

ORIGINAL RESEARCH ARTICLE

Seasonal Distributions of Heavy Metals in Vellar River, Vellar Estuary and Portonovo Coastal Waters, South East Coast of India

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ABSTRACT

In this present research work, the heavy metal contamination in Vellar River, Vellar estuary and Portonovo coastal waters, South East Coast of India was evaluated. In this study, heavy metals such as Zinc, Copper, Lead, Cadmium and iron were analyzed in the water samples. The sample analysis was done by microwave assisted digestion and Atomic Absorption Spectrophotometer.

Key words: Vellar River, Vellar estuary, Portonovo coastal waters, Heavy metals and Atomic Absorption Spectrophotometry.

INTRODUCTION

Heavy metals are high pollutants because of their relative high toxicity and persistent nature in the environment. Therefore, knowledge of the changing concentrations and distribution of heavy metals and their compounds in various compartments of the environment is a priority for good environmental management programmes all over the world^[1]. The enrichment of heavy metal in the environment can result from both anthropogenic activities and natural processes^[2,3,4]. As long as human-induced generation of heavy metals continues in industrial and domestic activities, sustained measurements will be needed to assess the effectiveness of set limitation standards and facilitate the identification and quantification of the state of environmental degradation attributable to the discharged heavy metals.

Contaminating elements and compounds are transported by water and gather in bottom and alluvial sediments. Thus, there has been growing concern in recent years that certain anthropogenic trace metals released by industries and domestic effluents are incorporated into accumulating sediments^[5]. Their modes of transportation and levels in sediments and soils have been the topic of many researchers in connection with environmental problems arising from contaminated materials^[6]. The elevation of metal levels often results in a high concentration in the bottom sediment. As a result, sediments become

“chemical archives” of heavy metal accumulations, which can provide valuable information in resolving the source and sink of heavy metal pollution^[7,8]. Therefore, the levels of input of the metals into the environment can be assessed by measuring the concentration in sediments above the natural background level.

The distribution of metals and pollution assessment in the coastal water is of great concern due to the rapid process of industrialization, urbanization and increased agricultural activities^[9]. Heavy metals in the sediments are assessing the extent of metal pollution. The distribution of heavy metals in solution has widely been recognized as a major factor in the geochemical. Behaviour, transport and biological effects of those elements in natural waters^[10]. In the present investigation, the heavy metals present in the the Vellar river, Vellar estuary and Portonovo coastal waters, South East coast of India was analyzed. It was located in neighbourhood of the river area and selected heavy metals *viz.*, Zinc, Copper, lead, Iron and Cadmium.

MATERIALS AND METHODS

Water samples were collected in pre-cleaned and acid-washed polypropylene containers of one litre capacity and kept immediately in an ice box and brought to the laboratory to avoid contamination. The water samples were then filtered through millipore filtering unit. The filtered water samples were pre-concentrated with APDC – MIBK extraction procedure. Filtered water was divided

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into two 200 ml aliquots and its pH was adjusted to 4 ± 1.0 by careful drop wise addition of 50% Nitric acid. The metals were pre-concentrated and separated from the bulk matrix by complexation with APDC and extracted into MIBK. The organic layer containing the metal chelates was collected and back extracted with 50% nitric acid and diluted with deionized water to a minimum quantity of 25 ml. This solution was aspirated into a standard Atomic absorption spectrophotometer (Perkin Elmer Model – 373) for the determination of metal concentrations against blank^[11]. The values are expressed in mg / l.

RESULTS AND DISCUSSION

The recorded metal concentrations in station 1, 2 and 3 are given in (Table 1). A small variation in

Table 1: Distribution of heavy metals in the study area During 2009- 10

Metals ($\mu\text{g/g}^{-1}$)	Seasons	Stations		
		Station1 Vellar river	Station2 Vellar estuary	Station 3 P. coastal area
Copper (Cu)	Monsoon	3.58 \pm 0.83	3.23 \pm 0.56	3.92 \pm 0.003
	Summer	3.12 \pm 0.01	3.13 \pm 0.28	3.18 \pm 0.02
Zinc (Zn)	Monsoon	4.82 \pm 0.81	4.53 \pm 0.26	4.01 \pm 0.23
	Summer	3.68 \pm 0.21	3.79 \pm 0.02	3.82 \pm 0.82
Cadmium (Cd)	Monsoon	2.12 \pm 0.28	2.36 \pm 0.07	2.80 \pm 0.04
	Summer	1.82 \pm 0.04	3.00 \pm 0.12	3.08 \pm 0.24
Lead (Pb)	Monsoon	2.11 \pm 0.06	0.87 \pm 0.08	0.79 \pm 0.01
	Summer	0.58 \pm 0.03	0.76 \pm 0.04	0.98 \pm 0.07
Iron (Fe)	Monsoon	3.01 \pm 0.11	3.92 \pm 0.43	3.71 \pm 0.36
	Summer	2.92 \pm 28	2.87 \pm 0.67	2.76 \pm 0.13

the metal concentration recorded in summer when compared to the monsoon season. Metals in water occurs as complex and diverse mixture of soluble and insoluble form such as ionic species, inorganic, organic complexes and associated with colloids and suspended particulate matter^[12]. Metals are the most harmful insidious pollutant because of their non-biodegradable nature and their potential to cause adverse effects to aquatic organisms at concentration higher than permissible limit^[13]. In recent years, environmental heavy metal pollution gives greater attention to many researchers so that extensive works have been carried out to study the toxicity of heavy metals in the environment as well as in the flora and fauna^[14].

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