Some Different Aspects of *Cystoseireta* in the Northern Adriatic Sea

Lorenza BABBINI and Guido BRESSAN(*)

(*)Dipartimento di Biologia, Università di TRIESTE (**Italy**)

Following studies on transformations of the Northern Adriatic underwater flora and vegetation, associations of genus *Cystoseira* which group together species gifted with a considerable polymorphism and with a great adaptability within the incidence of environmental factors have been examined.

The aim of this work is to gather every possible manifestation of such incidence on diversity, in terms of space and time, of Northern Adriatic *Cystoseireta*, and to characterize eventual quali-quantitative gradients of adaptability from the comparison among sampling sites in the Gulf of Trieste: 1. Miramare; 2. Aurisina 1; 3. Aurisina 2; 4. S. Bartolomeo and some sampling sites of the vicinity of Rovinj, Istrian Coast; 5. Val di Corrente; 6. Faborsa; 7. Bagnole Isle.

The site number 8., Salvore, has been chosen because it represents a transition zone between the Gulf of Trieste and the Istrian Coast, but because of the circumstances it was possible to have only summer samplings.

Phytosociological surveys were carried out by the modified Braun-Blanquet method (BOUDOURESQUE, 1971), in which covering values are expressed according to a scale from 0 to 100. The data recorded were set out in synoptic tables with species and surveys; data elaboration were carried out by means of multivariated analysis (automatic classification and ordination).

In terms of space, on biotic bases the results obtained show: 1) a quali-quantitative spatial difference (fig. 1), of floristic spectrum regarding *Cystoseireta* of the Istrian Coast and of Trieste; 2) an alteration gradient in the floristic composition of *Cystoseiretum barbatae* (PIGNATTI, 1962) of Trieste as can be seen from: -2.1 disappearance of *Cystoseira crinita* (Desf.) Bory and *Cystoseira schiffneri* Hamel; -2.2 consipcuos presence of sciaphilous *Rhodophyceae;* -2.3) settling of nitrophilous facies in competition with the association *(Nitophyllum punctatum* (Stack.) Grev., *Gigartina acicularis* (Wulfen) Lamor., *Pterocladla capillacea* (Gmelin) Bornet in Bornet et Thuret, *Ulva letevirens* Areschoug in Phillips, *Colpomenia sinuosa* (Mert.) Derb. et Sol., *Corallina elongata* Ellis et Sol.).

In terms of time, always on biotic basis, a perceptible physiognomic seasonal difference of *Cystoseireta* of the Gulf of Trieste can be seen (fig. 2).

The disappearance of some species of the genus *Cystoseira* (2.1) and competition with species belonging to ord *Ulvetalia* (2.3) agree, on the other hand, with what GIACCONE (1977) said about the effects of environmental alteration on *Cystoseiretum barbatae* (PIGNATTI, 1962).

These observations reveal a situation of regression of the studied phytocoenosis as the effect of a different deqree of sedimentation and of the influence of urban sewage on benthic biocoenoses, that *Cystoseira barbata* (Good. et Wood.) Ag. seems to support (CINELLI, 1976). As a matter of fact it is known that pollution causes: on the one hand, clouding of the sea water and consequently the reduction of light penetration with the disappearance of photophilous species (2.2) (BRESSAN, WELKER & SERGI, 1991); on the other hand it enriches the environment with nutrients stimulating the appearance of nitrophilous species (GIACCONE, 1977) (2.3).

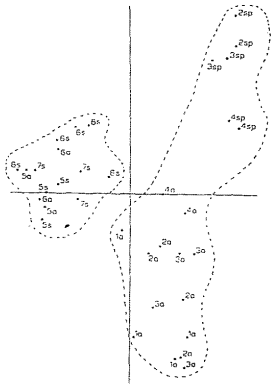

Fig. 1

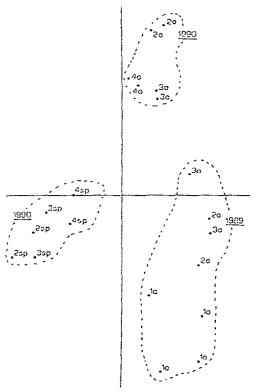

Fig. 2

Legend

1. Miramare
2. Aurisina 1
3. Aurisina 2
4. S. Bartolomeo

TRIESTE

5. Val di Corrente
6. Faborsa
7. Bagnole
8. Salvore

ISTRIAN COAST

Sp = spring
S = summer
A = autumn

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Sedimentological and macrobiological characterization of an area south of Po River Delta, Adriatic Sea, Italy

M.C. BERGAMINI, A. CASTELLI*, R. CREMA*, F. FRASCARI, E. IORI, L. MARINANGELI, S. MISEROCCHI, D. PREVEDELLI* and G. ROSSO

Istituto Geologia Marina, CNR, BOLOGNA (**Italy**)
*Dipartimento Biologia Animale, Universita' MODENA (**Italy**)

A sedimentological and macrobiological characterization of an area in the Northern Adriatic Sea is presented. The study area does not include nearshore environments. Sedimentary input is mainly due to the Po river; other rivers of Emilia-Romagna give minor contributions (BORTOLUZZI *et al.*, 1986).

