

HEAVY METAL CONCENTRATIONS IN SOME MOLLUSCS AND IN SURFICIAL SEDIMENTS FROM IZMIR BAY / TÜRKİYE

Özdemir Egemen*, Ugur Sunlu, Asly Kaymakçi

Ege University, Faculty of Water Products 35440 Yskele- Urla-Izmir, Türkiye

Abstract

Izmir bay has been affected by industrial and heavy metal pollution from the surrounding facilities and domestic effluent from the city. Concentrations of heavy metals (Pb, Cd, Cu, Zn, Ni) have been determined in the common edible molluscs *Mytilus galloprovincialis* (L. 1758), *Cerastoderma glaucum* (B. 1789) and *Tapes decussatus* (L. 1758) collected from different regions of Izmir Bay along with bottom sediment samples from their environment. Samples were analysed seasonally from May 1994 to February 1995. The levels of heavy metals in *M. galloprovincialis* L. 1758 ranged between 0.04-1.12 $\mu\text{g Cd/gr}$ wet weight, 0.58-1.82 $\mu\text{g Pb/gr}$ wet weight, 9.55-58.50 $\mu\text{g Zn/gr}$ wet weight, 0.32-3.25 $\mu\text{g Cu/gr}$ wet weight and 0.30-3.25 $\mu\text{g Ni/gr}$ wet weight. Corresponding ranges were 0.08-0.20 $\mu\text{g Cd/gr}$ w.w., 0.20-2.85 $\mu\text{g Pb/gr}$ w.w., 10.70-22.10 $\mu\text{g Zn/gr}$ w.w., 0.80-3.48 $\mu\text{g Cu/gr}$ w.w., 0.80-2.35 $\mu\text{g Ni/gr}$ wet weight in *T. decussatus* and 0.08-0.51 $\mu\text{g Cd/gr}$ w.w., 0.72-2.15 $\mu\text{g Pb/gr}$ w.w., 8.70-20.55 $\mu\text{g Zn/gr}$ w.w., 0.60-5.58 $\mu\text{g Cu/gr}$ w.w., 5.18-9.21 $\mu\text{g Ni/gr}$ w. w. in *C. glaucum*. Concentrations of heavy metals in surficial sediments varied between 1.60-3.70 $\mu\text{g Cd/gr}$ dry weight, 24.10-54.50 $\mu\text{g Pb/gr}$ d.w., 11.00-68.20 $\mu\text{g Zn/gr}$ d.w., 7.50-28.50 $\mu\text{g Cu/gr}$ d.w. and 29.00-110.00 $\mu\text{g Ni/gr}$ d.w.

Key-words: Pollution, bio-accumulation, Aegean Sea

Introduction

More than 3 million people live near Izmir which is located at the western end of Anatolia. Parallel to the population growth, there has been a rapid increase in fisheries, industrial and commercial activities. The domestic and industrial wastes of this densely populated settlement enter the Bay water. The untreated waste waters of Izmir city, consisting of factory discharges (leather, textiles, food, detergents, beverages, chemical etc.) and sewage, are released directly into the Bay through 128 canals and 10 streams. All these wastes dumped into the sea could have an adverse effect both on the marine organisms and the water quality; hence, Izmir Bay has become an important focal point for potential marine pollution in Türkiye. The main sources of pollution are organic substances, suspended matter, hydrocarbons, heavy metals and pathogenic microorganisms. These contaminants reach the Bay in many ways such as domestic and industrial wastes (50%), rainfall (15%), rivers and streams (10%), agricultural pesticides and fertilisers (10%), erosion (8%), Bay activities and traffic (4%) and other sources (3%) (1). The aim of this study was to investigate the present status of the distribution of heavy metals in economically important molluscs and their environment, i.e. bottom sediments and compare these results with other coastal areas of Türkiye and the Mediterranean Sea.

Study area

Izmir Bay, situated in the western coast of the Aegean Sea, lies between 38° 20'-38° 42' N latitude and 29° 25'-27° 10' E longitude. From the topographic and hydrographic point of view, it is divided into the inner, middle and outer bay regions (2) (Fig. 1). The inner bay is connected to the middle and outer bay by a narrow channel. The length of the coast is 55 km and the width varies between 2.5-6.4 km. The area of the bay is roughly 65.5 km² and the volume of the sea water 636.6 x 10⁶ m³. The average depth of bay is about 20-25 m. The inner bay which is shallower reaches a maximum depth of about 12-15 m., whereas the middle and the outer bay which is deeper reaches a maximum depth of 70 m. (Fig. 2).

