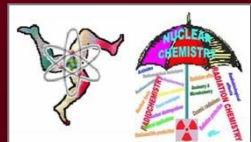


Study of bioaccumulation and effect biomarker in mussels *Perna perna* (Linnaeus, 1758: mollusca, bivalvia) from coastal regions of São Paulo state, Brazil.

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INTRODUCTION

- Contamination of coastal regions by organic and inorganic elements and compounds: urban and industrial discharges
- Analysis of marine waters and sediments
- Biomonitoring by using marine mussels :
 - ❖ Inorganic elements → Hg, Cd, Pb, As, Sb, Ni, Zn
 - ❖ Organic compounds → PCBs, PAHs, MeHg
 - ❖ Biomarkers → Cellular and Enzymatic
 - ↓
 - Neutral Red (NR)

Mussel
Perna perna



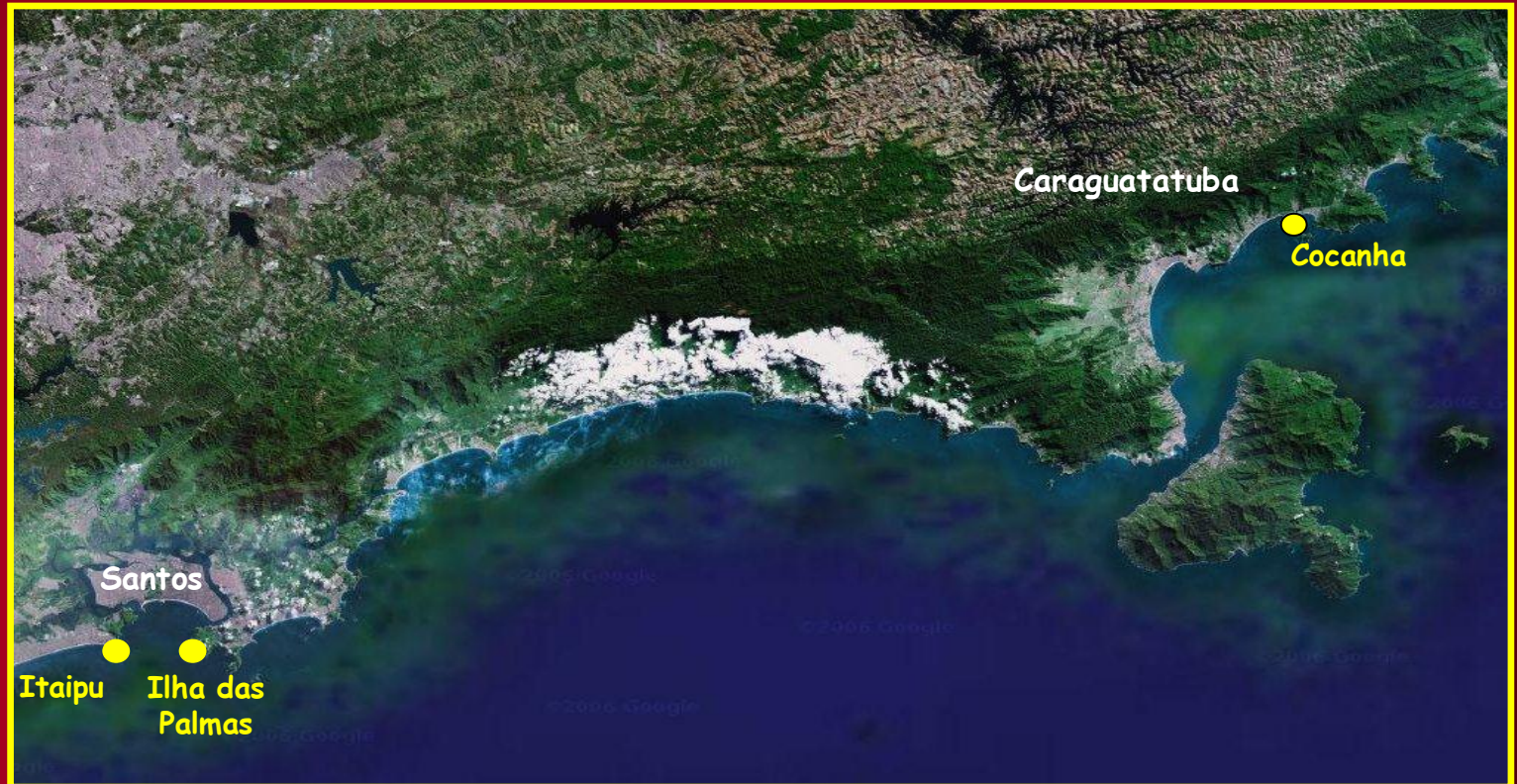
- In Brazil → Passive/Active Biomonitoring
- Very abundant in the coast of Brazil and one of the most consumed
- Cultivated in mussel farms: growing business

