

Assessment of Heavy Metal Contamination in Atlantic *Sargassum*

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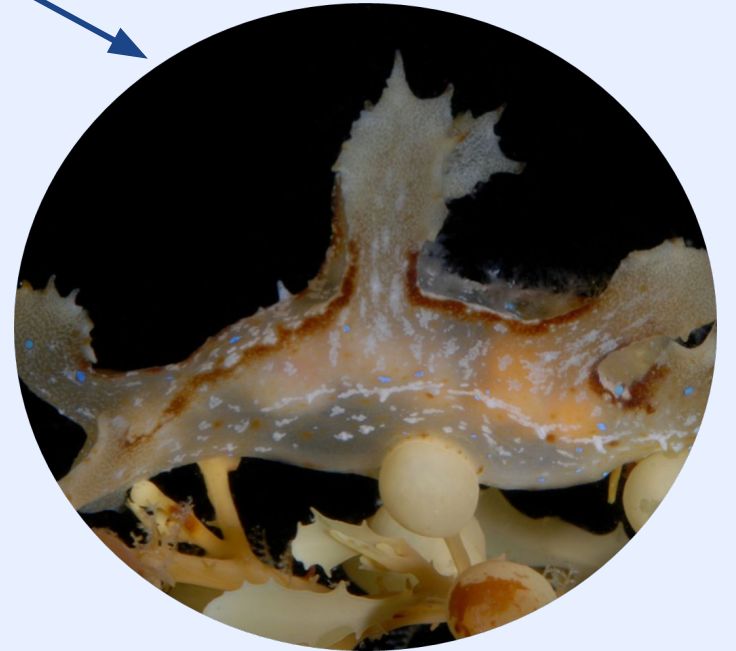
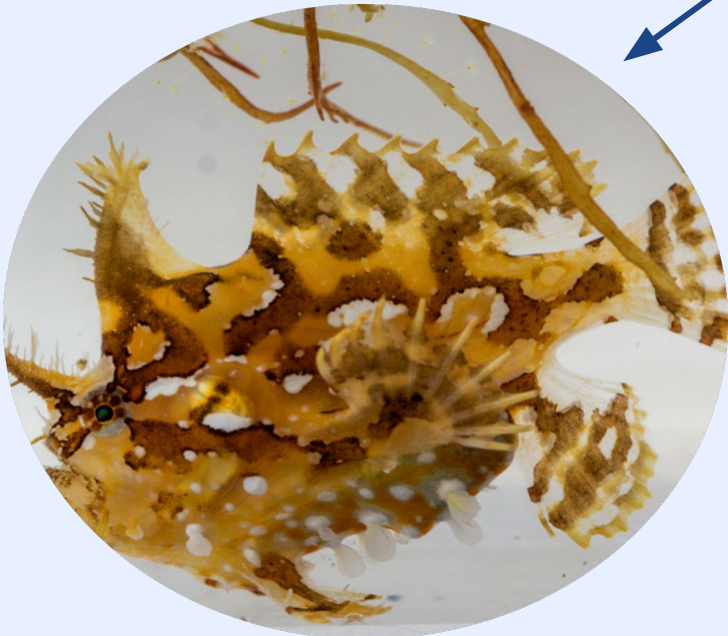
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Objectives

1. Analyze levels of 22 heavy metal(loids) in *Sargassum sp.* samples
 - a. Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Hg, Li, Mn, Ni, Pb, Sb, Se, Sn, Tl, U, V, Zn
2. Compare contamination between sites and with previous contaminant data





