

ABOUT ACCUMULATION FACTORS OF CD, CR, CU AND PB IN THE BLACK SEA COAST BIOTA

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Abstract

This paper deals to report original results concerning four metal accumulation factors in the Romanian Black Seacoast biota. Cd, Cr, Cu and Pb were determined in brown and green algae, mussels, crustaceans, fishes and also in water using flame atomic absorption spectrometry.

Keywords: trace metals, Black seacoast biota, FAAS, concentration factors.

Introduction

The release of heavy metals into our environment is still large. In certain areas of the world it is even increasing. Cadmium, chromium, copper and lead play an important role in marine ecosystems as pollutants or essential elements. Their study has increased in the last decades, but biogeochemical cycles may be better explained in active areas. Bioaccumulation (defined as association of a metal with an organism) is a necessary first step before organisms can manifest a response to metals or influence metal geochemical cycling. Many studies published in recent years evaluate the rates and mechanisms of metal bioaccumulation in marine organisms (1-4).

This investigation was carried out in the Black Seacoast ecosystem. Original results of Cd, Cr, Cu and Pb accumulation in marine biota are reported.

Experimental

Samples were collected during the summer of 2002 from eight stations placed on the Romanian Black Seacoast between Midia and Vama Veche. Algae (*Ceramium sp.*, *Cladophora sp.*, *Enteromorpha sp.*, *Polysiphonia sp.*, *Ulva rigida*), mussels (*Mytilus sp.*, *Scapharca sp.*), crustaceans (*Crangon crangon*, *Gammarus sp.*, *Idotea sp.*, *Palaemon sp.*, *Pontogammarus sp.*, *Sphaeroma sp.*) and fishes (*Apollonia melanostomus*, *Atherina sp.*, *Blennius sanguinolentus*, *Mugil auratus*, *Ponticola cephalargoides*) samples were carefully washed with deionised water, hashed and dried. 0.1 – 0.9 grams of each dry sample was submitted to digestion with nitric acid and hydrogen peroxide at 170 °C in a Digesdahl device provided by Hach Company [5, 6]. For the determination of metal concentration an AA 6300 flame atomic absorption spectrometer provided by Shimadzu Company was used.

Results and discussion

The goal of this work was to study the accumulation of cadmium, chromium, copper and lead in the Romanian Black Seacoast biota.

Aquatic organisms may take up trace metals mainly from solution and from food. For example mussels, as filter feeders effectively filter particulate matter out of suspension and therefore this suspended matter may be a source of trace metals. Gagnon and Fischer demonstrate that the organic content of suspended particles may influence bioavailability of trace metals (7).

The concentration factor was calculated as the rapport between ppm metal in organism and ppm metal in water (8).

The table 1 summarizes the obtained results. There are presented mean values of concentration factors for brown and green algae, for two shells species (*Mytilus sp.* – My and *Scapharca sp.* – Sc.), for crustaceans and fishes. In the same time in the table are presented the interval of concentration factor's values for each category.

Table 1. Concentration factors of Cd, Cr, Cu and Pb in the Romanian Black Seacoast biota.

Biota		Cd	Cr	Cu	Pb
Algae	brown	12652	404	2252	339
	green	3225	215	1917	811
	Min-max.	1280 - 14881	22.6 - 762.2	370 - 5322	88.7 - 1117
Shells	My	5564	197	3268	409
	Sc	6125	122	518	450
	Min-max.	390-21378	15.9-231.3	406.7-7021	28.6-1570
Crustaceans	mean	18259	357	9678	1341
	Min-max.	588-53658	125-843	598-36142	43.2-3947
Fishes	mean	18280	819	2639	1343
	Min-max.	746.9-50762	42.9-2891	24.2-14830	54.8-6668

It can be observed that brown algae have higher metal accumulation capacity than the green ones, excepting lead.

There is a large variation of concentration factors in each biota category. That may depend on the sample's collecting points, on the species but also on the physiologic behavior of organism.

Cadmium has the highest concentration factors in all biota species from Romanian Black seacoast.

As a conclusion, for all studied biota categories the concentration factors of trace metals increase as follows: Cr<Pb<Cu<Cd.

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