Present work

Perna perna used for passive biomonitoring of coastal regions in São Paulo, for metals and biomarkers

EXPERIMENTAL - Study Area

(23°58' - 23°39'S, 46°30' - 45°25'W)



EXPERIMENTAL - Study Area



Cocanha beach



Mussel farm

EXPERIMENTAL - Study Area



Ilha das Palmas



Itaipu



EXPERIMENTAL - Sample Preparation and Analysis - Metals



90 organisms from each point and season of the year



tissue removal of the shells



homogenization



Weighing of samples



lyophilization



crushing



sieving



INAA



As, Co, Cr, Fe, Se and Zn

CV AAS



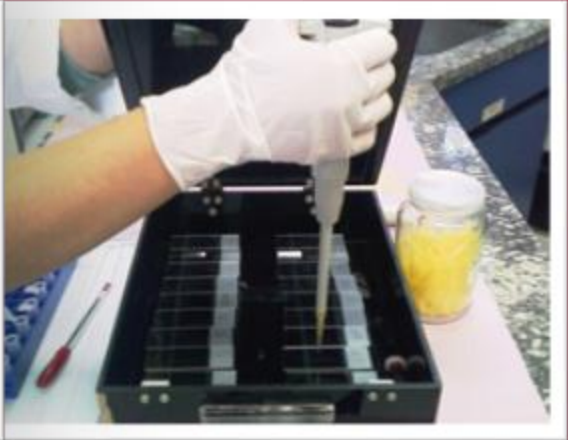
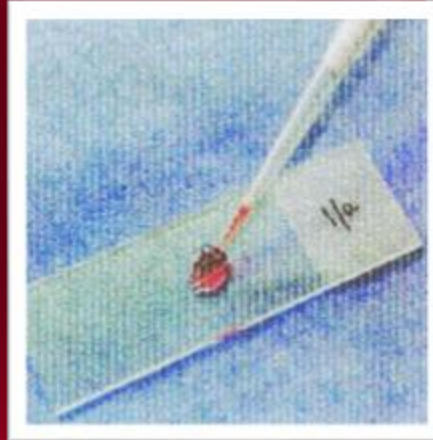
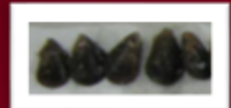
Hg

ET AAS



Cd and Pb

EXPERIMENTAL - Evaluation of lysosomal membrane stability Neutral Red assay (NR) - biomarker



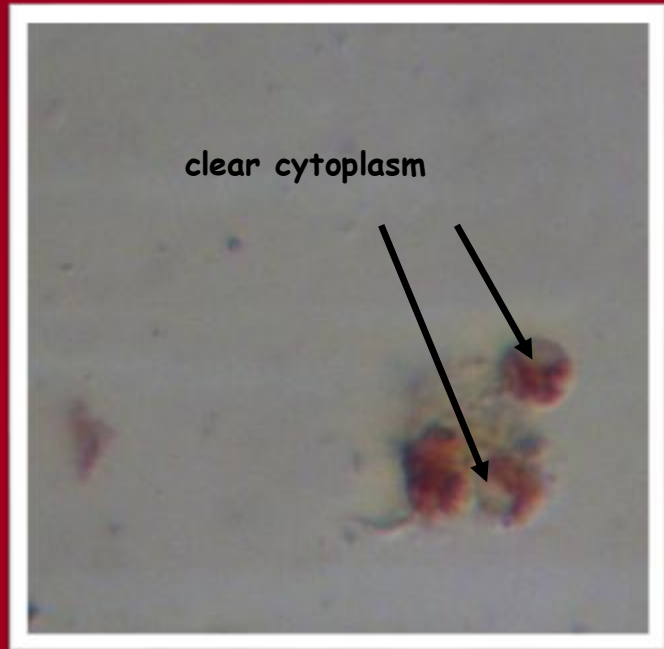
15 organisms from each point and season of the year

