

*Heavy metals from marine sediments and  
bioaccumulation in sea cucumbers*



Dr. Eddie N. Laboy  
Associate Professor  
Universidad del Turabo

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# Why my interest in heavy elements ?

- ★ The Pepipo War ...
- ★ Aphrodisiacs ...
- ★ Zn and gametogenesis
- ★ Sediments as sinkholes
- ★ Possible bioaccumulation



~ 100,000 acres tropical embayment, system of enclosed lagoons, fluctuating salinity, rare extreme water temperatures, coral reefs, seagrass beds, mangrove forests. Average of 1,000 boats visiting the system every weekend. The Park is surrounded by an oil refinery, a strip mine, two dumping sites, and very low income rural and high class settlements, none of them with a system for the treatment of raw sewage.







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### *Holothuria mexicana*

### *Isostichopus badionotus*

Valores Biométricos: LC = Largo Contraído (cm); PH = Peso Húmedo (g);  
PS = Peso Seco (g); B = Biomasa (g)

		Media (s)Alcance
LC	n=100	23.4(4.64)12.2-35.6
PH	n=100	561(212.3)163-1205
PS	n=30	56.7(28.7)16.1-145.3
B	n=30	11.2(2.97)5.64-19.09

	Media (s)Alcance	F
	13.6(4.26)4.1-21.3	240.35**
	205(62.3)79-355	260.37**
	9.8(4.3)1.7-17.1	78.267**
	4.4(1.87)1.14-8.16	106.27**

## Methods

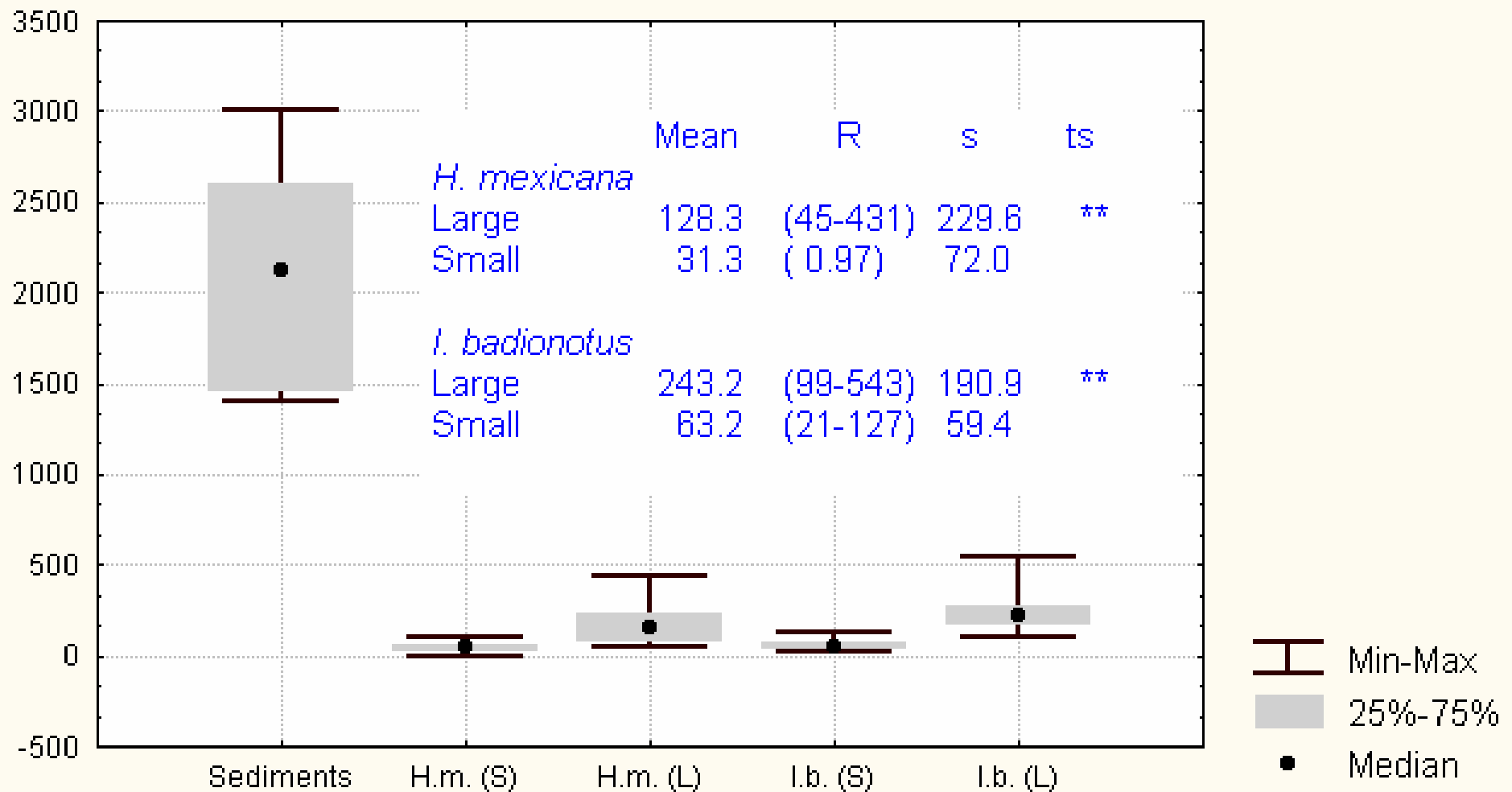
- **38 shallow** (depth < 4.0 m) stations were randomly established, of which 28 were inhabited by holothurians
- **Sampling of upper fraction of sediments** with PVC-stoppered cylinders, collection in sealed bags, further homogenization, drying and chemical treatment for acid digestion
- **Hand-capture of specimens** and classification in two size categories as for Cutress (1996)
- **Immediate evisceration:** occurred after submerging specimens in very warm (~ 36 °C) water
- **Digestive tracks** were collected in **sterile plastic bags and frozen**
- **In the lab, visceral samples** were **cleaned with deionized water and HCl (10%)** to remove sediments and mucous layers
- **Drying and further grinding of visceral tissue**
- **Chemical digestion with perchloric acid** (Moore et al., 1993)
- **Analysis with Varian Flame AA-20 Spectrophotometer**



