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Toxicity Study of Zooplanktons, Mixed Zooplanktons and Neuston of Rapti River Against Heavy Metals

Bhesh Raj Chaudari
Research Scholar,
Glocal School of Allied & Health Sciences, Glocal University,
Saharanpur, Uttar Pradesh, India
bheshrajchaudhary@gmail.com

Dr. Arun Kumar
Associate Professor,
Glocal School of Allied & Health Sciences, Glocal University,
Saharanpur, Uttar Pradesh, India

Dr S. K. Shukla
Associate Professor,
Dayanand PG College,
Bachhrawn, Raebareli,
Uttar Pradesh, India

ABSTRACT
The present study investigate that the Rapti river environment does not seem to be heavily contaminated with heavy metals, at least at the zooplankton level. Available result of present investigation shows that the concentrations of copper were in the same order of magnitude as the copper levels from different and similar climatic regions. The minimum and maximum value of zinc concentrations in both mixed zooplankton and neuston were considerably lower than in comparable aqua environments. The lowest concentrations of lead, measured both in mixed zooplankton and neuston, were lower than that of other tropical regions. The mean concentrations of cadmium were lower than those reported elsewhere but comparable within the Rapti river.

Keywords
Pond Zooplanktons, Toxicity, Heavy Metals

1. INTRODUCTION
After industrial revolution most of small rivers, ponds, and lakes is affected by hazardous heavy metals, this due to mining activities, industrial wastages, application of sewage sludge and many other reason. Most of heavy metals contamination stems from high temperature combustion sources such as coal fired powder plant and soil waste incinerators. Heavy metal is widely present in our environment and they can also move into food chain.
Chromium, lead, mercury heavy metals are produces more toxicity in water ecology system compare to other heavy metal. Bioremediation (Water Bioremediation) has emerged as an alternative to the engineering methods in which heavy metal potential plant (Hyper accumulators zooplanktons and phytoplankton's) provide more heavy metal stress contrast to other traditional method. For several ways in which plankons can be used to clean up contaminated soils and water but only optimum level. Clean up defined as the destruction, inactivation or immobilization of the pollutants in a harmless form. Planktons may break down or degrade organic pollutants, or remove and stabilize metal contaminants.

2. MATERIAL AND METHODS
Study Area- Zooplankton samples were collected at two Banke site Jhinjhari Khola confluence point and Rapti Bridge.
Sampling Techniques- Zooplankton samples were obtained by the neuston net (310 _m mesh aperture) towed horizontally for 10-15 minutes beside the boat during the day following procedure of Rezai et al. [1, 3]. The period of sampling coincided with SW monsoon. Heavy metals cadmium, lead, copper and zinc in neuston were analyzed from samples.
The risk of contamination were largely reduced by taking any visible debris such as paint chips, tar balls, rust flakes, etc. All samples were shortly rinsed after catch with double-distilled water to remove salts and were placed in acid-cleaned polyethylene bottles, and immediately frozen at –200C.

Upon arrival at the laboratory, the frozen samples were immediately lyophilized. Approximately 0.5- 2.0 g of zooplankton samples were digested for 3 hrs with a 10 ml concentrated HNO3 at 1400C. Duplicate digestions were made when the wet weight was sufficiently enough. The digests were then brought to 40 ml with Milli-Q-water and subsequently analyzed by Atomic Absorption Spectrometer. To avoid possible contamination, all glassware and other equipment were acid washed and rinsed with double distilled water before use. All results were expressed in g-1 on a wet weight basis. In order to assess the accuracy of the method, standards and blanks were also employed. The expression "mixed zooplankton" as the basic unit of observation is used to emphasize that separation of organisms into species for the determination of heavy metals was not possible [2]. In order to compare the present data on the metal concentrations with those from various river areas, wet weight of zooplankton were converted to dry weight by multiplying the wet weights by a factor of 0.12. Table 1 is showing the accumulation of cooper in zooplanktons, table 2 is showing the accumulation of zinc in zooplanktons and table 3 is showing the accumulation of lead in zooplanktons.

