



# Seasonal Investigation of Trace Metals in Water, Sediment, Some Commercial Fish and Seafood in the Coastal Area of Bangladesh and Health Risk Assessment

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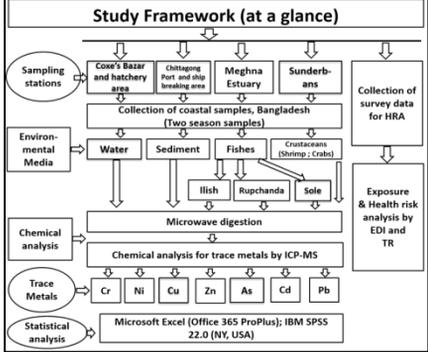
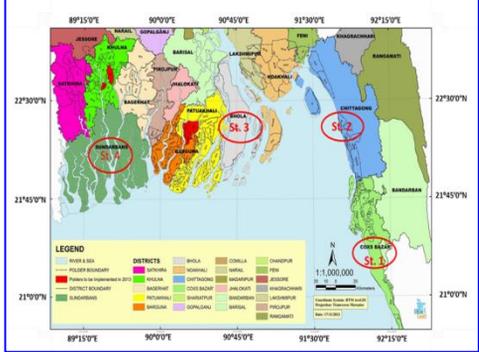
## Introduction

**Objective:** To determine the seasonal variation of certain trace metals and their distribution in surface water, sediment, some fishes and sea foods in relation to health risk issue in the Bangladeshi Coastal area

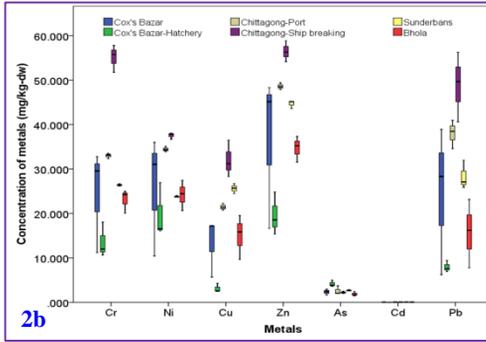
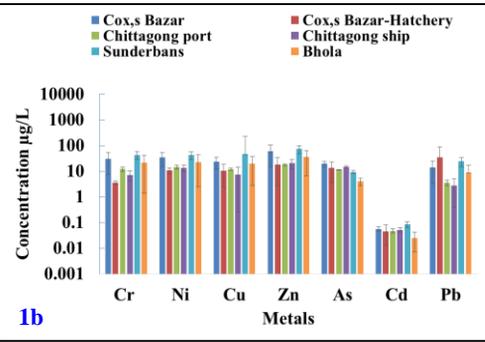
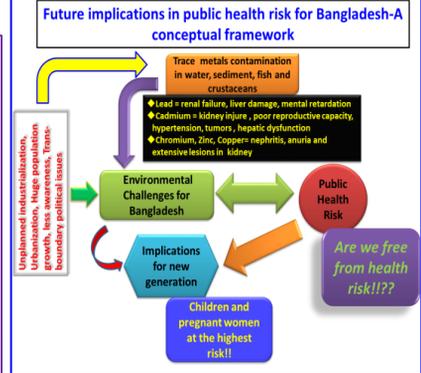
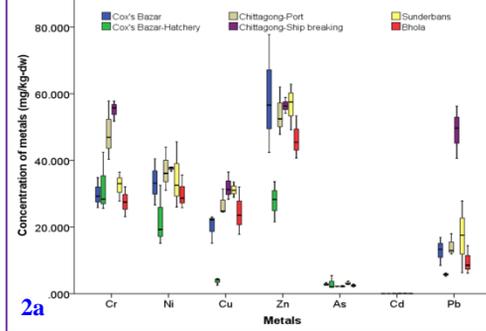
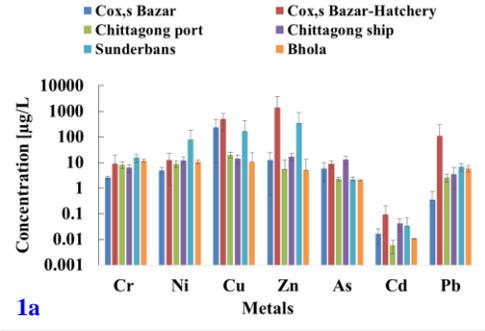
## Materials and methods

### Coastal Problem-Focusing Trace Metals Bangladesh insight!!

- Trace metals in coastal ecosystem is a prodigious problem in Bangladesh
- World's second largest ship breaking area (18 lakh sq. ft.) and 68 ships dismantling
- 580 km long coast line
- 8,542 industrial establishments
- 45,172.5 tons of pesticides/yr
- 22.34 million (mt.) of fertilizers/ year (BOBLME, 2011)
- Use of pesticides increased 328 % during the past 10 years (BRI,2010)
- 53 fish hatcheries, fish processing zone



## Results and discussion



### Conclusion

- Trace metals were exerted distinct seasonal variation
- Water, fish and crustaceans of Cox's Bazar in summer season were more contaminated.
- Sediment of Chittagong ship breaking area were highly polluted considering summer season
- The elevated level of season based trace metals are highly affecting and increasing the potential health risk of Bangladeshi coastal people that should not be ignored
- Continuous monitoring of these toxic trace elements are needed to evaluate with an integrated approaches if any impending risks of the study area do exist.

