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Study of trace metals content in some commercial fishes caught from Rupahi Beel, Nagaon, Assam (India)

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ABSTRACT

The present study was undertaken for assessing the concentration of heavy metals such as Iron, copper, Chromiun, Cadmium and zinc in four commercial fishes viz. Channa Punctatus, Catla catla, Silver carp and Labeo rohita caught from Rupahi beel, Nagaon, Assam. Metals were detected using flame atomic absorption spectrophotometry. The results revealed that by and large all the five metals are present in all the samples. The order of concentration of metals in channa punctatus is Zn > Fe > Cu > Cr > Cd. The Concentration of metals in catla catla and silver carp is in the order Fe > Cd > Zn > Cu > Cr and in labeo rohita, it is Fe > Zn > Cu > Cd > Cr.

Key words: Rupahi beel, Bioaccumulation, Fish, Heavy metals, Atomic absorption spectrometer.

INTRODUCTION

Rupahi Beel is situated towards North-East direction from Nagaon Town (District headquarter) of Assam, India.The geographical location of the beel is 92^{o} 61''E longitude and 26^{o} 27''N latitude. The area of the Beel is about 75Ha and is approximately 7km long and 0.5km wide.

The selected fishes are economically important as these are mostly consumed in the district and are abundant in the study area. In aquatic ecosystems water contamination by trace metals is one of the main types of pollution that may stress the biotic community. Although some metals are needed as micronutrients for autotrophic organisms, they can have toxic effects at higher concentrations [1]. Metal distribution between the different tissues within an organism depends on the mode of exposure and can serve as a pollution indicator [2] (Maheswari et al. 2006). Flesh (muscle) is preferred because it is a major target tissue for metal storage and is the main edible part of the fish [3,4,5.6,7] . Therefore, its study constitutes a tool for environmental assessment and for determining public health risk [8] (Reinfelder et al. 1998). Anthropogenic metal inputs have influenced the bioavailable metal supply in these aquatic ecosystems. Since most harvested fishes are located high in aquatic food chains, they accumulate metals from direct absorbtion from water (minor) and through trophic transfers (major), exposing human beings through food and thus causing a concern for the potential concentrations at the top of the food chain [9](Papagiannis et al. 2004

MATERIALS AND METHODS

Trace metal concentrations in the muscle tissue of four commercial fishes viz. Channa Punctatus, Catla catla, Silver carp and Labeo rohita were studied twice during monsoon and winter seasons. Fish samples were collected from

beel fisher directly from the beel. Each fish sample was placed in a small nylon sieve and thoroughly rinsed with deionised water for removing salts. Water adhering to the samples was removed by placing the sieve on good quality contaminant-free filter paper. Subsequently, dissected muscle of the fish samples was dried in an oven at 65°C and stored in a vacuum dessicator. The dried muscles were powdered and aliquots of about 300mg were digested for 3 hours at 80°C with 300µl HNO_3 (65%, suprapure, Merck) in tightly closed 2 ml Eppendorf reaction tubes. The digests were diluted to 50ml with HCl (0.1N) and metals were analyzed using Flame Atomic Absorption Spectrophotometer.

RESULTS AND DISCUSSION

The metals content in the muscle tissues of these fishes during monsoon and winter seasons are as shown in the Table-1. Different metal concentrations during monsoon and winter seasons are shown in the figure 2a and 2b. The percentage composition of metals in individual fishes are shown in the figure 3(i), 3(ii), 3(iii) and 3(iv).

Table-1: Trace metal accumulation (ppm) in the muscles of different commercial fishes of the Beel in different seasons

Sample	Channa. Punctatus					Catla catla					Silver carp					Labeo rohita				
	Fe	Cu	Cr	Cd	Zn	Fe	Cu	Cr	Cd	Zn	Fe	Cu	Cr	Cd	Zn	Fe	Cu	Cr	Cd	Zn
MON	1.65	0.54	0.03	0.02	5.70	1.23	0.11	0.08	0.87	0.75	1.40	0.11	0.09	0.87	0.67	1.54	0.10	0.04	0.09	0.83
WIN	1.62	0.38	0.06	0.03	5.60	1.28	0.11	0.08	0.85	0.74	1.22	0.10	0.08	0.82	0.61	1.31	0.08	0.04	0.08	0.82
AV	1.64	0.46	0.04	0.02	5.65	1.26	0.11	0.08	0.86	0.74	1.31	0.10	0.08	0.85	0.64	1.43	0.09	0.04	0.08	0.83

