# NEW RESULTS CONCERNING ACCUMULATION FACTORS OF METALS IN THE BLACK SEACOAST ECOSYSTEM

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**Abstract**
New original results concerning Ag, Cd, Cr, Cu, Ni and Pb accumulation factors in the Romanian Black Seacoast biota and sediment in 2003-2006 are reported. Metal were determined in green alga, mussels, shrimp, fishes and also in sediment and water using inductive coupled plasma - mass spectrometry (ICP-MS) technique.
*Keywords : Black Sea, Trace Elements, Bio-accumulation.*

Introduction
Determination of the metal concentrations in marine ecosystem is considered to provide useful information about the levels of metal contamination, and also about the rates and mechanisms of metal contamination or bioaccumulation [1-4]. Cadmium, chromium, copper, lead, nickel and silver play an important role in marine ecosystems as pollutants or essential elements. These six metals, commonly classified as heavy metals, are a subset of a larger group of trace elements that occur in low concentration in the Earth's crust. The two main pathways for heavy metals to become incorporated into air-soil-sediment- water are transport by air (atmospheric) and water (fluvial).
The investigation was carried out in the Black Seacoast ecosystem. Original results of Ag, Cd, Cr, Cu, Ni and Pb accumulation in sediment, flora and fauna are reported. The used analytical technique, ICP - MS, is generally considered to be a high sensitive, interference free technique for analysis of trace elements in environmental samples.

Experimental
Water, sediment, alga, shells, shrimp and two fish species samples have been collected in August 2003, 2004, 2005 and February 2006 from Mangalia Gulf, located in the southern part of the Romanian Black seacoast. The solid samples - biota ( *Ulva sp., Mytilus sp., Crangon sp., Ponticola sp., Encrasicholus sp*.) and sediment - have been carefully prepared (washed, dried) and subjected to dissolution with nitric acid and hydrogen peroxide in a Digesdahl device [5]. Water samples were filtered on quantitative filter paper, then nitric acid has been added for preservation and stored at 4°C in plastic bottles. Metal concentrations have been measured by atomic emission spectrometry with an Agilent 7500a ICP-MS apparatus [6]. The concentration factor was calculated as the rapport between ppm metal in organism or sediment and ppm metal in water.

Results and discussions
The assessment of bioaccumulation (defined as association of a metal with an organism) may help to elucidate the role of trace elements in the ocean geochemistry.
Some toxic metal species are soluble in water and can be readily absorbed into plant or animal tissue. After absorption, these metals tend to bind to biomolecules such as proteins and nucleic acids, impairing their functions. The obtained results concerning concentration factors of studied metals in sediment and marine flora and fauna evolution in 2003, 2004, 2005 and 2006 can be sumarized as follows (in parenthesis the mean values are presented):
- in marine sediments: cadmium 57-200 (149), chromium 115-559 (317), copper 33-164 (83), lead 64-270 (163), nickel 129-1694 (839), silver 12-313 (91);
- in alga *Ulva sp*.: cadmium 71-333 (206), chromium 114-274 (217), copper 44-386 (166), lead 61-507 (222), nickel 127-1389 (610), silver 25-104 (53);
- in mussels *Mytilus sp* : cadmium 186-3461 (1175), chromium 127-156 (141), copper 88-521 (260), lead 64-1477 (466), nickel 149-4768 (1750), silver 37-298 (160);
- in shrimp *Crangon sp.*: cadmium 178-308 (236), chromium 112-547 (264), copper 53-3857 (1092), lead 75-279 (157), nickel 205-2697 (930), silver 79-250 (166);
- in hanos *Ponticola sp*.: cadmium 93-814 (334), chromium 111-135 (131), copper 63-307 (131), lead 43-277 (154), nickel 61-684 (298), silver 37-134 (75);
- in anchovy *Encrasicholus sp*: cadmium 153-666 (294), chromium 146-196 (178), copper 50-221 (130), lead 34-300 (170), nickel 121-516 (352), silver 25-275 (97).
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. 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. It can be observed that Cd, Ni and Pb have the highest concentration factors in mussels and Ag, Cr and Cu in shrimps. Nickel has the highest concentration factors in all biota species from Romanian Black seacoast.

Conclusions
The concentration factors of studied trace metals in the Black seacoast ecosystem increase as follows:
- for sediments Cu<Ag<Cd<Pb<Cr<Ni;
- for all studied biota categories Ag<Cr<Pb<Cu<Cd<Ni.
These new results confirm our previous researches [4].

## References

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