

Assessment of Bioaccumulation Risks in San Diego Bay: Food Web Contamination

Steven Bay

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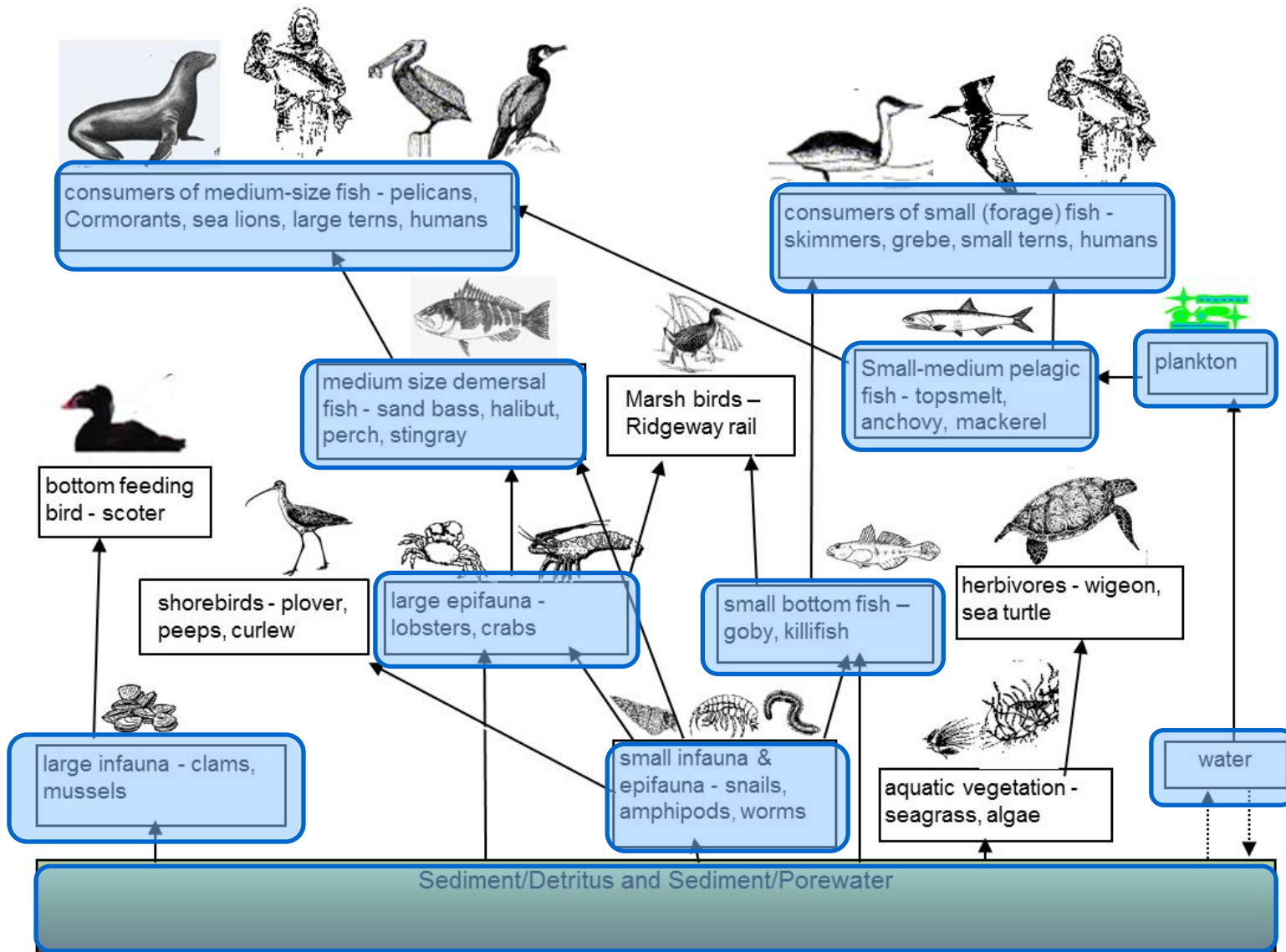
August 3, 2016



Food Web Contamination Study

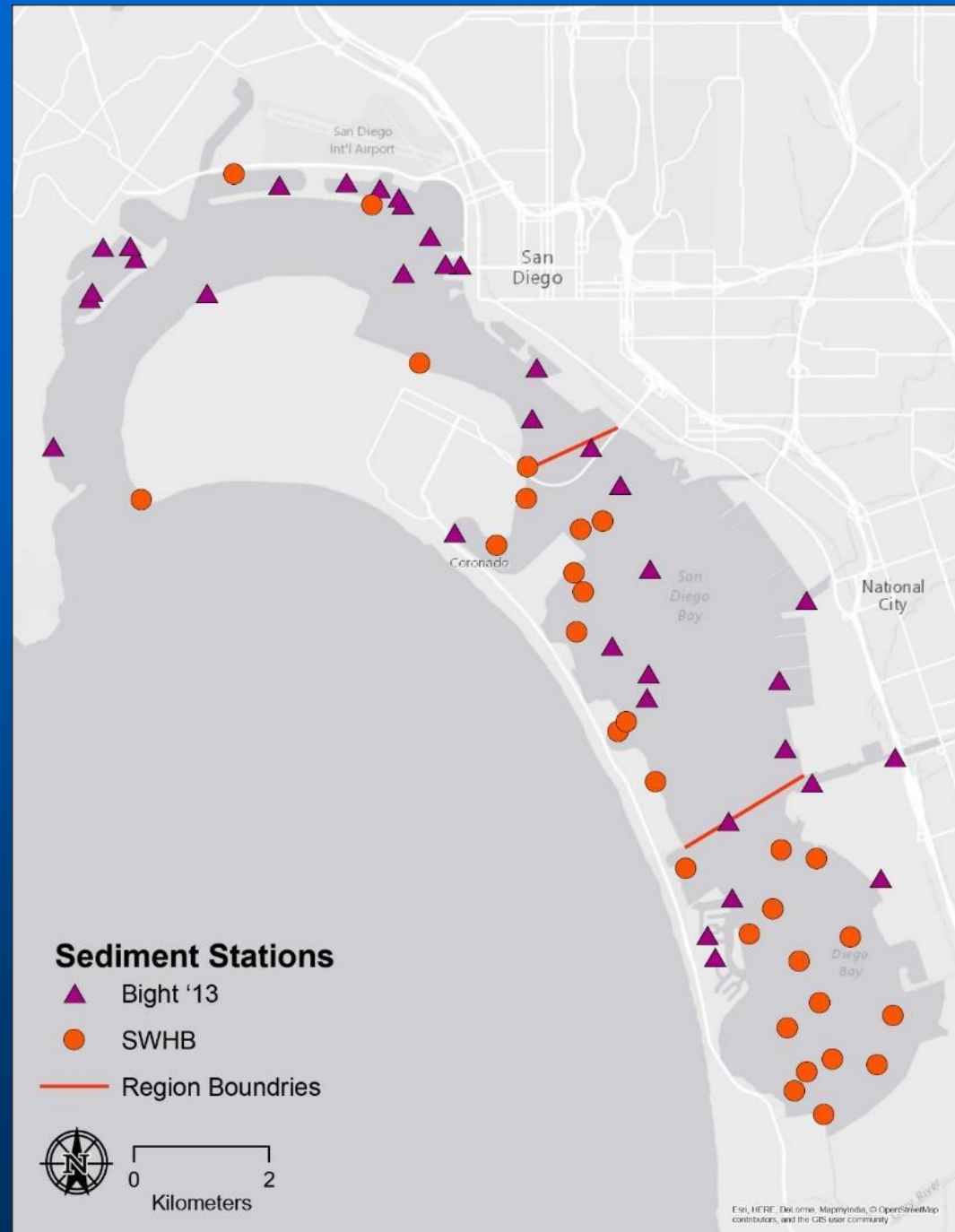
- Combined efforts of three programs to conduct a comprehensive study of food web contamination
- Sampling in 2013 and 2014
- Data analyses
 - Median contaminant concentrations by species group and bay region
 - BSAF: Biota Sediment Accumulation Factor
 - = **tissue concentration/sediment concentration**
 - Normalized to tissue lipid and sediment organic carbon

