Heavy metals and other elements in *Zostera marina* L. on the Trabzon Coast Line (Black Sea; Turkey)

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The marine phanerogam *Zostera marina* forms vast beds was found along the Black Sea coastline at depths rarely exceeding 5-20 m. It has been studied that importance of the diversity and abondance of sea grass comes from their role as primary producers and they have a very important role in detritus formation. They constitute also a natural resource that must not only be protected but also investigated, assessed and managed.

In addition that in previous papers (TUNCER, 1988, 1989) the abilities of *Z.marina, Posidonia oceanica* and some algae were accumulated some heavy metals from sea water.

Eeel grass *Zostera marina* were collected by Scuba diving the period between June and August 1991 in the Sana coastline (Trabzon) at a depht of 16-18 m. in homogeneous beds. This area is affected by domestic and some hydrocarbons wastes coming directly from pumping stations and harbour activities.

All materials were brought to the laboratory, the epiphytes were scraped off, and samples were oven-dired for 24 hr at 105°C, then leaves and shoots (15-20 g. D. W) were mineralised in Pyrex vessels with $HNO_3 : HClO_4$ (5 : 1) under the reflux. Each sample was made in triplicate, filtered and assayed using AAS for heavy metal analysis.

Some principal elemental composition has also been analysed by Spectrometry, Colorimetry and Kjeldall.

All the mean results were summarized in Table I.

Table I. Some Heavy metal and Elemental Composition in the Marine Phanerogam *Zostera marina*.

Element	Symbol	Unit	Leaves	Shoots
Cadmium	Cd	ppm	1.05	1.05
Calcium	Ca	%	1.08	2.58
Chromium	Cr	ppm	1.52	2.20
Cobalt	Co	ppm	3.04	3.14
Copper	Cu	ppm	0.84	0.60
Iron	Fe	mg/g	9.37	0.51
Lead	Pb	ppm	1.17	3.14
Magnesium	Mg	%	0.12	0.27
Manganese	Mn	ppm	138.40	91.60
Nickel	Ni	ppm	4.80	3.56
Nitrogen	N	%	1.65	0.92
Potassium	K	%	1.24	1.10
Phosphate	P	%	0.20	0.23
Sodium	Na	%	2.10	2.16
Zinc	Zn	ppm	3.63	23.22

According to our present results, the levels of element concentration vary among the leaves, and shoots. Our data, are in conformitly with (GRAUBY *et al.*, 1991) in a marina phanerogam *Posidonia oceanica.* Some of heavy metals Fe, Zn, Cu, Pb and Cd used in antifouling paints was applied to boats, and it may be considered that contamination of *Z.marina* is directly related with these metals (BYRAN, 1976). There is a need for further investigation into the other species.

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A Comparative Study on Cr_{tot} Concentrations of Water, Sediments and Some Benthic Organisms of Izmir Bay

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The discharge and dumping of sewage and industrial spoils had released significant quantities of heavy metals in Izmir Bay. Some of these industries such as chemistry, fertilizier, paper, painting, plastics, iron and steel, textile especially well established leather and tinning has been well known as responsible of increased chromium concentration in aquatic environment (IRPTC 1978, KESTIOGLU and SENGUL, 1984). In this investigation chromium content of sediment, water and some benthic organisms collected from Izmir Bay between Dec. 1989 - Dec. 1990 from 11 sampling stations (Fig. 1), has been determined considering with the transportation processes of heavy metals in marine environment.

Water samples were prepared for analyse by solvent extraction technique using APDC-chloroform (KINRADE and VANLOON, 1974). Sediment samples were dried at 110°C for 24 hours and 1 gr of dried samples were wet ashed with $HNO_3 : HClO_4$ (1:5). Biological samples were also digested with $HNO_3 : HClO_4$ (1:5) (FAO Technical Paper No:158).Cr_{tot} content of the samples were determined using Pye-Unicam Model SP9. AAS with flame technique supported by acetilen-NO_2 fuel.

