**Ultrastructure of gelatinous aggregates in the Northern Adriatic Sea**

Giorgio HONSELL and Laura TALARICO

Department of Biology, University of TRIESTE (**Italy**)

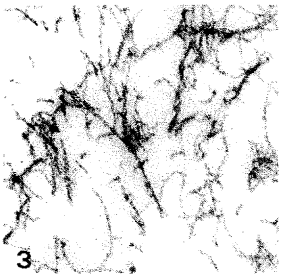
The formation of large amounts of gelatinous aggregates, containing microalgae, bacteria and protozoa has occurred extensively in the Northern Adriatic waters during summer months since 1988 (HONSELL and CABRINI, 1990-1991; CABRINI *et al.*, 1990). This phenomenon, although it has been reported in historical reviews since 1729, represents a change of the trend observed in the Northern Adriatic Sea in the mid-seventies and early eighties, which were characterized by recurrent red tides caused by monospecific blooms of dinoflagellates (BONI, 1983).

Samples of gelatinous aggregates were collected weekly by SCUBA divers in the Gulf of Trieste (Marine Reserve of Miramare) in the period June-August 1991 to investigate their species composition and fine structure. They were first observed in vivo, before and after staining with toluidine blue to show acid polysaccharides. For electron microscopy the aggregates were fixed with 3% glutaraldehyde in 0.1 M cacodylate buffer pH 7.1, postfixed in 2% osmium tetroxide, dehydrated with an ethanol series and embedded in Spurr resin for sectioning (TEM) or critical point dried and coated with gold/palladium (SEM). Ruthenium red (0.15 %) was added to the post-fixative to stabilize the extracellular polysaccharidic network (AVANZINI and HONSELL, 1984).

Many species of microalgae were present in the aggregates: the diatoms were generally very abundant, but sometimes the dinoflagellates also occurred in high cell numbers. The dominant species observed in the mucilage aggregates in the Gulf of Trieste were not the same during the different years: *Skeletonema costatum* was particularly abundant in 1988, *Thalassiosira sp.* in 1989, and *Nitzschia closterium* in 1991.

Preliminary results indicate that: a) the most abundant species found in aggregates during their maximum development was *Nitzschia closterium*. The cells appeared viable with a well developed frustule and no morphological indication of stress was noticed, different from what occurred to *Skeletonema costatum* in 1988 (HONSELL and CABRINI, 1990-1991). Blue toluidine staining revealed the presence of a polysaccharidic sheath surrounding the cells disposed in long rows (Fig. 1). b) transmission electron microscopy confirmed the presence of a fibrillar network around the cell (Fig. 2). This layer was organised in short and branched chains irregularly distributed in an amorphous matrix. The fibrillar network presented a variable sized mesh (Fig. 3). c) scanning electron microscopy showed various microalgae (mainly diatoms, dinoflagellates and small flagellates), bacteria and detritus embedded in an amorphous matrix with filaments (Fig.4).





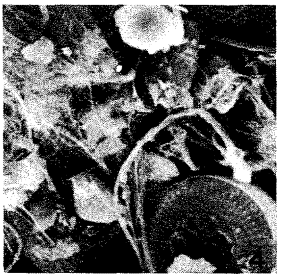



Fig. 1 - Light microscopy: *Nitzschia closterium* stained with toluidine blue: a mucilaginous sheath around the cells is evident. 600x.

Fig. 2 - Transmission electron microscopy: detail of a section of *N. closterium* with a fibrillar network around it. Ruthenium red staining. 5400x.

Fig. 3 - Enlargement of the gelatinous layer with short branched chains. 23600x.

Fig. 4 - Scanning electron microscopy: various microalgae and detritus are entrapped in a tridimensional filamentous network. 6000x.

## REFERENCES

AVANZINI A. & HONSELL G., 1984.- Membrane tubules in the tetraspores of a red alga. *Protoplasma*, 119:156-158.

BONI L., 1983.- Red tides of the coast of Emilia Romagna (North-Western Adriatic Sea from 1975 to 1982). *Inf. Bot. It.*, 15:18-24.

CABRINI M., FONDA UMANI S. & HONSELL G., 1990.- Mucilage aggregates in the Gulf of Trieste (Northern Adriatic Sea): analysis of phytoplankton communities in the period June-August 1989. Proceedings International Conference "Marine Coastal Eutrophication", Bologna 21-24 March 1990, *Elsevier*, in press.

HONSELL G. & CABRINI M., 1990-1991.- Il fitoplancton durante il mare sporco dell'agosto 1988 nel Golfo di Trieste (Adriatico settentrionale). *Boll. Soc. Adr. Sci.*, LXII: 7-20.

X