STUDY OF THE NITRATE REDUCTASE ACTIVITY IN THE ELEFSIS GULF

Fani Sakellariadou
Lab of Oceanography and Marine Geochemistry, Dept of Maritime Studies, University of Piraeus, Greece - fsakellar@gmail.com

Abstract
Nitrate reductase activity was measured along the water column during summer and fall by determination of nitrite produced in nitrate rich denitrifying bacteria extracts. It was found that below the thermocline, there was an oxygen depletion, and a second nitrite maximum associated with the activity of the enzyme respiratory or "anaerobic" nitrate reductase (NR). In the upper part of the water column, nitrate reductase activity was absent. The destruction of the seasonal thermocline, was followed by termination of the nitrate reductase activity.
Keywords : Anoxia, Phytoplankton, Enzymes, Models, Oxygen.

In marine systems, the N-cycle plays a significant role controlling the biological productivity [1]. Many microorganisms are able, via membrane transporters, to take up and assimilate dissolved inorganic nitrogen. Nitrate assimilation refers to biological conversion of nitrate to ammonium, a two step eight-electron reduction process using two enzymes. Under oxygen limiting conditions, denitrifying bacteria reduce nitrate to nitrite by assimilatory nitrate reductase and then to ammonium by assimilatory nitrite reductase [2]. Respiratory or "anaerobic" nitrate reductase (NR) is an enzyme present in various marine phytoplanktonic species that grow in nitrate rich environments while when there is either ammonium enrichment or grow on nitrite, urea or amino acid, low enzyme levels are found [3].

The measurement of nitrate reductase activity is an indicator of plankton metabolism. In the present study, nitrate reductase activity was measured during summer and autumn, at various depths along the water column of the deepest area of Elefsis gulf, a rather closed gulf in Saronicos, receiving various anthropogenic pollutants. The sampling site was selected as anoxic conditions occur seasonally near the sea-floor due to stratification. For this purpose, nitrite content, produced by nitrate rich denitrifying bacteria extracts, was determined [3-6].

It was found that during the summer, when the seasonal thermocline was well established and the water column stratified, the deeper water column was depleted in oxygen and hydrogen sulphide was present. At the same time, a secondary nitrite maximum was found, associated with nitrate depletion, showing a close relation between nitrogen species distribution and denitrification procedure. Also, nitrate reductase activity corresponded to higher values as nitrate respiration, via the enzyme NR, which is the first step of denitrification mechanism.

Nitrate reductase activity was increased in nitrate enrichment while decreased in ammonium enrichment. in the upper seawater layer, where high dissolved oxygen content was measured, nitrate reductase activity approached zero values.

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