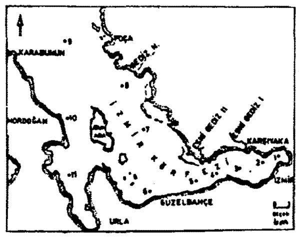

Figure 1. Sampling stations

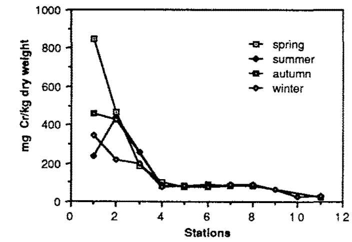

Figure 2. Cr_{tot} concentrations of sediment samples

According to the results of this investigation, there were strong enrichment of Cr_{tot} in sediments of Izmir Bay. Precipitation processes of high organic and inorganic suspended matter which may adsorbe chromium from seawater, gives rise to chromium content of sediment while chromium concentration of sea water is considerably low. The Cr_{tot} concentration in sediment ranged between 26.753-471.150 mg Cr_{tot} kg^{-1} dry weight. It has also apparent that inner bay has the greatest Cr_{tot} content (Fig 2). Literature review shows that Cr_{tot} concentrations of sediment has increased gradually from Sept. 1986 to Sept. 1990 (ALYANAK, 1989, USLU, 1990). It means that Cr_{tot} input to inner bay is a continuous problem.

Cr_{tot} content of sea water were ranged between 5.5-8.5 µg Cr_{tot} l^{-1} with average 7.7 µg Cr_{tot} l^{-1} (Fig. 3).This average value were considerably high as two fold of clean waters of Mediterranean (JEANDEL and MINSTER, 1987; SENGUL and MUEZZINOGLU, 1982; USLU, 1986). On the other hand, this average Cr_{tot} content were comparable with the results of SCOULLOS *et al.* 1982, who obtained 6.6 µg Cr_{tot} l^{-1} from the samples of Gulf Gera (Greece).

Average Cr_{tot} concentrations of muscle of some demersal fish such as *S.vulgaris, A.laterna, G.niger* and *B.luteum* were determined. *S.vulgaris* had a maximum value in outer by (station number 8) with 663.3 µgCr_{tot} kg^{-1} while lower in inner bay as 257.5 µgCr_{tot} kg^{-1} (Fig.4). Cr_{tot} concent of *B. luteum*, were range between 458.8-198.2 µg Cr_{tot} kg^{-1} while the concentration of were 176.3-1215.0 and of *G.niger* were 132.2-1493.0 µg Cr_{tot} kg^{-1}. Concentration factors of *S.vulgaris, B.luteum, A.laterna, G.niger* were 549.7, 502.7, 708.4, 627.1 respectively.

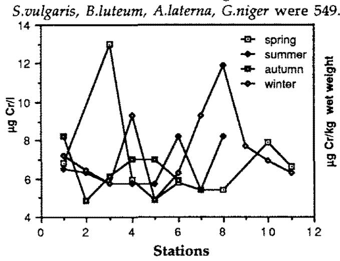

Figure 3. Cr_{tot} concentrations in sea water

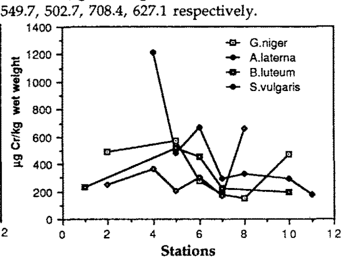

Figure 4. Cr_{tot} concentrations of some demersal fish

Also, *D.annuiaris, S.alcedo* and *S.scriba* had 382.4, 210.9, 219.0 µg Cr_{tot} kg^{-1} but they were not enough in number to have statistical considerations . Some these values were comparable to the values obtained from the demersal fish sample of Gera bay (Greece) such as 435 µg Cr_{tot} kg^{-1} for *D.annularis*, but some of then were quite low (such as *S.scriba* 35, *S.alcedo* 53 µg Cr_{tot} kg^{-1}) comparing to our results (GRIMANIS *et al.*, 1980).

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