



Apr 30th, 3:30 PM - 5:00 PM

## Characterizing changes in Puget Sound benthic infaunal invertebrate assemblages: A functional approach

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# **Characterizing Changes in Puget Sound Benthic Infaunal Invertebrate Assemblages: A Functional Approach**

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Salish Sea Ecosystem Conference

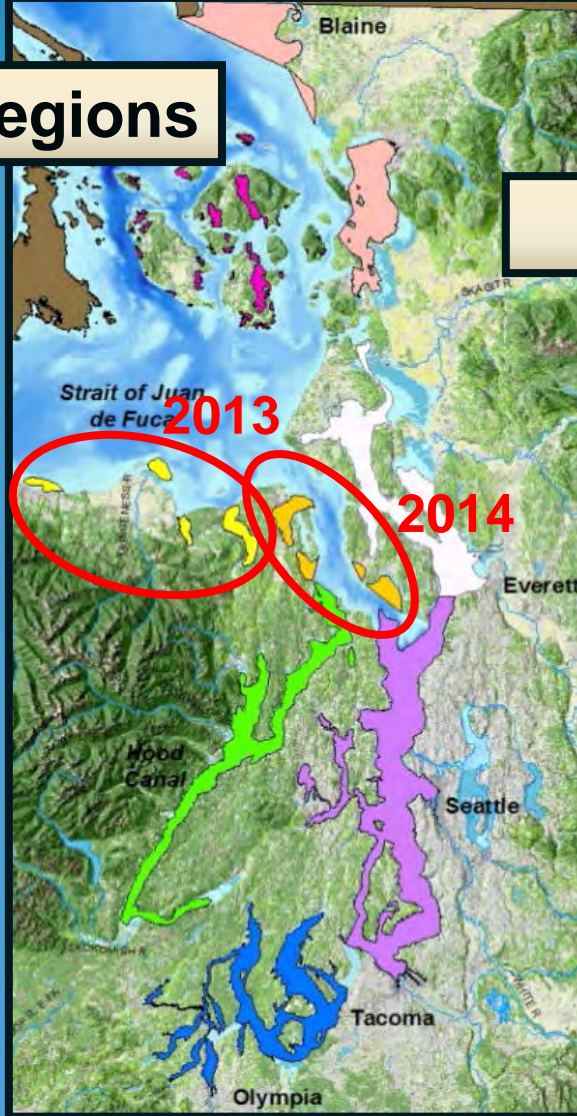
