Co-occurrence of marine toxins and anthropogenic contaminants in Florida Keys marine sediment

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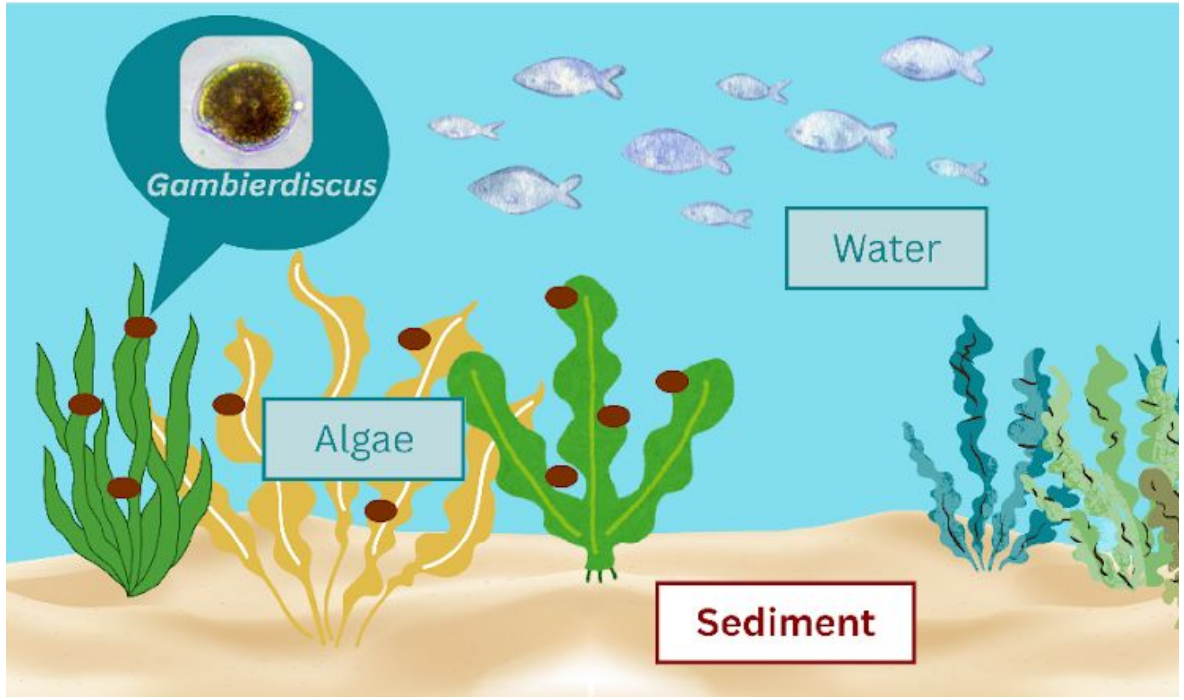
Combined effects of marine natural toxins (i.e. ciguatoxins) and anthropogenic contaminants not well understood