The sedimentological and macrobenthic characteristics in the top 20-30 cm of sediments sampled by 8-replicas box-corers were examined. In particular we considered: grain size distribution; sedimentological structures; water content and redox conditions at different levels; type, degree and depth of influence of biological populations (CREMA *et al.*, 1991). Three main facies were identified (Fig. 1).

Facies A evidences an irregular, but continous belt from the submerged beach to the 12-18 m isobath. It is mainly composed of silts, generally oxidized at the surface; although, in places, some sand is present. In front of river mouths - proximal prodelta zones (facies A') - sediments are reduced, finer, and richer in flocculated materials. In general, erosion surfaces characterized by discontinuities and by layers or lenses of reworked shells frequently occur. The degree of colonisation is variable, usually very high. Macrobenthic faunas are not homogeneous: at shallower depths they mainly include *Owenia fusiformis*, numerous Amphipoda and Bivalves (especially *Corbula gibba)* with varying proportions; at relatively deeper depths Polychaetes (*Nephtys incisa, Sternaspis scutata* and *Lagis koreni*) and Mollusks (*Nucula nucleus*) prevail. These macrobenthic associations are typically found in sediments with high inputs of organic and inorganic detritus, that are subject to very strong reworking by waves and currents.

Facies B can be divided into three subfacies (B', B'', and B'''). In general, it includes all offshore deposition areas of river-borne fine materials, especially from the Po, and reaches 30-35 m depth. Grain size ranges from silt to clay. Macrobenthic populations feature muddy sea bottom species. The *Corbula gibba* bivalve and many species of Polychaetes - among which *Prionospio malmgreni, Aricidea claudiae* and *Aricidea assimilis* - prevail in surface layers, whereas polychaetes such as *Maldane sarsi* or *Glycera rouxii* dominate in deeper layers. Density of peuplement differ in the three subfacies.

Subfacies B' is located south of the Po delta and it spreads from facies A to 20-22 m depth. Sediments have grain sizes from fine silt to clay; at the surface they are highly hydrated and not always oxidised, whereas in depth they are always highly reduced and present very few discontinuity surfaces. In some cases lenses of decomposed Bivalves occur. In addition there is a low density of benthic fauna.

Subfacies B'' extends south of Ravenna and reaches 20-22 m depth. Sediments are mostly composed of silt, with clay and rare sand interbeds. Their colour indicates a general oxidised condition not only at the top. Discontinuities, shell debris deposits - even in lenses - and, in general, structures that indicate high energy on the bottom are frequent. The degree of macrobenthic colonization is medium-high to high. The peuplement is more varied in deeper layers, with the polychaete *Sthenolepis yhleni* associated to the above-mentioned species.

Subfacies B''' features offshore fine deposit areas. They are mainly composed of highly hydrated, dark green clays including some shell debris layers and fecal pellet lenses. The degree of macrobenthic colonisation is medium-high. This is an area where finer sediments, either resuspended at shallower depths or from large Po floods settle.

Facies C includes sea bottoms offshore 32-33 m. In this area relict sands of nearshore facies emerge. They were generated during sea level changes in the last Eustatic cycle. The ochreous or light grey colour, and the large colonisation mainly due to *Ophiura* indicate a strongly oxygenated environment which is undoubtedly affected by general Adriatic circulation currents.

It is important to emphasize that transition facies with heterogeneous benthic populations and lithological types are present between all the above-mentioned facies.

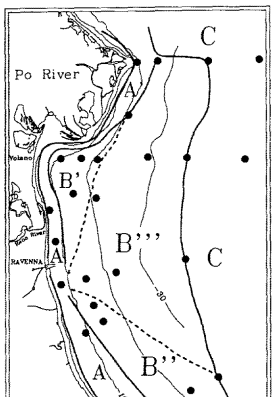

Fig. 1

In conclusion, we have been able to point out:

- a sharp definition among areas that do (A, B) and do not (C) receive modern river-borne material;

- a further distinction among facies that experience direct fluvial deposition (including also flocculated material) (A), and facies that are mainly influenced by eroded and redeposited, or lenghty transported fines (B);

- a third distinction within facies B sea bottoms that:
  - are protected by the Po delta from general current circulation and N and NE storms and receive high input from rivers (B');
  - are characterized by higher (B''') and lower (B'') impact of Po river fines;

- that benthic species are more sensitive to differences in lithology of substrata, rather than to differences in depth variations or chemical-physical conditions; on the contrary, population density is highly affected by the average oxigenation of sea bottoms.

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