Introduction: Sargassum Inundation Events

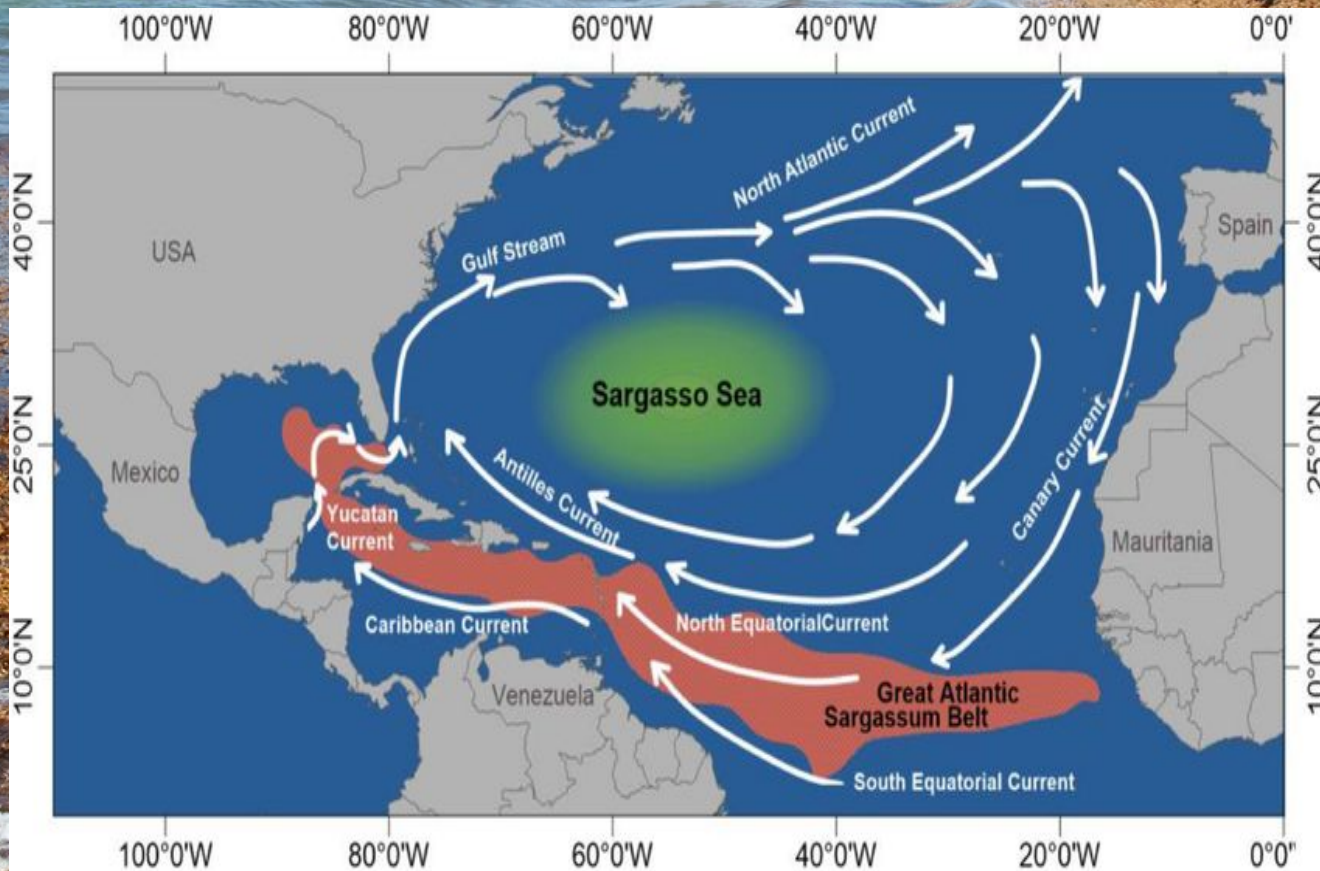


Image Credit: NOAA AOML; Sargassum Inundation Event