April-May 2014



PUGET SOUND ECOSYSTEM  
MONITORING PROGRAM

8 Regions

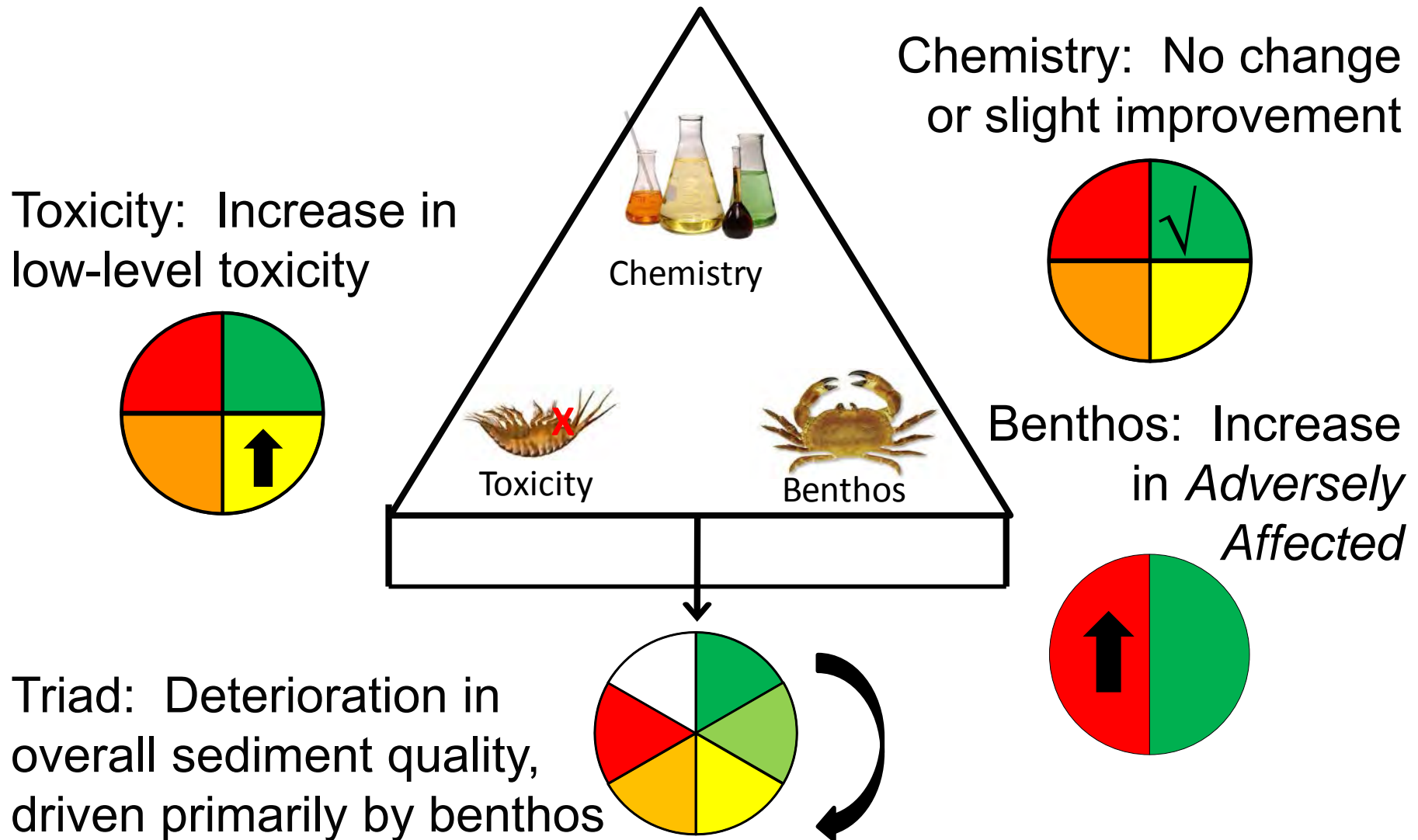
6 Bays



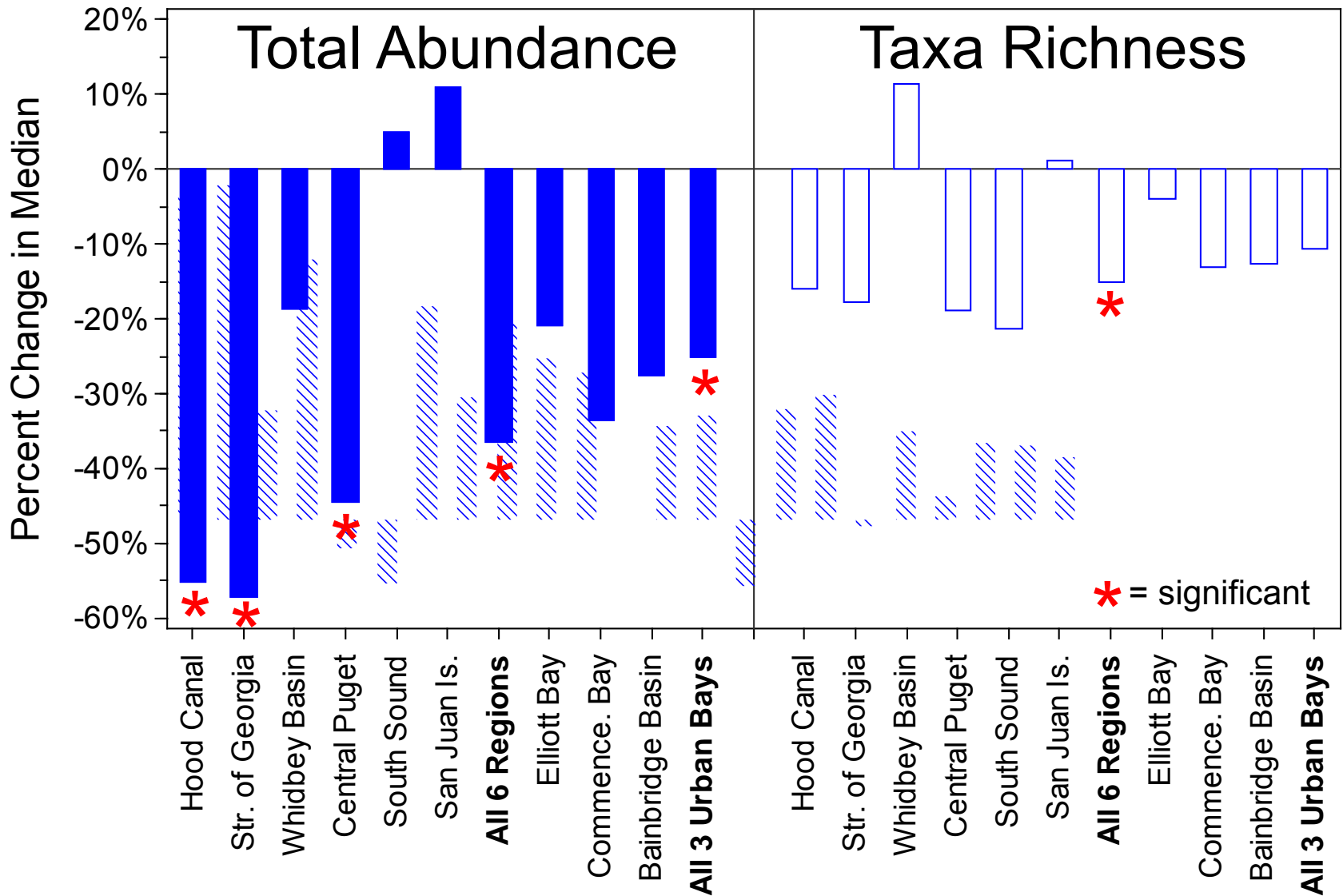
## Spatial Monitoring

- Baseline 1997-2003
- 2<sup>nd</sup> Round 2004-2014
- 10-yr regional and 6-yr urban bay rotation
- Probabilistic, random stratified design
- **Sediment Quality Triad = Chemistry, Toxicity, Benthos**

