HEAVY METAL POLLUTION IN WATER, SEDIMENT, AND FISH OF THE KAPTAI LAKE: ASSESSMENT OF CONCENTRATION, ENVIRONMENTAL IMPACT AND HEALTH IMPLICATIONS

Farjana Akter
Roll No.: 0123/03
Registration No.: 1293
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Department of Fisheries Resource Management, Faculty of Fisheries
Chattogram Veterinary and Animal Sciences University
Chattogram-4225, Bangladesh

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This is to certify that we have examined the above Master's thesis and havefound that is complete and satisfactory in all respects and that all revisionsrequired by the thesis examination committee have been made

Dr. Sk. Ahmad Al Nahid	**Mrs. Shahida Arfine Shimul**
Supervisor	**Co-supervisor**

Mrs. Shahida Arfine Shimul
Chairman of the Examination Committee

Department of Fisheries Resource ManagementFaculty of Fisheries
Chattogram Veterinary and Animal Sciences University
Chattogram-4225, Bangladesh

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LIST OF ABBREVIATIONS

ABBREVIATION	FULL FORM
mg	Milligram
Kg	Kilogram
L	Liter
CF	Contamination Factor
CSF	Cancer Slope Factor
SEL	Severe Effect Level
PEl	Probable Effect Level
TEL	Threshold Effect Level
TRV	Toxicity Reference Value
DWSB	Drinking water Standard Bangladesh
PLI	Pollution Load Index
As	Arsenic
Ni	Nickel
Cu	C0pper
Cd	Cadmium
Pb	Lead
Cr	Chromium

ABSTRACT

The presence and concentration of heavy metals from water, sediment, and eight selected fish species from Kaptai Lake were investigated**.** The sampling sites were categorized as Tourist (Shubholong Waterfall, Julonto Bridge, and Buddha Mondir), Non-tourist (Borokoler much, Chilar dam, Hazari Bazar), and Market (BFDC Fish Market, Shubholong Market, Reserve Market). The study was conducted from July to December 2023, and sampling was carried out on July 2023. The concentration of heavy metals in water (mg/L) sediment (mg/kg) and eight fish species on a dry weight basis (mg/kg) of Kaptai Lake were determined by Atomic-absorption-spectrophotometer (AAS) (Model: AA-7000. SHIMADZU, Japan). Six heavy metals such as Arsenic (As), Cadmium (Cd), Chromium (Cr), Nickel (Ni), Lead (Pb) and Copper (Cu) in sediment, water, and fish species were investigated from Kaptai Lake. No significant variation (P>0.05) in heavy metal concentration was found among the sites in sediment and water samples. The decreasing trend of the mean concentration of metals was observed in water (mg/L) as Cu>Cr>Ni> Cd> Pb>As and in sediment (mg/kg) Cr >Ni >Cu> Pb >As >Cd. The Cu, Cd, and Pd levels in water samples exceeded the safe drinking water limits, indicating that water from this river was unsafe for drinking and cooking. While in sediment, the concentration of Ni (mg/kg) was higher than PEL, TEL TRV, and Cd (mg/kg), and Cr (mg/kg) was higher than TEL and TRV, indicating adverse biological effects on the Kaptai Lake. The sediment's pollution load index (PLI>1) stated the advanced decline in sediment quality. The sum of average metal concentrations (∑6HM) followed the descending order of *L. rohita* (17.578) >*G. chapra* (15.031)> *O.pabda* (14.801) > *L. calbasu* (9.125)> *P pangasius* (7.616)>M. *tengra* (6.022)> *S. aor* (5.840), *H.fossilis* (5.55) mg/kg. Maximum allowable concentration was lower in all metals except Pb in eight species. A potential non-carcinogenic risk was indicated that the target hazard quotients (TTHQ) of all fish species exceeded the safe limit of 1.0. Furthermore, the target cancer risks (TR) of all metals were greater than the acceptable risk limit (10−4) in all fish species, indicating that their long-term consumption could potentially result in chronic cancer risk for adults.

Keywords: Kaptai Lake, Heavy metal, Water, Fish, Sediment