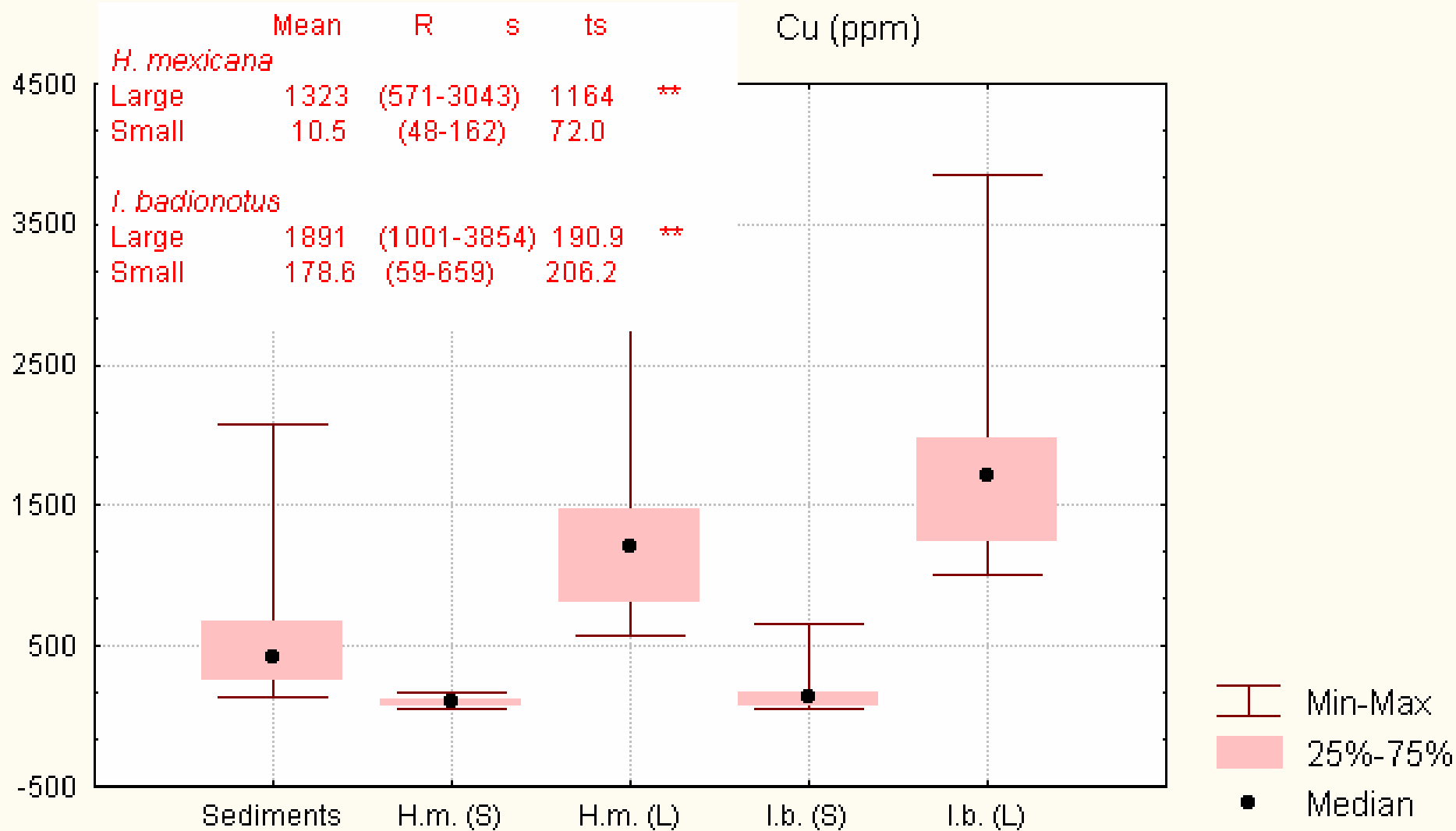


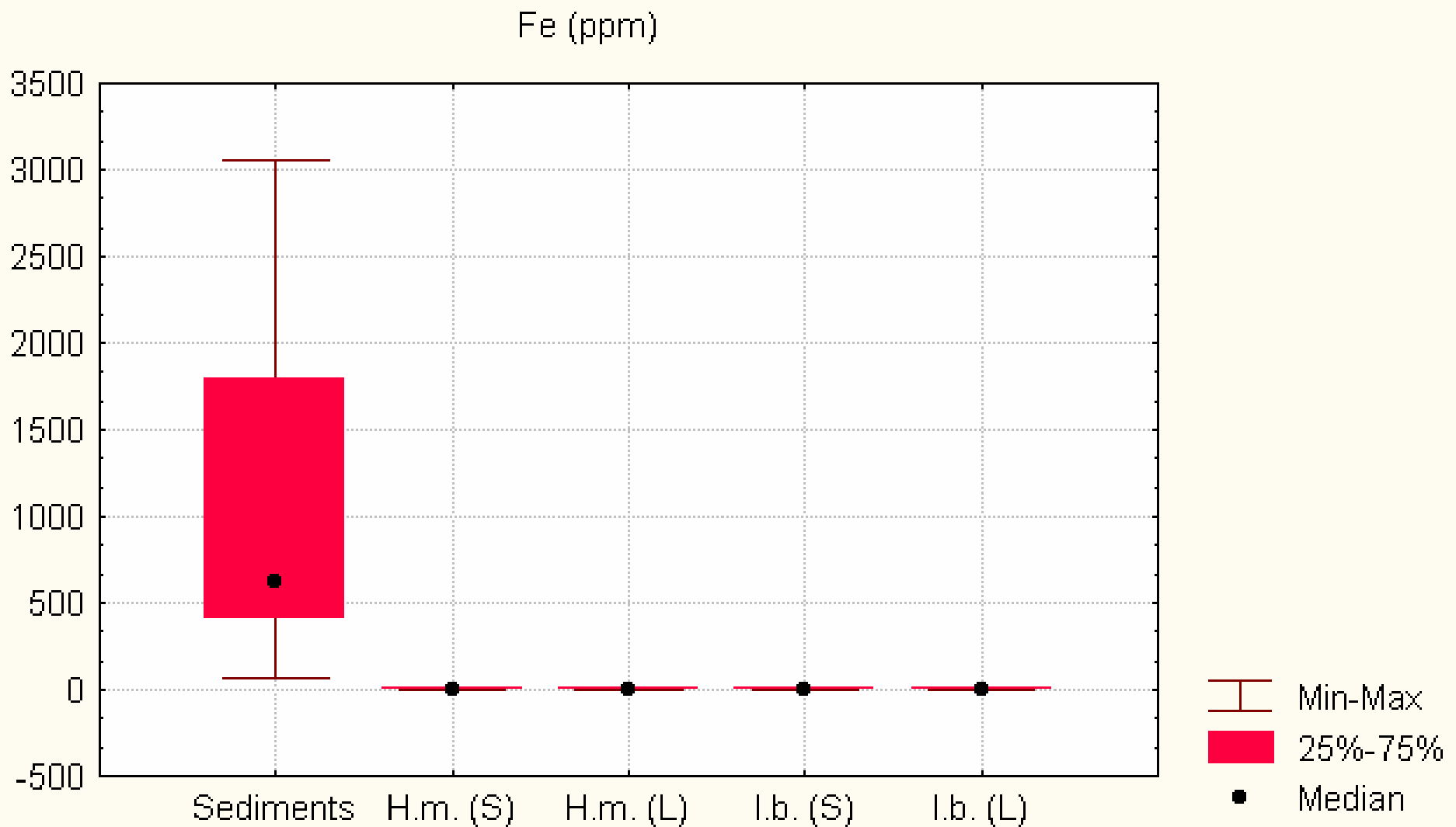
- \* There was no significant difference in the trace elements concentration in sediments inhabited by holothurians
- \* **Large specimens** of both species exhibited significantly higher metal concentrations than smaller individuals, except for Zinc in small individuals of *I. badionotus*
- \* The mean concentration for all metals was higher in *I. badionotus*, but it was not significant (Sign Test :  $P = 0.031$ )
- \* The **enrichment ratio** (the metal concentration in tissues relative to the metal loads in sediments) for Cu, Ni, Pb, & Zn was significant in large individuals from both species.
- \* Although Fe is plentiful in sediments, non of the species ingest it.

