ASSESMENT OF PRIORITY HAZARDOUS CHEMICAL SUBSTANCES Cu AND Zn PRESENCE IN CRISUL REPEDE RIVER IN 2007

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Abstract

The article describes the presence of the priority hazardous chemical substances Cu and Zn in the Crisul Repede River ,in 2007. The water pollution extent on different stretches along the Crisul Repede River was monitored, taking into account the determination of different factors (pollution sources) which led to the increase of priority hazardous chemical substances concentration in water. The polluting chemical indicators were compared with the standards in order to allow the embracement of protective and preservation measures.

Key words: priority hazardous substances, monitored indicators, pollution, maximum concentration admitted.

INTRODUCTION

The assessment of hazardous substances presence was carried out in Crisul Repede by comparing the obtained values of water sample analysis by the Water Quality Laboratory of Crisuri Water Basin Administration with maximum concentrations admitted by 161/2006 Order.(Order 161 / 2006). The analysis bulletins containing the analysis carried out by the Quality Laboratory of ABA Crisuri in 2007 were used, and the used methods to determine the concentration values were specific to the laboratories standards.(* * *, STAS 4706-74 on surface water quality).

Copper is present in the aquatic environment in streams, in rivers, seas and oceans. Copper comes from rainwater, soil erosion, land, and underwater volcanic phenomena, agricultural or other activities from which copper is released into the water and atmosphere. During these processes, some of the copper is deposited, and a part of this part comes in the oceans. Annually due this natural phenomenon in the global waters deposits an amount four times higher than copper from human activities.

Zinc is an essential element that provides many therapeutic benefits, often overlooked. The real value of zinc for the human body is more than opinion formed on this element in general. Even though zinc is an essential requirement for a healthy body, excess zinc can be harmful, and cause zinc

toxicity. Excessive absorption of zinc can suppress copper and iron absorption. (Rosu C., (1999) - *Gospodarirea apelor*, Ed. Orizonturi)

MATERIALS AND METHODS

In order to achieve our objectives, the following steps undertaken were to identify the representative sections, taking samples, performing laboratory analysis and data processing. There were used accredited methodologies of analysis and evaluation of the results. (Luca,C., Duca, Al., Crişan, Al., (1983) *Chimia analitică şi Analiza instrumentală.* Editura Didactică şi Pedagogică, Bucureşti);

The samples were taken during 2007, namely, in different campaigns organized: the frequency of the sampling activity depended on the type of the monitoring program of every section. There were monitored 23 sections: Crisul Repede – am Alesd. Crisul Repede – am Oradea, Crisul Repede – Tarian, Cropanda – Tileagd, Uileac – Ineu de Cris, Tasad – Osorhei, Peta – am. Sanmartin, Peta – av. Oradea, Alceu – Toboliu, Secatura – Pestis, Crisul Repede - Saula, Dobrinesti – Cacuciul Vechi, Alunis – Braisoru, Chijic – Sacadat, Mnierea – am. Galaseni, Dragan – am. Dragan, Crisul Repede – av. Suncuius, Iad – Bulz, Crisul Repede - Cheresig, Secatura – Pestis, Margauta - Margau.

They were sampled according to the sampling standards and proposed methodologies by the Romanian Waters National Administration. (Water Framework Directive and the groundwater Directive 118/2006/EC; Directive 2008/105/CE of the European Parliament and European Council) . The determinations were made according to the determination standards of each metal. (*Normativul privind clasificarea calităţii apelor de suprafaţă în vederera stabilirii stării ecologice a corpurilor de apă*, iunie, (2006) Ministerul Mediului, Monitorul Oficial);

RESULTS AND DISCUSSIONS

Most often heavy metals with high concentrations found in the Crisuri hydrographic basin are described below.

Toxic substances (pollutant) are those substances which have in composition a toxic, harmful to the environment or to the living organisms which came in contact, possibly causing in some doses even its death.