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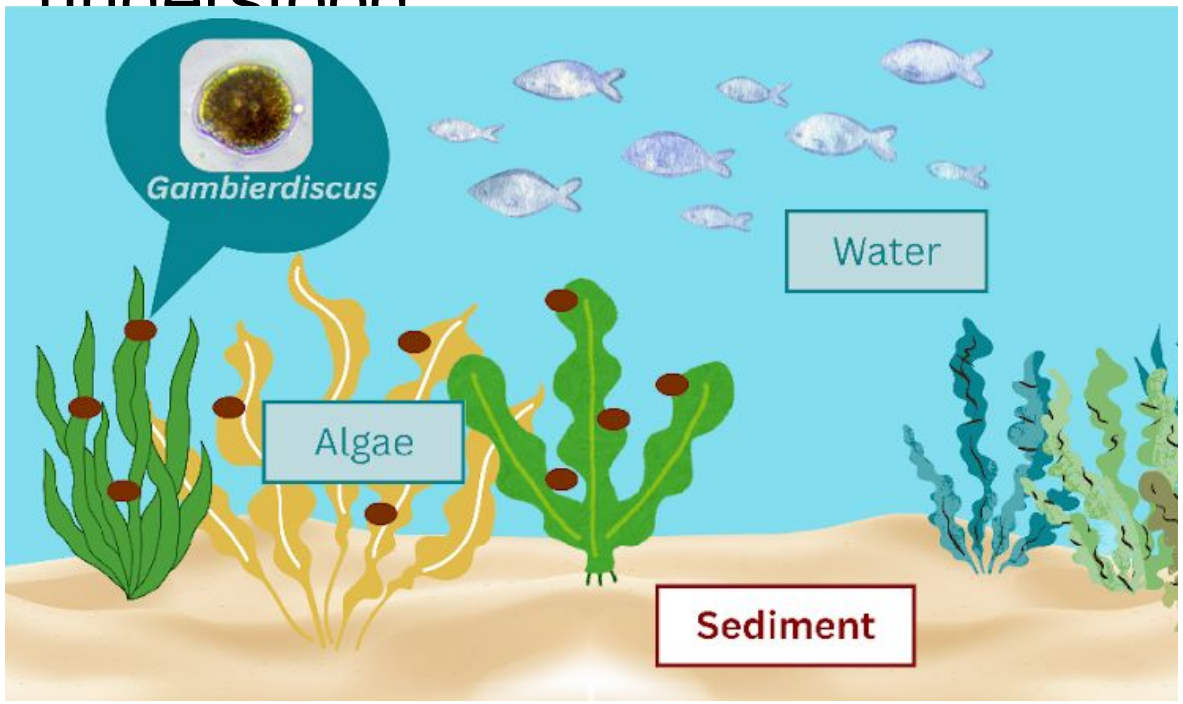
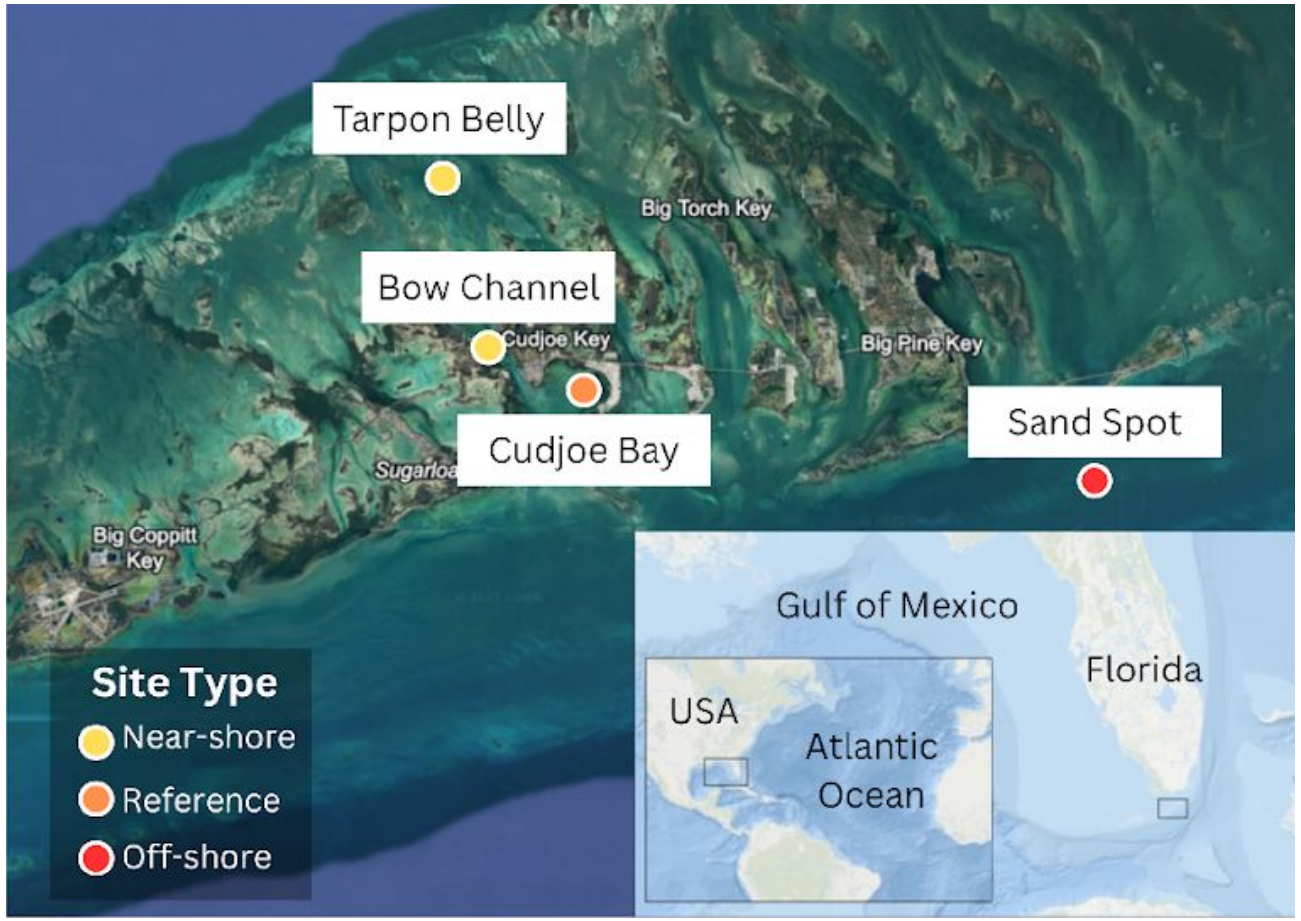