MON: Monsoon, WIN: Winter, AV: Average

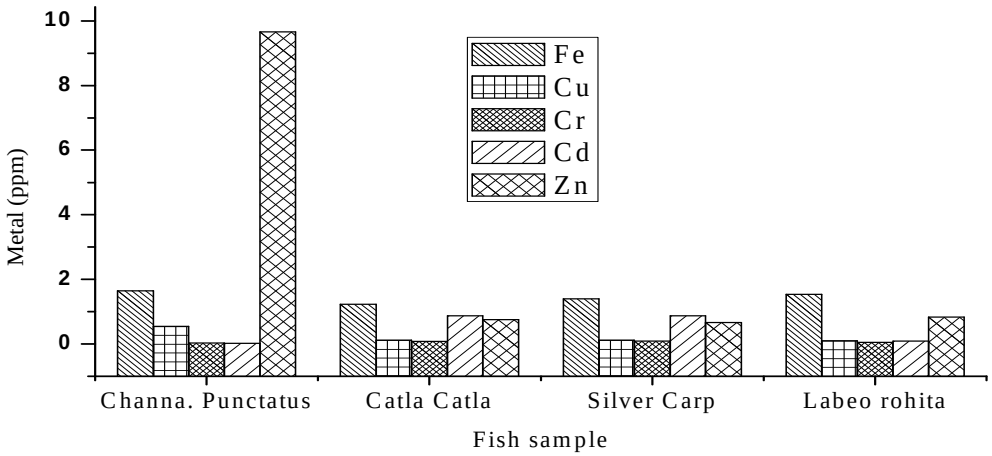

Fig:2a Metal concentration of different fishes in monsoon season

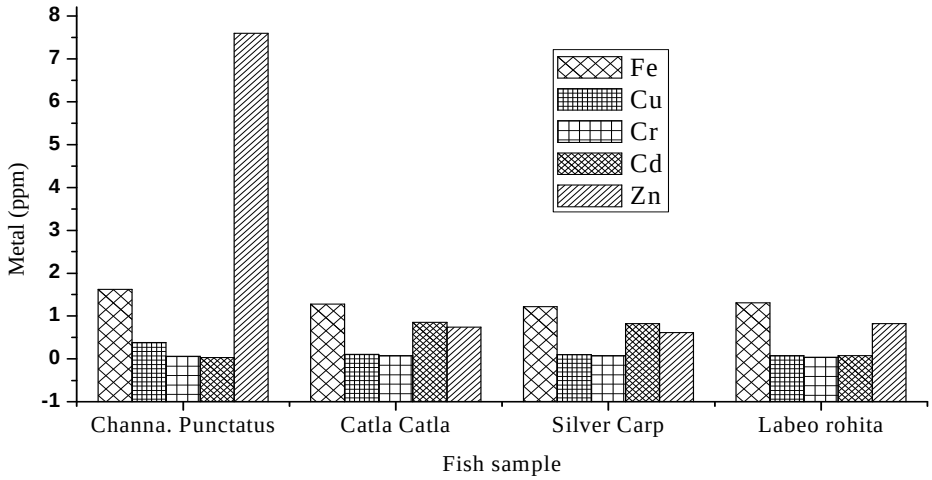

Fig:2b Metal concentration of different fishes in winter season