Introduction: Heavy Metals in the Environment

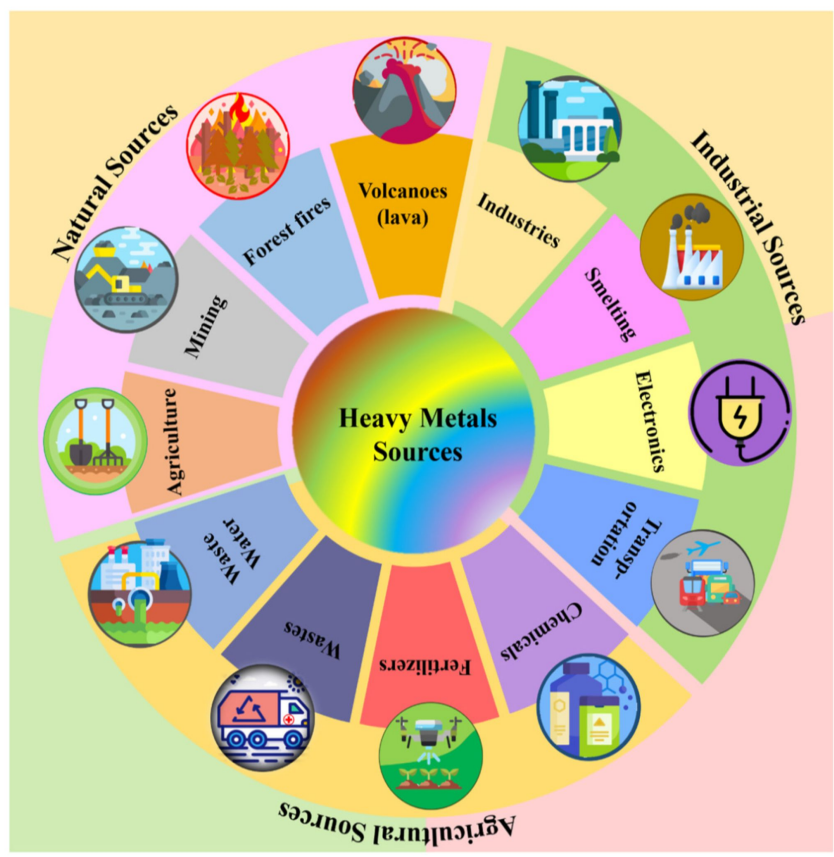
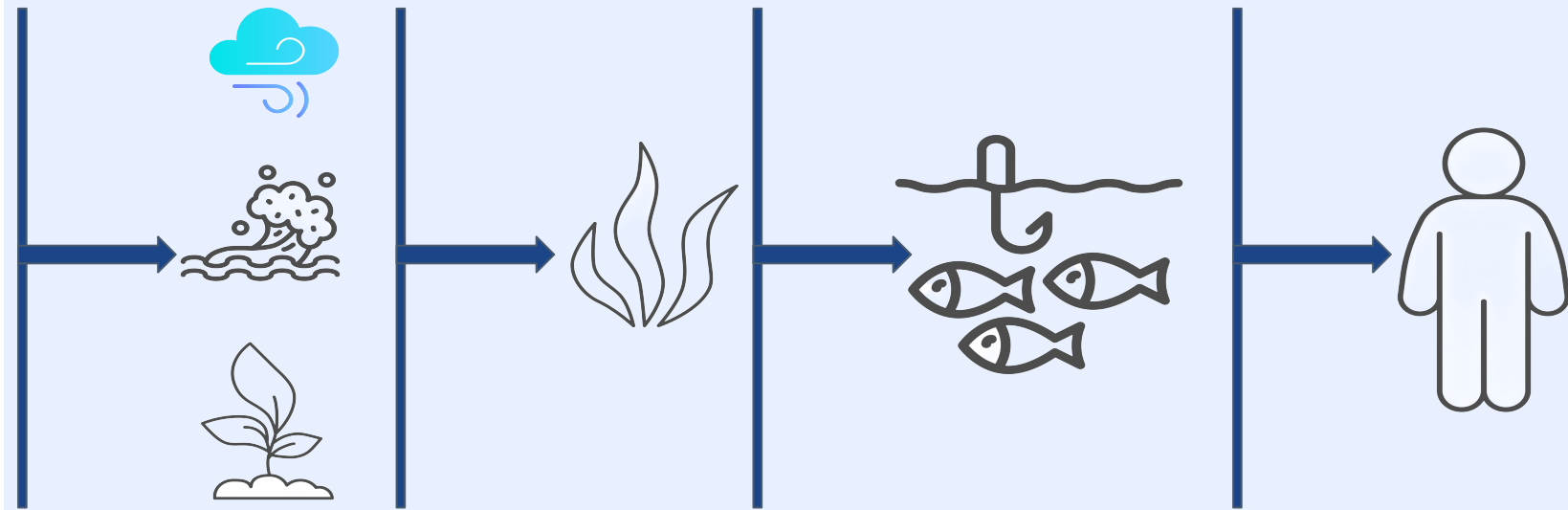
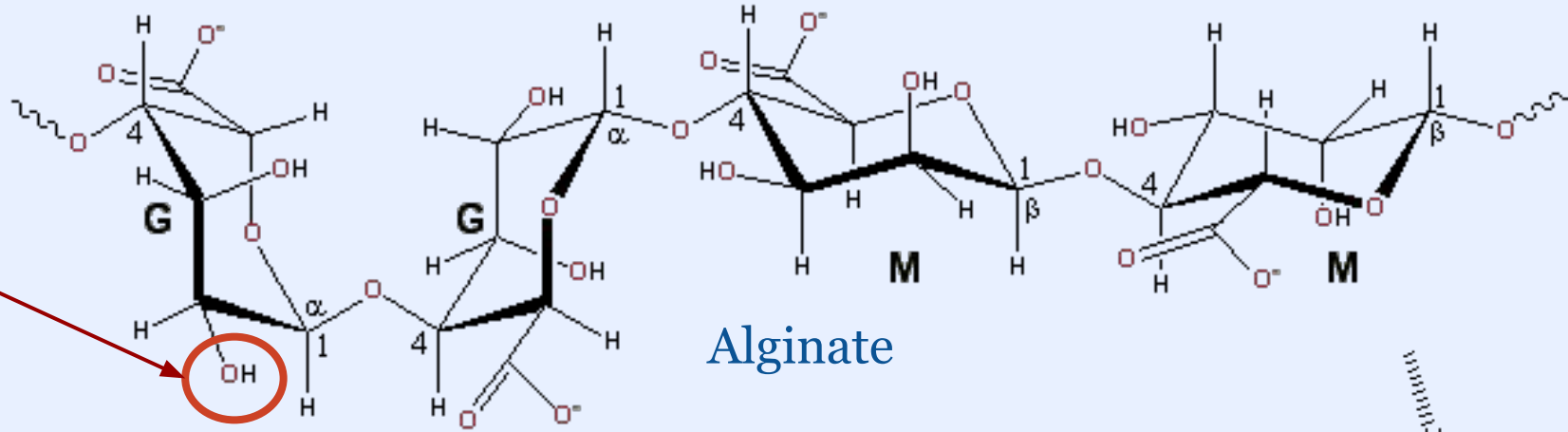