Potentially relevant to incidents of irregular marine organism behavior – i.e. fish spinning in the Florida Keys!

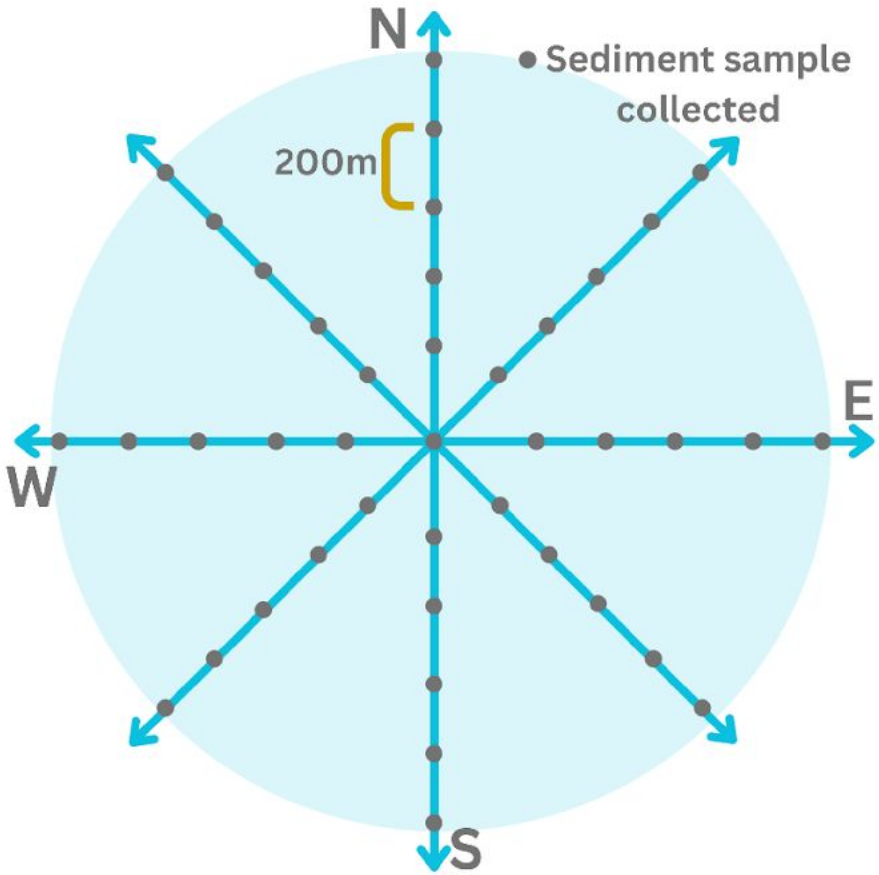
Video Credit: Alison Robertson, taken in Cudjoe Key, Monroe County (March 16th 2024)

To determine the **ecologically relevant concentrations** of **trace metals, organic contaminants,** and **natural toxins** in Florida Keys sediment to support future analyses of their **combined effects** on marine ecosystems.

