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## Heavy metal concentration in water samples of Ranchi lake (Jharkhand State)

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**Abstract :** The Present work was Carried out in Ranchi lake to Determine the heavy metal Concentration in Water .The Sample Collected in the month of the January, April, July and October 2013, Showed the presence of zinc And Copper Below the permissible Levels, while the level of lead and cadmium were above the permissible level .The concentration of iron was slightly above the permissible level. The Concentration of all five heavy metals studied was found to be higher during the rainy season.

**Keywords :** Heavy metal concentrations, Zn, Cu, Pb, Cd, Fe, permissible levels.

### INTRODUCTION

Ponds and lakes are most important source of freshwater throughout the world. Around 30% of the freshwater is found in these aquatic ecosystem. Aquatic ecosystems are the most vulnerable ecosystem in terms of pollution and are the ultimate recipients of almost everything including the heavy metals which is a growing problem worldwide and India is no exception.

The term heavy metal refers to any metallic chemical element that has a relatively high density and is toxic or poisonous at even low concentrations. These metals are natural components of Earth's crust and enter into human bodies via food, drinking water and air.

Heavy metal are dangerous because they cannot be degraded or destroyed, and hence tend to bioaccumulate. Some of the heavy metals such as copper, selenium, zinc etc. are essential for metabolic processes, but high concentration of these elements lead to poisoning<sup>1-5</sup>.

Ranchi lake is a man-made pond which was excavated in the year 1842 under the supervision of British agent Colonel Onsley. It is spread over an area of 20 acres.

During earlier times it was the principal source of drinking water for the city dwellers. Today the lake is sounded by commercial establishments, hospital, warehouses and thick human habitation. The anthropogenically generated solid and liquid wastes are dumped directly into the lake without any treatment.

### MATERIALS AND METHODS

In the present communication the data obtained in the year 2013 has been presented .The samples were collected in the month of January, April, July and October .Water samples were collected from depth of 30cm at 4 select sites .The samples were collected in polyethylene bottles and acidified with 10% HNO<sub>3</sub> acid at the field site, The bottles were refrigerated in the laboratory .The samples were analyzed by atomic absorption spectrophotometer through standard APHA protocol<sup>6</sup> at Jharkhand State Pollution Control Board accredited laboratory, YBEEEL, Sigroul, Ranchi.

### RESULT AND DISCUSSION

Table I contains the concentration of various metals in water samples during the study period. Iron was detected in all samples with the annual average of  $0.31 \pm 0.09$ mg/l .The highest desirable level of iron presumable by WHO(1999) is 0.30mg/l .Thus the concentration of

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iron is slightly above the prescribe level and unsafe for aquatic biota as well as humans. Zinc was detected in all sample. The annual average for zinc was found to be  $0.18 \pm 0.07$  mg/l. The permissible level of zinc has been set at 5.0 mg/l. The concentration of zinc as found in the present investigation is well below the permissible level. The annual mean value of Copper was found to be  $0.24 \pm 0.6$  mg/l. The prescribed maximum limit for this metal given by WHO (1999) is 2.0 mg/l. while the India Specification has set a value of 0.05 mg/l as highest desirable level and 1.5 mg/l as the maximum permissible level. The concentration of copper in water of this lake is thus on the safer side. The Annual average value for lead was found to be 0.28 mg/l. with highest value of 0.62 mg/l in the month of July. The permissible maximum limit of lead by WHO (1999) is 0.05 mg/l. The concentration of lead obtained in the present study was found to be beyond the permissible level. making the water unstable for the domestic in drinking. Accounting to USEPA (2005) the limits of lead for aquatic life are between 0.0013-0.077 mg/

l. The high concentration of lead in water is a meter of consent because of its bioaccumulation properties. The annual average concentration of cadmium was found to be  $0.02 \pm 0.01$  mg/l. the perusable maximum limit for Cadmium is 0.005 mg/l.

According to USEPA (2005) the limit values of cadmium for aquatic life ranges between 0.00066-0.002 mg/l. In the present study the cadmium content was higher than the permissible values, but the higher hardness of water the toxicity and bioavailability may be much lower.

The Concentration of all the heavy metals was found to be higher during the rainy season. This can be attributed to leaching of these metals from the catchment soil due to rain and their transport into the water bodies. These metal could also be leached from the water and effluents of the nearby areas and catchment during rain and could easily be carried into the lake. This is in agreement with the reports of Bordoloi et.al (2002), Roberto et.al.(2008) and Nwani (2008), Who reported high concentrations of metals during rainy season in their studies of water bodies.

**Table 1. Heavy metal concentration in water Sample of Ranchi lake**

Month	Fe	Zn	Cu	Pb	Cd
January 2013	0.23	0.15	0.19	0.08	< 0.01
April 2013	0.27	0.28	0.33	0.33	0.03
July 2013	0.44	0.11	0.20	0.62	0.01
October 2013	0.29	0.16	0.25	0.07	0.01
Average	0.31	0.18	0.24	0.28	0.02

**REFERENCES**

- Bordoloi RK, Kotoky P, Barua J, Haquel and Borah CG.2000.**Heavy metal in the rudiments of Tokial River, Assam.IJEP,22
- Nwanil CD,2008.**Heavy metal pollution Statues of a Tropical fresh meter lentil ecosystem, Angular lake, South -East Nigeria .J.Ecophysiol. Occup Health ,8:231-236
- Roberto GL,Health R.A.Ray O.,Juan A.O and Mend G:2008.**Heavy metals in water of the san Pedro River is Chihuahua,Mexico and its Potential health side .International J. of Envirom.res.5:91-98
- USEPA 2005** Ecological soil screening levels for cadmium: interim final office of solid waste and emergency Response U S Environmental protection Agency Washington D.C
- W.H.O. 1999** Guidelines for Drinking water Quality .2nd Ed Vol.2.Health Criteria and other supporting Information .W.H.O. Geneva:973
- APHA,1989.** Standard Methods for Examination of Water and waste water .American Public Health Association ,New York ,USA

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