San Diego Bay Exposure Pathways



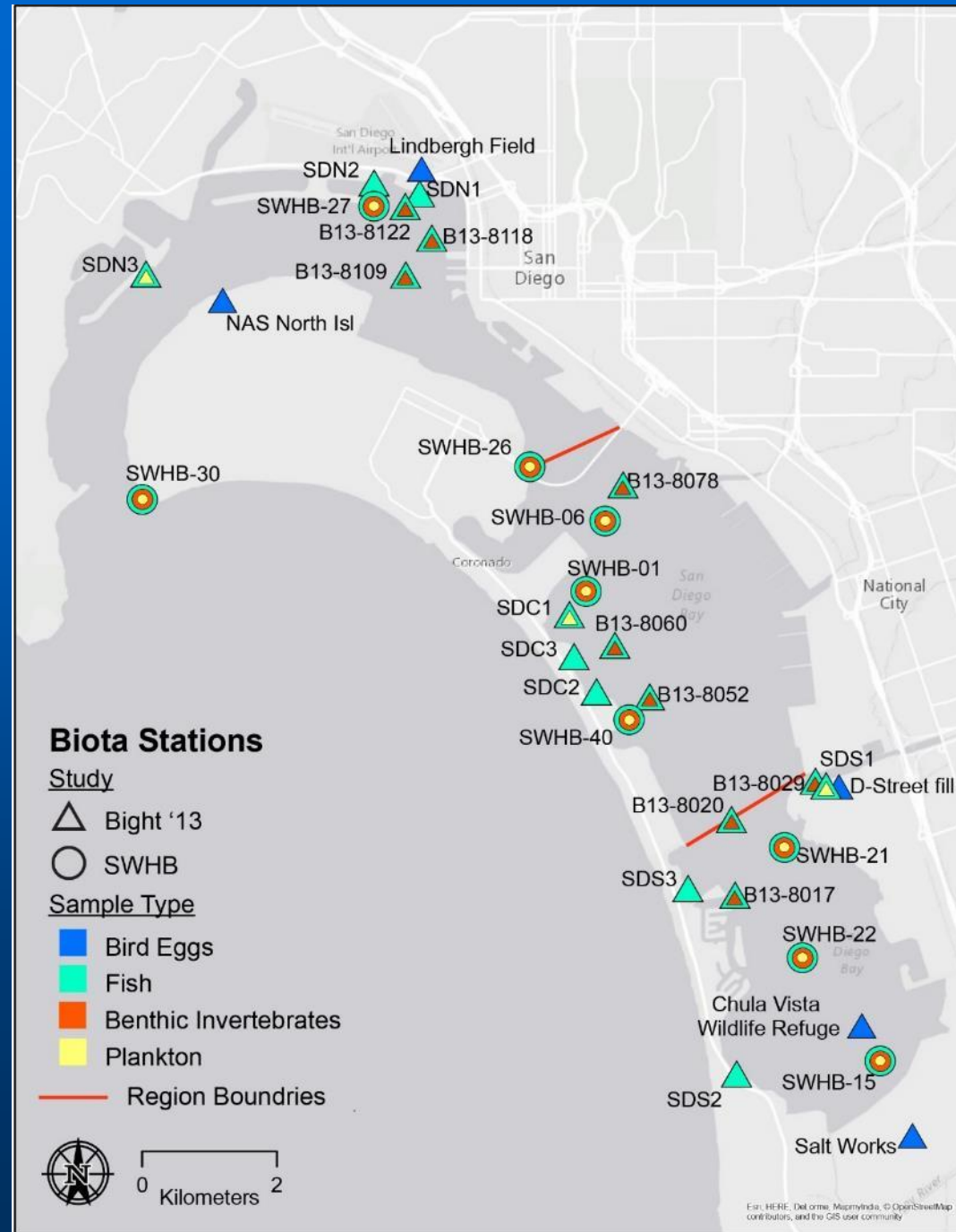
Sediment

- Three bay subregions
 - North, Central, South
 - Surface sediment
- Different habitats and uses
 - Marina, Port
 - Open bay, shallow



Tissue

- Multiple food web elements
- Matched sediment and biota samples from each region
- Includes shallow and deep areas