# Changes in Regions and Bays

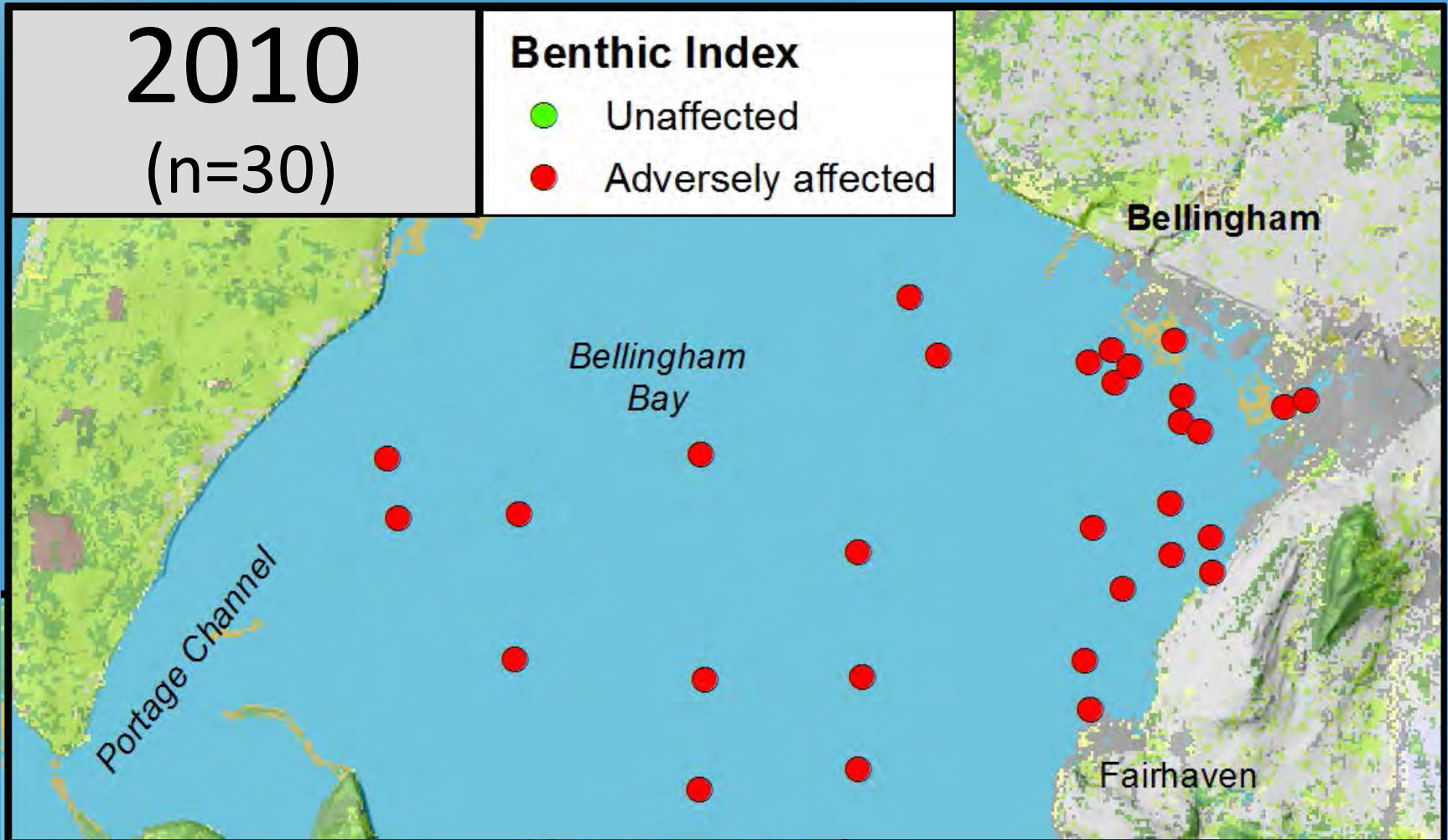


# Declines in Abundance, Richness



# Bellingham Bay 2010

100% *Adversely Affected* benthos

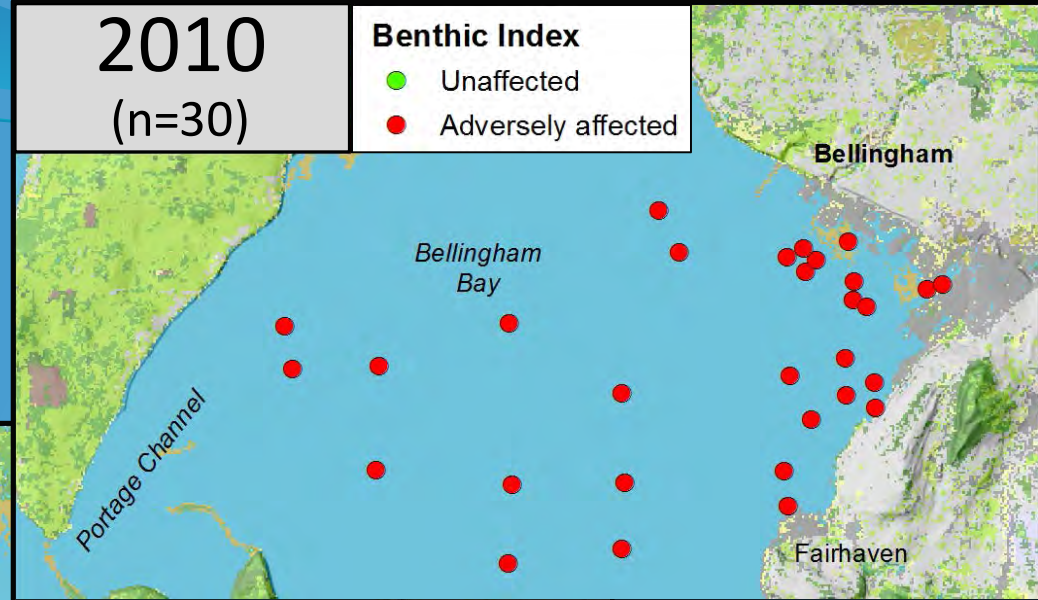


# Change Between 1997 and 2006?

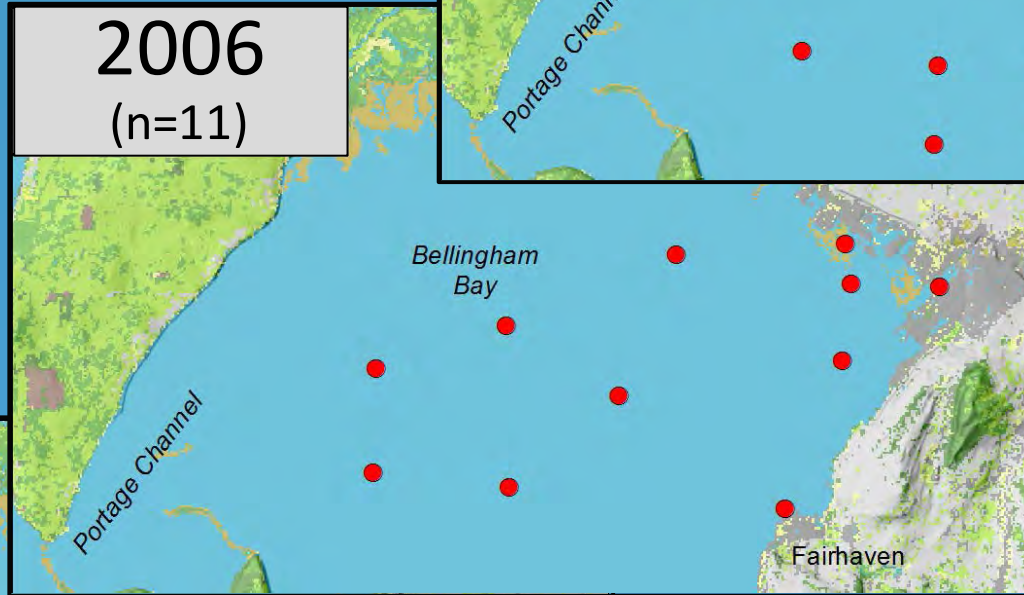
2010  
(n=30)

