Elements for an Ecological Characterization of a Lagoon in the Deltaic System of the Po and Adige Rivers : Porto Caleri

Renato SCONFIETTI* and Valerio VENDEGNA**

*Dipartimento di Genetica, Sezione di Ecologia, Centro interuniversitario di Ecologia delle Acque Interne, Piazza Botta, Pavia (Italia)

**Centro di Ricerca sulle Acque dell'Università di Pavia, Via Montefiascone, Pavia (Italia)

The lagoon of Porto Caleri lies to the south of the Venetian lagoon, between the mouths of the Adige and Po rivers. Its origin is mostly due to the alluvial sediments from Adige, which is the third Italian river as length and the second one as catchment- basin after Po. Most of the original lagoon basin is now left out from the free exchange with the Adriatic Sea, to delimit fishing ponds ("valli"). Therefore the internal boundary is wholly artificial, in the form of low banks. The lagoon has two communications with the sea; the northern mouth supplies the main portion of the sea water exchange, while the southern one has even more narrowed its opening after the building of an embankment with a short bridge, which links up the mainland with the touristic port of Albarella on the homonymous island. Through the Varco Pozzatini dissalate waters flow into the lagoon from a lateral branch of the river Po (Po di Levante), whose inflow is retained by a littoral bar (Scanno Cavallari). Irregular inflows of low salinity waters may also come from the surrounding "valli", which produce high organic loads. From the northern Palude di Boccavecchia a few years ago freshwater flowed directly from Adige through a narrow canal ("Ghebo" della Testa), now silted up. Only traces of schorres persist after the marked subsidence of the last years.

Two mussel-breeding areas and a clam one are placed along the two canals directly influenced by the sea during the tidal cycles, that show an amplitude of about 60-80 cm.

A biological survey has been carried out in autumn 1989 in order to identify different ecological communities in macrobenthos. The complex hydrological pattern does not allow to define well diversifiable benthic communities in terms of salinity gradients, as observed in other estuarine systems (SCONFIETTI, 1988, Crustaceana, 52: 193-201). On the contrary different communities are explainable in terms of different rate of marine "vivification" (sensu D'ANCONA et al., 1954, Archo Ocean. Limnol., 9: 9-295) or of confinement gradients (sensu GUELORGET & PERTHUISOT, 1983, Trav. Labor. Geol. Ecole sup. Paris, 16: 1-136) (for a discussion, see SACCHI, 1985, Mem. Biol. mar. Oceanogr., 15: 71-89). Five ecological communities can be mainly pointed out (fig. 1): A) a community remarkably influenced by the marine vivification and characterized by essentially marine or open lagoon species of hard substrata (wooden piles or banks): Mytilus galloprovincialis Lam., Ostrea sp. and Crassostrea sp., Actinia equina (L.), Cryptosula pallasiana (Moll), Hyale perieri (Lucas), Littorina neritoides (L.), Fucus virsoides J.Ag.; B) a banal lagoon community typical of confined sectors, poor as species distributed all over the lagoon, in which the most "marine" elements of the community A are absent: C) a community influenced by scarce freshwater inflows and, at the same time, subject to a still efficient water exchange, characterized by Bowerbankia gracilis (Leidy), Conopeum seurati (Canu), Balanus eburneus Gould, Hyale perieri (Lucas); D) a community made by elements of different origin, but dominated and characterized by large "masses" of Ficopomatus (=Mercierella) enigmaticus (Fauvel), to show the frequent freshwater influence; E) a very poor community, including large amounts of Ulva sp. and Enteromorpha sp.pl., Haminea navicula (Da Costa) and Gammarus insensibilis Stock, which are distributed all over the lagoon, but here present without other species, more sensitive to the drastic reduction of the vivification.

In a small internal bay, isolated by the main circulation of the water (community E), the presence of a very little spot of Zostera marina L. must be pointed out. In the lagoon of Porto Caleri we confirm the persistence of Fucus virsoides, which has here the southern limit of its characteristic north-Adriatic distribution (SACCHI et al., 1983, Rapp. Comm. int. Mer Medit., 28: 225-228), probably due to the strong ecological disjunction imposed by the large freshwater plume of the river Po into the sea (SACCHI, 1978, Boll. Mus. civ. Stor. nat. Venezia, 29 suppl.: 43-73).

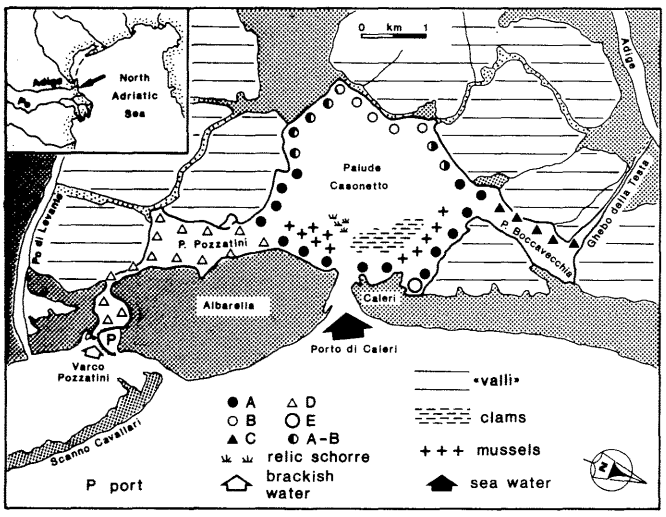

Fig. 1 - Ecological characterization of the lagoon of Porto Caleri.