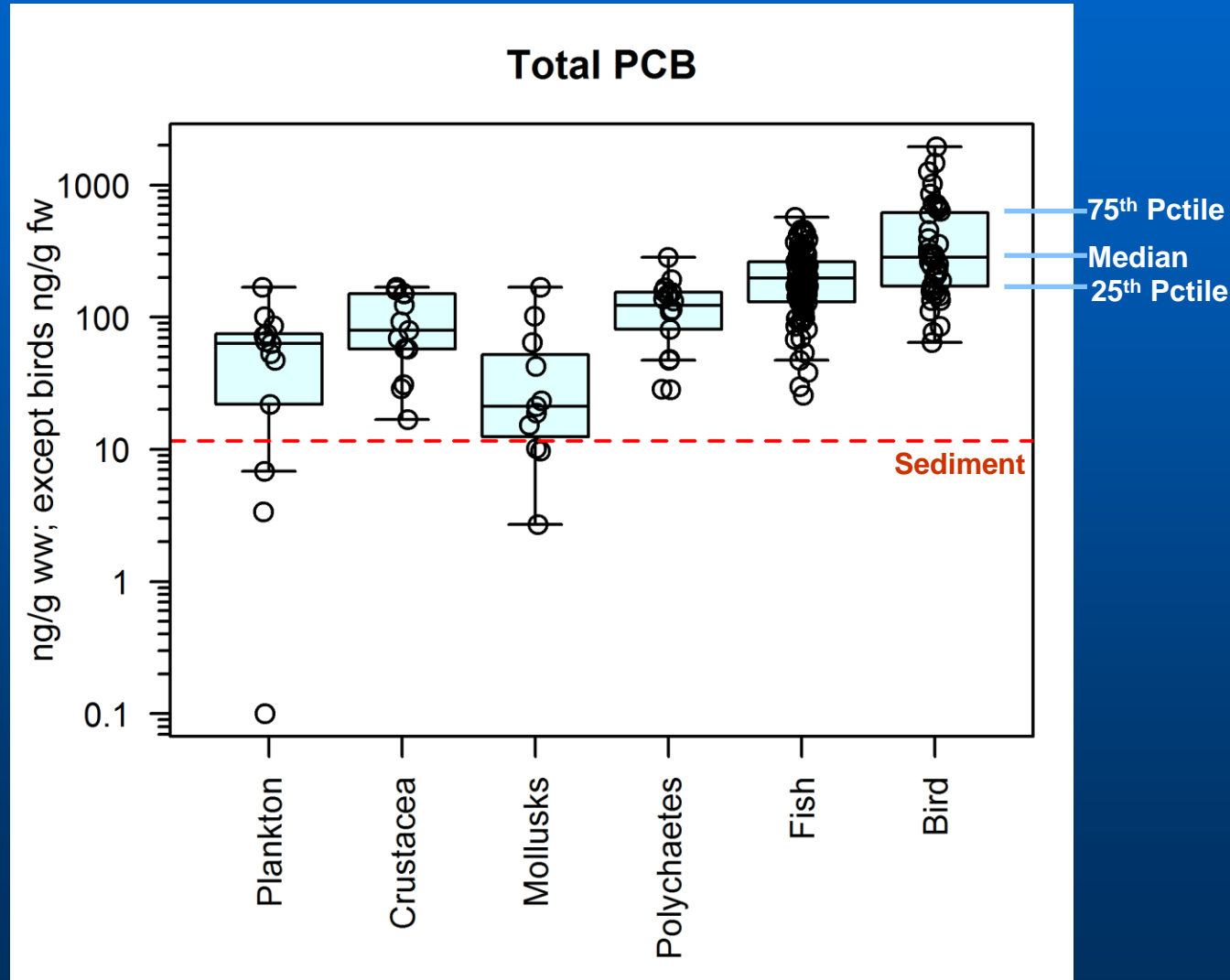
Tissue Sample Summary

- Least tern eggs collected from multiple sites
 - Single site for other bird species
- Collection success varied for fish
 - Best regional coverage for bass, halibut, and topsmelt

Sample Group	Common Name	Count
Bird	California least tern	18
	Caspian tern	10
	Double-crested cormorant	8
	Western gull	8
	Bird Total	44
Forage fish	Arrow goby	1
	Barred sand bass	9
	Black perch	2
	California halibut	20
	California killifish	2
	Deepbody anchovy	11
	Goby sp.	3
	Northern anchovy	2
	Round stingray	1
	Shiner perch	6
	Slough anchovy	10
	Spotted sand bass	11
	Topsmelt	9
	Forage Fish Total	87
	Sediment	Sediment