## Aluminum (ppm)



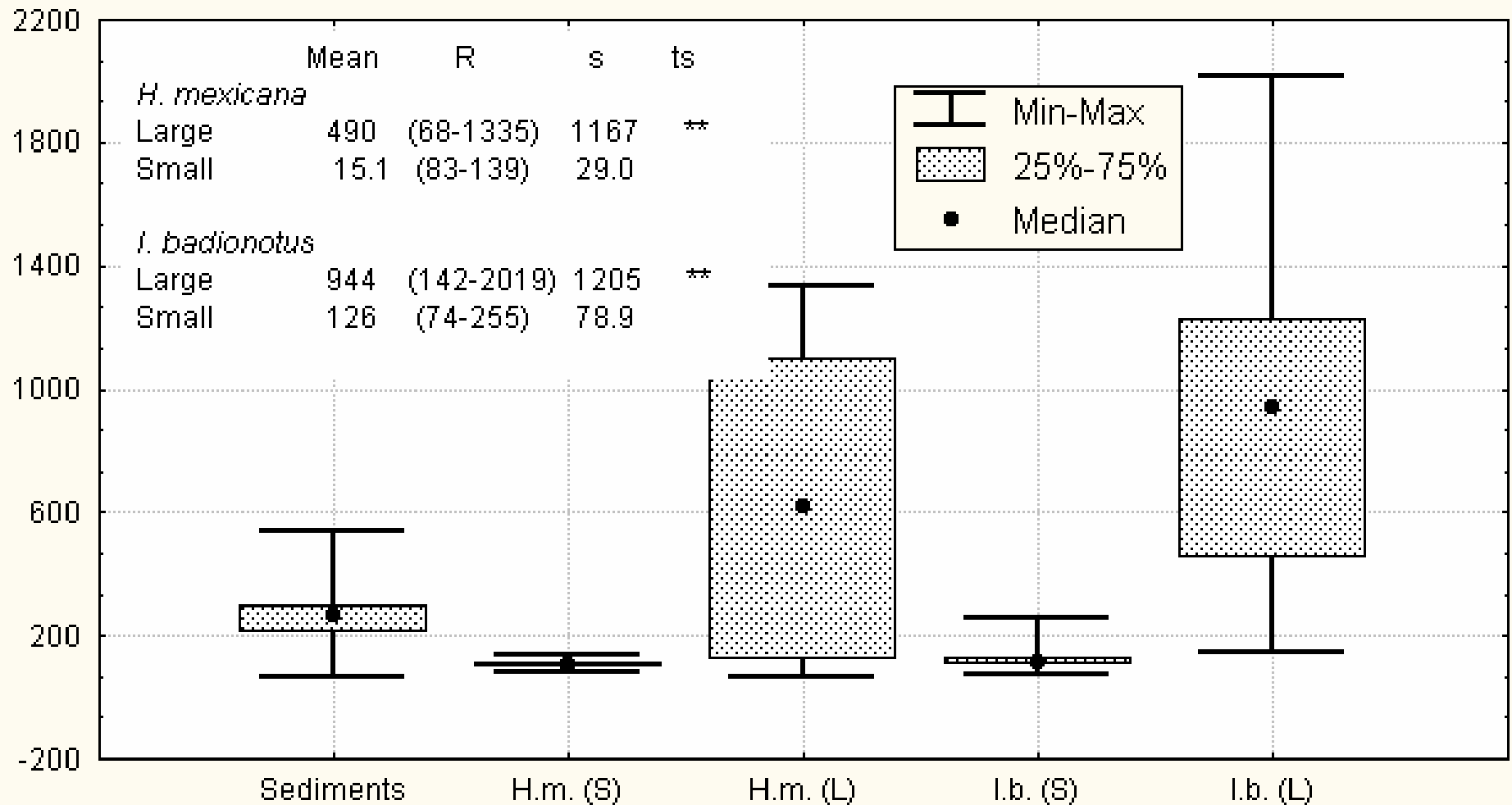
What do these data suggest ?