Figure 1 (a, b) : Seasonal distribution [Mean (±SD)] of trace metals concentration (µg/L) in water samples (a = summer, b = winter; n = 3).

Figure 2 (a, b) : Box plot showing the seasonal distribution of trace metals concentration (mg/kg-dw) in sediment samples (a = summer, b = winter; n = 3).

- In Bangladesh, seasonal vagaries play vital role in controlling the anthropogenic inputs like fisheries, agriculture expansion, and industrial activities which might regulate the variation of metal distribution in coastal ecosystem.
- Water of Cox's Bazar hatchery site showed the highest levels of Zn, Cu and Pb in summer (Figure 1 a). During summer, fish processing, aquafarm operation, hatcheries, crop cultivation and ship dismantling activities are vigorously increased. It might be due to huge discharge of different salts and chemicals from hatcheries, aquafarms and other industrial intrusions.
- Sediment of Chittagong ship breaking area showed the highest level of Cr in summer and Ni, Cu and Pb in winter (Figure 2 a, b) which exceeded the Quality Guidelines (ISQG and TRV) (Table 1). It might be due to influence of, ship scrapping, cement factories, agrochemicals etc. Besides, variation in water distribution of the river to the sea, less rainfall effect, less input of water, stability of weather and geomorphological effect resulting in the precipitation of pollutants in the sediment.
- Metals concentration were remarkably high in fish and crabs in summer at Cox's Bazar site due to interference of uncontrolled huge hatcheries and industrial activities during summer. Metal accumulation in fish has been evidenced to be pretenacious by metabolic activities, swimming patterns and living environments. During the summer, the metabolic and swimming activities are increased vigorously which lead to more bioaccumulation and biotransformation of trace metals in fish.
- Estimated daily intake (EDI) revealed the high dietary intake of As, Cu and Pb (Figure 3) which might lead to public health risk issue.

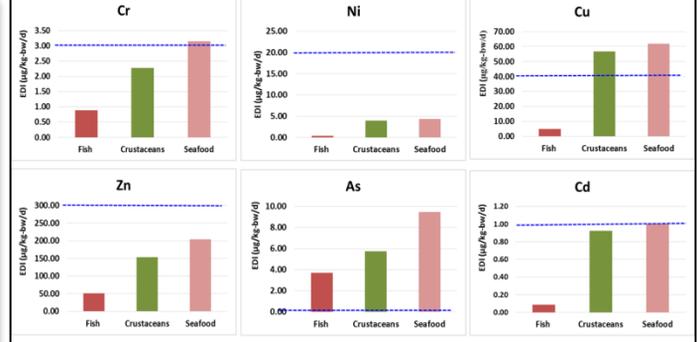


Figure 3 : Bar graph showing estimated daily intake (EDI) of selected toxic trace metals from fish and crustaceans (seafood) consumption by average Bangladeshi coastal adults in comparison with oral reference dose (RfD) (USEPA, 2008). -Blue dot lines (---) are marked as RfD.

Table 1 : Comparison of detected metal concentration (mg/kg-dw) in coastal sediments (n=3) with some guideline values along with a reported value in Bangladeshi river (Summer Vs Winter).

Coastal area in Bangladesh (mean range)	Cr	Ni	Cu	Zn	As	Cd	Pb	References
Summer	13.6-55.8	19.9-36.7	3.1-28.3	19.6-54.2	1.9-4.2	0.003-0.070	8.0-40.6	Present study
Winter	27.6-55.1	22.3-37.5	3.8-32.0	27.8-58.9	2.2-3.2	0.01-0.08	5.7-48.9	Present study
Guideline value	52.3	15.9	18.7	124	7.24	0.7	30.2	ISQGa
Guideline value	26	16	16	120	6	0.6	31	TRVb
Guideline value	26	16	16	120	6	0.6	31	LELc
Guideline value	110	75	110	270	33	10	250	SELd
Mouth of Karnafully River	78.1	-	32.9	33.5	-	0.88	23.2	Khan & Khan, 2003*

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