HEAVY METAL CONTAMINATION IN CANDARLI BAY SEDIMENT: EASTERN AEGEAN SEA

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Abstract
The accumulation of trace metals in sediments may cause serious environmental problems in the aquatic system. 8 sediment samples were collected using box corer in the Candarli Gulf in 2009 for a study on trace metal pollution. The concentrations of Hg, Pb, Cr, Zn and Al in the surface sediment layers were generally elevated when compared with the sub-surface layers. The metal levels were evaluated according to the enrichment factor analysis. The results revealed significant anthropogenic pollution of Hg and Pb in the surficial sediments of Candarli Gulf.
Keywords: Aegean Sea, Metals, Sediments

Introduction
Heavy metals are deemed serious pollutants because of toxicity, persistence and non-degradability in the environment [1, 2, 3]. Heavy metal contamination in sediment, soil and groundwater is one of the largest threats to environmental and human health [4]. Therefore, heavy metal contamination is still an environmental problem today in both developing and developed countries throughout the world. Few published data are present on metal concentrations from Aliaga Bay [5], but no data are available on metal levels in Candarli Gulf. The aim of this study is to comparatively evaluate Hg, Pb, Cr, Zn and Al concentrations in sediment, collected from different sites of Candarli Gulf.

Materials and Methods
In the framework of MEDPOL Phase IV Project, sediment samples were collected from 8 stations in Candarli Gulf using box corer to detect heavy-metal concentrations by *R/V K. Piri Reis* (Institute of Marine Sciences and Technology). At each station surface and subsurface sediments (15-20 cm below the surface) were collected. Subsurface sediments were used as background levels for each element at all stations. Concentrations of Hg, Pb, Cr, Zn and Al were determined in the digested phase using ICP-ES/ICP-MS (ACME Analytical Labs, Vancouver, BC) in sediment samples.

Results and Discussion
Trace metal concentrations in sediments from the Station 6 (Sta. 6) are consistently higher than those from the other locations. The station near the PETKIM Complex has the highest values for Hg (6.3 mg/kg) Pb (138 mg/kg), and Zn (358 mg/kg). Cr level was measured as 44.6 mg/kg at Sta.6. This area is under the influence of the wastewaters and water-runoff from that industrial activity (rich in heavy metals). EFs present the identification and quantification of metal enrichment. Major population and industry in Candarli Gulf are located in Aliaga town. The relatively high trace metal enrichments in this region are therefore likely to originate from past and present day inputs. EF values tended to the greatest in Sta. 6. Enrichment factor of Cr are generally less than 1.5 (except Sta.6) suggesting that Cr contamination is not a problem at present. However, Candarli Gulf is severally contaminated by Hg, Pb and Zn as reflected by the enrichment factor values of these metals are all greater than 1.5. Enrichment factor results further indicated that these contaminants came from human impacts.

Conclusion
The metals contamination in sediment of studied locations may of anthropogenic origin with the exception of some local anomalies. When compared with the elemental background compositions, surface sediments were observed to be not contaminated with Cr. However, other elements, Zn, Pb and Hg with greater anthropogenic inputs, were observed to be enriched in the gulf sediment samples.

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