Copper is a semi-precious metal and often used in the electrical industry. The toxic effects of copper's components result from its application as

algaecide and fungicide. Copper is toxic for the aquifer organisms even in small quantities, such as bacteria, marine algae and fishes. Copper can have negative effects on population and on water's auto purification. Copper is one of the most important oligoelements for the human metabolism. But in high concentrations, this affects the health, although, regularly, only temporarily and not chronically.

Zinc, same as copper, is a very important element for the human body. Zinc is most used in the manufactory and treatment of pipes surfaces and tins. Same as copper, zinc in high concentrations has toxic effects on the aquifer organisms. Zinc accumulates in mollusks as well as in shell snails and mussels. The sub-basin of the Crisul Repede river was monitored on 23 different locations.

"Maximum concentration admitted" is in reality an arbitrary notion and when interpreting it, the principles and methodology must be taken into consideration when those values are assessed.

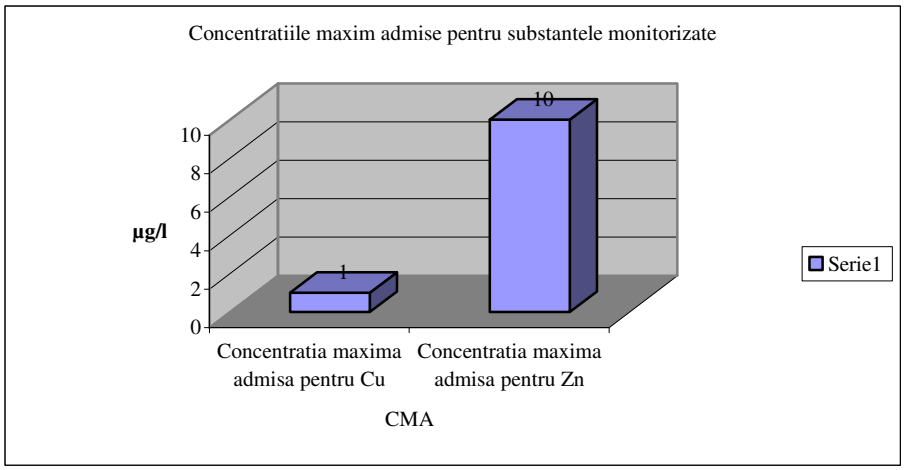

Fig. 1. Maximum concentration admitted of monitored substances

The monitored sections on Crisul Repede river in 2007 are: Crisul Repede – Am. Oradea, Crisul Repede – Tarian, Crisul Repede – Cheresig, Crisul Repede – Am. Alesd, Crisul Repede – Av. Alesd, Crisul Repede –Av. Huedin, Crisul Repede – Av. Suncuius, Crisul Repede – Ciucea, Crisul Repede – Izvorul Crisului, Crisul Repede – Saula, Alceu – Toboliu, Alunis – Braisoru, Chijic – Sacadat, Cropanda – Tileagd, Dobrinesti – Cacuciu Vechi, Dragan – Am. Dragan, Iad – Bulz, Iad – Am. Ac. Lesu, Margau – Margauta, Mnierea – Am. Galaseni, Peta – av. Oradea, Peta – am. Sanmartin, Peta – mijloc

rezervatie, Secatura – Pestis, Tasad – Osorhei, Uileac – Ineu de Cris. The samples were taken in March-November in 2007.

They were sampled according to the sampling standards and proposed methodologies by the Romanian Waters National Administration. (Water Framework Directive and the groundwater Directive 118/2006/EC; Directive 2008/105/CE of the European Parliament and European Council) .

The determinations were made according to the determination standards of each metal. (Jula G., Serban P., 2001, *Monitorizarea si caracterizarea calitatii apelor de suprafata in conformitate cu prevederile Directivei Cadru 2000/60/EC in domeniul apei*, Hidrotehnica).

