

IN SITU UREA UTILIZATION IN THE SEA WATER IN THE GULF OF TRIESTE  
(NORTH ADRIATIC)

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In situ urea uptake and mineralization rates have been studied at two stations in the eastern part of the Gulf of Trieste.

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Urea is thought to be an important nitrogen source for phytoplankton in the sea water. The present paper describes the results of in situ urea uptake and mineralization rates at two stations located in the Bay of Koper (Station K-1) and Bay of Piran (Station MA) using the  $^{14}\text{C}$  labelled urea. Both stations have the maximal depth of 16 m.

Samples were taken from four depths (0.5, 5, 10, 15 m) using plastic Van Dorn samplers. Sea water was poured in sterilized glass-stoppered clear and dark bottles after adding 100  $\mu\text{l}$  of  $^{14}\text{C}$  - labelled urea (Amersham, England) solutions containing 100 nCi  $^{14}\text{C}$  urea to the 100 ml of sea water samples and incubated at the place of sampling for approximately 2.5 - 3.5 hours. Controls (samples killed with 0.5 ml of 37 % formalin) were run with each set of samples. Samples were successively filtrated through Millipore (0.45  $\mu\text{m}$  pore size) and Sartorius (3.0  $\mu\text{m}$  pore size) membrane filters and Nucleopore (5  $\mu\text{m}$  pore size) filters and activity on filters measured with a Nuclear Enterprises (NELSC 1) liquid scintillation counter. Filtrated samples were acidified by 50 %  $\text{H}_2\text{SO}_4$  and  $^{14}\text{CO}_2$  absorbed in a vial containing n-ethanolamin. The activity of n-ethanolamin solution was determined as described above. Data from each station were integrated for the water column.

Urea was determined colorimetrically by the method of Newell et al. (1967) and DON using the UV combustion technique (Armstrong et al., 1966).

The concentration of urea ranged from 0.03 (April 1982) to 8.82 (December 1981)  $\mu\text{mol/l}$  at both stations and comprised between 0.1 - 78 % of the DON in the area. The seasonal variation of the DON concentrations showed the highest concentrations in the period April - May 1982 (up to 226  $\mu\text{mol/l}$ ) and the lowest in the period July - August 1981 (0.5 - 7  $\mu\text{mol/l}$ ).

The seasonal variation of urea mineralization rates integrated for the water column (Fig. 1) showed the highest rates in the period June - September 1981, probably in correlation with higher sea water temperature and also more

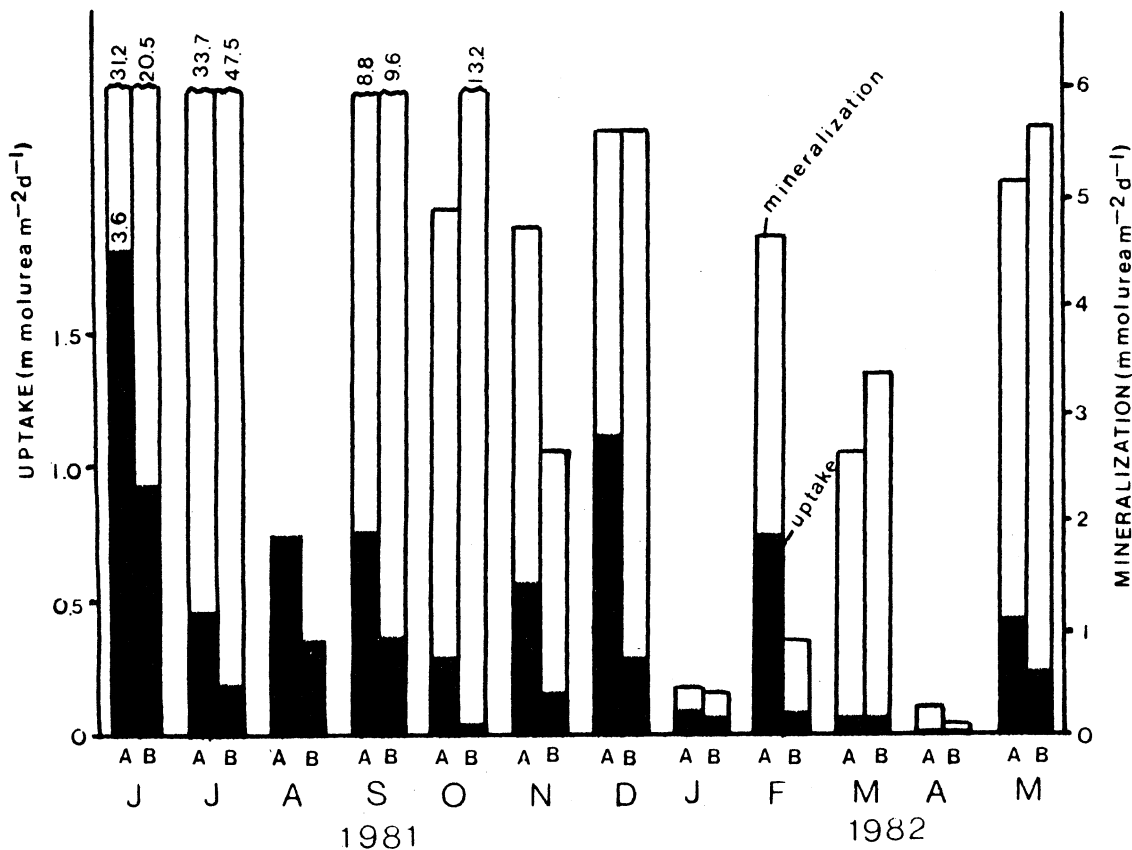


Fig. 1: Seasonal variations of urea uptake and mineralization rates integrated for the water column at the Station K-1. A-light bottle, B-dark bottle.

favourable light conditions. The urea uptake rates showed similar seasonal dynamics. Somewhat lower urea uptake and mineralization rates were observed in the Bay of Piran, not so influenced by the anthropogenic nutrient input as the Bay of Koper. The results obtained revealed that the urea decomposed more actively in light than in dark, what suggests that the fitoplankton is responsible for the major part of the urea utilization. This statement is

supported by the successive filtration experiment, showing the highest activity associated with the particles larger than 3  $\mu\text{m}$ . The assimilation rates (uptake/total uptake) were very low, most being less than 10 %, indicating that the urea is immediately broken down to inorganic nutrients.

#### REFERENCES

- Armstrong, F.A.J., P.M.Williams and J.D.H.Strickland (1966). Photo-oxidation of organic matter in sea water by ultra-violet radiation, analytical and other applications. Nature 211, 481-483.
- Newell, B.S., B.Morgan and J.Cundy (1967). The determination of urea in sea water. J.mar.Res. 25, 271-280.

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"In situ urea utilization in the sea water in the Gulf of Trieste (North Adriatic)"

Paper presented by J. Faganeli (Yugoslavia)

#### Discussion

- Castellvi: Influence de la flore bacterienne dans la metabolisation d'uree?
- Faganeli: We arbitrarily discriminate between total microbial and bacterial uptake using the differential filtration technique through several filters: 0.45, 3, 5  $\mu\text{m}$  pore sizes. We have assumed that the organisms, taking up the substrate, retained on the 5 and 3  $\mu\text{m}$  pore sizes filters were mainly phytoplankters.
- Brisou: L'ureolyse microbienne est un phénomène tres commun en milieu marin - dans les eaux et au niveau des sédiments - il est donc difficile de faire abstraction des microbioceneses lorsque l'on s'interesse à l'ureolyse.
- Faganeli: I agree.