**Benthic Index**

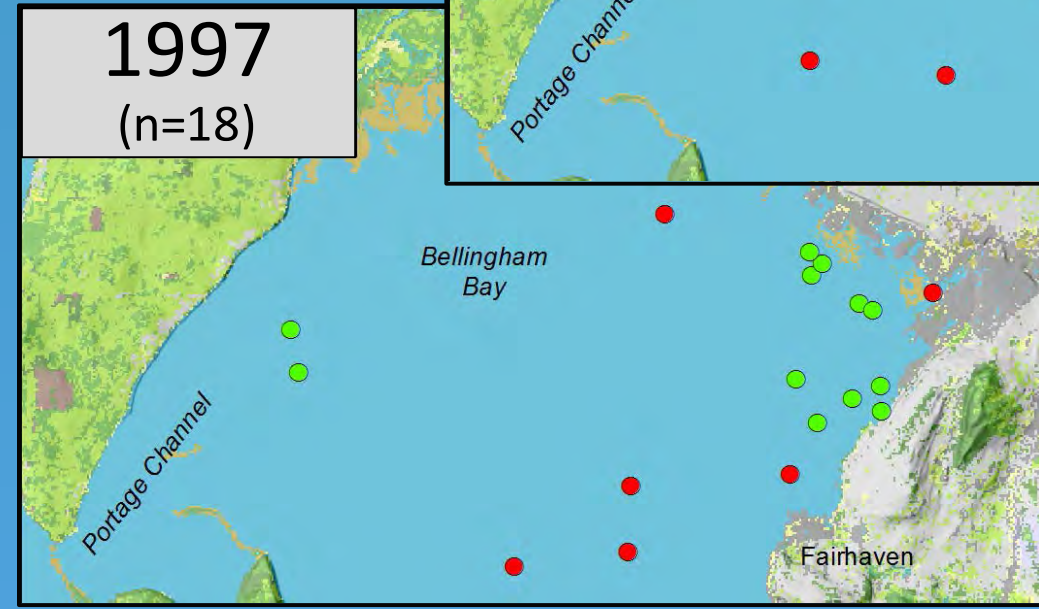
- Unaffected
- Adversely affected



2006  
(n=11)



1997  
(n=18)