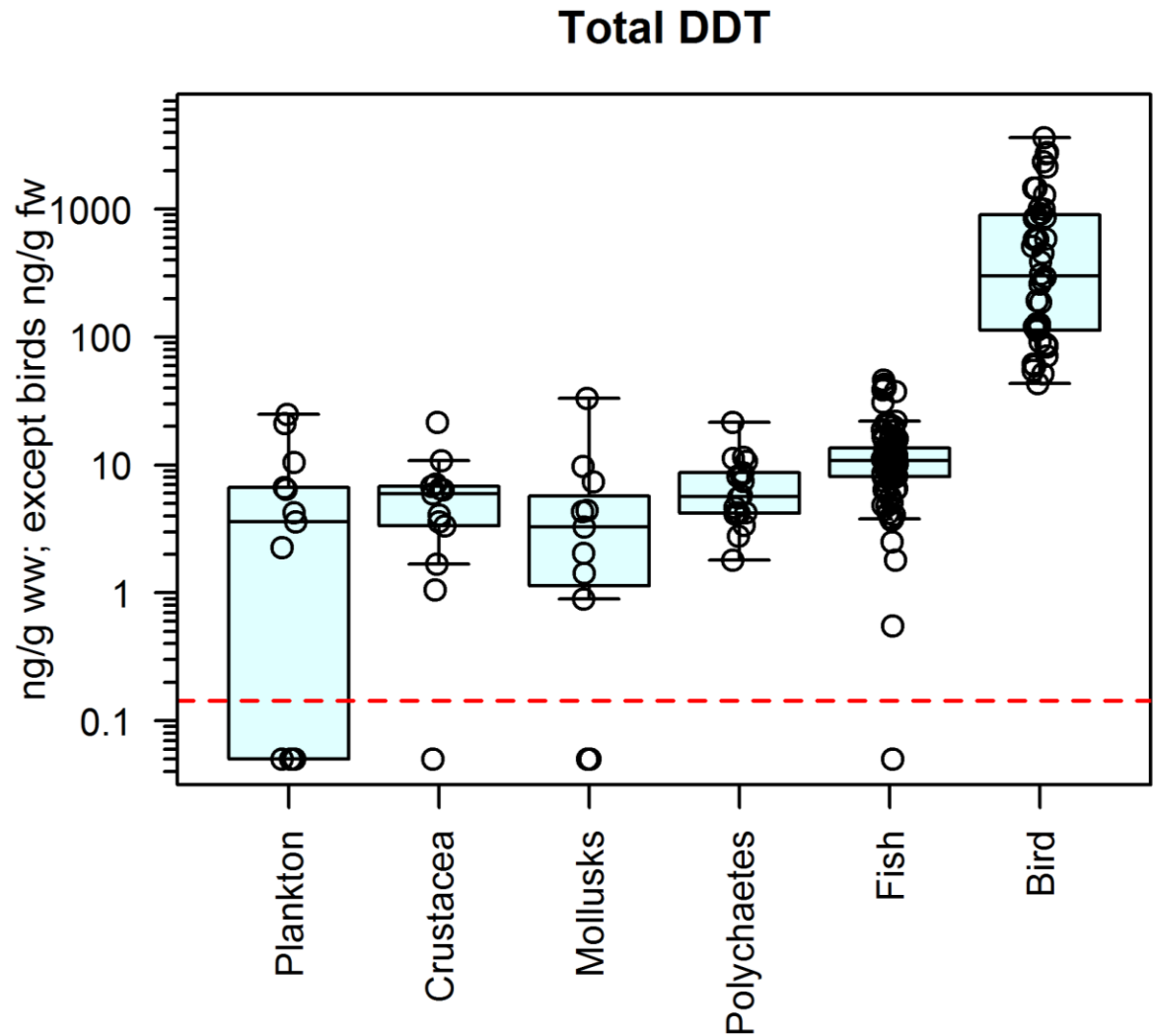
Food Web Summary: PCBs

- Highest overall concentrations among contaminant types



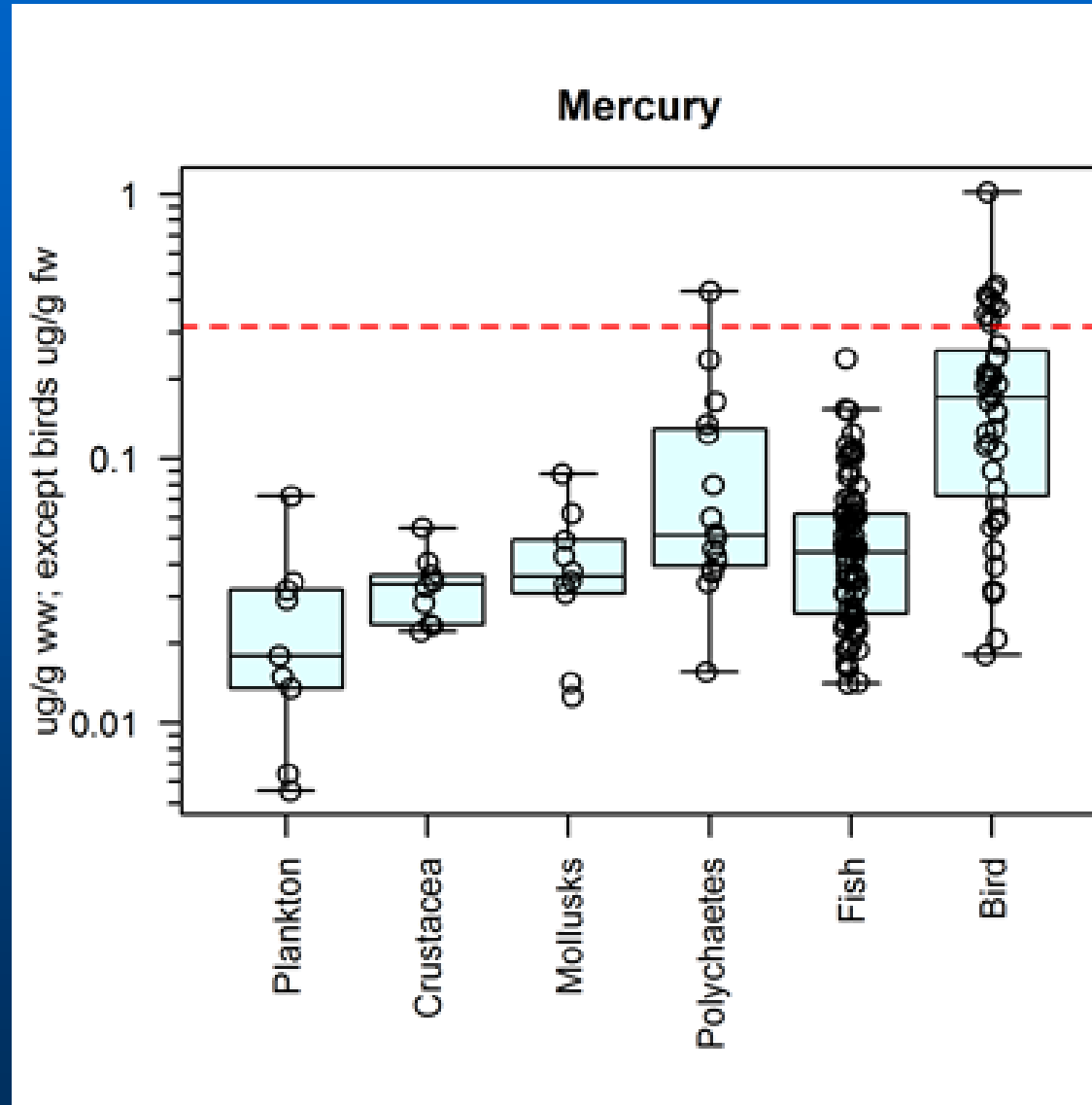
Food Web Summary: DDTs

- Bird eggs with large increase relative to fish



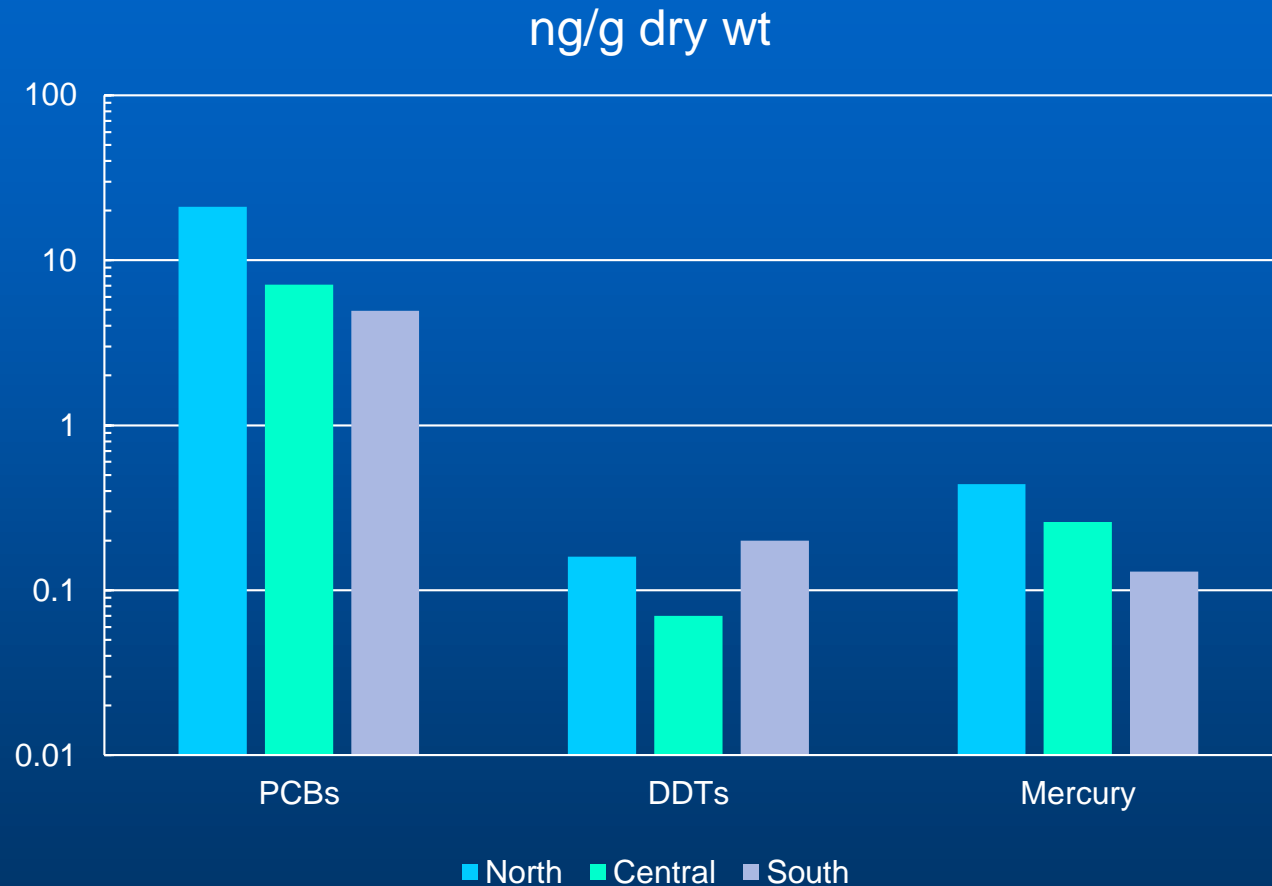
Food Web Summary: Mercury

