

ASSESSMENT OF THE BIOGEOCHEMICAL PARAMETERS IN NEMRUT BAY AEGEAN SEA

Esin Esen ^{1*}

¹ Dr. - esinsn@gmail.com

Abstract

The biogeochemical properties of the water column in Nemrut Bay showed that the anthropogenic influence is mostly detected in stations closer to the shoreline. The heavy metal content of the sediment revealed that the contaminant levels for most of the trace elements were heavily polluted throughout the Bay.

Keywords: Metals, Nutrients, Pollution, Coastal Waters, Aegean Sea

Introduction

Aliaga town located 50 km northwest of Izmir Municipality has been subjected to extensive industrial developments. Nemrut Bay, neighboring marine environment of Aliaga town was investigated to provide baseline information about the environmental conditions within the framework of an environmental impact assessment of a proposed Zinc Recovery Plant which aims to recover zinc oxide from waste material produced in the Aliaga Heavy Industrial Zone [1]. Nemrut Bay is a subsystem within the Candarli Bay ecosystem and opens up to the Aegean Sea.

Material and Methods

Field measurements were carried out by RV/K. Piri Reis during 2005. Seawater samples were collected from three depths in 15 stations. Dissolved oxygen was recorded *in situ*. Nutrient and total organic carbon analyses have been carried out according to the methods presented in [2]. Metal measurements were carried out in AAS using flame, graphite furnace and cold vapor techniques. Particulate phosphate (PP) contents were measured by the spectrophotometric method where the particulate organic carbon and particulate organic nitrogen contents were analyzed at CHN analyzer.

Results and Discussions

Nutrients : Dissolved oxygen values for July sampling varied between 6.29-7.20 mg/l that were found to be lower than the values measured for February sampling (7.50-8.28 mg/l). Nitrate and nitrite concentrations of Nemrut Bay were below the typical values determined in coastal waters in both periods (0.09-2.90, 0.01-0.29 μM respectively). High ammonium and ortho phosphate concentrations were measured in February along coastal stations of the Bay (0.5-9.9, 0.1-4.6 μM) where the same parameters varied between 0.2-1.6 μM and 0.03-0.09 μM , respectively in July. The values of chlorophyll-a varied from 0.07 to 0.24 $\mu\text{g/l}$ in February and between 0.01-0.15 $\mu\text{g/l}$ in July. The results show similarity to those of the Aegean Sea. In winter season, the decrease in primary production caused less consumption thus high values of nutrients in February were determined. In summer season, the primary production increased so that the nutrients were depleted.

Heavy Metals : The heavy metal content of the water column have been determined for February and September. Hg, Cd, Pb, Cu, Zn, Mn and Fe concentrations are below the unpolluted seawater levels (0.001-0.018; 0.001-0.0025; 0.8-2.8; 0.27-3.1; 2.1-5.8; 0.5-1.9; 3.3-7.7 $\mu\text{g/l}$, respectively). Cr and Ni concentrations ranged 0.69-1.2 $\mu\text{g/l}$ and 1.1-1.8 $\mu\text{g/l}$ respectively and determined to be higher than typical seawater levels. The heavy metal content of the sediments in Nemrut Bay have been determined in February. Contamination Factors (CF) calculated for Nemrut Bay indicated that Pb and As had very high contamination levels where there were considerable Zn contamination in most of the sediment samples [3]. Hg concentrations that were measured in this study correspond to very high contamination and should be investigated in further studies (CF ranged 32.3-395 corresponding to a concentration range of 1.70-9.60 mg/kg). The elevated enrichment levels of Pb (2.03-16.06) and Zn (1.08-8.52) indicates anthropogenic pollution.

PAH and Phenols in Surface Water : Polycyclic aromatic hydrocarbon (PAH) and phenol concentrations were measured from surface water samples. The results indicated that there were no PAH and phenol pollution for the sampling area and the sampling period.

Conclusion

The biogeochemical properties of the water column in Nemrut Bay showed that the anthropogenic influence is mostly detected in stations closer to the shoreline.

Acknowledgements This study is financed by ZincOx Plc. Inc. The author thank to the staff of RV Piri Reis and IMST for sampling and analysis.

References

- 1 - IMST-160 Feasibility Study on Marine Discharge of the effluents of Aliaga Zinc Recovery Plant
- 2 - Methods of Seawater Analysis, 1983, Second, Revised and Extended Edition, Edited by K. Grasshoff, M. Ehrhardt, K. Kremling, Verlag Chemie, 419p.
- 3 - Esen E., F. Küçüksezgin, E. Uluturhan., 2008. "Assessment of trace metal pollution in surface sediments of Nemrut Bay, Aegean Sea", *Environ Monit Assess*, DOI 10.1007/s10661-008-0692-9.