

FROM MANGROVE TO FORK: METAL PRESENCE IN THE GUAYAS ESTUARY (ECUADOR) AND COMMERCIAL MANGROVE CRABS

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Introduction

Mangroves are unique coastal ecosystems, located in tropical and subtropical regions. Yet, the provisioning of essential ecosystem services like coastal protection and fisheries is threatened by the presence of pollutants, including **metals**. Also human health is threatened, as these pollutants potentially **accumulate** in red mangrove crabs, which is a popular dish in Ecuador. To assess the associated environmental and human health risk, metals concentrations were investigated in the Guayas estuarine environment.

Method

- Metal concentrations were assessed in different compartments of the commercial red mangrove crab *Ucides occidentalis* (hepatopancreas, carapax, and white meat) and the environment (sediment, leaves, and water), sampled at 15 sites over 5 stations.
- The metals Cu, Ni, Cr, As, Pb, Cd, and Hg were determined using ICP-MS. Zinc was analyzed using ICP-OES.

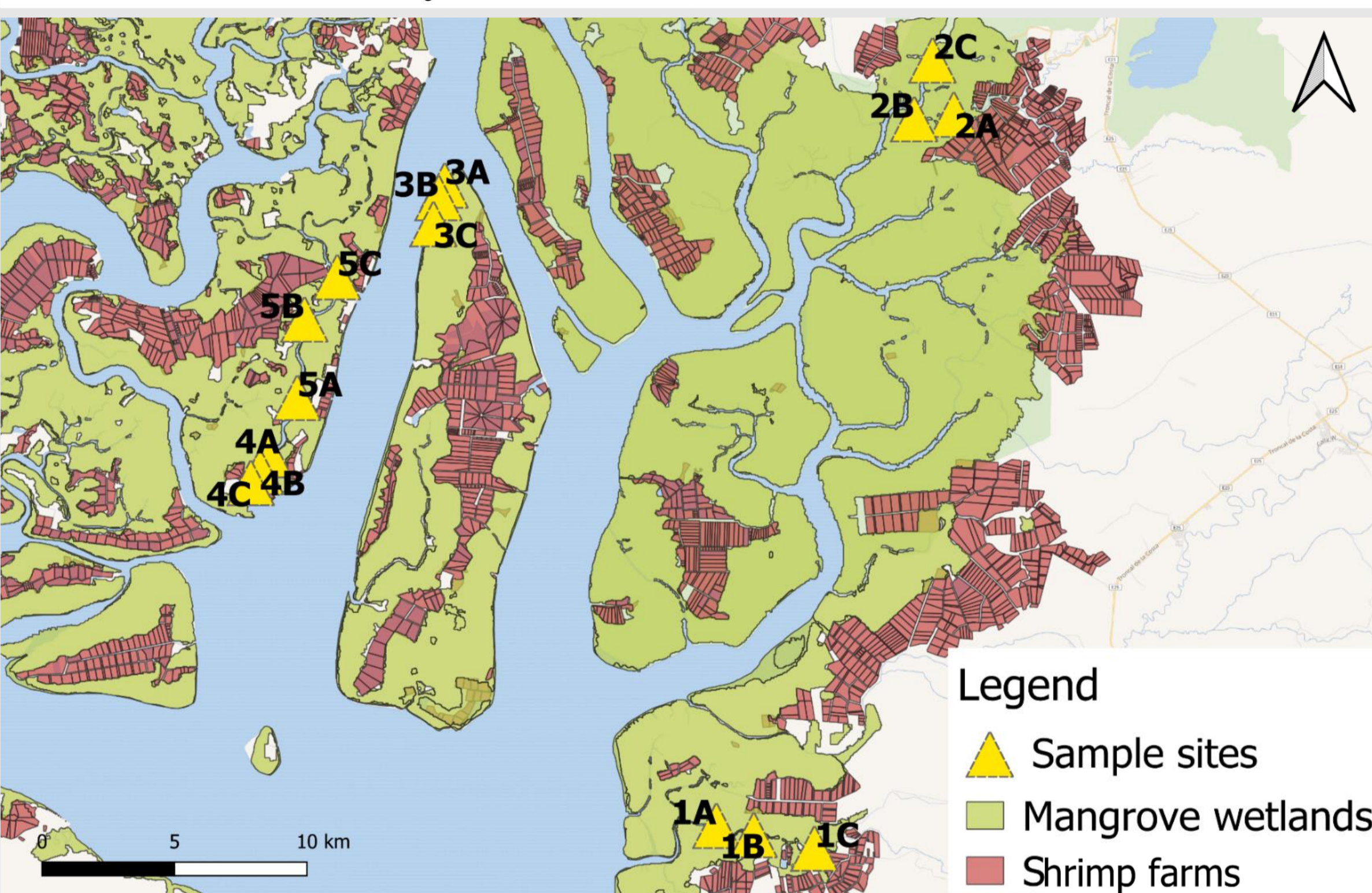
Ecotoxicological risk assessment

$$HQs = \frac{Cs}{EQS}$$

$$HQw = \frac{Cw}{EQS}$$

Human health risk assessment

$$Clim = \frac{EXPlim}{Res} \cdot a \cdot b \cdot c$$

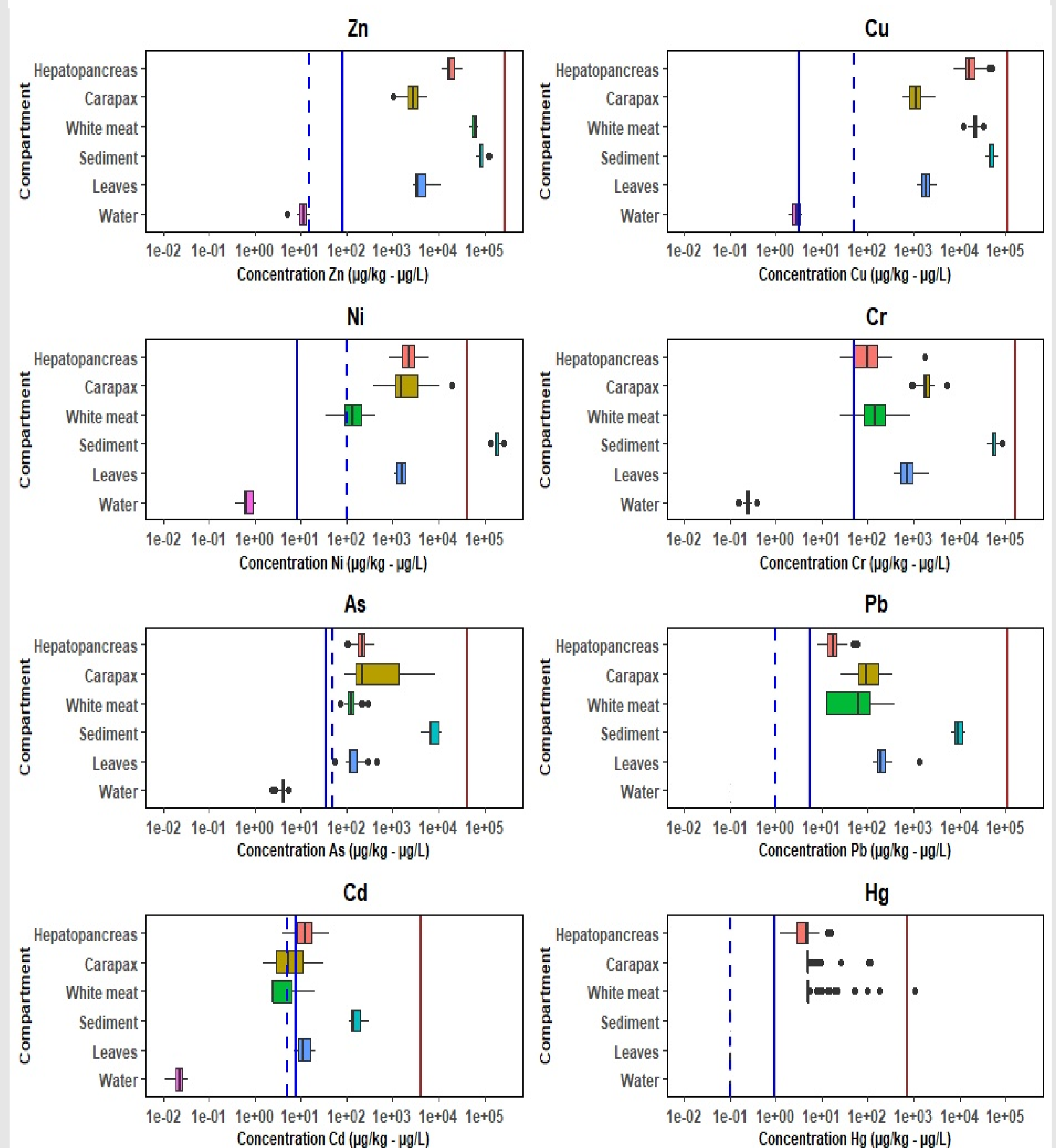


Result 2

Probabilistic exposures of metals in hepatopancreas and white meat of red mangrove crab for adults (mean, standard deviation (SD), and percentiles (Px)), % TDI calculated as (estimated mean exposure/TDI) × 100; mean, SD, and percentile expressed as µg/kg-bw/day. TDI: tolerable daily intake; MOE: margin of exposure.

Metal	Mean	SD	P50	P75	P95	Population Exceeding TDI (%)	% TDI	MOE at Mean Exposure
Zn	6.97	8.19	3.96	9.60	27.1	0	2.32	-
Cu	3.26	4.03	1.74	4.25	12.2	0	0.65	-
Ni	0.15	0.20	0.07	0.19	0.56	0	1.15	-
Cr	0.022	0.036	0.010	0.027	0.100	0	0.01	-
In-As	0.0005	0.001	0.0002	0.0005	0.002	-	-	1423
Pb	0.009	0.015	0.003	0.011	0.035	-	-	55.8