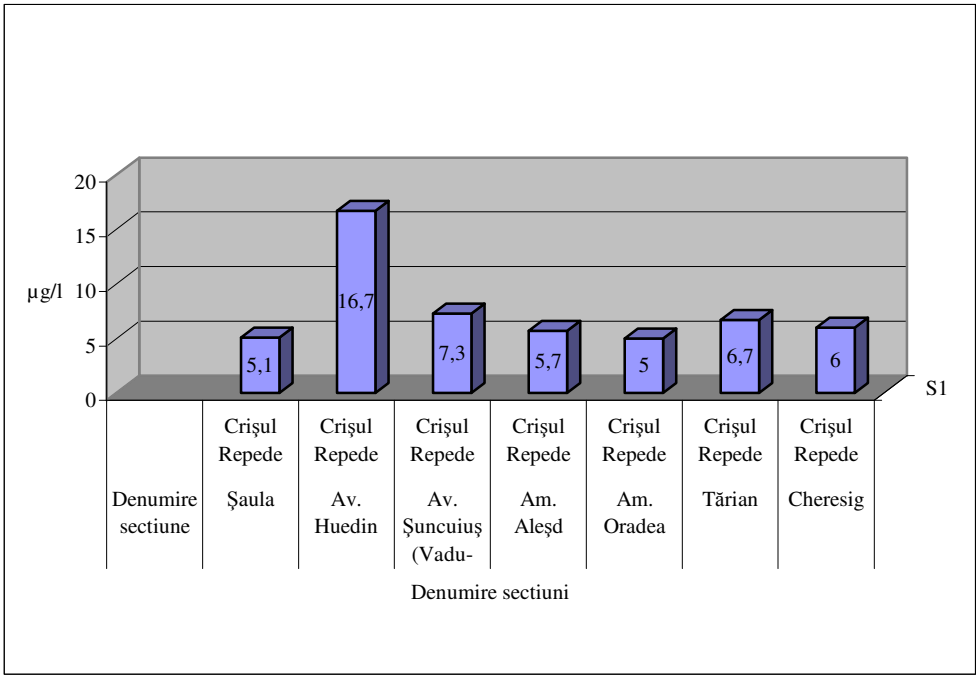

Fig. 2. The monitoring section on the main water courses on Crisul Repede where the excess of CMA at Cu were registered

In the Figure no.2 note that in most sections monitored on the main water courses of Crisul Repede river, were recorded in excess of maximum permissible concentration of Cu, with values between 5 µg/l at Crisul Repede – am. Oradea and 16,7 µg/l at Crisul Repede – av. Huedin.