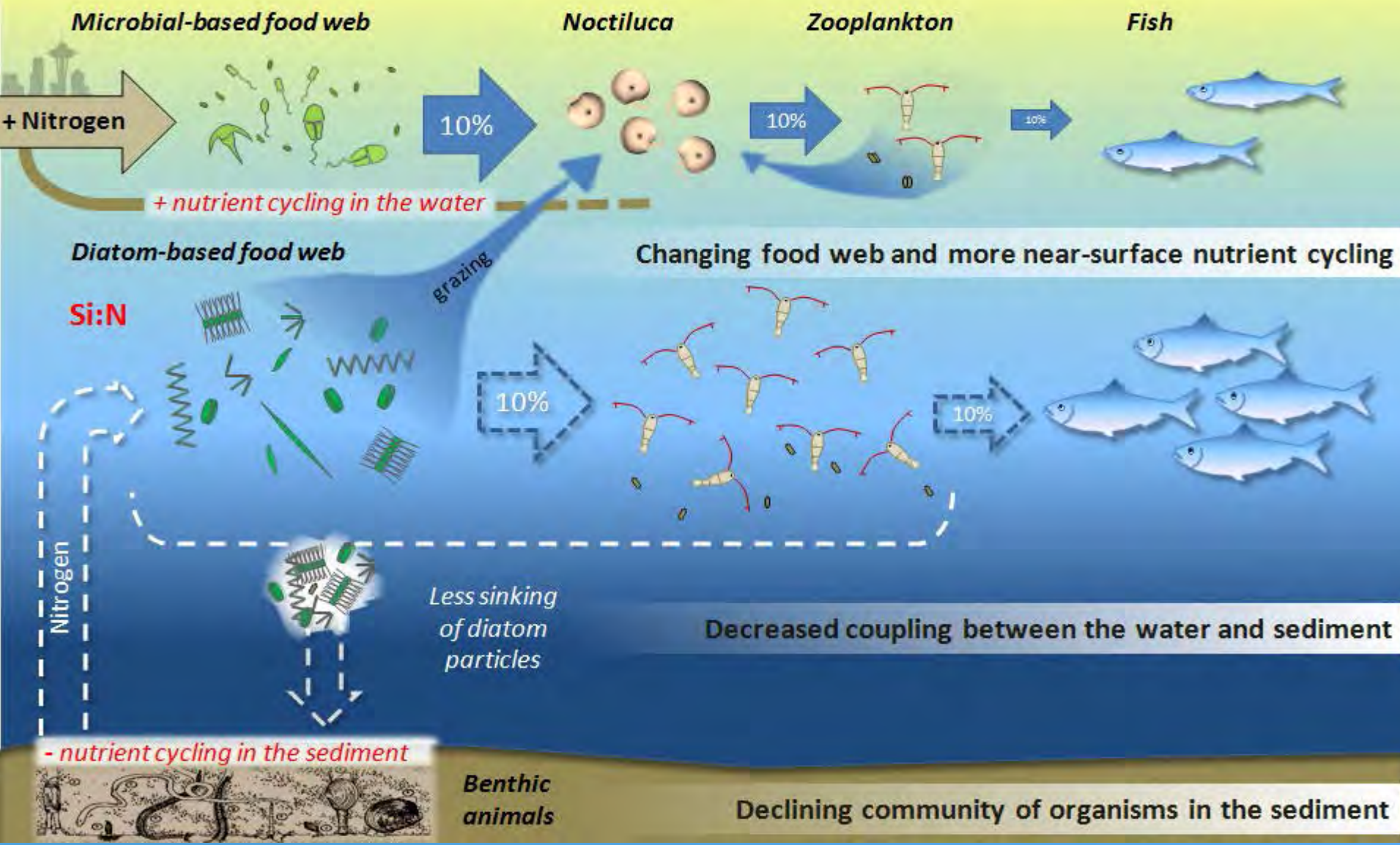


# Correlation of Benthos & Env. Variables

- Bio-Env (PRIMER)
- Input Variables: Metals,  $\Sigma$ PAHs, TOC, Grain Size, Toxicity Index, Depth
- Spearman correlation = 0.53 (all samples)
- Range 0.57 – 0.80 for individual regions/bays
- Top Variables: Depth, Grain Size, Cd, Toxicity Index