Image Credit: Awa & Hadibarata, 2020



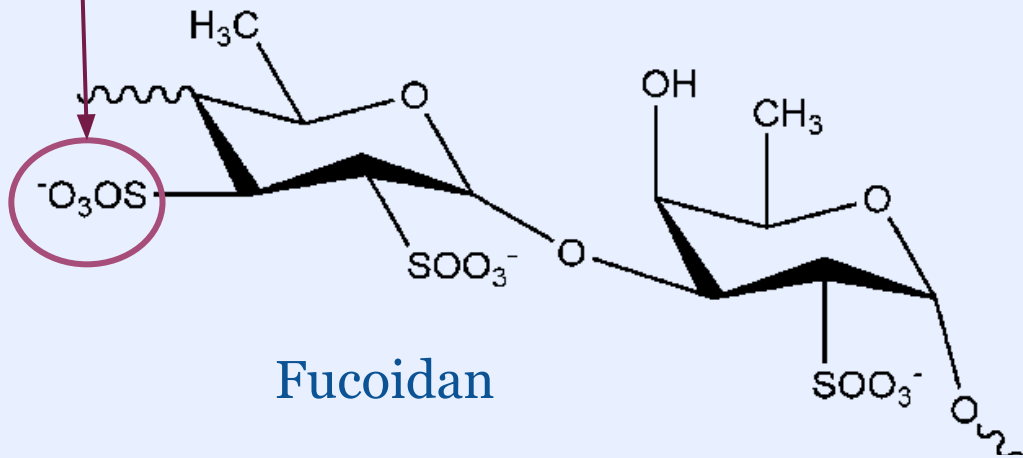
Introduction: Heavy Metal Accumulation



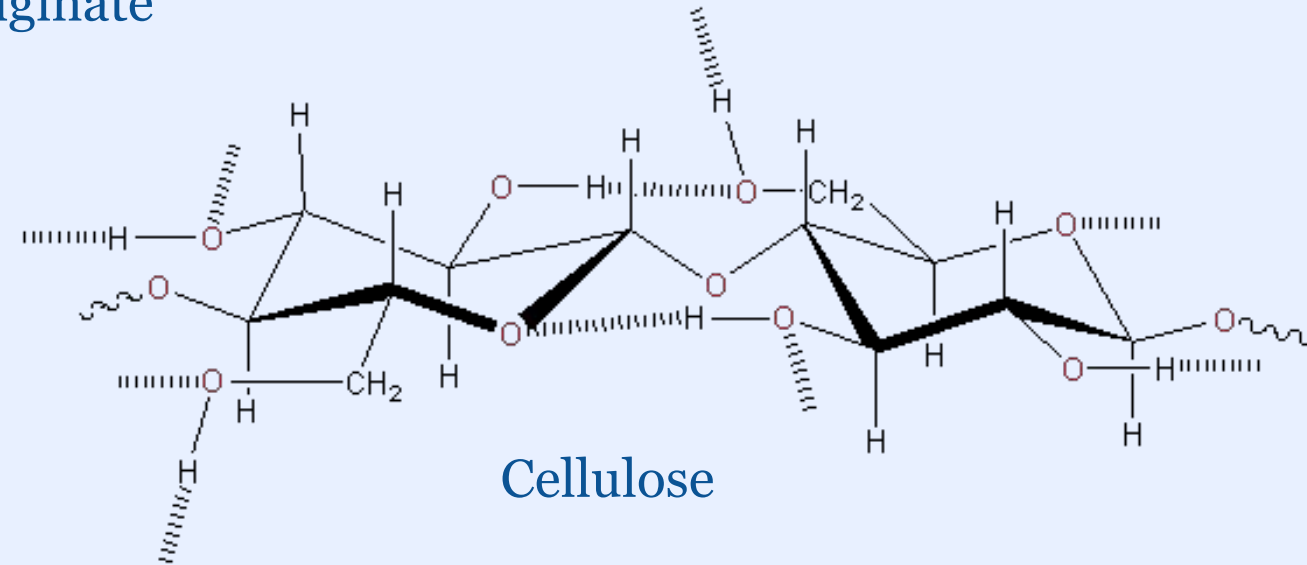
Alginate

hydroxyl

sulfate



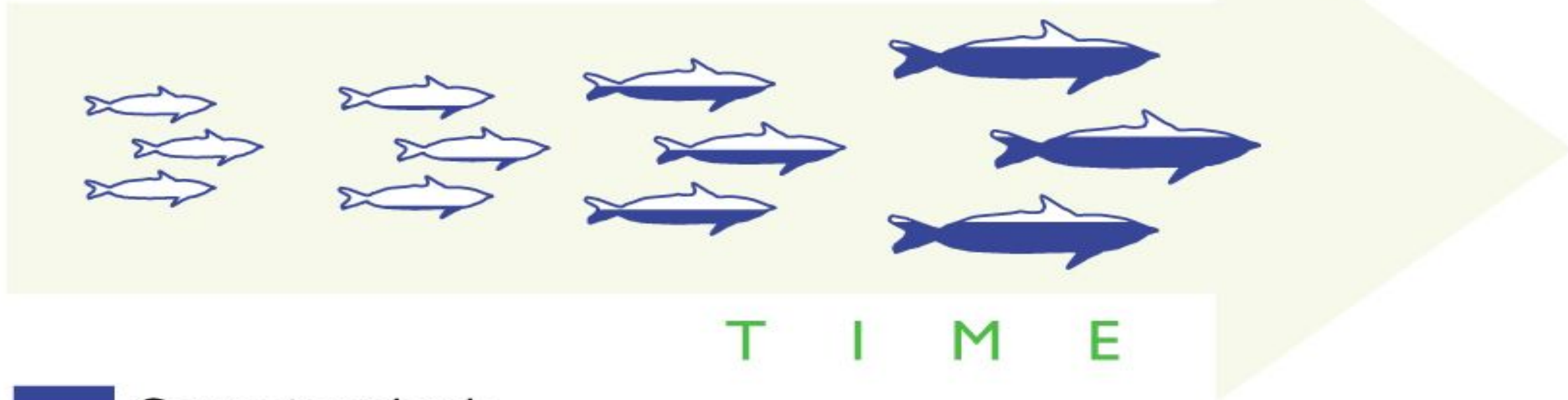
Fucoidan