Table 1: Accumulation of Cooper in Zooplanktons, Mixed zooplanktons And, Neuston

Month	Jhinjhari Khola confluence point 1in μg g^{-1} Dry weight (Range)			Rapti Bridge in μg g^{-1} Dry weight (Range)		
	Z	MZ	N	Z	MZ	N
January	41.1	43.2	31.2	38.2	39.8	28.2
February	42.3	43.3	32.9	42.3	41.1	31.8
March	44.7	45.7	34.1	42.7	42.3	33.9
April	44.1	46.5	34.1	42.1	44.7	33.1
May	45.2	47.2	35.5	43.2	44.5	34.7
June	45.8	48.7	35.6	45.8	45.2	35.5
July	46.3	49.3	36.4	44.3	45.7	35.6
August	45.1	46.3	35.1	41.1	46.3	36.7
September	44.7	43.7	34.4	40.7	45.1	35.6
October	44.9	42.7	34.4	41.9	44.3	34.4
November	43.7	42.2	36.7	40.7	44.8	34.4
December	42.1	41.1	32.6	42.1	43.7	36.7

Z=Zooplanktons, MZ=Mixed zooplanktons, N= Neuston

Table 2: Accumulation of Zinc in Zooplanktons, Mixed zooplanktons And, Neuston

Month	Jhinjhari Khola confluence point in μg g^{-1} Dry weight (Range)			Rapti Bridge in μg g^{-1} Dry weight (Range)		
	Z	MZ	N	Z	MZ	N
January	428.1	405.2	385.2	410.2	395.8	375.2
February	428.3	403.3	382.9	412.3	391.1	371.8
March	424.7	405.7	384.1	412.7	391.3	373.9
April	424.1	406.5	384.1	422.1	392.7	373.1
May	425.2	407.2	375.5	423.2	394.5	374.7
June	425.8	408.7	375.6	425.8	385.2	385.5
July	426.3	409.3	376.4	434.3	385.7	385.6
August	425.1	406.3	375.1	411.1	376.3	386.7
September	424.7	403.7	364.4	410.7	375.1	385.6
October	424.9	402.7	364.4	411.9	264.3	384.4
November	423.7	402.2	366.7	410.7	374.8	374.4
December	42.1	41.1	32.6	42.1	43.7	376.7

Table 3: Accumulation of Lead (Pb) In Zooplanktons, Mixed zooplanktons And, Neuston

Month	Jhinjhari Khola confluence point in μg g^{-1} Dry weight (Range)			Rapti Bridge in μg g^{-1} Dry weight (Range)		
	Z	MZ	N	Z	MZ	N
January	49.1	47.2	41.2	46.2	41.8	39.2
February	49.3	46.3	39.9	45.3	41.1	37.8
March	48.7	45.7	34.1	44.7	42.3	36.9
April	48.1	46.1	34.1	43.3	44.7	33.1
May	47.2	47.2	35.8	43.2	44.5	34.7

June	46.8	48.8	35.6	45.4	45.2	35.1
July	46.3	49.3	36.4	44.3	45.7	35.6
August	45.1	46.3	35.6	41.1	46.3	36.9
September	44.7	43.3	34.4	40.5	45.1	35.6
October	44.9	42.7	34.7	41.9	44.3	34.1
November	43.7	42.2	36.8	40.7	44.8	34.4
December	42.1	41.1	32.6	42.1	43.7	36.7

3. DISCUSSION

3.1 Analytical Analysis

In this study, the overall distribution of some metals in mixed zooplankton organisms from the Rapti river meaningful spatial pattern. The present data are in with those by Rezai et al. [4] in the Straits, in which generally higher heavy metal concentrations were found in the near-coastal versus neritic waters. In addition, two groups of stations as revealed by the dendrogram and MDS plots with higher and lower heavy metal concentrations correspond mostly to near-coastal and offshore areas respectively. Heavy metals, including cadmium, copper, lead, mercury and nickel, were reported in the coastal waters of West Rapti, particularly the coastal. High concentrations of copper, cadmium, cobalt, nickel, lead and zinc were found in the waters of the southern coast and the main port [5].

The significant correlations between Pb and Zn; Cu and Zn; and Pb and Cu indicated that these metals had the same source of pollution, whereas negative correlations between Cd and other heavy metals may indicated a Possible different pollutant source, and as mentioned earlier, cadmium presented a higher concentration in offshore waters, whereas other metals showed high concentrations in near-coastal areas. In addition, some sort of pollutants may play a role, at least by coupling to other parameters, influencing and/or preventing the normal distribution of zooplankton. This is particularly prominent in the southern part of the river where there exist various sources of pollutants such as outflow of factories, refineries and boating, among others. The results on the status of heavy metals in the zooplankton also indicated relatively high loads from the south. In fact, higher mercury content was also reported from zooplankton samples in the southern part (Rezai et al.). In addition, recently, showed higher levels of petroleum hydrocarbon in the southern parts of the river compared with the northern and the central parts. To what extent might the heavy metal concentrations contribute to the overall distribution and abundance of zooplankton is not known. Since copepods of the area were almost equally represented by carnivores and herbivores, they occupied the lower point of entry for pollutant.