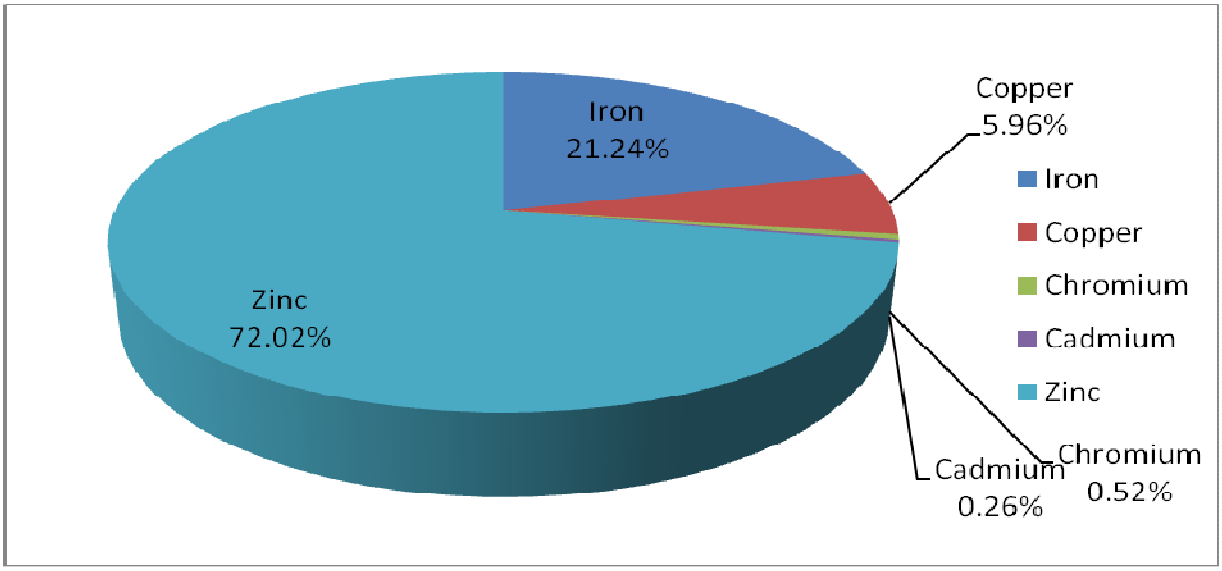

Figure 3(i) Percentage composition of Fe, Cu, Cr, Cd and Zn metals in muscle tissue of channa punctatus

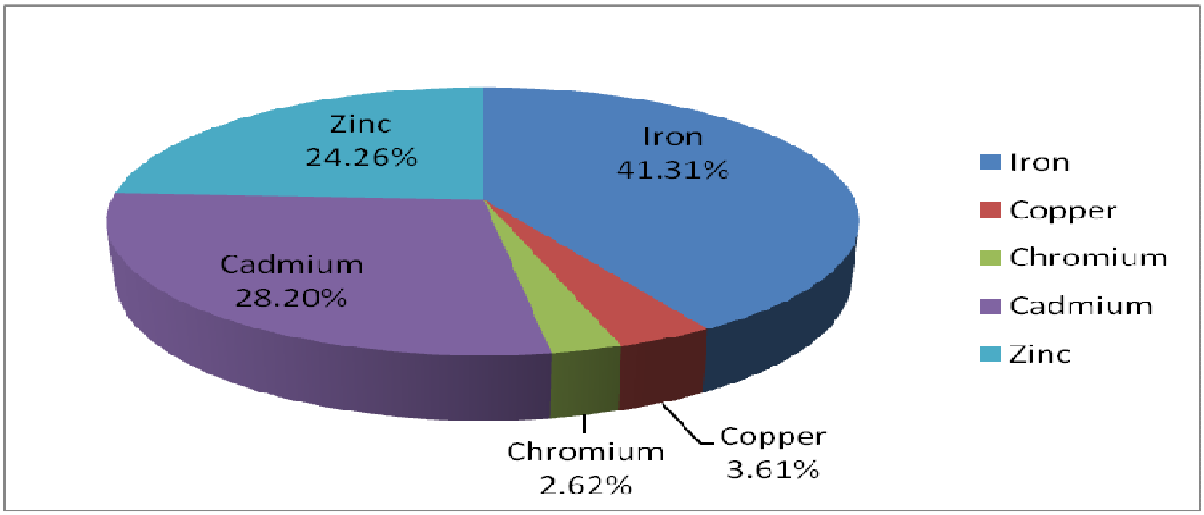

Figure 3(ii) Percentage composition of Fe, Cu, Cr, Cd and metals in muscle tissue of Catla catla

