *Revue de Biologie-Ecologie Méditerranéenne*, VII (2): 89-96.

CALVO S., GENCHI G., LUGARO A., FRADA ORESTANO C., BARONE R. and DI BERNARDO F.. 1986. Osservazioni ecologiche su una laguna siciliana (Lo stagnone, Trapani): nutrienti, clorofilla e parametri batteriologici. Atti del VII Congresso A.I.O.L., 185-194.

CEFALI A. and ANADALORO F. 1979. Considerazioni sulla distribuzione di alcune specie di poriferi nello Stagnone di Marsala. *Mem. Biol. Mar.Ocean.*, 9(1-2): 49-55.

CORRIERO, G. 1989. The sponge fauna from the stagnone di Marsala (Sicily): taxonomic and ecological observations. *Boll. Mus. Ist. Biol. Univ. Genova*, 53: 101-113,

RIGGIO, S., CALVO S., DI PISA G., GENCHI G., LUGARO A. and RAGONESE S. 1983. The Stagnone lagoon (Western Sicily): an ecological approach to the management of its natural resources. *Rapp. Comm. int. Mer Médit.*, 28(6): 143-146.