Sampling

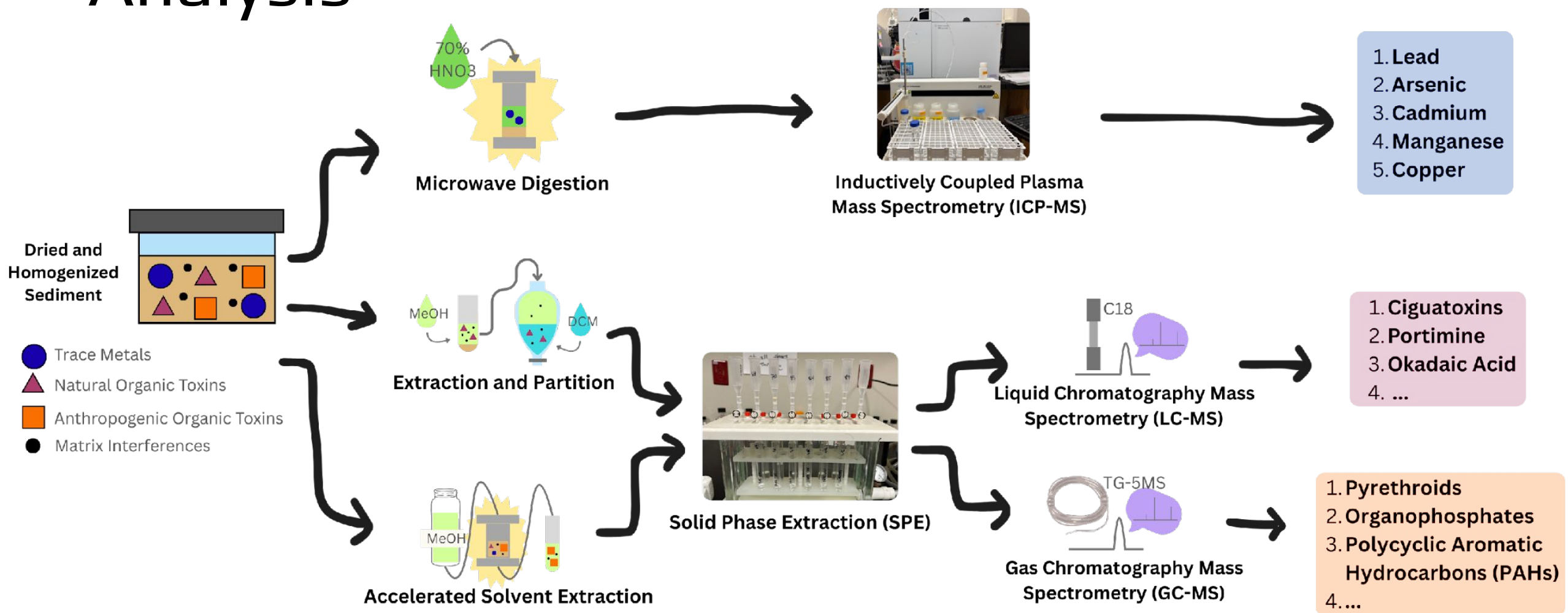


Map of sampling sites in the Florida Keys Marine Sanctuary



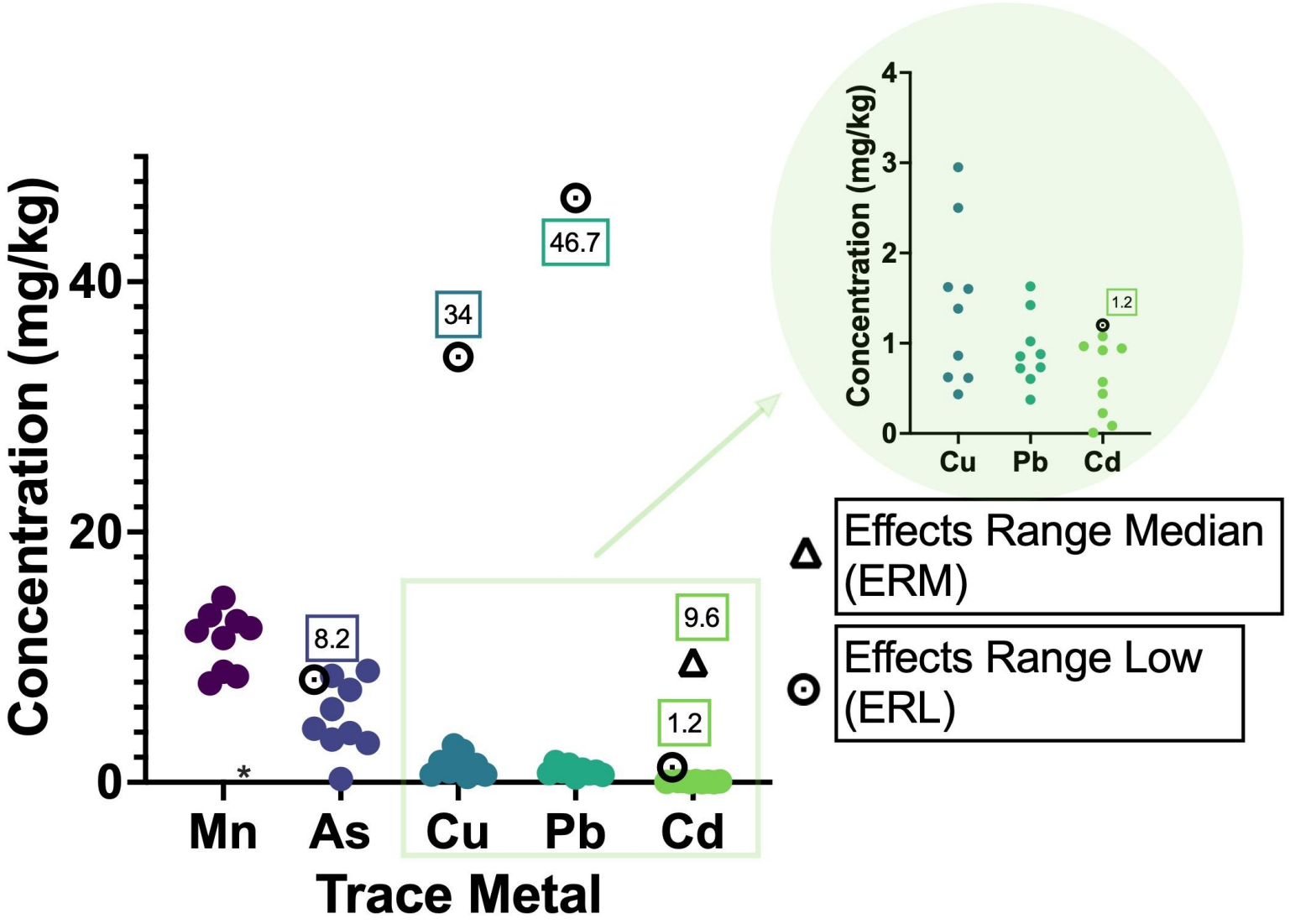
Sampling schematic

Analysis


70% HNO3
Microwave Digestion
Inductively Coupled Plasma Mass Spectrometry (ICP-MS)
1. Lead
2. Arsenic
3. Cadmium
4. Manganese
5. Copper
Dried and Homogenized Sediment
Trace Metals
Natural Organic Toxins
Anthropogenic Organic Toxins
Matrix Interferences
MeOH
DCM
Extraction and Partition
C18
Liquid Chromatography Mass Spectrometry (LC-MS)
1. Ciguatoxins
2. Portimine
3. Okadaic Acid
4. ...
Solid Phase Extraction (SPE)
MeOH
Accelerated Solvent Extraction
TG-5MS
Gas Chromatography Mass Spectrometry (GC-MS)
1. Pyrethroids
2. Organophosphates
3. Polycyclic Aromatic Hydrocarbons (PAHs)
4. ...