- Little bioamagnification in fish relative to infauna
- Sediment data not comparable to tissue
 - Sediment: total mercury
 - Tissue: organic mercury



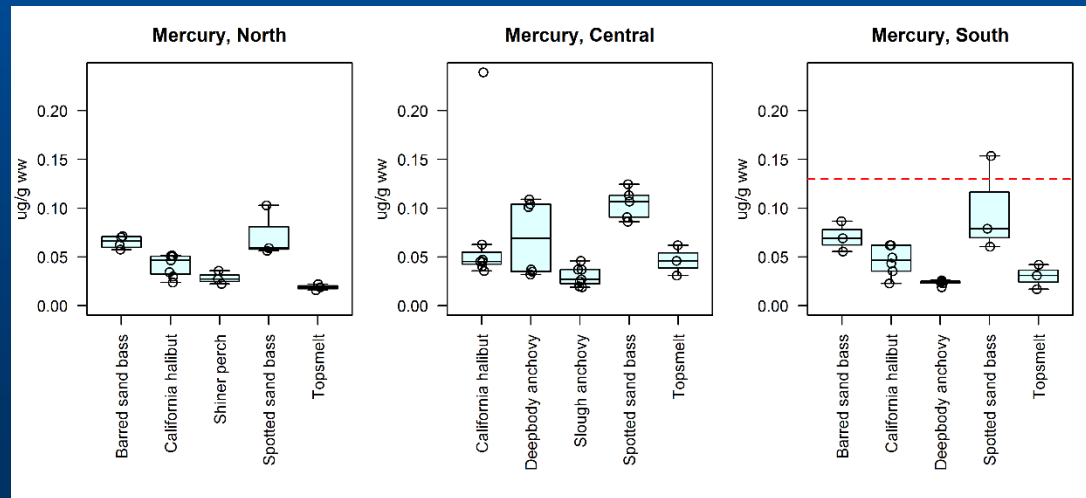
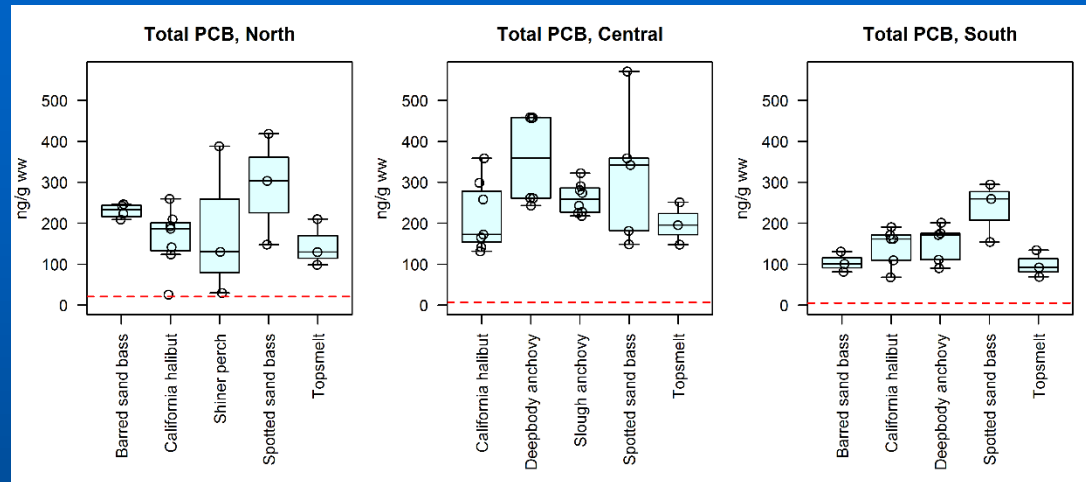
Bay Region Patterns: Sediment

- Higher concentrations of industrial contaminants in North
- No consistent trend for DDTs