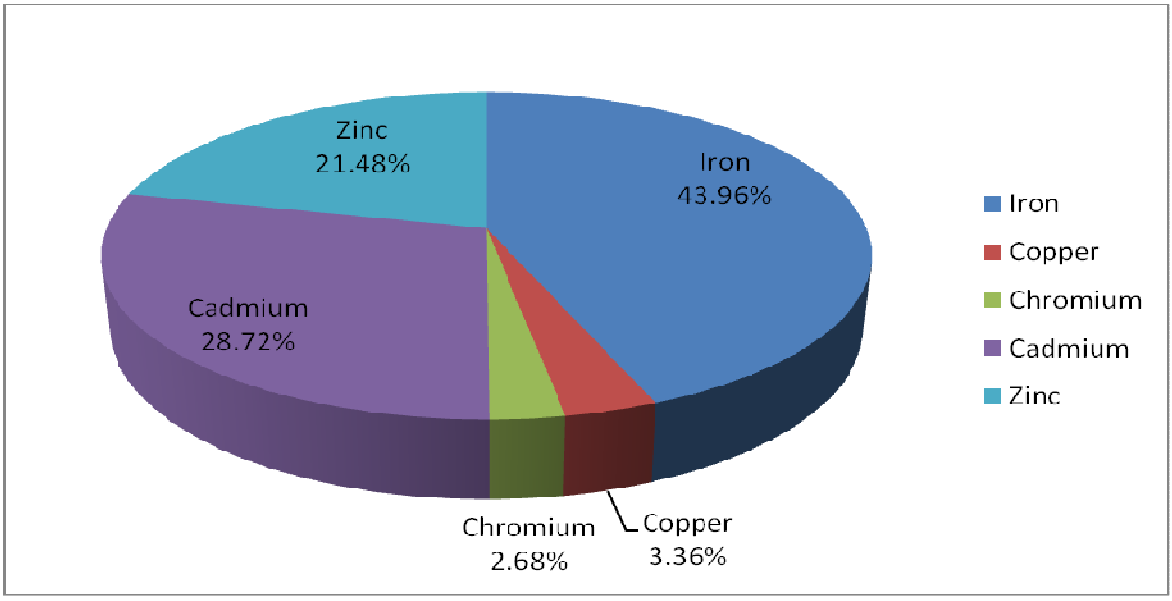

Figure 3(iii) Percentage composition of Fe,Cu,Cr,Cd and Zn metals in muscle tissue of Silver carp

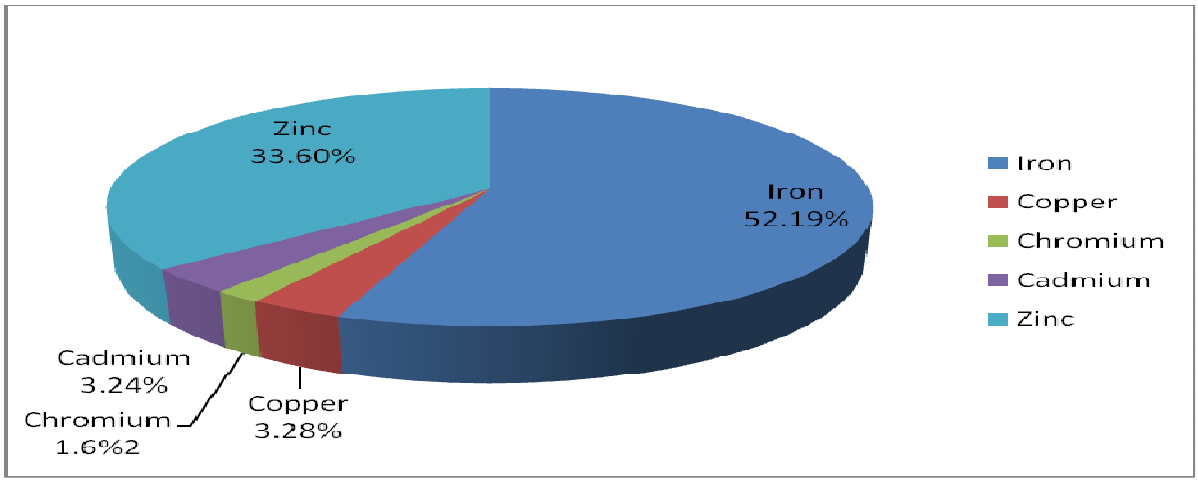

Figure 3(iv) Percentage composition of Fe, Cu, Cr, Cd and Zn metals in muscle tissue of Labeo rohita

CONCLUSION

The metals present in the muscle tissues of fishes are below the permissible limit prescribed by WHO (1984) except Cd in catla catla and silver carp which need to be controlled. Also Zn in channa punctatus was found to be higher than prescribed value of WHO (1984). The probable source may be due to application of fertilizers in the nearby agricultural field that has biomagnified in fish body. Therefore, the consumption of certain fishes is risky and need attention.

The trace metals Fe, Cu, Cr, Cd and Zn in muscles of channa punctatus(CP), Catla catla(CC), Silver carp(SC) and Labeo rohita(LR) were found to be-

CP: Fe: 1.64 ppm, Cu: 0.46 ppm, Cr: 0.04 ppm, Cd: 0.02 ppm and Zn: 5.65 ppm;
CC: Fe: 1.26 ppm, Cu: 0.11 ppm, Cr: 0.08 ppm, Cd: 0.86 ppm and Zn: 0.74 ppm;
SC: Fe: 1.31 ppm, Cu: 0.1 ppm, Cr: 0.08 ppm, Cd: 0.85 ppm and Zn: 0.64 ppm
LR: Fe: 1.43 ppm, Cu: 0.09 ppm, Cr: 0.04 ppm, Cd: 0.08 ppm and Zn: 0.83 ppm

The Cd contamination in Catla catla and Zn in Channa punctatus are higher than the prescribed value of WHO (1984). This may be due to biomagnifications because of sewage disposal and use of fertilizers in nearby agricultural fields. Therefore, the consumption of certain fishes is risky in the long run and need attention.

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