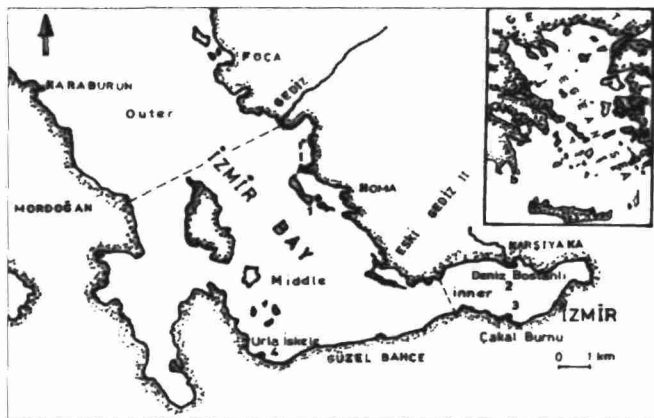


Fig. 1. Map of sampling locations. (2)

Materials and methods

This study was carried out at two stations of the inner bay and two stations in the middle bay as indicated in Fig 1. Samples were analysed seasonally from May 1994 to February 1995. Edible molluscs and surficial sediment samples were collected from these stations at the same time. *Mytilus galloprovincialis* (Mediterranean mussel), *Tapes decussatus* (Surf clam) and *Cerastoderma glaucum* (Cockle) were collected by hand and trans-

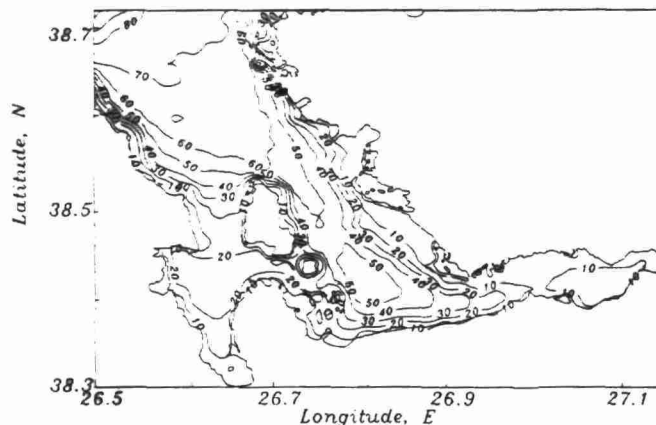


Fig. 2. Bathymetric map of Izmir Bay.

ported daily to the laboratory. These samples were kept in a deep freeze (-21°C) until analysis and were prepared according to international standard methods (3). The composite samples of molluscs were weighed and digested with conc. HNO₃ : HClO₄ (5:1) (extra pure Merck) under reflux and filtered. Sediments were collected seasonally with a "Orange peel" grab of capacity 4.5 l. then stored in plastic bags at -21°C. Each sediment sample oven dried at 60°C for 24 h and then sieved using a mesh. From the dried sediment samples, an aliquot of 1g (<160 μ) was oxidized with 10 ml., conc. HCl:HNO₃ (3:1) (extra pure Merck) under reflux at 120°C for h and then filtered through Whatman 40 filter paper. All samples were diluted with bidistilled water and analysed (4). Metal samples were analysed by atomic absorption spectrophotometry using a 2380 Perkin-Elmer (AAS). Metals were determined by direct aspiration using an air acetylene flame. Intercalibration homogenate samples (MA-A-2, SP-M-1, from the IAEA, Monaco Laboratory) were used as a quality control for the analytical methodology.

Results

Molluscs. The concentrations of some heavy metals (Pb, Cd, Cu, Zn, Ni) in the tissues of the afore mentioned species were determined separately from different regions of Izmir Bay. Minimum, maximum and mean levels of these metals in the various species are given in Table I. It is evident from the table that there are differences in the metal concentrations according to the species and localities. Heavy metal concentrations in *M. galloprovincialis* are slightly higher than in *C. glaucum* and *T. decussatus*. The sites of Deniz Bostanlysy [2] and Çakalburnu [3] are in the inner bay, Homa [1] and Urla Iskele [4] are in the middle bay. The outer bay is less contaminated than the inner and middle parts of the bay. According to our results, levels of heavy metals in all mollusc species from the inner and middle parts of the bay are higher than in the outer bay. *M. galloprovincialis* seems to be much better adapted to the environmental conditions of contaminated bay waters than the other molluscs (5).

Sediments. Table II presents the minimum, maximum and mean values obtained from analyzing the superficial sediments of Izmir bay. According to the results obtained (40 samples), surface sediments from the study area show heavy metal concentrations similar to those reported for other polluted Mediterranean regions (Table IV). Levels of contamination by heavy metals in the inner bay is more important due to the factories, harbour activities and domestic discharges, but a clear decrease upon leaving this zone is also noted.