Extraction of haemolymph

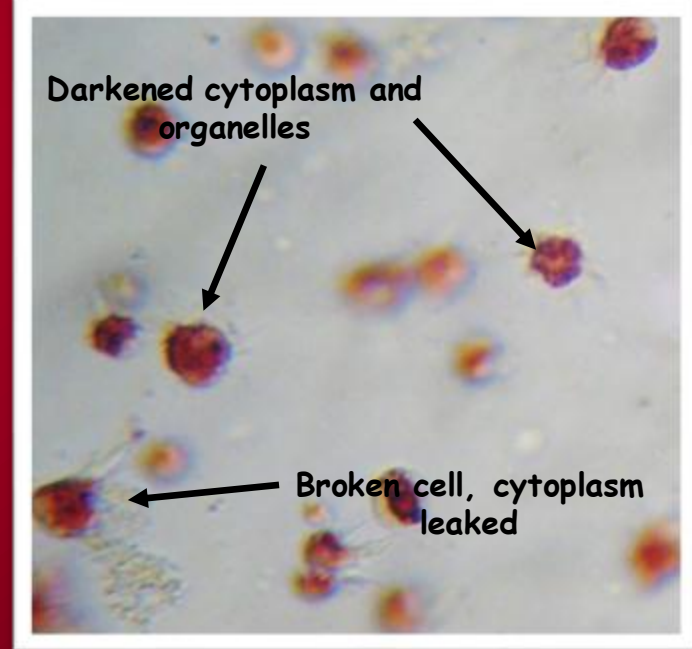
Sample preparation



reading

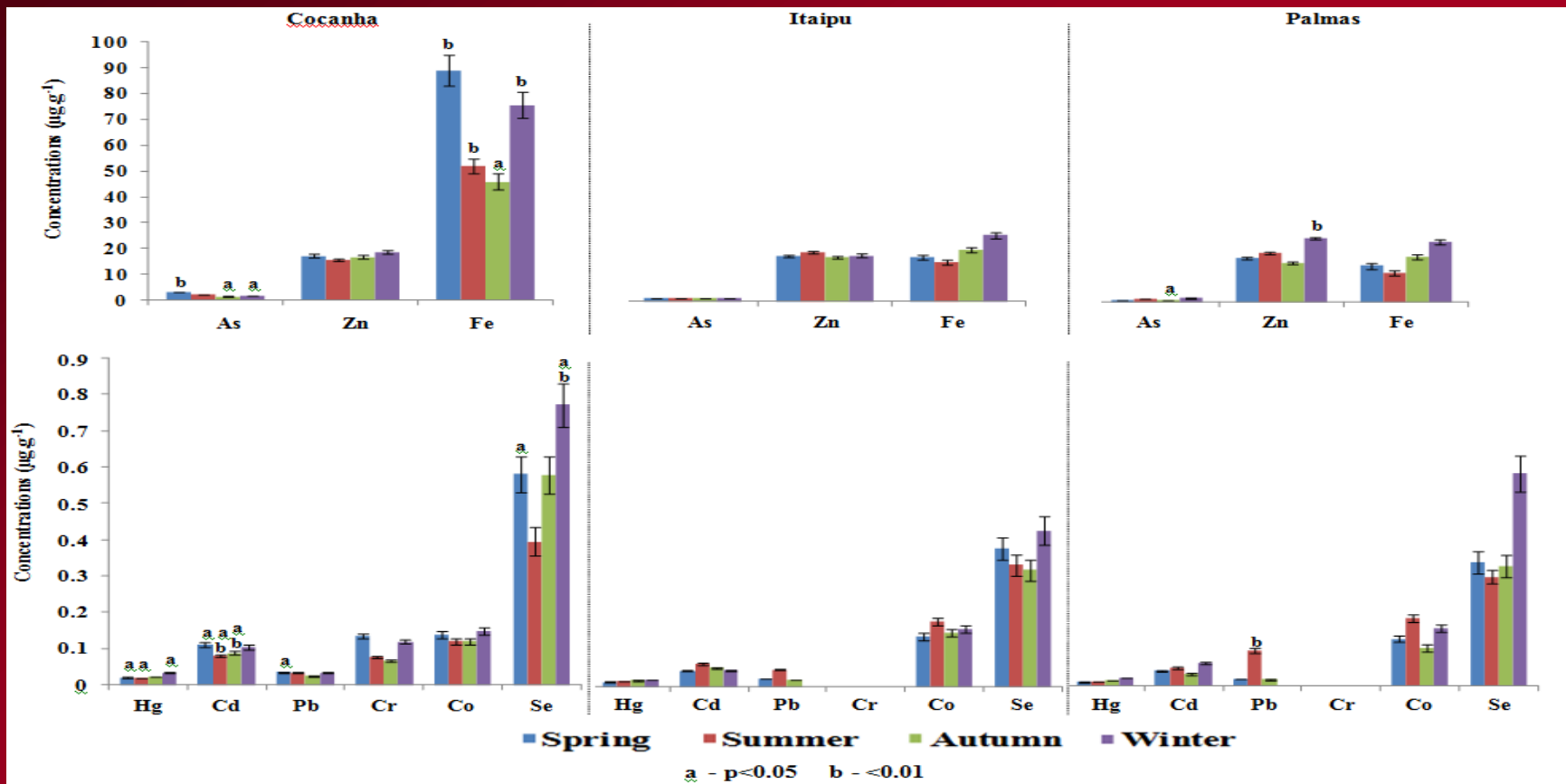


Healthy cells



Stressed cells

RESULTS - Metals - Comparison between sites



Cocanha { ↑ [As, Fe, Hg, Cd and Se] in all seasons = $p < 0.05$ in the majority of the cases
 ↑ [Pb] in spring, autumn and winter = $p < 0.05$ in spring

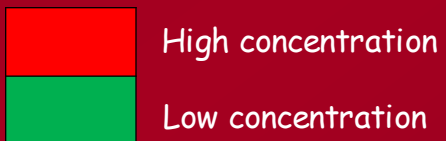
Itaipu { ↑ [Pb] in summer = $p < 0.05$
 ↓ [As] in winter = $p < 0.05$, Itaipu x Palmas
 ↑ [Zn] in spring, summer and autumn = no significant differences