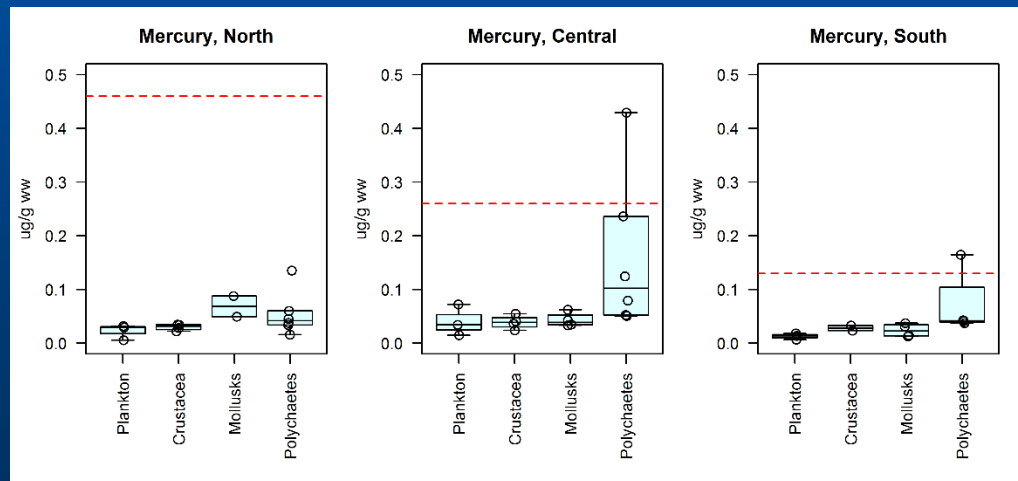
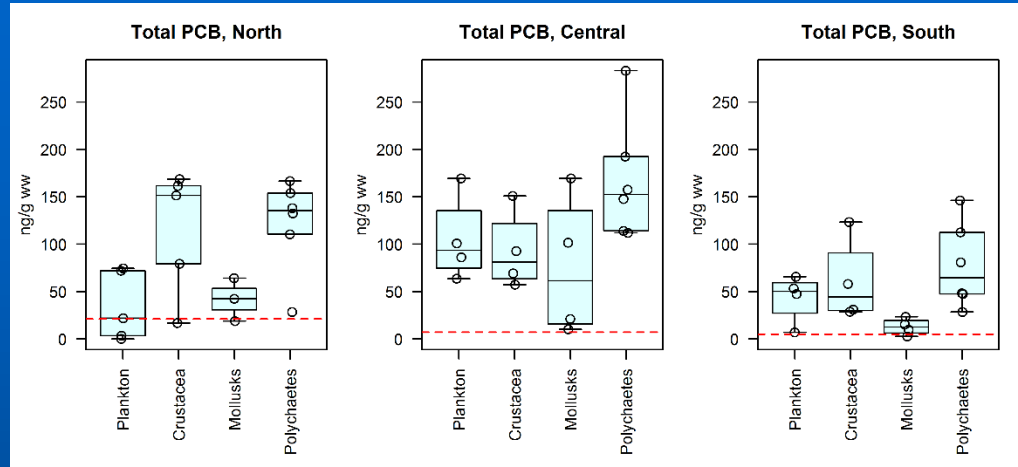
Bay Region Patterns: Fish

- Central bay fish tend to have higher concentrations



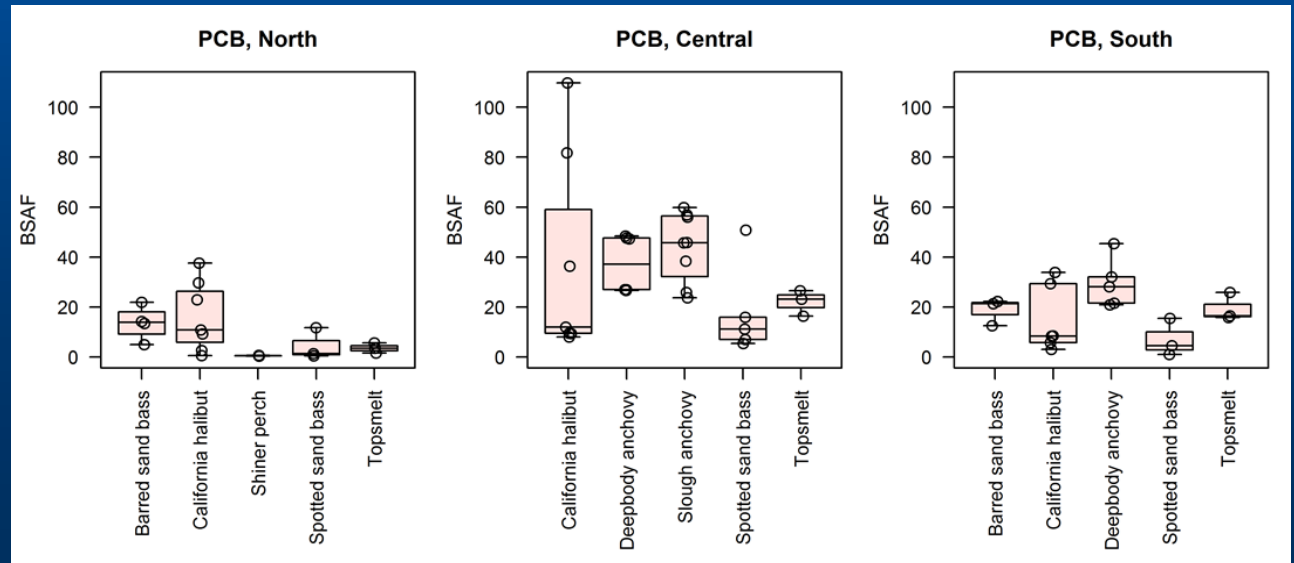
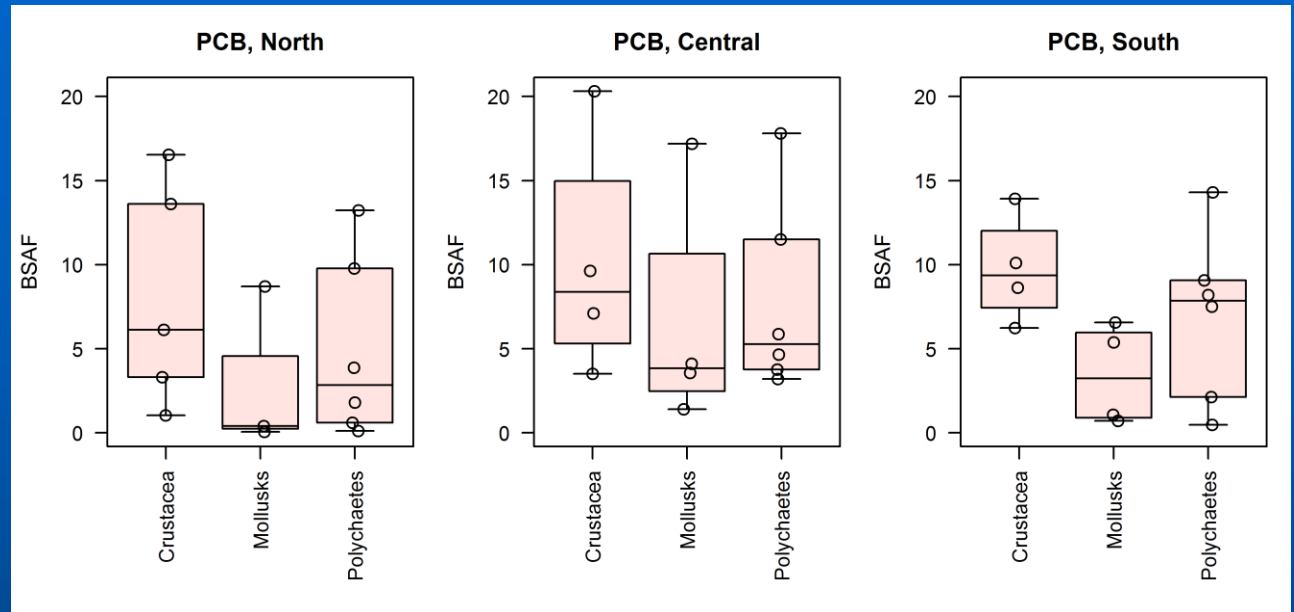
Bay Region Patterns: Infauna