The present distribution pattern of heavy metals is related to some extent, to spatial distribution of zooplankton. Except for Cd, the relatively higher loads of heavy metals in compared with other areas of the Straits may be partially attributed to the increased industrial development such as shipping activities and/or increased amount of land drainage in these areas. Moreover, it may also be due to the lower water dilution-taking place in the southern compared with the northern part. Anti-fouling paints that leach out from transport vessels are probably the main source of Cu and Zn in zooplankton samples collected at stations near Harding bridge areas, although other source. On the other hand, the reason for relatively high load of Cd in offshore of Lumut is not known, but may be related partially to increase naval activities as well as discharge of pollutants. Furthermore, the distribution pattern of heavy metals may not only be related to the location of the potential metal sources, but also to some extent, to spatial distribution of zooplankton in conjunction with hydrographical characteristics of the area [7]. Comparison of the present data on the metal concentrations with those from various river areas led to the following conclusions.

The concentrations of copper were in the same order of magnitude as the copper levels from different and similar climatic regions. The minimum and maximum value of zinc concentrations in both mixed zooplankton and neuston were considerably lower than in comparable aqua environments. The lowest concentrations of lead, measured both in mixed zooplankton and neuston, were lower than that of other tropical regions.

The mean concentrations of cadmium were lower than those reported elsewhere but comparable within the Rapti river. It should be understood that the numbers quoted refer to the biological effects on chemical composition. In addition, partially as a result of this, as well as the statistical techniques employed, the numbers should be viewed as indicators, rather than as absolute values. There are a few noticeable trends in the neuston samples but they only appear in individual stations and are not universal throughout the area. The problem of discerning any meaningful trends is further compounded by the variations in sample makeup. Thus, it is impossible to make coherent comparisons from station to station. The only significant finding can be reported is that although there are chemical variations between the various samples, they tend to fall within the ranges that have been reported elsewhere for zooplankton (I.O.D.E., 1972). However, plankters are representative for the water body within which they grow and are moved, their short life means that they remain in given water body for the duration of their life, at least in the open river [6]

4.CONCLUSION

In conclusion, the Rapti river environment does not seem to be heavily contaminated with heavy metals, at least at the zooplankton level. Available information suggests that enhanced metal levels in some organisms do not necessarily imply anthropogenic contamination. Since the obtained data are limited in space and time, further sampling would be needed to see if these trends continue over longer periods or merely reflect short-term local variations. In the absence of similar published data from the Rapti River, it is impossible to draw any conclusions about temporal trends of metal concentration.

REFERENCES

[1] Biesinger KE, Christensen GM (1972). Effects of various metals on survival growth, reproduction and metabolism of Daphnia magna. J. Fish. Res. 29: 1691-1700.

[2] Chen CY, Stemberg RS, Klaue BJD, Pickhardt C, Folt CL (2000). Accumulation of heavy metals in food web components across a gradient of lakes, Lim. Ocean, 45(7): 1525-1536.

[3] Fuakai, R. and Huynh-Ngoc, L., 1976. Intercalibration measurements for non-nuclear pollutants. Trace metals in Mediterranean seawater. Report of the International Laboratory of Marine Radioactivity, Monaco, 1976: 122-133 (IAEA-187). Grace, L.M., Woo, K.H. and Choo, L.M., 1987.

[4] I.O.D.E. 1972. Baseline studies of pollutants in the marine environment. (ed. E.Goldberg) Background papers for a Papers for a Workshop at Brookhaven National Laboratory, 24-26 May, 1972, 799 pp.

[5] Ramírez-Luna V, Andrés F, Navia Rubio EA. Food habits and feeding ecology of an estuarine fish assemblage of Northern Pacific Coast of Ecuador. Pan-American Journal of Aquatic Sciences 2008; 3:361-372.

[6] Rajasegar M, Srinivasan M, Rajaram R (2000) Phytoplankton diversity associated with the shrimp farm development in Vellar estuary, south India. Seaweed Res. Utiln 22: 125-131.

[7] Strickland JDH, Parsons TR (1972) -A practical handbook of seawater analysis. Bull Fish Res Bd, Canada.