Palmas → ↑ [Zn] in winter = $p < 0.05$

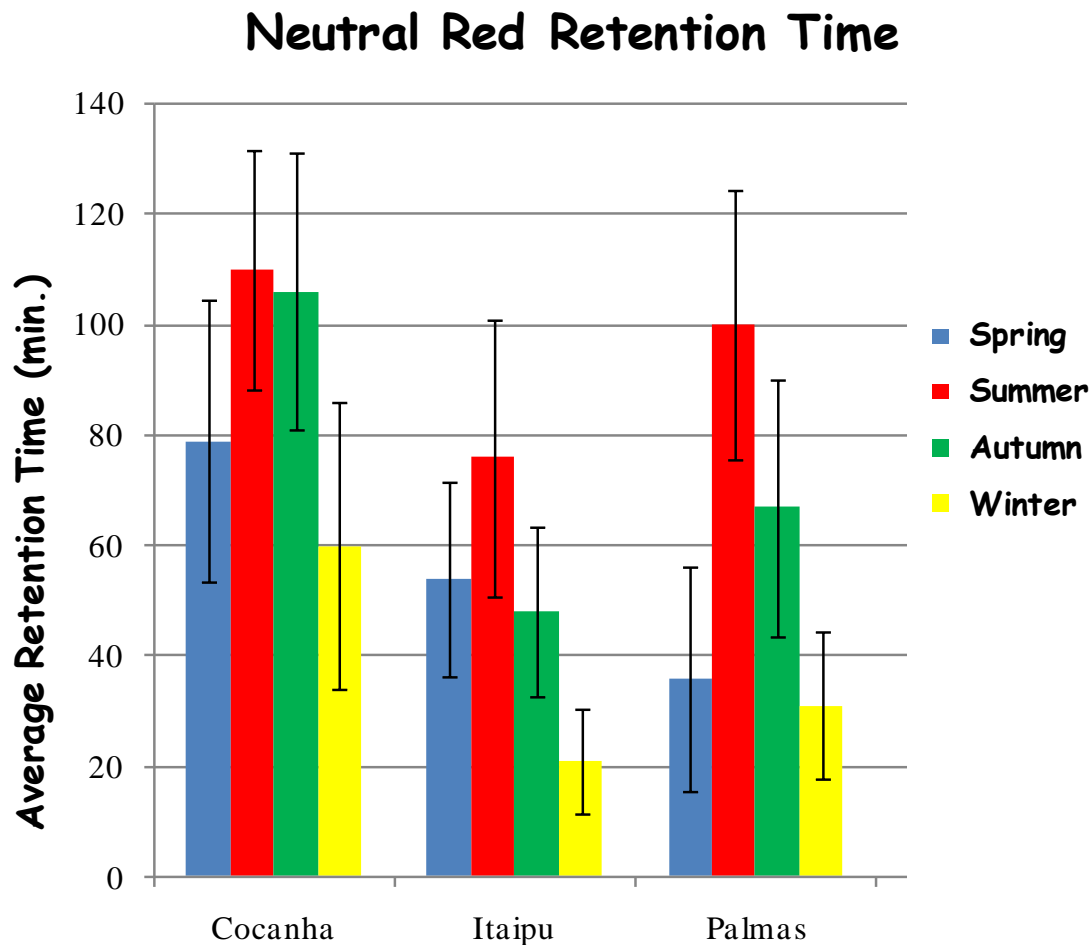
❖ Cr / Co = no significant differences

RESULTS - Metals - Seasonal Variations

	Spring			Summer			Autumn			Winter		
	Cocanha	Itaipu	Palmas	Cocanha	Itaipu	Palmas	Cocanha	Itaipu	Palmas	Cocanha	Itaipu	Palmas
As	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Cd	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Co	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High