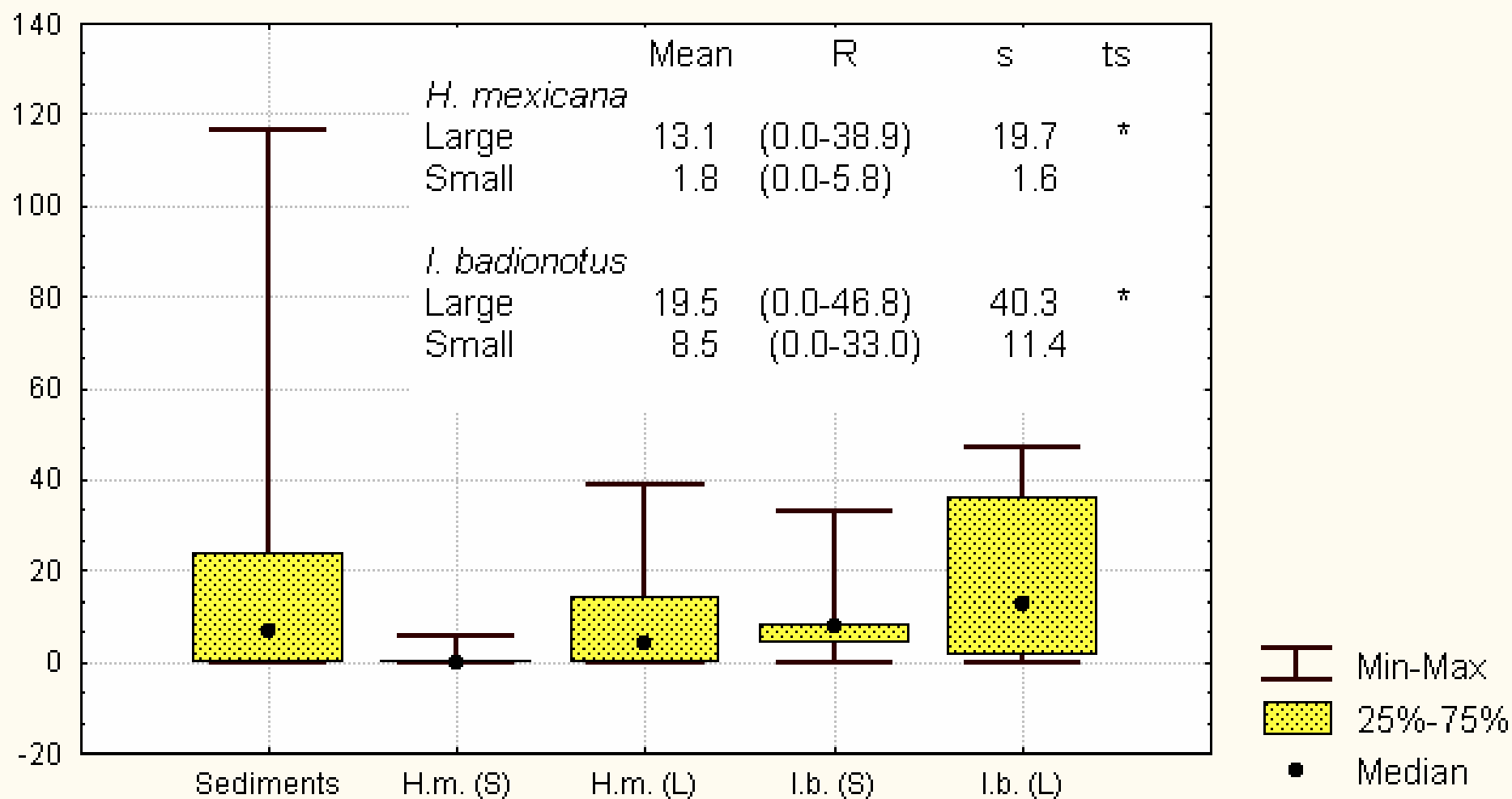
Are sea cucumber exhibiting selective feeding?

Pb (ppm)

