PHYSICAL-BIOLOGICAL INTERACTIONS IN SURFACE WATERS OF THE NORTHERN CATALAN SHELF-SLOPE (NW MEDITERRANEAN) AT THE END OF SPRING

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Abstract

We studied physico-chemical (temperature, salinity, inorganic nutrients) and biological (phytoplakton pigment composition, bacterial numbers, protein, DNA, RNA, and POM) characteristics of a hydrographically diverse area of the northern Catalan sea during the stratification period (June 2000). The sampled stations were affected by a) continental shelf (coastal waters), and b) low salinity surface waters from the Gulf of Lions in?uenced by the Rhone runnoff (called Plume), carried by the shelf-slope Catalan current. We compared these areas with oceanic waters. The relative fertilising effect of the Plume for the plankton communities is discussed.

Keywords: nutrients, pigments, plankton, Rhone plume

The objective of the cruise was to study the fertilising effect of Rhone in?uenced waters on plankton communities structure and function at the end of the spring. Such water masses may constitute a nutrient input to otherwise nutrient depleted layers when the seasonal thermocline is well stablished (1).

Three drifters launched at the northern part of the Gulf of Lions were used to identify the presence of low salinity surface waters (above 10 m depth) from the Gulf of Lions in?uenced by the Rhone runnoff, carried by the shelf-slope Catalan current (2). Samples for biological, physical and chemical parameters were taken from 0-100 m depth. The study presented here concerns only the samples collected at 5 m, where the Rhone Plume waters were clearly identified.

As expected, higher nitrate and phosphate concentrations along with higher chlorophyll concentrations were found at the coastal and Plume waters (Fig. 1). Surprisingly, low silicate concentrations were measured at the Plume and coastal waters, likely related to a high development of diatoms (fucoxanthin estimated by HPLC, 3). In oceanic waters, relatively low diatom and high dino?agellate (i.e., oxyperidinin) biomasses were observed. Cyanobacteria (i.e., zeaxanthin) and diatom abundance showed similar patterns with highest abundances in the Plume, especially in the northermost sites and decreasing towards the south. Haptophytes (i.e. 19'hexanoiloxyfucoxanthin) were more abundant in both coastal and Rhone Plume waters than in oceanic ones. The highest bacterial numbers (epi?uorescence microscopy counts) were found in the relatively nutrient rich coastal waters, specially southwards (in front of Barcelona). Taken together, the relative distribution of different phytoplankton groups, bacterial numbers and inorganic nutrients indicate ecological preferences and competition processes resulting in characteristic zonal patterns and a temporal sucession within the Plume.

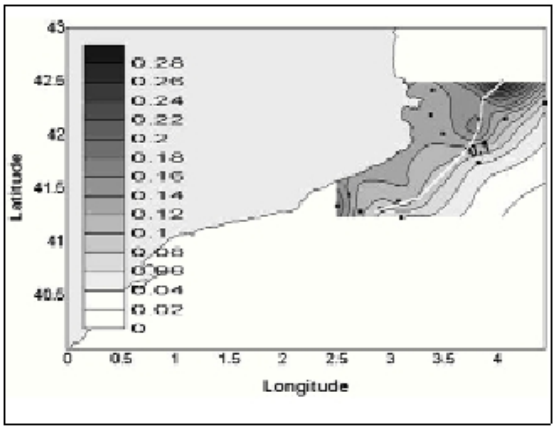

Fig. 1. Distribution of chlorophyll concentrations (i.e. monovinyl-chlorophyll a plus chlorophyllide a, estimated by HPLC) at 5 m depth. The Plume is indicated by the white line.

The concentrations of POC, PON, protein and DNA (biomass indicators, 4, 5, 6) and RNA (activity indicator) in the seston were estimated. Protein concentration distribution matched the autotrophic biomass, specially that of diatoms, while DNA were more related to bacterial abundances (Fig. 2). RNA were higher at the coastal and southwards stations, associated to bacteria.

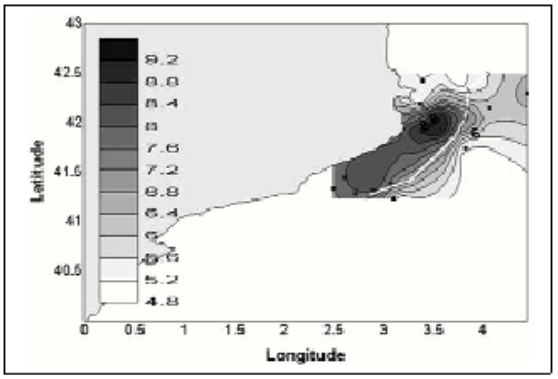

Fig. 2. Distribution of the DNA concentrations at 5 m depth. The Plume is indicated by the white line.

The data obtained from this cruise showed that at surface (above 10m) the waters affected by the Rhone Plume had similar or slightly higher biomass than the coastal waters, and in any case higher than the closer oceanic stations. It suggests the Rhone Plume contribution to the enlargement of the coastal zone production in the Catalan sea area. Further sudies must be conducted in the area to understand the temporal and spatial variability of the Rhone input in the NW Mediterranean waters.

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