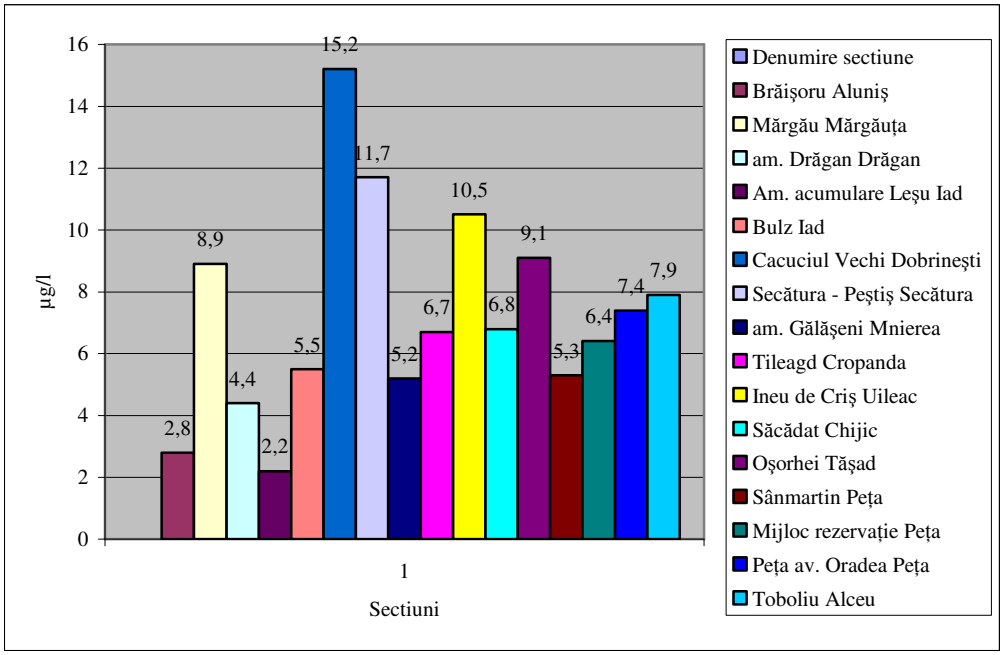

Fig. 3. The monitoring section on the secundary water courses on Crisul Repede where the excess of CMA at Cu were registered

In the Figure no.3 note that in most sections monitored on the secondary water courses of Crisul Repede river, were recorded in excess of maximum permissible concentration of Cu, with values between 2,2 µg/l at Tasad - Osorhei and 15,2 µg/l at Dobrinesti – Cacuciu Vechi.

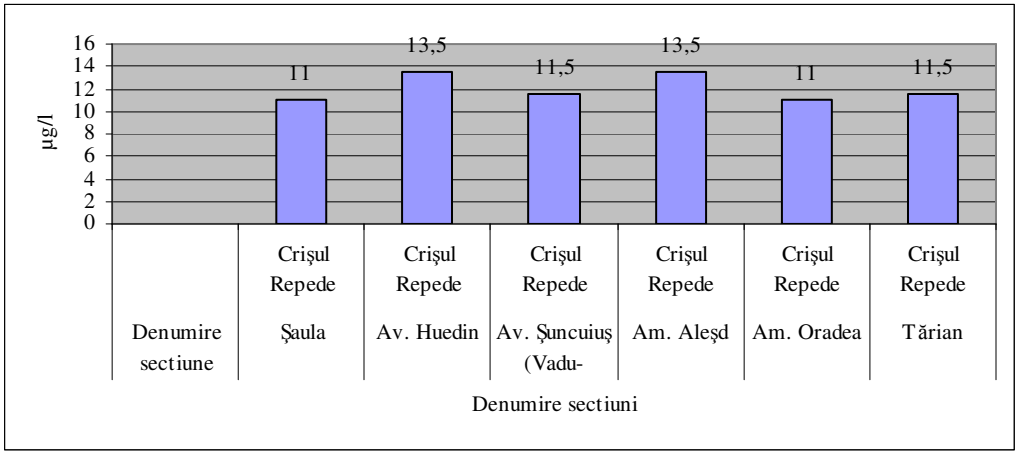

Fig. 4. The monitoring section on the main water courses on Crisul Repede where the excess of CMA at Zn were registered

In the Figure no.4 note that in most sections monitored on the main water courses of Crisul Repede river, were recorded in excess of maximum permissible concentration of Zn, with values between 11 µg/l at Crisul Repede – am. Oradea, Crisul Repede – Saula, and 13,5 µg/l at Crisul Repede – av. Huedin, Crisul Repede – am. Alesd.

