Concentration of heavy metals in water, sediment and some commercial fish species in the coastal area, Bangladesh and health risk assessment

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Introduction

- Heavy metals contamination in aquatic ecosystems create great problem especially in developing countries like Bangladesh
- Impact on the health of marine ecosystem due to their toxicity and bioaccumulation
- The waste materials through the rivers pollute the coastal aquatic environment.
- Fishes are often at the top of the aquatic food chain
- The contaminated commercial fish and crustacean species may become a public health concern
- Bangladesh context, no complete study carried out so far regarding heavy metals contamination in coastal ecosystem

Objective: To determine the concentrations of certain heavy metals and their spatial and temporal distribution in water, sediment and some commercial fishes emphasizing on public health risk assessment in the coastal area of Bangladesh

Materials and methods

Fig. Map of study area (coastal)

Future implications in public health risk for Bangladesh-a conceptual framework

Heavy metals contamination in water, sediment and fish

- Lead = renal failure, liver damage, mental retardation
- Cadmium = kidney injure , poor reproductive capacity, hypertension, tumors , hepatic dysfunction
- Chromium, Zinc, Copper= nephritis, anuria and extensive lesions in kidney

Unplanned industrialization, Urbanization, Huge population growth, less awareness, Trans-boundary political issues

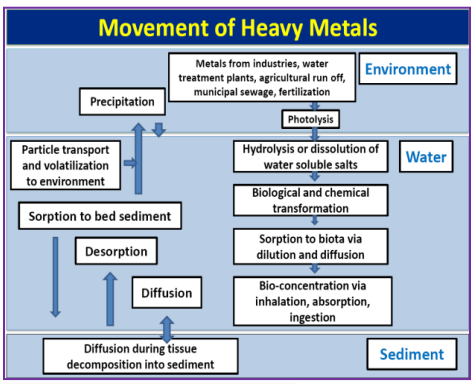
Environmental Challenges for Bangladesh

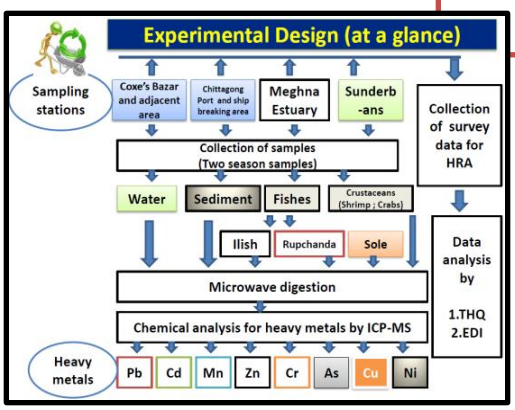
Public Health Risk

Are we free from health risk!!??

Implications for new generation

Children and pregnant women at the highest risk





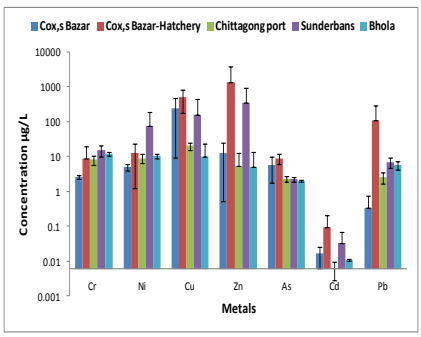


Figure 1: Mean (±SEM) values of metal concentrations (µg/L) in water for each sampling site.

Results and discussion

- Cox's Bazar hatchery showed the highest levels of Zn , Cu and Pb (Figure 1) due to huge discharge of different salts and chemicals from hatcheries to the beach area.
- Significantly higher metal concentration observed in crab than those in fishes (Table 1). Crabs considered as an absolutely discrepant aquatic species with different bioaccumulation pattern.
- Benthic fish, sole similar to crabs often making them closer to sediments and thus expose to higher concentration of metals
- Arsenic (As) concentration remarkably high in Cox's bazar fish and crab (Table 1) due to illegal operation of hatcheries and other industries near beach area.
- Interestingly, remarkable higher concentration of Zn was observed in every fish and crustaceans species.

Table 1: Mean metal concentrations (mg/kg wet-weight) in fishes and crustacean species from sampling sites.

Sampling sites	Species	Cr	Ni	Cu	Zn	As	Cd	Pb
Cox's Bazar	Fish	2.2	0.56	14	138	13	0.075	0.63
	Shrimp	1.1	1.3	13	131	2.5	0.086	0.38
	Crab	29	43	400	1480	53	8.3	68
Chittagong port	Fish	1.1	0.51	5.9	53	2.7	0.06	0.51
	Shrimp	1.0	1.4	22	107	2.0	0.12	0.31
	Crab	14	34	305	902	34	4.2	79
Sunderbans	Fish	0.15	0.10	1.3	31	1.1	0.033	0.07
	Shrimp	0.34	0.49	63	53	0.92	0.022	0.10
	Crab	0.48	1.4	80	157	1.3	0.094	0.49
Bhola	Fish	0.32	0.28	1.6	34	0.76	0.051	0.25
	Shrimp	0.27	0.77	52	114	0.30	0.097	0.13
	Crab	0.29	0.81	111	137	1.5	0.19	0.24

Conclusion

- Cox's Bazaar hatchery water was more contaminated by the metals.
- Crab and Sole (benthic fish) were more susceptible to possess high metal accumulation than other fishes.
- Arsenic (As) concentration remarkably high in Cox's bazar fish and crab
- High metals concentration affecting the aquatic life and may increase public health risk.

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