In conclusion, we can distinguish two main hydrological sub-basin, characterized by almost separated circulations of the water: 1) a main basin, Palude Casonetto, influenced by the marine waters flowing through the Porto di Caleri and expanded towards Palude di Boccavecchia; 2) a secondary basin, Palude Pozzatini, where the strong dominance of Mercierella delimites the area influenced by the brackish waters of the Po river, flowing from its Levante branch through Varco Pozzatini. The difficult circulation in the inner sector of the lagoon causes a long-time stagnation of water masses with their high organic contents, coming from "valli", that actually cause important dystrophic crysis during the hottest months. The rational exploitation of the natural resources for the production of mussels and clams will be preserved in the next years only by a wise management of the active circulation of the water.

Periodicity and Distribution of Bottom Fauna in Hyper-Saline Bardawil Lagoon (Egypt)

Sawsan M. ABOUL-EZZ

National Institute of Oceanography and Fisheries, Alexandria (Egypt)

Bardawil Lagoon is a shallow hyper-saline water basin, located at the northern extrimity of Sinai Peninsula (Egypt). Its depth ranges between 0.5 and 2 meters with a total area of about 65000 hectar. It is in the direct connection with the Mediterranean Sea through two narrow openings (Figure 1).

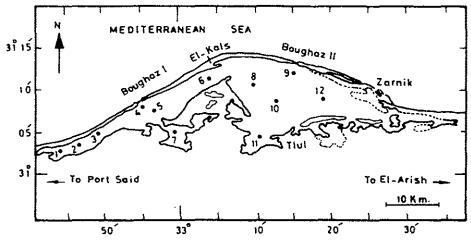

Fig. (1): Morphometry of Bardawil Lagoon and location of stations.

Quantitative sampling of bottom fauna was performed seasonally during the years 1986 and 1987. The samples were collected from tweleve stations representing the different habitats in the lagoon, using a modified Ekmann bottom sampler. Two dredges were taken from each station representing an area equivalent to 0.06 m^2.

The different groups were counted and their biomasses were determined. Results were given as their total numbers per square meter as well as their biomasses in gram fresh-weight per square meter.

The living benthic macrofauna in Bardawil Lagoon comprised about 46 species belonging to the phyla; Annelida, Arthropoda, Mollusca, Echinodermata, Coelentrata and Nematoda Most of the recorded species are typical hyper-saline or euryhaline water forms. The benthic community in the lagoon was dominated by members of Polychaeta (Hydroides, Sabella and Nereis), Crustacea (Corophium and Gammarus), Insecta (Chironomid larvae), Lamellibranchiata (Brachiodontes) and Gastropoda (Cerithium) which constituted respectively about 60.7 %, 12.3 %, 11.5 %, 9.8 % and 2.7 % by number of the total benthos. The other groups were less frequent or rare (table 1).

Table (1)

Annual distribution of the total bottom fauna (Organisms/m^2) and their total Biomass (gram fresh wt/m^2) in Bardawil Lagoon during 1986 & 1987.

groups	1986				1987			
	No/m^2	%	gm/m^2	%	No/m^2	%	gm/m^2	%
Polychaetes	2510	64.5	23.3	38.6	2010	57.0	8.5	14.1
Crustacea	298	7.6	9.2	15.2	571	16.2	8.3	13.8
Insecta	361	9.3			462	13.1		
Lamellibranchs	528	13.6	24.4	40.4	203	5.8	25.7	42.6
Gastropods	63	1.6	3.5	5.8	123	3.5	17.8	29.5
Other groups	134	3.4	--	--	159	4.5	--	--
	3894		60.4		3528		60.3	

The total biomass of benthos in the lagoon averaged 60.4 gram fresh weight/m^2. Lamellibranchs were the heaviest bottom dwellers during the two successive years, followed by Polychaetes in 1989 and Gastropods in 1987.

The highest counts of bottom fauna were recorded at the semiclosed station 7 due to polychaetes and insects larvae. While the highest biomasses appeared at stations 8 and 10 during 1986and 1987 respectively due to the presence of big molluscs.

The benthic community was more diversified during the spring of the two successive years and harboured the highest biomasses. The middle part of the lagoon was more productive in bottom fauna. The dominant species of the benthic community slightly differed within the two successive years.

Results indicate that the distribution of benthos in Bardawil Lagoon were controlled by the prevailing ecological conditions. The dominant species are marine forms which usually inhabits muddy bottoms and are more resristant to low oxygen concentration.