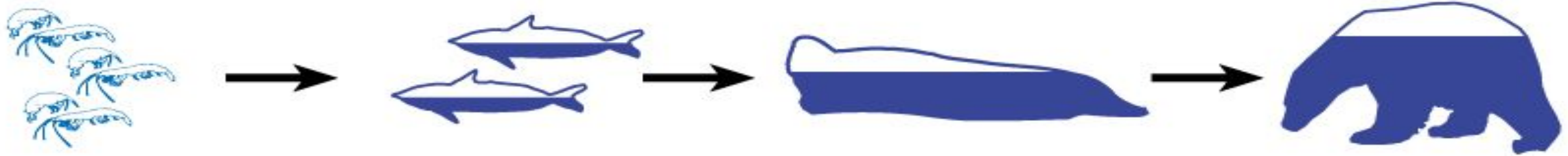
Cellulose



Bioaccumulation



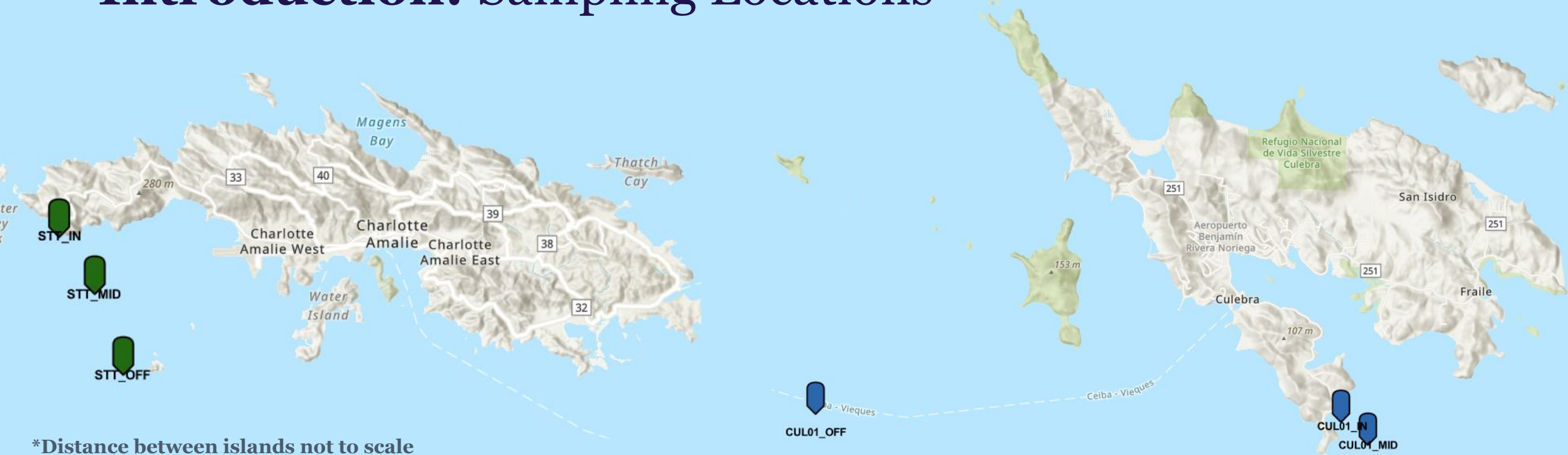
■ Contaminant levels



■ Contaminant levels

Biomagnification

Introduction: Sampling Locations

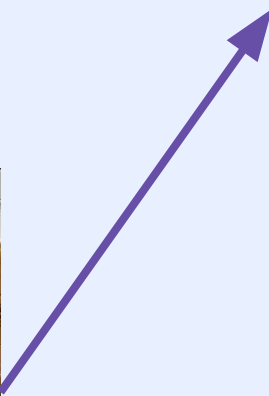