- Few consistent trends
- Little correlation with sediment concentrations

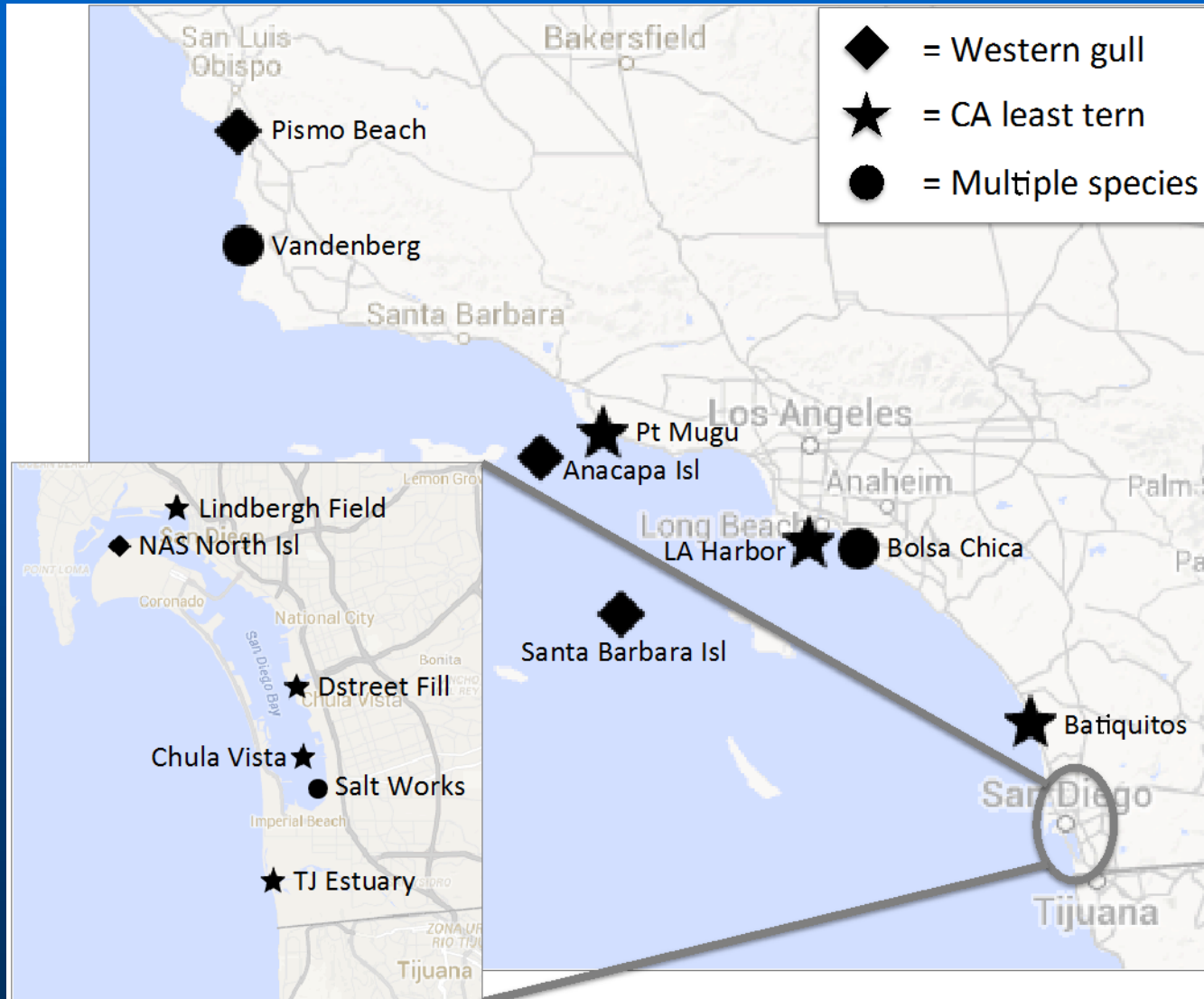


BSAF: PCBs

- No strong regional trend
- Greatest infauna accumulation in crustaceans
- Relatively high accumulation in anchovy and topsmelt