Cr	High	Low	Low	Low	Low	Low	Low	Low	Low	High	Low	Low
Fe	High	Low	Low	High	Low	Low	Low	Low	High	High	High	Low
Hg	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Pb	Low	Low	Low	Low	Low	High	Low	Low	Low	Low	Low	Low
Se	Low	Low	Low	Low	Low	Low	Low	Low	Low	High	Low	Low
Zn	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High



RESULTS - Neutral Red



- Cocanha ⇒ more healthy organisms

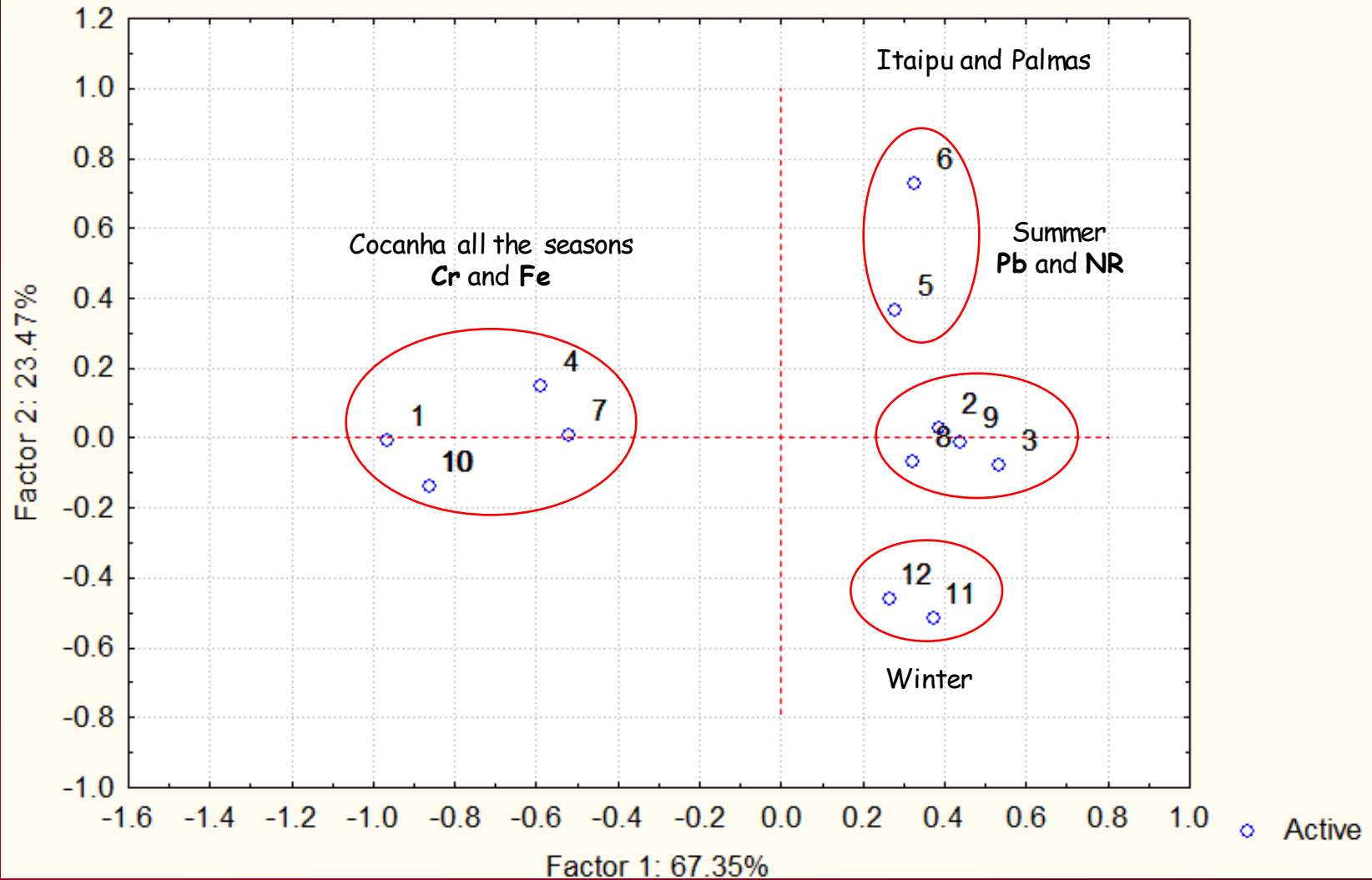
- Itaipu ⇒ stressed organisms, except in spring

