SEDIMENTARY ORGANIC MATTER LABILITY ALONG THE RIVER – SHELF TRANSITION ZONE IN A SEMI-ENCLOSED BAY (MALIAKOS BAY, AEGEAN SEA, GREECE).

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Abstract

Sedimentary organic matter lability was estimated along a river-shelf transition zone by measuring the concentrations of biolymeric compounds (proteins, carbohydrates, lipids) in a semi-enclosed bay in Eastern Mediterranean. Samples were taken in three stations, River, River Mouth and Shelf, in Winter 2000 and 2001. Biopolymeric concentrations displayed a seaward increase. Contribution of Labile Carbon to Total Organic Carbon ranged from about 15% (River) to about 35 % (River Mouth, Shelf). These results indicate the presence of a benthic trophic gradient along the transition zone with a seaward increase in nutritional quality of sedimenaty OM.

Keywords: biopolymers, lability, river-shelf transition zone

The sum of proteins (PRT), carbohydrates (CBH) and lipids (LIP), referred as biopolymers, is used as a measure of the amount of food potentially available for heterotrophic metabolism [1]. The contribution of Labile Carbon (LC) to Total Organic Carbon (TOC) was assessed along a transect in the mixing zone between Sperheios River and Maliakos Bay (Aegean Sea, Greece) in relation to the quality of suspended organic material (OM) in the water column. Samples were taken in three stations, River, River Mouth and Shelf, 1 mile apart, at 2.5, 4 and 22 m depth, respectively, in winter 2000 and 2001. Sediment samples were taken by Ponar grab, water column samples by Limnos bottles and salinity profiles by Aandera CTD. Biopolymer and sedimentary chloroplastic pigment concentrations were measured and converted to carbon equivalents as in [2] and [3] and to carbon content in the top 6 cm of sediment (g/m^2) assuming specific density of 2.6 g/cm^3.

LC content displays considerable spatial differences along the mixing zone, with definite seaward increase (Fig. 1), which coincides with an increase in silt-clay % from River (< 30%) to Shelf (>90%). Carbohydrate to Protein concentrations ratio, a measure of the relative contributions of phytodetrital and living material, ranged from 0.88 – 096 in River to less than 0.56 in River Mouth and Shelf stations. Contribution of sedimentary Chlorophyll *a* Carbon equivalent to LC was less than 10% with a peak in River Mouth in both sampling periods. Suspended Particulate Organic Material (SPOM) and Chloroplastic Pigment Equivalent (CPE) in water column did not exhibit consistent spatial trends (Fig. 2), with higher OM inputs in River in Winter 2000 and low phytodetrital inputs along the transition zone in Winter 2001. The temporal differences in CPE levels may be attributed to the fact that sampling in winter 2000 coincided with the phytoplankton bloom in the area. With respect to salinity, River station represents a fresh water environment whereas River Mouth and Shelf are virtually marine.

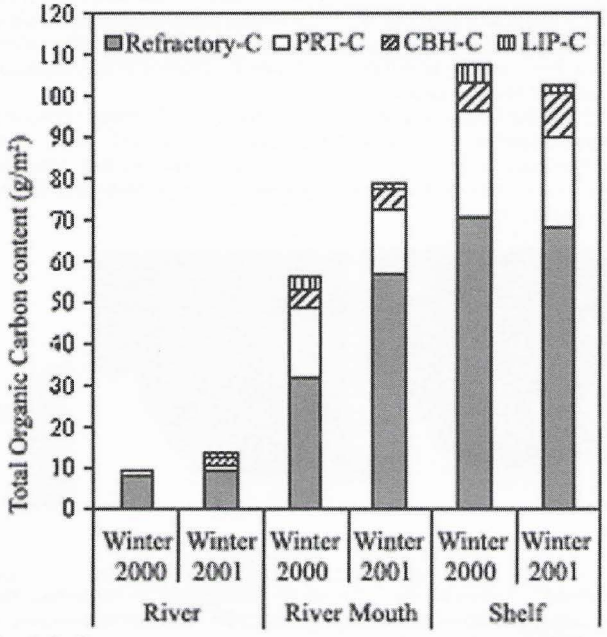

Fig. 1. Sedimentary Labile Carbon distribution to Total Organic Carbon.

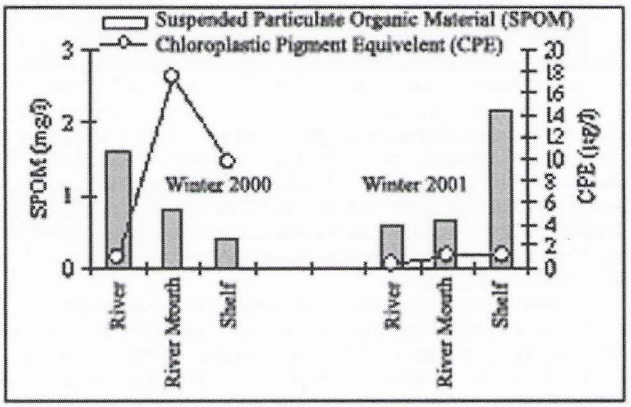

Fig. 2. Suspended Particulate Organic Material and Chloroplastic Pigment Equivalent along the river-shelf transition zone.

The results of the present study indicate that River sediments are mainly dominated by refractory material. River station corresponds to a high energy environment that does not allow the settling and accumulation of riverine OM while autochthonous primary production is negligible during winter. In contrast, water mixing in the estuaries and low hydrodynamic regime in Maliakos Bay favour the sedimentation of fine suspended material and the accumulation of OM in the sediments of the River Mouth and the Shelf stations. Although, primary OM production in water column is relatively high, especially during the bloom period, the low CBH:PRT ratio provides evidence that the labile fraction of sedimentary OM along the transect is mainly composed of living material or freshly derived detritus rather than old phytodetrital material. Provided that sedimentary chlorophyll *a* contributes a small amount to bioplymeric fraction it is assumed that the high percentage of proteins corresponds to heterotrophic microbial populations that take advantage of the high OM inputs in the topsets and the delta front. Concluding, there is a trophic gradient along the river – shelf transition zone in Maliakos Bay with low nutritional quality OM in the riverine end and high nutritional quality OM in the marine end. The consistency of this gradient during winter, despite temporal variation in the occurrence of phytoplankton bloom in the area, indicate that benthic processes are not solely coupled to water column productivity.

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