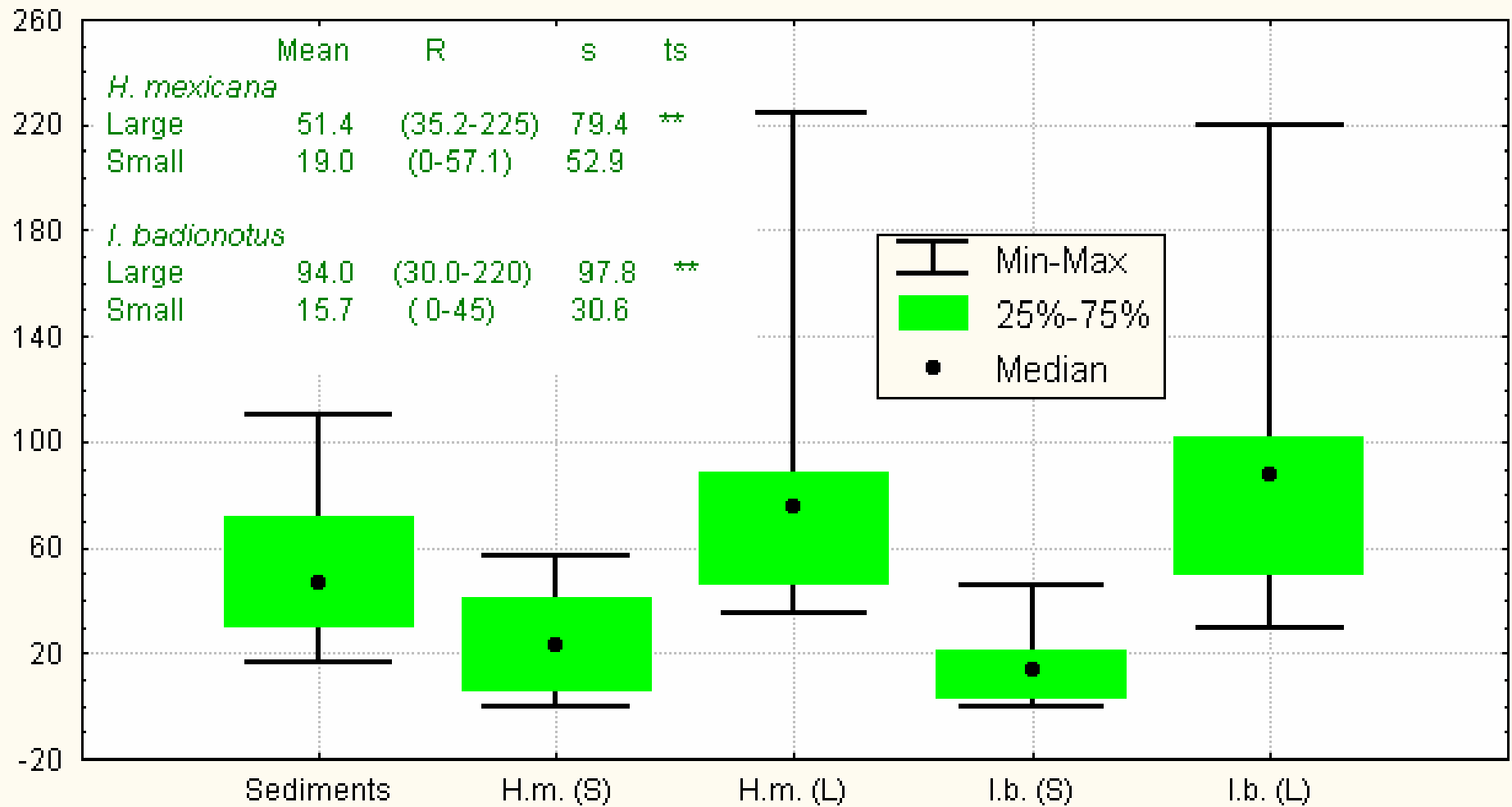


Do these graphs suggest bioaccumulation?

Mn (ppm)