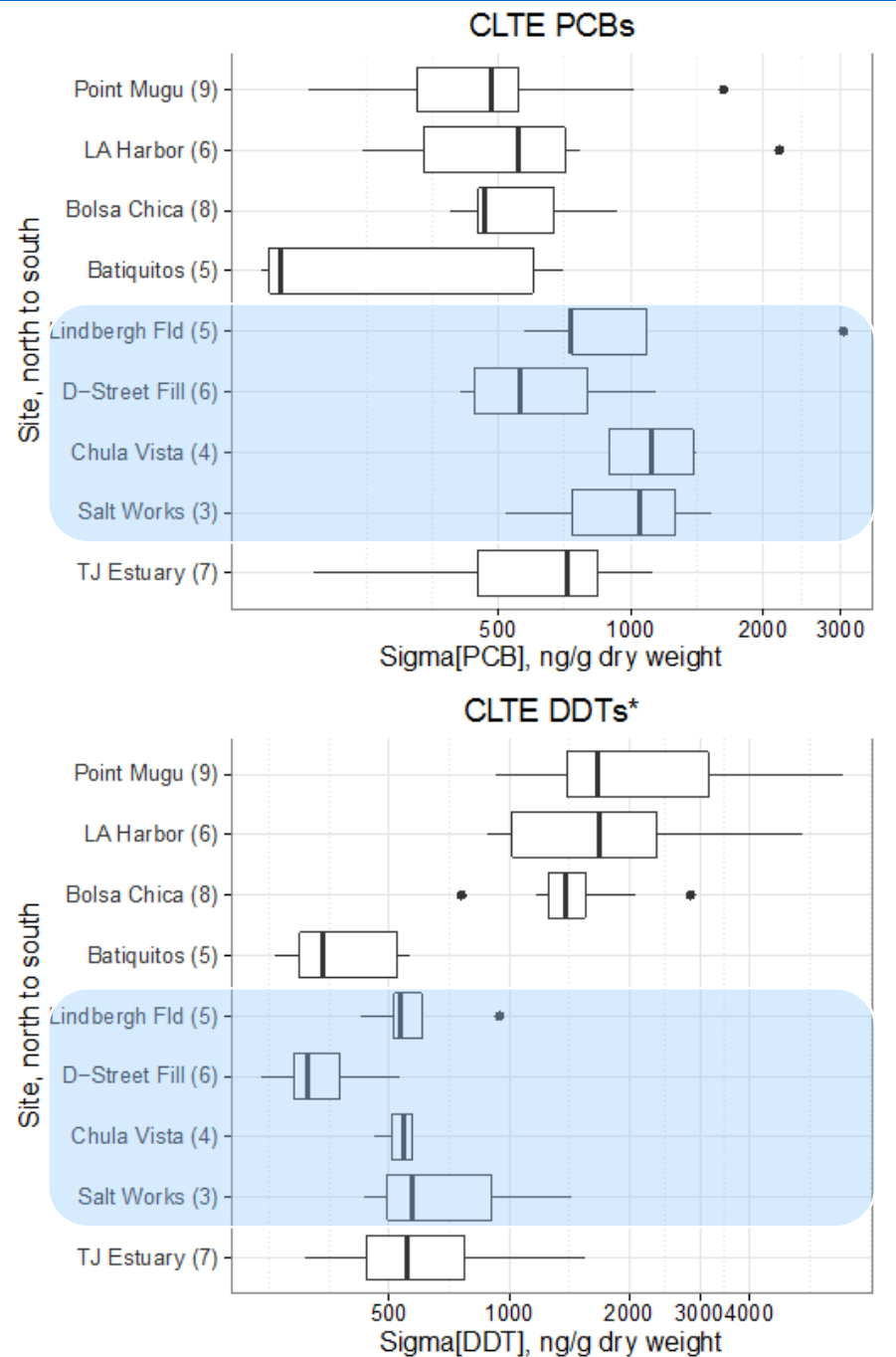


So Calif Bight Bird Nesting Sites



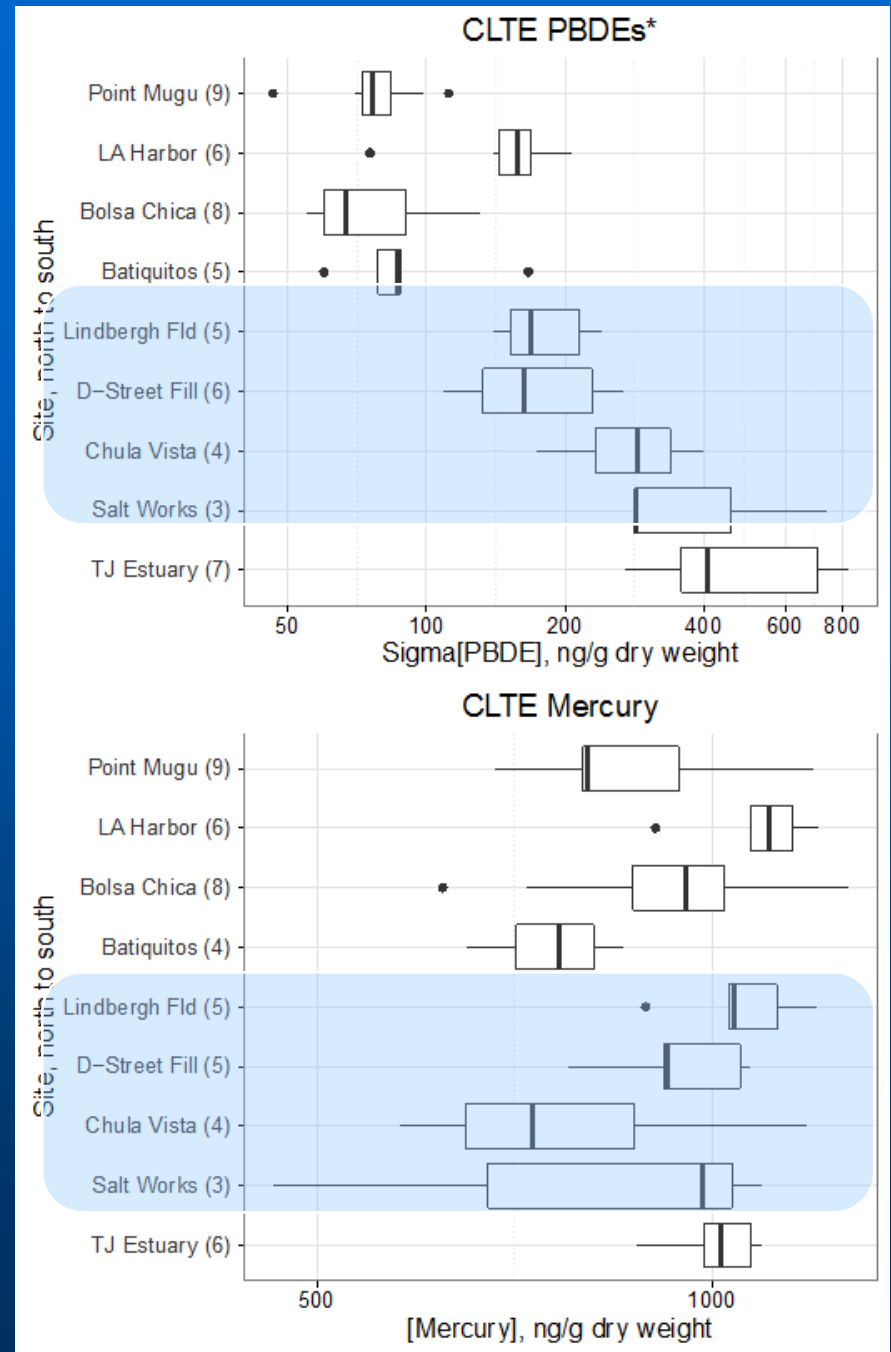
Bight Regional Pattern: Bird Eggs

- Greater PCB exposure in the Bay than most areas
- Low relative DDT exposure



Bight Regional Pattern: Bird Eggs

- Southern trend for PBDE flame retardants
- No spatial trend for mercury
 - Global processes influence exposure



Summary

- **Bioaccumulation among food web components evident for all contaminant types evaluated**
- **Greatest bioaccumulation observed for DDTs and PCBs**
- **Differences among Bay regions were relatively small and variable**
 - Central fish generally more contaminated
 - North sediments contain more industrial contaminants
- **Round stingray among the most contaminated fish for PCBs**

Workshop Agenda

- **Study overview – Steve Bay**
- **Results summary – Steve Bay**
- **Wildlife risk – Katie Zeeman**
- **Human health risk – Steve Bay**
- **Next steps and perspectives**