# Hypothesis: Changes in the Marine Food Web and Energy Transfer in Puget Sound



# Feeding Guilds (Macdonald et al., 2012)

**Surface  
Detritivore**



*Aphelochaeta* sp N5



*Eudorella pacifica*

**Subsurface  
Detritivore**



*Heteromastus filobranchus*



*Cossura pygodactylata*

**Facultative  
Detritivore**



*Axinopsida serricata*



*Owenia johnsoni*

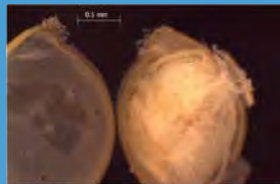
**Benthic  
Carnivore**



*Pholoe minuta*



*Odostomia* sp

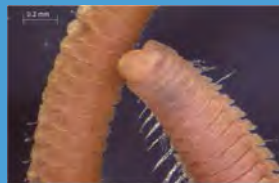


*Euphilomedes carcharodonta*



*Sigambra bassi*

**Facultative  
Carnivore**



*Scoletoma luti*



*Bipalponeptyys cornuta*

**Other:**

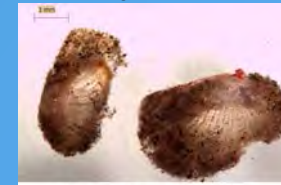
**Suspensivore**

**Herbivore**

**Planktivorous Carnivore**

**Macro-Omnivore**

**Suspensivore**

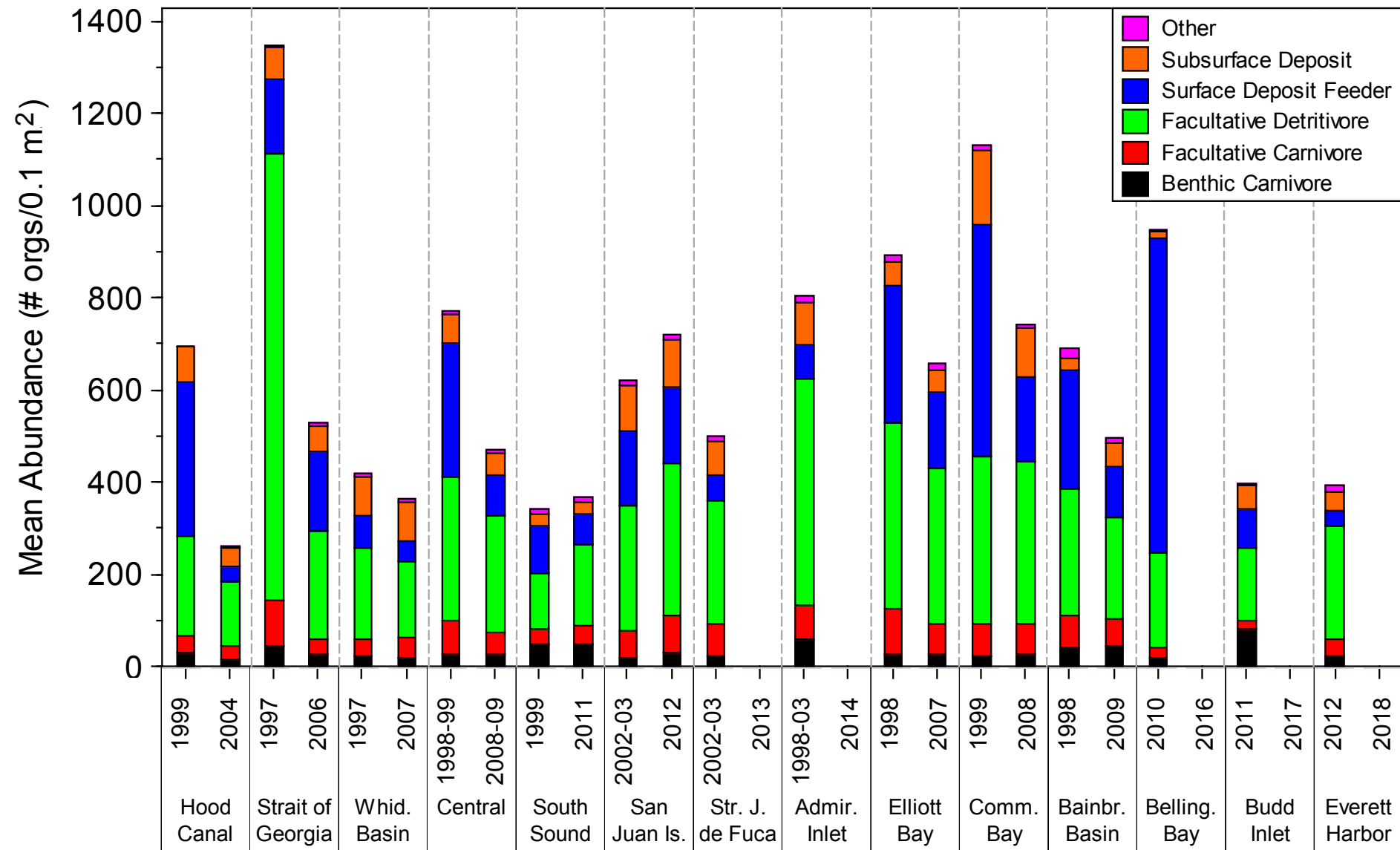


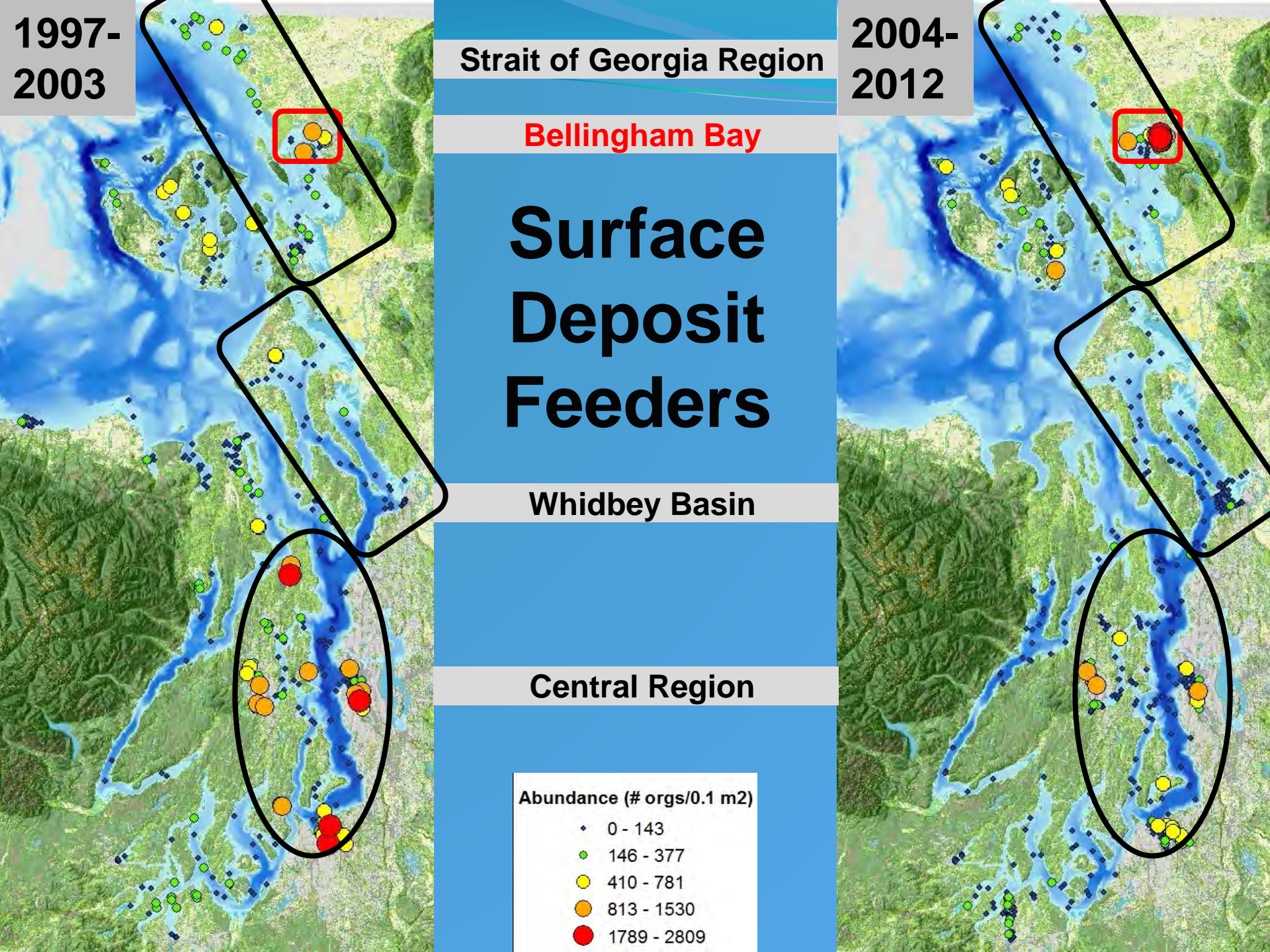
