

ASSESSMENT OF CU, MN, NI, ZN AND FE LEVELS IN SEDIMENT AND BIOTA OF THE IZMIR BAY (EASTERN AEGEAN)

Aynur Kontas

Dokuz Eylul University, Institute of Marine Sciences and Technology, Inciralti 35340 Izmir, Turkey. - aynur.kontas@deu.edu.tr

Abstract

Baseline metal (Cu, Mn, Ni, Zn, Fe) concentrations in sediment and biota were investigated in Izmir Bay of the Eastern Aegean Sea. Cu and Zn concentrations and organic matter contents in sediment increased from the outer bay to the middle-inner bays. Maximum Cu concentrations were obtained in *Penaeus kerathurus*. Maximum Zn and Fe concentrations were found in *Mytilus galloprovincialis*. Relatively high Cu levels were found in *Sardina pilcardus* and *Mullus barbatus* than other fish species. Cu levels were lower in *Diplodus annularis* and *Merluccius merluccius* than in other species.

Keywords : Metals, Sediments, Fishes, Organic Matter, Aegean Sea.

Introduction

In the present study, the level of metals in the Izmir Bay was determined in organisms and bottom sediment.

Materials and Methods

Samples were collected during the cruises of R/V K. Piri Reis in 1996 in the Izmir Bay. Sediment samples (UNEP, 1986) and biota tissues (UNEP, 1984) were digested in suitable acid mixture. All acid digestions were made in Milestone 1200 close microwave digestion system. Organic matter were determined spectrophotometrically. Metal concentrations were quantified using a Varian SpectrAA 300 Plus spectrometer.

Results

Sediment: Organic matter contents in the bay ranged between 0.40-4.09 % for the outer bay and attained their highest values, between 3.27-10.1 % in the middle-inner bays. In general, organic matter content increased from the outer bay to the middle-inner bays. Metal concentrations in the sediment (dry weight) ranged between 4.26-45.2 for Cu, 233-923 for Mn, 14.9-127 for Ni, 25.6-154 for Zn, 12404-76899 $\mu\text{g g}^{-1}$ for Fe in the outer parts of the bay. In the middle-inner parts of the bay, sediment metal concentrations ranged between 27.4-70.8 for Cu, 356-583 for Mn, 72.8-106 for Ni, 93.5-295 for Zn, 42109-68901 $\mu\text{g g}^{-1}$ for Fe. Cu and Zn concentrations of Izmir bay sediments increased from the outer bay to the middle-inner bays. Relatively high concentrations were measured at Gediz Estuary and Dump Site in the outer bay. Maximum Cu (70.8 $\mu\text{g g}^{-1}$) and Zn (295 $\mu\text{g g}^{-1}$) concentrations were observed at harbour station in the inner parts of the bay. Maximum Mn (923 $\mu\text{g g}^{-1}$ at station 7), Fe (76899 $\mu\text{g g}^{-1}$ at station 7) and Ni (127 $\mu\text{g g}^{-1}$ at station 15) concentrations were measured in the outer parts of the bay. Based on the correlation matrix obtained for metal data, organic matter was the dominant factor controlling Cu ($r=0.84$) and Zn ($r=0.87$) distributions in the sediment. Sediment Cu showed positive correlation with Zn ($r=0.93$). A significant positive correlation was also observed between Fe and Mn ($r=0.83$) and Ni ($r=0.94$). According to Salomons and Förstner (1984), those correlations are probably indicating that these elements have the same source, possibly lithologic, characteristic of sediment was non impacted and therefore, of natural origin. Those correlations are also indicators of the importance of the co-precipitation process controlled by Fe and Mn oxy-hydroxides.

Biota: Maximum Cu concentrations (6.98 $\mu\text{g g}^{-1}$ wet weight) were obtained in *Penaeus kerathurus* and maximum Zn (30 $\mu\text{g g}^{-1}$) and Fe (130 $\mu\text{g g}^{-1}$) concentrations were found in *Mytilus galloprovincialis*. Relatively high levels of Cu were found in *Sardina pilcardus* (values ranging between 1.39-1.91 $\mu\text{g g}^{-1}$), *Mullus barbatus* (0.16-1.88 $\mu\text{g g}^{-1}$) and *Mytilus galloprovincialis* (values ranging between 0.71-1.72 $\mu\text{g g}^{-1}$) than other species. Cu levels were lower in *Diplodus annularis* and *Merluccius merluccius* than other species. Relatively high Zn (values ranging between 2.62-14.9 $\mu\text{g g}^{-1}$) and Fe (values ranging between 7.84-24.7 $\mu\text{g g}^{-1}$) concentrations were found in *Diplodus annularis* than other fish species. Interestingly, the standard error and deviation for mean Zn and Fe concentrations were very large in all organisms studied. Zn and Fe concentrations were significantly different in each tissue from different fish species as a result of their biological needs.

Conclusion

Cu and Zn concentrations in sediment were high in the inner bay. The results demonstrated that the middle-inner bays are facing severe copper and zinc pollution. Gediz River was the most important input of metals to the outer bay. Maximum Cu concentrations were obtained in *Penaeus*

kerathurus. Maximum Zn and Fe concentrations were found in *Mytilus galloprovincialis*. Relatively high Cu levels were found in *Sardina pilcardus* and *Mullus barbatus* than other fish species. Cu levels were lower in *Diplodus annularis* and *Merluccius merluccius* than in other species.

References

- 1 - Salomons, W., Förstner, V., 1984. Metals in the Hydrocycle, P. 6-10, 63-93
- 2 - UNEP., 1984. Determination of total Cd, Zn, Pb and Cu in selected marine organisms by flameless AAS, vol. 11.
- 3 - UNEP., 1986. Determination of total manganese in marine sediments by flame atomic absorption spectrophotometry, No: 38