*Distance between islands not to scale

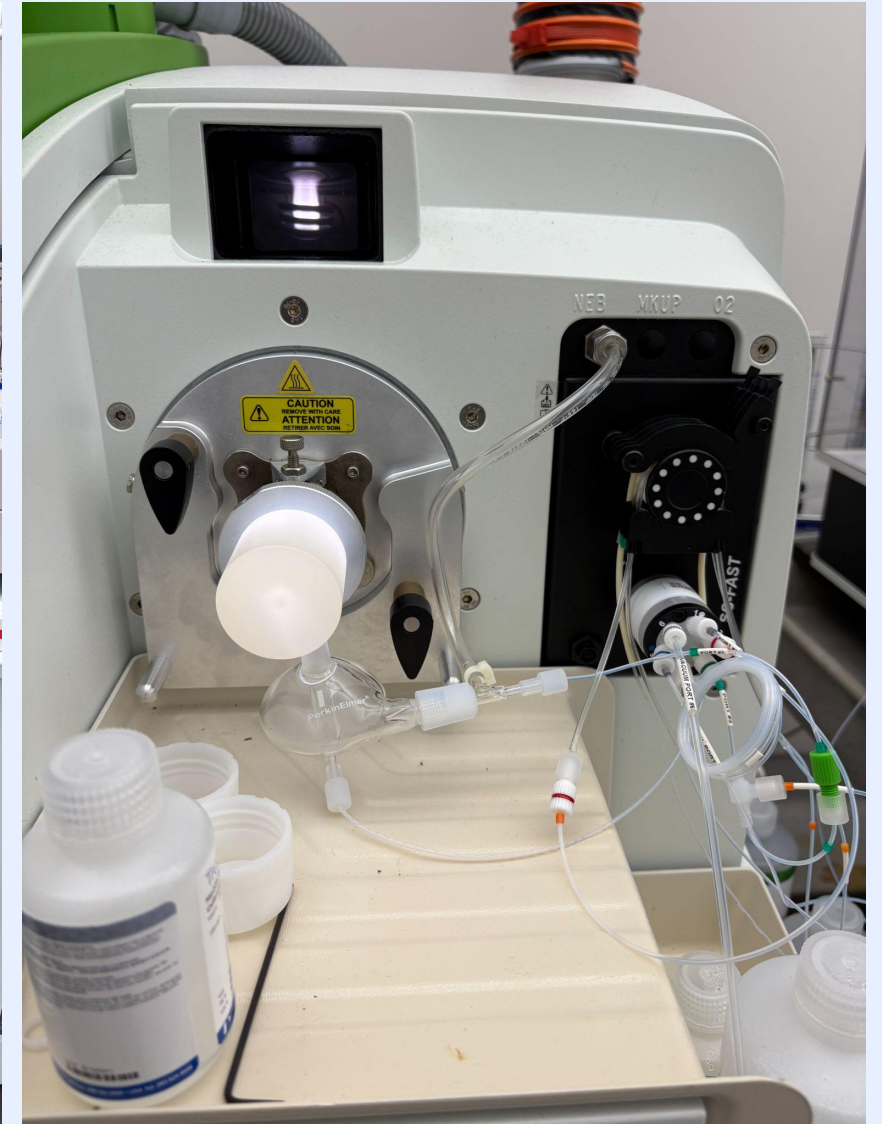
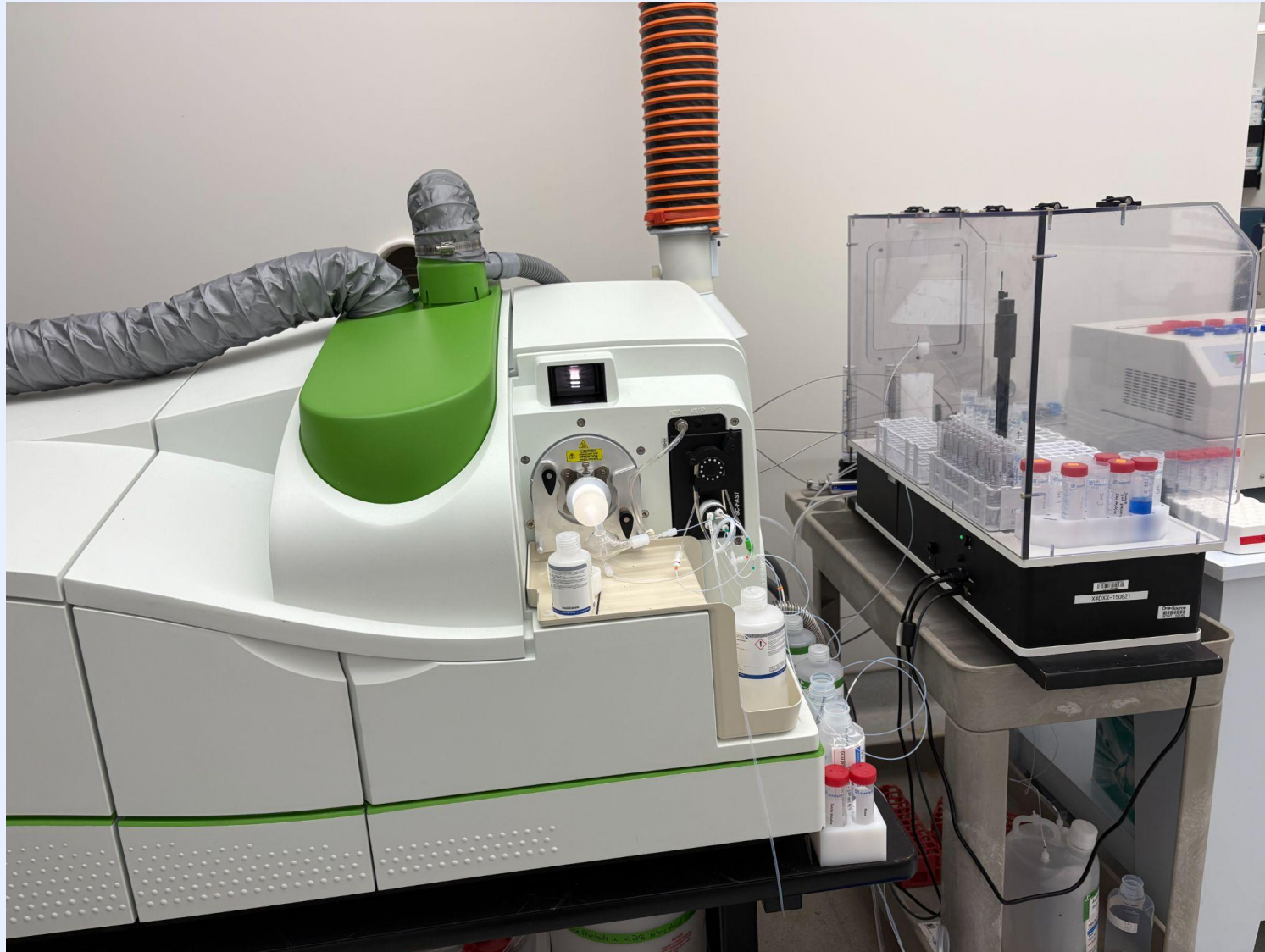
- **Project collaborators:**
 - NCCOS Ecotoxicology
 - NCCOS Monitoring and Assessment
 - University of Puerto Rico Mayaguez



