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Trace Metals in Zooplankton of River Coringa, Coringa Wild Life Sanctuary, East Coast of India.

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ABSTRACT

Study of trace metals in the aquatic environment is significant, in the sense that they act as limiting factors in the growth of phytoplankton. Sea weeds accumulate to high concentration of trace metals which in turn act as biological indicators for the metal pollution. The distribution and concentration level of trace metals in the coastal environment is essential to assess their possible transfer to man through food chain. Zn, Pb, Fe and Cu metal concentrations in zooplankton samples collected from the river Coringa were analysed. The metal concentrations were within the limits of the FAO standards.

Introduction:

Phytoplankton and Zooplankton play an important role in the biogeochemical cycle of trace metals due to bioaccumulation and later transfer to higher levels. Zooplankton organisms are known to accumulate chemical by direct absorption from water and through food substances intake. The importance of the sensitivity of zooplankton to trace metals stems from their role in marine food chains and direct effect on fish and fish larvae which feed on them.

The measurement of trace metals in the marine environment leads to better understanding of their behavior in the aquatic environment and identification of indicator species which serve as indicators of ambient levels of the radioisotopes of these elements (Matkar *et al.,* 1981). Many trace metals are being released by growing industries into the environment at increasing rates. Most of the toxic trace metals accumulate at various trophic levels of the marine food web are cycled back to the terrestrial environment and create potential hazard for man and many of the organisms of the marine biota (Bernhard and Zattera,1975).

The relatively shallow waters of coastal zones and estuaries are particularly vulnerable to such hazards, since they predominantly subjected to continuous inputs from polluted rivers and coastal outlets. These areas are an important part of the marine environment with usually large biological activity and productivity. (Valenta *et.al* 1983).

Material and Methods:

A station in Coringa river was selected for the trace metal analysis of zooplankton. As soon as the plankton was collected it was gently transferred into a clean polythene bottle and deep frozen on the boat, later brought to the laboratory (with in Six hours) and filtered through plankton net, the plankton so collected over the plankton cloth was washed with tap water, later with distilled water. After washing the plankton was transferred into a clean petri dish and oven dried at 60^{o}C for 48 hrs. Finely powdered dried material (0.5 – 2 gm) was weighed, the material was dissolved in 50% 3 N Nitric acid followed by concentrated Perchloric acid until a clear solution was obtained. The acid digestion was carried out in the water bath. The solution made up to 50

ml by triple distilled water (APHA, 1971). The concentration of 4 metals viz., Copper, Zinc, Lead and Iron were determined by AAS. The metal concentrations were determined by using the formula:

Metal concentration in the sample (ppm) =

$$\frac{\text{Metal content in solution (ppm) x V}}{\text{Sample dry weight}}$$

Where V is the volume of the sample solution makeup with triple distilled water. All the metal concentrations were expressed in terms of mg. gm^{-1} dry weight.

Results & Discussion:

Zinc (Zn):

This is an element essential for normal growth, reproduction and longevity of animals. It is the component of several enzymes. Zinc is associated with enzymes which regulate cellular metabolism (Rowe and Gloyna, 1964). Carbonicenhydrase is an important enzyme that catalyzes the carbonate reaction and increase the rate of Co_2 exchange to a level sufficient to sustain life. In the present investigation the Zinc concentration in the zooplankton form the Coring river varied between 0.05 mg. gm^{-1} dry weight to 1.04 mg. gm^{-1} dry weight river (Table -1). The observed values of zinc in the Zooplankton are in agreement with the observations made by (George and Kureish, 1977)

Table: 1. Trace metal concentrations (mg. gm^{-1} dry weight) in zooplankton at slected station in the river Coringa.

Sampling Month	Concentration of the trace metals			
	Zn	**Pb**	**Fe**	**Cu**
January,1996	1.54	0.56	9.83	1.82
February	0.27	0.49	2.93	0.61
March	0.59	0.80	7.08	1.32
April	0.19	0.21	2.06	0.42
May	0.26	0.25	1.97	0.18
June	0.05	0.05	1.53	0.24
Min	0.05	0.05	1.53	0.24
Max	1.54	0.56	9.83	1.83
Mean	0.47	0.38	4.53	0.91

Lead (Pb):

Lead is supposed to be a harmful element as it is known to show affinity with lipids. In the present investigation lead concentration of zooplankton from the Coringa River varied between 0.05 mg. gm^{-1} dry weight to 0.56 mg. gm^{-1} dry weight. Srinivasa Rao (1990) reported that the mean values lead in the zooplankton samples was 0.75 mg. gm^{-1} dry weight. (Table-1), which corresponds with the present results. The concentration of lead in water shows a trend towards surface enrichment.

Iron (Fe):

Iron is important and required in high concentrations as it is the chief constituent of hemoglobin in blood. Iron as a component if hemoglobin (70%) myoglobin and cytochromes, plays a key role in oxygen transport in cellular oxidation. In the present investigation the iron concentrations in the zooplankton samples from the Coringa river varied between 1.53 mg. gm^{-1} dry weight to 9.83 mg. gm^{-1} dry weight (Table-1). Zingdae and Syngbal (1983) from the Binge Bay, Karwar, reported that the dissolved Fe value was between 9 to 26.2 ч $g.l^{-1}$. Srinivasa Rao (1990) form the coastal waters of Visakhapatnam reported that Fe concentration in the zooplankton had a mean of 0.9 ppm.gm^{-1}. I n the present study the observed Fe values of Zooplankton were comparatively higher because the process of biological degradation of mangrove leaves, and litter decomposition, results into the input of nutrients into the aquatic phase. The zooplankton populations dwelling in the mangrove areas are mostly detritivores and herbivores which mostly feed on the detritus and phytoplankton, so the Fe concentration was relatively high in the zooplankton samples.

Copper (Cu):

Copper plays a role somewhat analogous to that of iron as hemoglobin in blood of mammals (Chalapathi Rao and Satyanarayana Rao,1974). Copper is necessary for the activity of cytochromes and various enzymes of the body. Copper favors absorption of iron from intestine and also its transport from intestine to tissues. Copper is present in blood of invertebrates as haemocyanin and serves as an oxygen carrier. In the present investigation the copper concentration in the zooplankton samples varied between 0.24 mg. gm^{-1} dry weight to 1.83 mg. gm^{-1} dry weight (Table-1).

Seasonal variations of the Copper concentration in the surface waters of the sea have been ascribed to two important factors one the Phytoplankton activity, and the other contribution from the land drainage (Atknis, 1953: Chalapathi Rao and Satyanarayana Rao, 1974). The present observations were similar with the reported values. Srinivasa Rao (1990) from the coastal waters of Visakhapatnam reported that the copper concentration of the zooplankton samples with a mean of 2.08 ppm. gm^{-1}.

Conclusions:

In the present observations the trace metal concentrations in Zooplankton showed the order of Fe >

Cu > Zn > Pb. In Coringa river relatively higher concentrations of trace elements were recorded. This may be due to the land run off along with fresh water inflow from the river Godavari. The composition of zooplankton may also have a role in determining the concentrations of trace elements.

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