*Lyonsia californica*

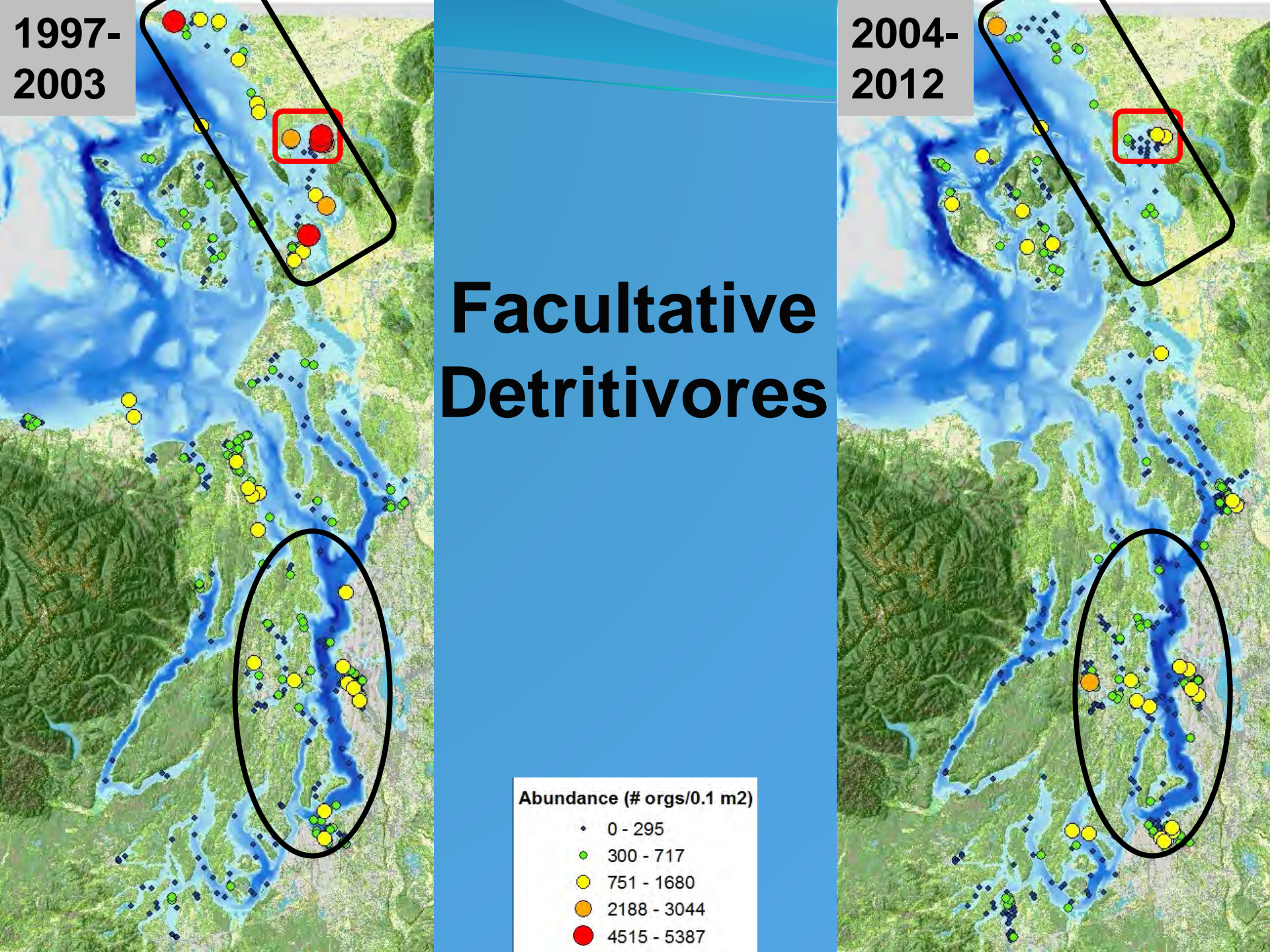


*Lumbrineris californiensis*

# Mean Abundance of Major Feeding Guilds by Regions/Bays







# Other Possible Mechanisms?

- Low DO in porewater and at sediment/water interface
- Ammonia/sulfides
- Changing pH
- Contaminants
  - Point/nonpoint
  - Contaminants of Emerging Concern
  - Slow migration to deeper areas
  - Delayed population-level effects
- **Natural cycles**

