

HEAVY METAL CONCENTRATIONS IN BIOTA, SEDIMENT AND SEA WATER SAMPLES FROM DIL ISKELESI REGION

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Abstract

Concentrations of Zn, Fe, Mn and Pb were determined in biota, sediment and sea water samples collected seasonally from two stations in the Marmara Sea in Turkey. The levels of Fe and Mn in biota and Zn, Mn and Pb in sediment samples were higher than the previous studies. The order of heavy metal concentrations in all samples was: Fe > Mn > Zn > Pb.

Keywords: *Metals, Bivalves, Sediments, Marmara Sea*

Introduction

Dil Iskelesi is located in the east of the Marmara Sea. Dil stream is one the most polluted streams of Turkey passing through Dilovasi and carries untreated effluent from its basin to the Dil Iskelesi (Izmit Bay-Marmara Sea). Besides the effluents of 34 (total of 171) heavy industrial plants located in the Dilovasi, the wastewaters of more than 400.000 people are discharged to Izmit Bay from Dil Iskelesi region via Dil stream. The objective of this study is to understand the biogeochemical composition of some heavy metals on Dil Iskelesi shore under different seasonal conditions.

Materials and methods

Two sampling stations were chosen on Dil Iskelesi inshore. The first station is located next to a huge metallurgy plant cooling water discharge at a distance of 50 m from the shore. Second station was chosen in front of the Dil stream at a distance of 250 m west from 1st station (Fig. 1).



Fig. 1. Stations at Dil Iskelesi (Izmit Bay-The Marmara Sea)

Ulva lactuca (macro algae), *Mytilus galloprovincialis* (bivalvia), *Paracentrotus lividus* (echinoderm), sea water and sediment samples were collected from these stations between summer 2008 and autumn 2009. For metal analysis in biota samples, whole soft parts of *M. galloprovincialis* and soft parts, Aristotle's lantern and shell of *P. lividus* were dissected and washed with bidistilled water. Biota and water samples were analyzed by flame atomic absorption spectrophotometer for Zn, Fe and Mn and by graphite furnace for Pb. The sediment samples were analyzed by ICP-MS. Other procedures of the methods were described previously [1, 2].

Results and Discussion

The maximum heavy metal levels were determined in autumn for both stations except Pb at 1st station in *U. lactuca*. Higher Zn, Mn and Pb levels were found in summer while Fe in autumn at 2nd station in *M. galloprovincialis*. In *P. lividus*, Zn and Pb levels were higher in soft parts while Fe and Mn levels were high in shell in lantern parts, respectively. In sediment samples, the metal levels in summer season were higher for all metals. All metal levels in the sediment samples were higher than those in biota samples. In the sea water samples metal levels close to each other. However Fe levels were higher in autumn while Mn in summer (Table 1). Among the biota samples, higher Zn and Pb levels were found in mussel while Fe and Mn in algae samples. While Zn levels were higher at 2nd station, Mn levels at 1st station both algae and sea water samples in summer and autumn seasons. Pb and Fe levels were higher at 1st station in summer and 2nd station in autumn season.

Compared with the literature data, our results in biota and sediment are

generally at the same level or higher than the other Marmara Sea studies [1, 3, 4]. The Fe and Mn levels in the present study are clearly higher than the biota samples collected from the different locations of the Marmara Sea. On the other hand, Pb levels in biota samples in the present study are slightly lower than those given in previous results. Zn, Mn and Pb levels in the sediment samples are higher than the levels observed in other Marmara Sea locations except for Mn in the Gulf of Gemlik. The Fe levels in the sediment samples are lower than those in Erdek Bay of the Marmara Sea [4]. Acknowledgements This study was funded by TÜBİTAK (Grant No: 107Y261) and Kocaeli University (Grant No: 2008/017)

Tab. 1. Heavy metal concentrations in biota sediment ($\mu\text{g g}^{-1}$ dry wt) and sea water ($\mu\text{g ml}^{-1}$) samples from Dil Iskelesi shore of Izmit Bay

Season	Station	Zn	Fe	Mn	Pb
<i>Ulva lactuca</i> (mean dry wt (%) in Summer at 1 st , 2 nd station and Autumn at 1 st , 2 nd station were 11.3, 6.1 and 14.2, 7.0 respectively)					
Summer 2009	1	98.4 ± 0.01	2305.7 ± 0.60	92.8 ± 0.01	1.6 ± 0.01
	2	153.5 ± 0.10	732.1 ± 1.10	50.3 ± 0.01	0.5 ± 0.01
Autumn 2009	1	149.7 ± 0.01	5229.5 ± 1.10	294.5 ± 0.10	0.5 ± 0.01
	2	223.4 ± 0.01	5270.1 ± 0.20	219.2 ± 0.10	3.4 ± 0.01
<i>Mytilus galloprovincialis</i> (mean dry wt (%) in Summer and Autumn were 15.7 and 15.6 respectively)					
Summer 2009	2	250.2 ± 0.20	335.1 ± 0.40	14.9 ± 0.01	5.5 ± 0.20
Autumn 2009	2	237.6 ± 0.10	468.4 ± 0.60	4.8 ± 0.01	3.9 ± 0.01
<i>Paracentrotus lividus</i> (Soft Part (mean dry wt 14.1%), Lantern, Shell respectively)					
Autumn 2009	1	49.8 ± 0.01	81.5 ± 0.01	9.7 ± 0.01	0.5 ± 0.01
		27.4 ± 0.01	4.7 ± 0.01	191.2 ± 0.10	0.1 ± 0.01
		36.7 ± 0.01	205.6 ± 0.10	39.4 ± 0.01	0.02 ± 0.01
Sediment					
Summer 2008	2	613 ± 34	25100 ± 150	670 ± 44.5	108.5 ± 2.1
Autumn 2008	2	356 ± 13	19400 ± 100	513 ± 7.2	60.7 ± 1.6
Sea water					
Summer 2008	1	0.015 ± 0.011	<0.001	0.086 ± 0.001	<0.01
	2	0.033 ± 0.001	0.003 ± 0.001	0.082 ± 0.001	<0.01
Autumn 2008	1	0.007 ± 0.007	0.018 ± 0.001	0.034 ± 0.001	<0.01
	2	0.032 ± 0.008	0.015 ± 0.001	0.033 ± 0.001	<0.01

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