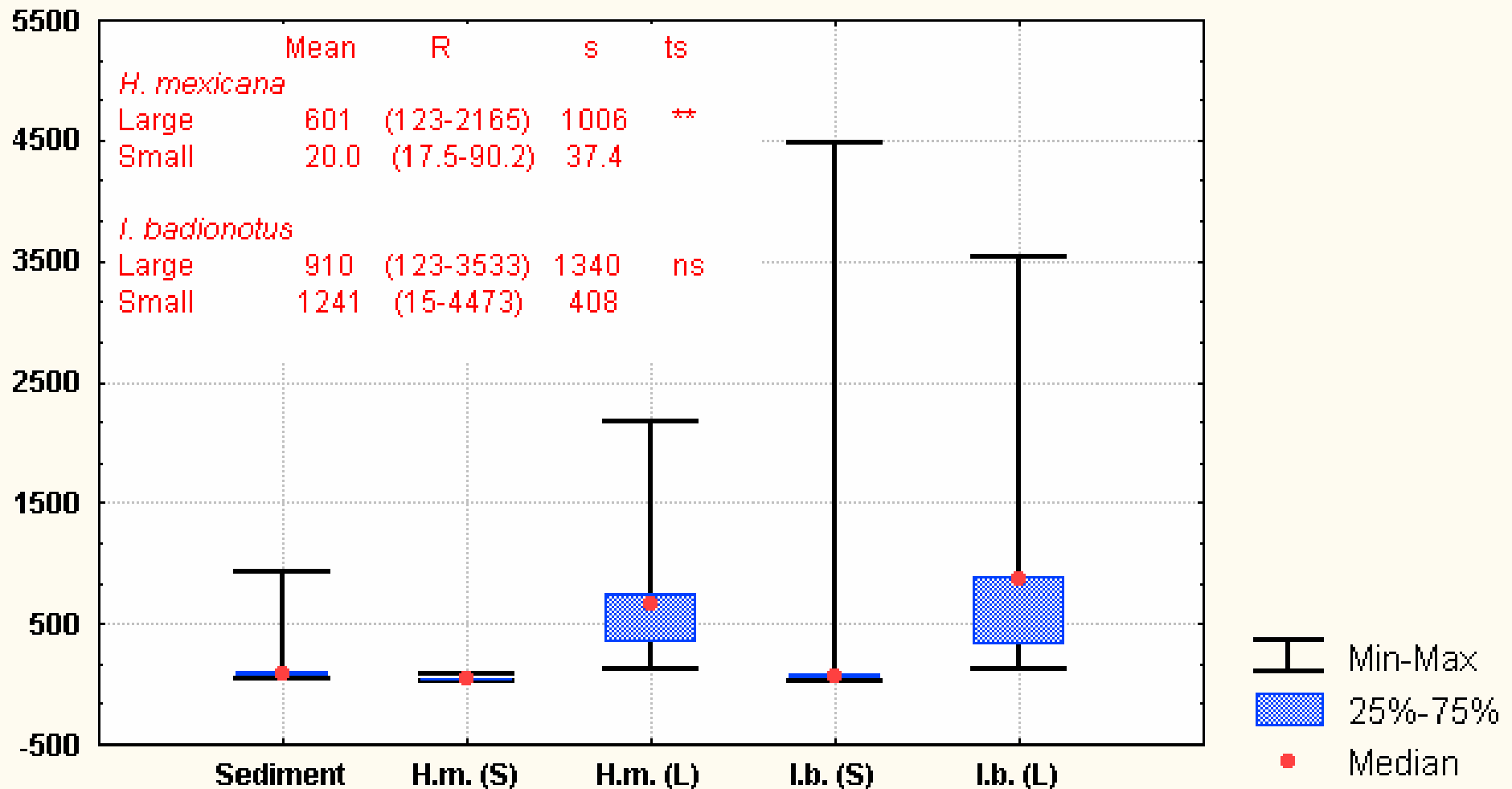


### Ni (ppm)





### Zinc (ppm)



Can you link cultural and scientific knowledge ?

## Conclusions

1. Large individuals of both species have a **potential to be biomonitors**, due to their ability to accumulate Cu, Ni, Pb & Zn.
2. The **difference in biocumulation** level could be a consequence of **interspecific dissimilarities**, given the fact that there are differences in the amount of sediments ingested
3. The **biocumulation** of trace elements **suggests a potential hazard on public health**. Smaller size specimens (the preferred by consumers) are not guarantee of lack of metals.
4. The high concentration of trace elements in the sediments of **Morrocroy** indicates an above standard input of such metals, thus the park **is polluted**.
5. **More studies are needed** to determine desintoxication mechanisms and size-related bioaccumulation differences.



The findings from this coincidental research were published in 2001 in the internationally recognized journal **Hydrobiologia**

Cited as [Laboy-Nieves, E. N.](#) & J. E. Conde.

Heavy metals in eviscerated tissues of two shallow water deposit feeding holothurians.

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**Thanks for your attention**