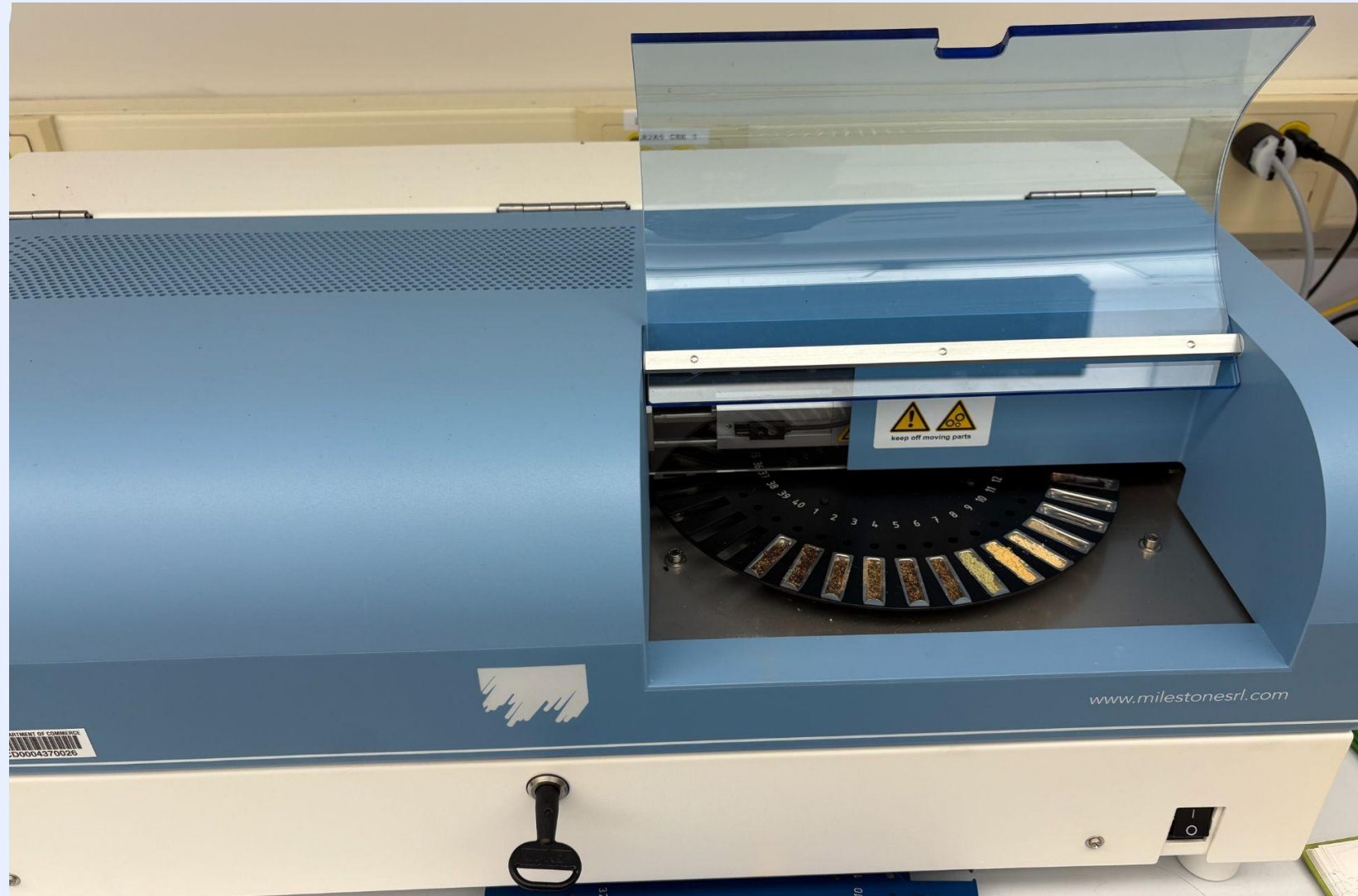
Methods: Sample Preparation



Methods: ICP-MS Analysis



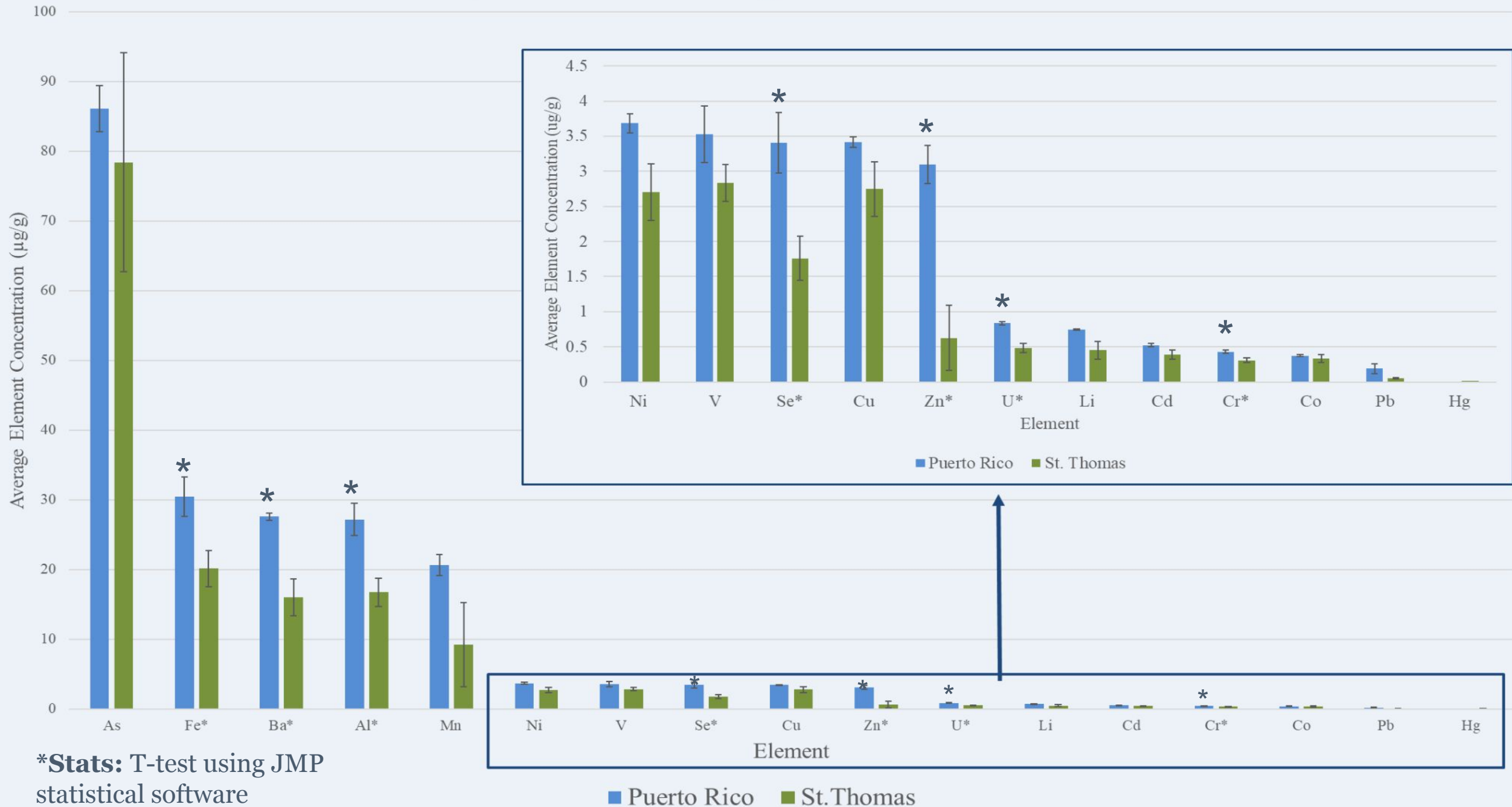
Methods: DMA-80 Analysis



Results



Spatial Variations in Average Element Concentration

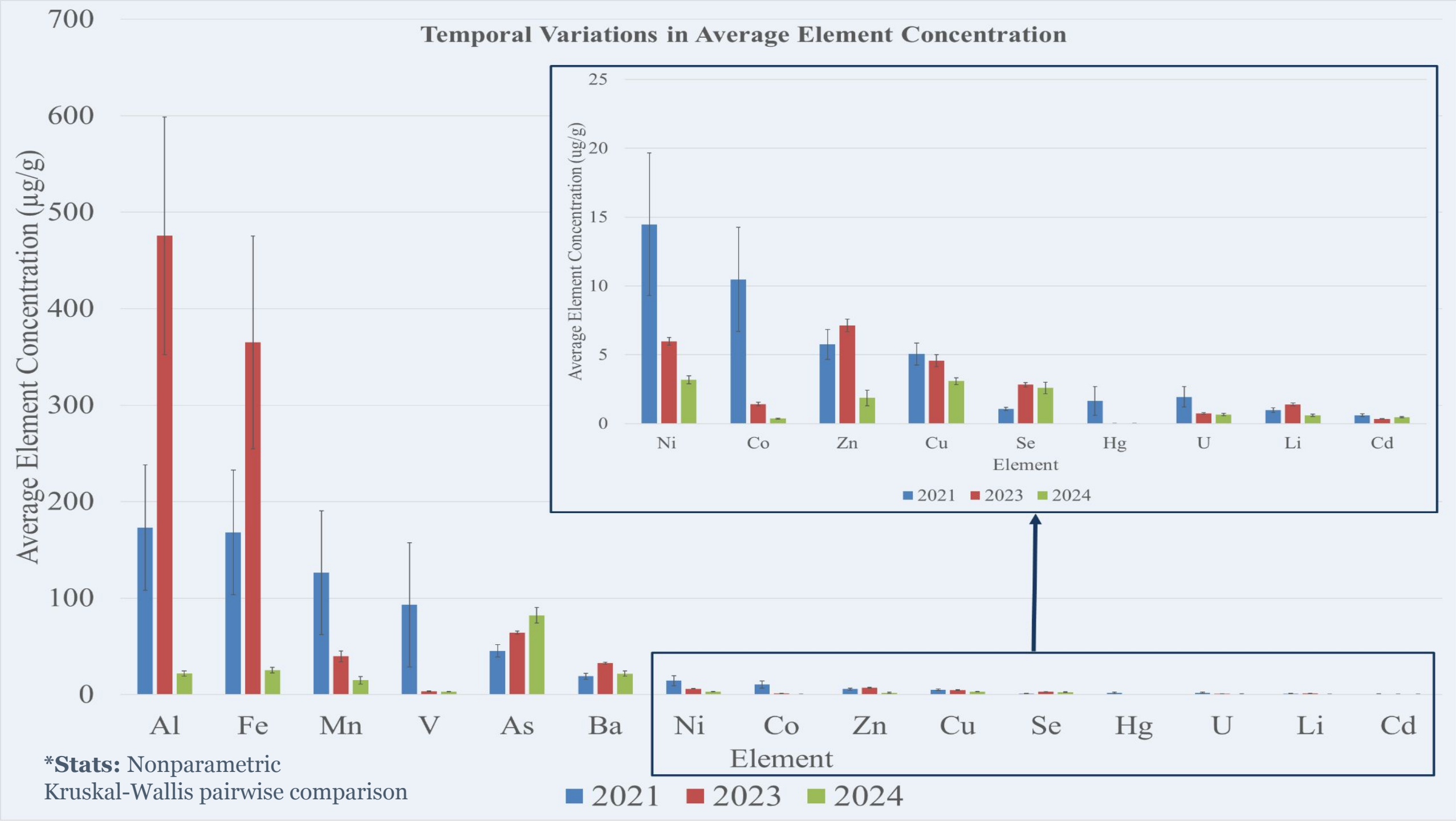


Discussion: Spatial Variations

- Elevated **Fe, Ba, Al, Se, Zn, U, and Cr** in Puerto Rico
- **Natural:** Fe, Al, U
 - highly abundant in crust
- **Anthropogenic:** Ba, Se, Zn, Cr
 - mining operations and fossil fuel combustion
- **St. Thomas:** tourism centered
- **Puerto Rico:** mixed land use
 - manufacturing of pharmaceuticals, electronics, petrochemicals



Temporal Variations in Average Element Concentration



*Stats: Nonparametric
Kruskal-Wallis pairwise comparison

Discussion: Regulatory Standards

	As _(FDA)	Cd _(FDA)	Hg _(CEVA)	Pb _(FDA)	Sn _(CEVA)
<i>Limit (µg/g)</i>	<i>0.3</i>	<i>3</i>	<i>0.1</i>	<i>1</i>	<i>5</i>
PR_IN	93.32	0.46	0.01	0.36	0.00
PR_MID	79.42	0.56	0.01	0.11	0.00
PR_OFF	85.63	0.54	0.01	0.10	0.00
STT_IN	62.43	0.34	0.01	0.05	0.00
STT_MID	56.04	0.28	0.01	0.04	0.00
STT_OFF	116.75	0.54	0.01	0.08	0.01



Conclusions:

- Heightened HM accumulation in Puerto Rico
 - Potential anthropogenic and natural sources
- Mostly steady declines
- Increasing arsenic
- Bioaccumulation risk

Future Work:

- Continued monitoring of algae for inorganic contaminants

Acknowledgements

- Educational Partnership Program with Minority Serving Institutions (EPP) Undergraduate Scholarship Program
- Marie DeLorenzo and Emily Pisarski
- NCCOS Ecotoxicology Branch
- Monitoring and Assessment Branch - Felipe Arzayus
- Research and Development Center of the University of Puerto Rico Mayaguez - William Hernandez
- EPP Class of 2024 Scholars





Thank You



Questions?

