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# HEAVY METALS ANALYSIS IN SOME MOLLUSKS SHELLS FROM BLACK SEA♦

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**Abstract:** This work presents aspects regarding some heavy metals (Cd, Pb, Cu and Zn) concentration in shells of different mollusks (*Mytilus galloprovincialis*, *Rapana thomasiana*, *Mya arenaria*, *Scapharca*) collected from the Romanian Black Sea Coast (Mamaia zone), in August 2007. The

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heavy metals were analyzed using atomic absorption spectrometry. We used atomic absorption spectrometry to establish the concentration of heavy metals: Cd ($\lambda$ = 228.8 nm), Cu ($\lambda$ = 324.7 nm), Zn ($\lambda$ = 213.9 nm) and Pb ($\lambda$ = 217 nm). We observed a high concentration of Zn in the *Mytilus* [22.99 $\mu g \cdot g^{-1}$] and *Rapana* [16.82 $\mu g \cdot g^{-1}$] samples comparing to the other samples. In the *Rapana* samples we have detected the lower concentration in Cu [5.88 $\mu g \cdot g^{-1}$]. In the shells samples of *Rapana* we have detected the highest concentration in Cd [0.94 $\mu g \cdot g^{-1}$]. The shells of *Scapharca* have presented the lower concentration in Pb [3.11 $\mu g \cdot g^{-1}$]. In *Mya arenaria* samples it has been detected the highest concentration in Pb [9.93 $\mu g \cdot g^{-1}$].

**Keywords:** *heavy metals, mollusks shells, atomic absorption spectrometry*

## INTRODUCTION

Heavy metals in trace concentrations may have adverse effects on water quality, aquatic invertebrates, fish survival, and human health. The effects of heavy metals on aquatic organisms have been the subject of numerous investigations, the majority of them on the action of individual metals [1, 2]. According to Westernhagen [3], the relatively limited number of studies available on the combined effects of metals on aquatic biota shows that the action of two metals in combination can be simply additive, antagonistic or synergistic. Also, a great variety of environmental factors (dissolved oxygen, temperature and salinity) are known to modify the toxicity of metals for determined organisms [4, 5].

Heavy metals and organic pollutants are persistent and non-biodegradable and they can be bioaccumulated through the biologic chains: soil-plant-food and seawater-marine organism-food [6]. So, the presence in high amount of organic pollutants and heavy metals in environment represents a potential danger for human health and for environment due to their extreme toxicity. For this reason, accurate monitoring of their concentration plays an important role. Population can be contaminated with organic pollutants and heavy metals by ingestion of contaminated or polluted food and water. The gravity of toxic effect depends on nature, concentration, body resistance and presence of other contaminants [6, 7]. The concentration of these elements in food products is varied, depending of their origin, storage conditions and processing technologies.

In this paper we have analyzed some heavy metals (Cd, Pb, Cu and Zn) concentration in shells of different mollusks (*Mytilus galloprovincialis*, *Rapana thomasiana*, *Mya arenaria*, *Scapharca*) collected from the Romanian Black Sea Coast. The concentration of heavy metals was determined using atomic absorption spectrometry.

## MATERIALS AND METHODS

The shells of mollusks (*Mytilus galloprovincialis*, *Rapana thomasiana*, *Mya arenaria*, *Scapharca*) were collected on the Romanian Black Sea Coast during July 2007.
In order to analyze the heavy metals concentrations, the shell samples were washed, dried at 105 $^0$C, grinded and then mineralized by wet digestion method ($HNO_3$ - $H_2SO_4$). About 0.5 g of each sample of shells powder was predigested in 2 mL 65% $HNO_3$ for 24 hours at room temperature, then 2 mL of 98 % $H_2SO_4$ were added and the mixture was digested in a VELP DK6 heating digester. After cooling, the solution was made up to 25 mL with deionizer water. All used reagents were of analytical reagent grade (Merck). The resultant solutions were analyzed with an atomic absorption spectrophotometer GBC-AVANTA (air / acetylene flame) in order to determine the heavy metals concentration: Cd ($\lambda$ = 228.8 nm), Cu ($\lambda$ = 324.7 nm), Zn ($\lambda$ = 213.9 nm) and Pb ($\lambda$ = 217 nm). Two replicate determinations were done for each sample.