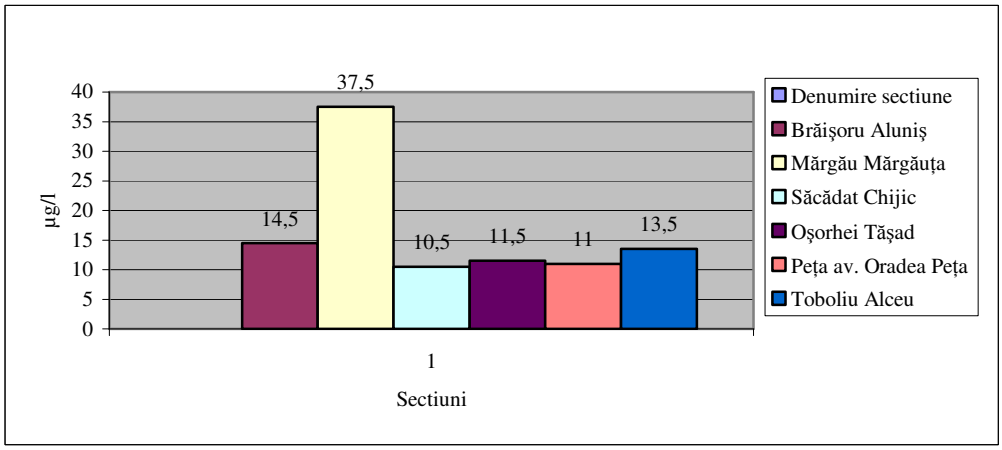

Fig. 5. The monitoring section on the secundary water courses on Crisul Repede where the excess of CMA at Zn were registered

In the Figure no.5 note that not in most sections monitored on the main water courses of Crisul Repede river, were recorded in excess of maximum permissible concentration of Zn.

CONCLUSIONS

Water pollution affects globally the quality of life. The water represents the source of life for any organism within all environments. Without water there is no life. The water quality started more and more to degrade as a result of physical, chemical and bacteriological alteration. Because of the actual conception valid in Romania and in many other countries, the main purpose is to monitored the water as a exploitation potential for different human usages and as a pollution level generated by different human usages (in order to compute the total amount of pollutants carried by waters, to penalize and amend the pollutants, etc.), the announced results are medium statistics towards we need to relate because these concentrations show that if the increase or decrease of a certain pollutant is real, pointing out a higher or a lower discharge, or it is apparent due to different dilutions through the oscillatory water discharge. The result is very useful for pollution sources monitored, not as for the aquatic life! A certain living organism is "interested" in the effective real concentration of a certain pollutant/the level of a certain indicator in the water it lives at that moment. (Simon – Gruita A., Brezeanu Gh. – 2002 –General Limnology, Ed. H*G*A, Bucharest)

Great majority of aquatic organisms have mechanisms that enable them to effectively regulate the absorption of copper and copper optimal assimilation. Today wild life and water bodies are one of the most sensitive systems exposed their environment, a series of research aimed at studying the chemical behavior of copper in aquatic ecosystems. This research examines how they behave in different situations copper environment, and thus determine the potential environmental impact. Above effect depends mainly on the factor called bioavailability. (Botnariuc N., (1981) - Productia si productivitatea ecosistemelor acvatice). This means that the soluble part of an item can have biological effects on living organisms (plants, animals, humans), with who they come into contact.

Bioavailability of copper is much smaller than the total concentration present in the aquatic environment. Whatever, its nature, water interacts with copper present in the aquatic environment and thus produce compounds, the bioavailability of copper is not done. For this reason, international experts agree that taking into account the different regions, the bioavailability of copper is 5 – 25% in water. These water pollutants can be highlighted by water color. Even the water temperature may be an indirect indicator of pollution, especially groundwater, where it is known that temperature is constant. Variation of this temperature, however, along with air temperature variation, indicates the

existence of a communication with the outside and thus the possibility of water penetration into the source of pollutants from outside.

At the base of the evaluation of this priority hazardous substances of Crisul Repede rive, sat results obtained by laboratory tests conducted at the water quality of ABAC.

Results obtained during 2007 were recorded in water quality monitoring programs.

From the results obtained, it follows that the 23 monitored sections, in :
23 sections were recorded exceeding the CMA at Cu
12 sections were recorded exceeding the CMA at Zn

As water pollution prevention measures include: prohibition of random removal of any waste that could pollute water, proper swage systems organization and local facilities, the construction of stations or specific treatment systems waste water of industrial enterprises, providing restraint systems and collection of radioactive substances in waste water units where radio nuclides are produced or used, solid waste storage control. (Radescu C.O., (1971) *Protectia calitatii apelor*, Ed. didactica si pedagogica;).

Acknowledgments

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