SOME PRELIMINARY OBSERVATIONS ON THE DISTRIBUTION OF PARTICULATE ORGANIC CARBON AND NITROGEN IN THE NORTHERN ADRIATIC SEA

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ABSTRACT: The concentrations of particulate organic carbon and particulate organic nitrogen in the northern Adriatic is presented. The concentrations are a function of a eutrophic gradient produced by the discharge of the Po River in Italy. Attention has been given to horizontal and vertical gradients along a transect from the Po delta to the Istrian Peninsula in Yugoslavia.

RESUME: Un rapport sur les concentrations de carbone en suspension (POC) et d'azote en suspension (PON) en Adriatique septentrionale est présenté. Ces concentrations sont fonction d'un gradient produit par la décharge du Pô. L'attention a été portée sur la distribution horizontale et verticale le long d'un transect partant du delta du Pô, jusqu'à la péninsule istrique en Yugoslavie. La distribution est fonction des gradients trophiques.

Introduction

The amount of non-living organic matter in the water column greatly exceedes the living fraction, yet the distribution of particulate organic matter in the Adriatic Sea is still an enigma.

In the context of a more general food web study of the northern Adriatic, information was collected on the distribution of particulate organic carbon (POC) and nitrogen (PON) in the water column. Data are reported and discussed, for the late spring to early summer period of 1978 and 1982. This is the period when water column stratification has become well established in the northern Adriatic, and a period during which

summer phytoplankton blooms frequently occur above the pycnocline. Samples were collected from 4 station on the eastern, oligotrophic side of the Adriatic, at 3 stations on the western, relatively eutrophic side, and along a transect from the Istrian Peninsula in Yugoslavia to off the Po delta in Italy.

Samples were dry combusted and analysed on Perkin Elmer and Hewlett CHN analyzers. A summary of the data set is presented below.

POC ALL DATA

(n): 71

range: 75-1701 /ug l^{-1}

mean: 275±269 /ug l^{-1}

surface data

(n): 24

range: 112-1701 /ug l^{-1}

mean: 446±391 /ug l^{-1}

bottom data

(n): 24

range: 87-306 /ug l^{-1}

mean: 210± 59 /ug l^{-1}

PON ALL DATA

(n): 73

range: 86-302.6

mean: 35.9 46.5

surface data

(n) = 24

range: 14.0 - 302.6 /ug l^{-1}

mean: 68.1 ± 70.7 /ug l^{-1}

bottom data

(n) = 24

range: 8.8 - 39.9 /ug l^{-1}

mean: 22.8 ± 10.0 /ug l^{-1}

Detailed analyses revealed that the surface range and mean concentrations of POC and PON were two to three times those observed in the bottom layer; and the variabilty at the surface was high, with standard deviations approsimating mean concentrations, compared with bottom concentrations where standard deviations were much less than half the mean concentrations.

Both POC and PON concentrations increased westward with the greatest increase occurring in the surface layer. The surface POC was closely correlated with the chlorophyll a standing crop of phytoplankton. In marked contrast, the bottom layer POC showed no correlations with the phytoplankton crop. Thus, while phytoplankton are a variable fraction of the total water column POC, in surface waters the POC concentrations were directly proportional to the crop.

On the average, the POC and PON concentrations were about 5o to more than loo% than concentrations reported from other coastal regions in the Pacific, Atlantic or Mediterranean, and on occasion exceeded concentrations reported from the rich upwelling ecosystems of California, Peru, and southwest Africa.

Gilmartin, M., Revelante, N.

"Some preliminary observations on particulate organic carbon and nitrogen in the Northern Adriatic Sea"

Paper presented by M. Gilmartin (USA)

Discussion

M. Branica: Regarding your figure of POC concentrations along a transect from Yugoslavia to Italy. How do you explain the great difference in the surface layer, and practically no difference in the bottom waters?

M. Gilmartin: We attribute the westward increase in POC and PON in the surface layer to a combination of the direct and indirect effects of Po river discharge: directly, by dontributing seston which tends to remain in the less dense surface layer, and indirectly, by contributing nutrients which support an increased phytoplankton crop, whcih during most of the year is also concentrated in the surface layer.

Y. Halim: What was the filtration procedure and what was the minimum particle size sampled?

M. Gilmartin: Depending on the amount of seston in the sample, between 5oo and 2ooo ml of water was filtered through a precombusted Whatman GF/C filter, under a vacuum of about 5o RPa. The pore size of these filters is not well defined but the effective particle retention is probably about 1.2 µm.

V. Žutić: Could you please identify the station with a constant POC content along a depth profile? Does it correspond to an autumn bloom?

M. Gilmartin: The POC samples (0 m = 112, 5 m = 132, 1o m = 128, 2o m = 128, and 32 m = 132 g l^{-1}), where collected at our station 9 ($44^{o}59'3o''$ - $12^{o}49'86''$) at the west end of the Adriatic transect, just northeast of the Po delta, in December, 1981. At this time there was no phytoplankton bloom. It should be noted that homogenous POC water column concentrations are very uncommon.

J. Faganeli: What is the C/N ratio in the particulate matter in the Northern Adriatic?

M. Gilmartin: The C/N ratios in our samples varied widely, with a mean of about 7.7 and a standard deviation approximating 2. The C/N ratio tended to decrease westward, implying larger proportions of degradable organic compounds in the suspended matter off the Po delta, presumably associated with river discharge.

G. Cauwet: Can you distinguish between the organic material originating from marine organisms and from detrital material brought in by the Po river?

M. Gilmartin: We have not made such a distinction, but it may be possible. One of our colleagues at the University of Maine, Professor Larry Mayer, has had some success in distinguishing between marine and terrestrial plant material in detritus by considering the differences in various isotope ratios. You may wish to contact him directly for further information.