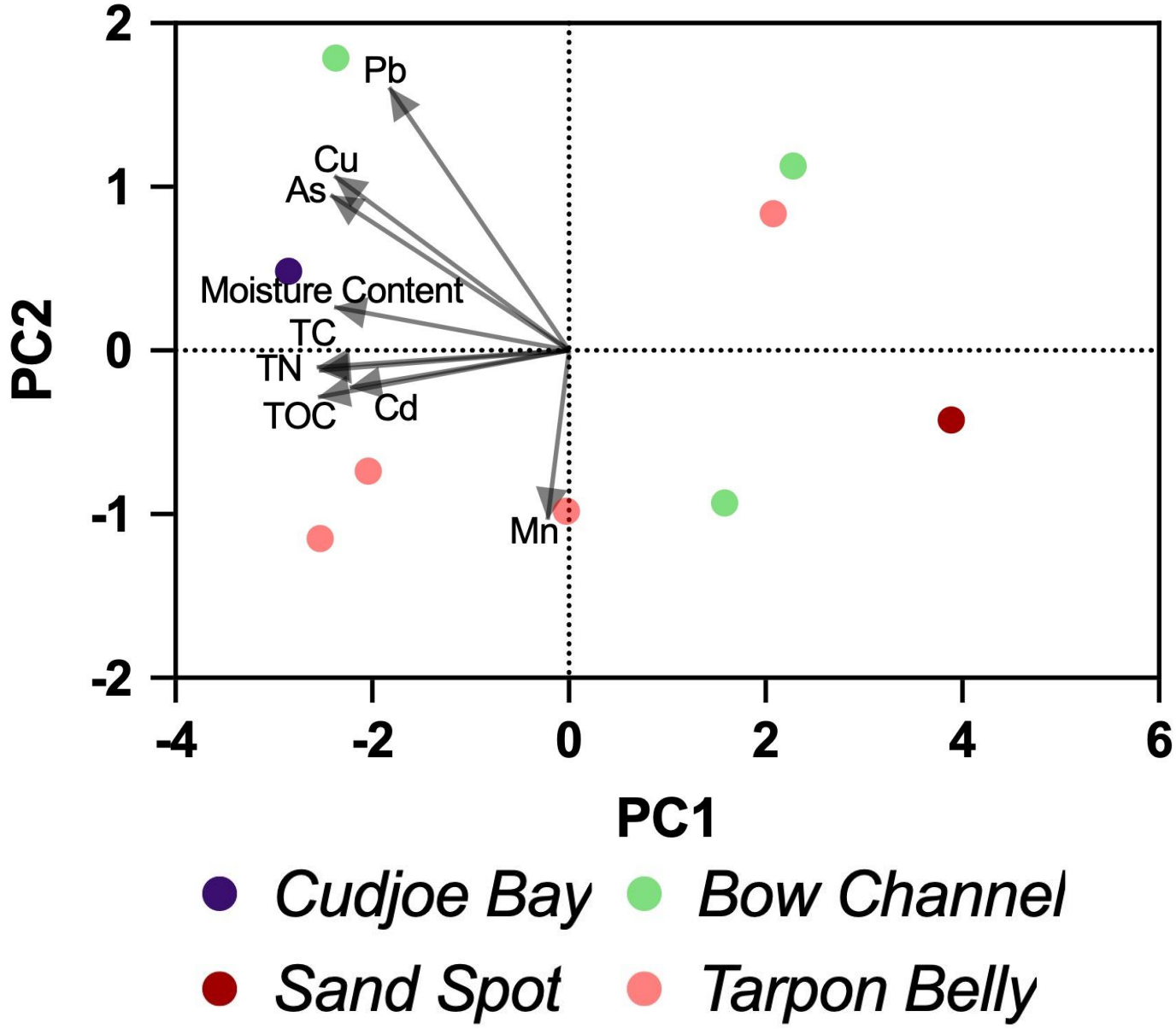
Trace Metals

Trace metal concentrations largely below a level toxic to marine organisms!



Principal Component Analysis (PCA)

PCA of moisture content, total organic carbon (TOC), total carbon (TC), total nitrogen (TN), and trace metals – **no clear trends!**



Future Directions

Concentrate large-scale extractions of sediment for natural toxin analysis

Combine bioassays of environmental samples with non-targeted analysis to guide identification of unknown neurotoxic compounds

Evaluate the effects of Florida Keys-relevant mixtures and concentrations on *Gambierdiscus* and toxin production

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Bonefish & Tarpon TRUST


Thank
you!
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