Cd	0.001	0.002	0.001	0.001	0.004	0	0.15	-
Hg	0.002	0.005	0.0004	0.001	0.007	0	0.30	-

Result 1



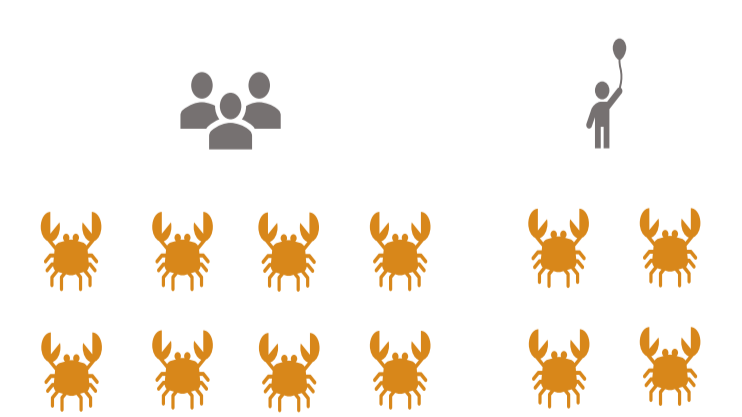
Metal concentrations in the considered compartments (µg/L for water compartment, and for others µg/g dry weight). Indication of Probable Effect Level threshold for sediment quality (PEL) in brown, Criterion Continuous Concentration (CCC) for water quality in blue, and the national legislation threshold values for metals in water in dashed blue.

Discussion

- Elevated Ni concentrations in the mangrove sediments could lead to potential adverse health effects for sensible aquatic organisms.
- The presence of As in the crabs generated potential concerns on the consumers' health.

Conclusion

- A limit of eight crabs per month for adults and four crabs per month for children is advised.
- When eating the white meat and the hepatopancreas, only half of the suggested limit is advised.



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