

EVALUATION OF HEAVY METAL POLLUTION IN SEDIMENT AND *MULLUS BARBATUS* FROM THE IZMIR BAY (EASTERN AEGEAN) DURING 1997-2009

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Abstract

Izmir Bay (western Turkey) is one of the great natural bays of the Mediterranean. Outer and middle bays show low levels of heavy metal enrichments except estuary of Gediz River. Heavy metal levels were lower than the results in fish tissues reported from polluted areas of the Mediterranean Sea.

Keywords: Metals, Sediments, Fishes

Introduction

Izmir is an important industrial and commercial centre and a cultural focal point. The Gediz River, which flows to the northern part of the bay, is the second biggest river along the eastern Aegean coast. Gediz River is densely populated and includes extensive agricultural lands and numerous manufacturing, food and chemical industries. A number of studies have been carried out on the concentrations of nutrients and heavy metals in the bay during a year, but no long-term and seasonal data are available. The main aim of this study was to monitor levels, temporal variability and distribution of heavy metals in edible fishes and sediments of Izmir Bay.

Materials and Methods

The study area located between the longitudes 26°30'-27°08' E and latitudes 38°41'-38°21' N. Sediment and fish samples were analysed according to UNEP [1,2,3]. Sediment (SD-MEDPOL-1/TM) and fish (MA-MEDPOL-1/TM) samples were used as a control for the analytical methods.

Results and Discussion

The highest concentrations of metals were found in sediments from the inner part of the bay where intensely industrialized (mainly iron, paper and pulp factories, antifouling paints, chlorine-alkali plants, chemical industries, textile industries, metal processing, timber processing, cement factories, food processing, beverage manufacturing and bottling, tanneries, oil, soap and a very busy harbour) compared to the middle and outer parts of the bay. The concentrations of Cd, Cu and Pb in the outer bay were generally similar to the background levels and mean concentrations from the Mediterranean and Aegean Seas except chromium, zinc and mercury. ANCOVA was used to compare the regional differences in the heavy metal concentrations of sediments. In consequences, the comparison of metal concentrations demonstrate that, there are significant ($p < 0.05$) regional variations. *M. barbatus*, being bottom dwellers to a certain extent, are species that tend to concentrate contaminants to a higher degree than other species due to high mobility. For this reason it was recommended by FAO/UNEP [4] as monitoring species. The concentrations of heavy metals found in *M. barbatus* varied, with Hg ranging from 14-520, Cd from 0.10-10, Pb from 2.6-478, Cr from 22-270, Cu from 178-568 and Zn from 2157-3832 mg kg⁻¹ wet weight in the bay. The order of heavy metal concentrations were: Zn > Cu > Pb > Cr > Hg > Cd. The comparison of metal concentrations demonstrate that, there are no significant ($p < 0.05$) regional variations during 1996-2009 except mercury ($df=5$, $F=4.974$, $p=0.0005$).

Conclusions

Most of the heavy metals concentrations in sediments were generally similar to the background levels from the Mediterranean and Aegean Sea, except delta of Gediz River in the outer bay. The high concentration of heavy metals is observed in the inner part of the bay. The levels of metals are lower in the inner bay than polluted areas of Mediterranean. Hg and Cd concentrations are higher than the reported mean values of heavy metals in fish organisms from the Aegean Sea and Mediterranean. Lead concentrations are similar to those reported in fish from Mediterranean countries.

References

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