## RESULTS AND DISCUSSIONS

The heavy metals concentrations in the samples analyzed are presented in the figures 1 – 4.

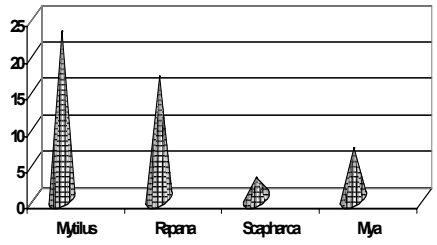


***Figure 1.*** *Concentration of Zn [$\mu g \cdot g^{-1}$] in dried sample*

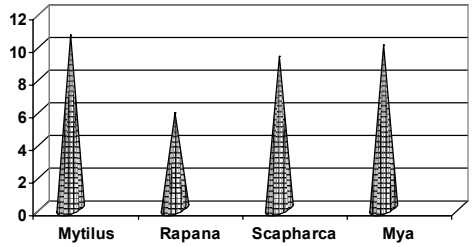


***Figure 2.*** *Concentration of Cu [$\mu g \cdot g^{-1}$] in dried sample*

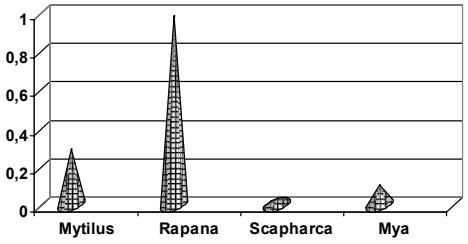


***Figure 3.*** *Concentration of Cd[$\mu g \cdot g^{-1}$] in dried sample*

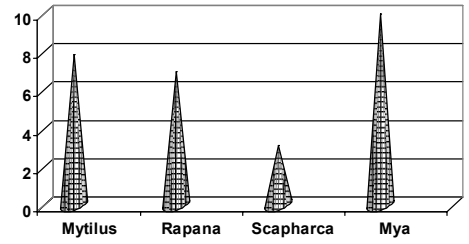


***Figure 4.*** *Concentration of Pb[$\mu g \cdot g^{-1}$] in dried sample*

From Figure 1 it can be observed a high concentration of Zn in the *Mytilus* [22.99 $\mu g \cdot g^{-1}$] and *Rapana* [16.82 $\mu g \cdot g^{-1}$] samples comparing to the other samples.
In the *Rapana thomasiana* samples it has been detected the lower concentration of Cu [5.88 $\mu g \cdot g^{-1}$] (Figure 2). On the contrary, the shells samples of *Rapana* exhibited the higher concentration of Cd [0.94 $\mu g \cdot g^{-1}$] (Figure 3).

The shells of *Scapharca* have presented the lower concentration of Pb [3.11 $\mu g \cdot g^{-1}$] but in *Mya arenaria* samples it has been detected the highest concentration of Pb [9.93 $\mu g \cdot g^{-1}$] (fig. 4).

## CONCLUSIONS

Determination of heavy metals concentration in the Black Sea mollusks presents a major importance because in the seawater are discharged the most effluents with high concentrations of pollutants and mollusks have bioindicator properties. Mollusks are biofiltering organisms which retain small particles from seawater, so the presence of some pollutants in mollusks shells indicates a contamination of the marine environment. The concentration values of heavy metals are generally high and their presence indicates a high degree of pollution and permits the identification of the principal contamination sources. We have detected the highest concentrations of Cd in the shells samples of *Rapana* and Pb in the *Mya arenaria* samples.

We remark that the shells samples of *Scapharca* have presented the lower concentrations in heavy metals. This mollusk retains the smallest quantity of heavy metals from seawater comparing to the others.

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