RESULTS - Principal Components Analysis

Projection of the cases on the factor-plane (1 x 2)

Cases with sum of cosine square ≥ 0.00

Labelling variable: Study Area



CONCLUSIONS

- Santos mussels have presented higher stress in all seasons of the year, especially in summer and winter.
- In Summer there is an increase of pluviometric indexes to marine environment, causing a higher carrying of xenobiotics from sewage, industries, port activities, and tourism.
- In Winter there is a higher acumulation of substances provided by the resuspension of the sediments due to the successive cold front entries.

CONCLUSIONS

- Since the mussels were collected in the coast of the Santos Bay and Cocanha beach, the concentrations found in the organisms provided information about the quality of these environments, reinforcing the beaches conditions balneability as published by CETESB (Company for environmental control in São Paulo state) thus showing that the organisms are adequate for environmental biomonitoring.

ACKNOWLEDGMENTS

- FAPESP, IAEA, CNPq
- THANK YOU FOR YOUR ATTENTION!



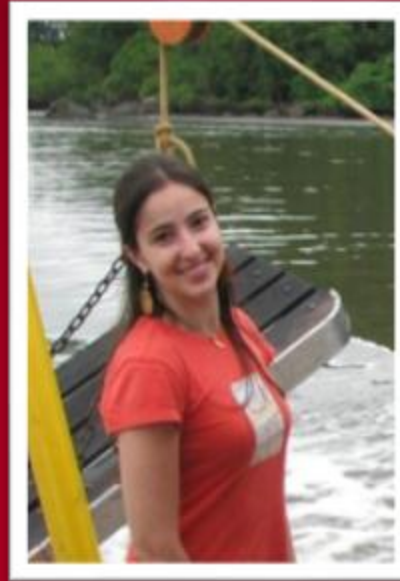
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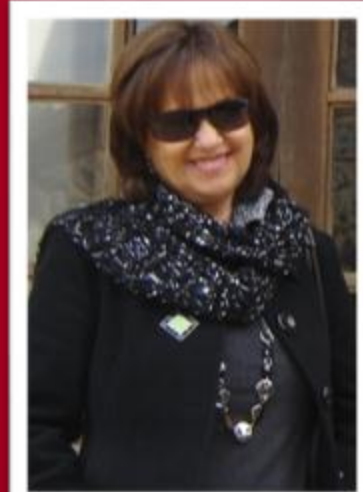
A. A. Kirschbaum



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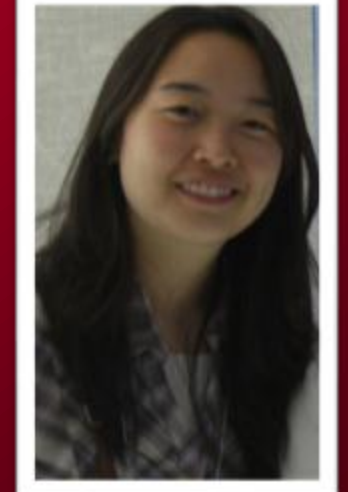
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