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Lessons from long time-series of benthic invertebrate communities in the southern Salish Sea, and an expansion of parameters to assess nutrient loading and climate change pressures

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Partridge, Valerie; Dutch, Margaret; Weakland, Sandra; Burgess, Dany; and Eagleston, Angela, "Lessons from long time-series of benthic invertebrate communities in the southern Salish Sea, and an expansion of parameters to assess nutrient loading and climate change pressures" (2018). *Salish Sea Ecosystem Conference*. 539.

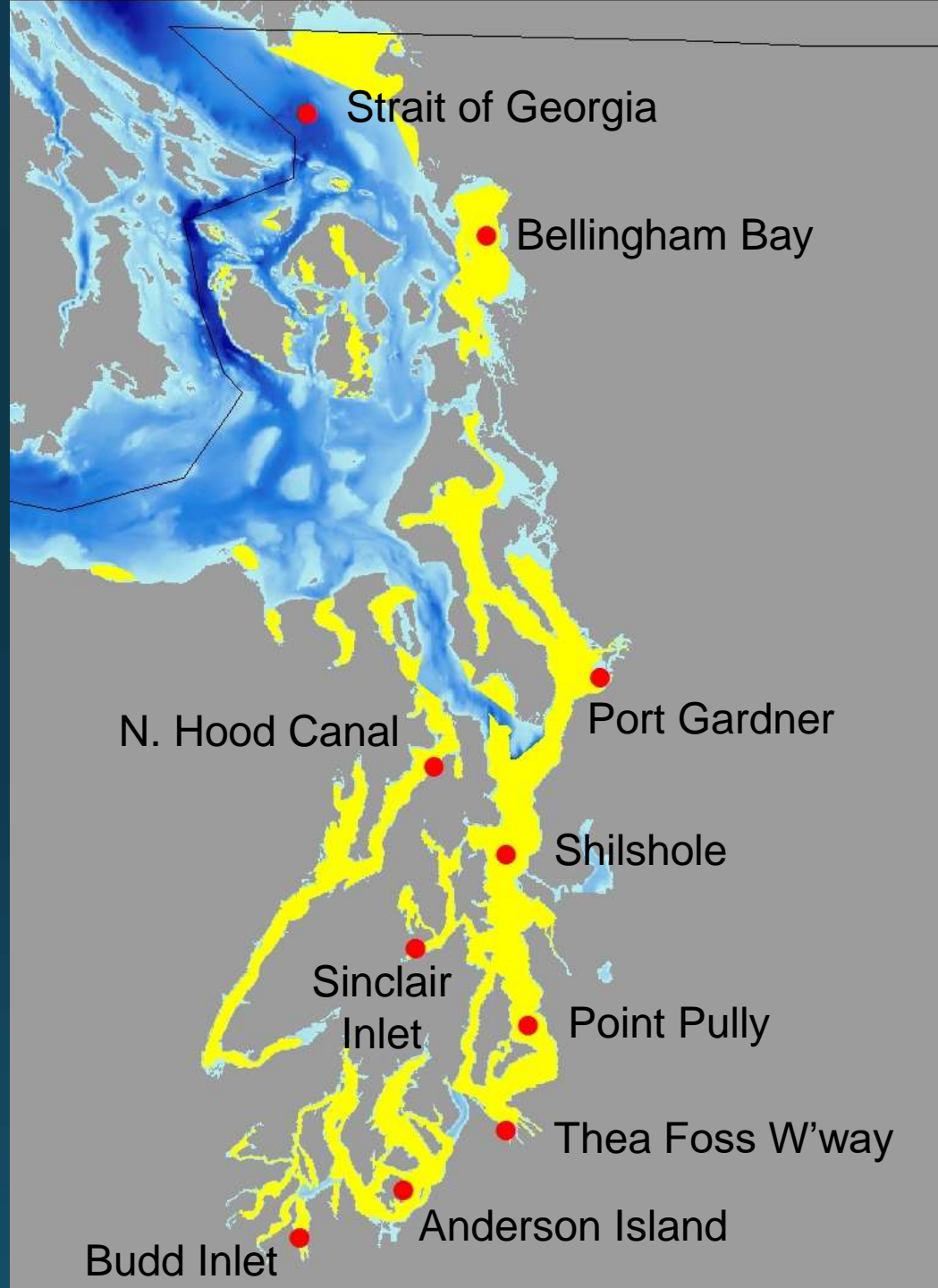
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Lessons from long time-series of benthic invertebrate communities in the southern Salish Sea

Valerie Partridge*, Margaret Dutch, Sandra Weakland,
Dany Burgess, and Angela Eagleston



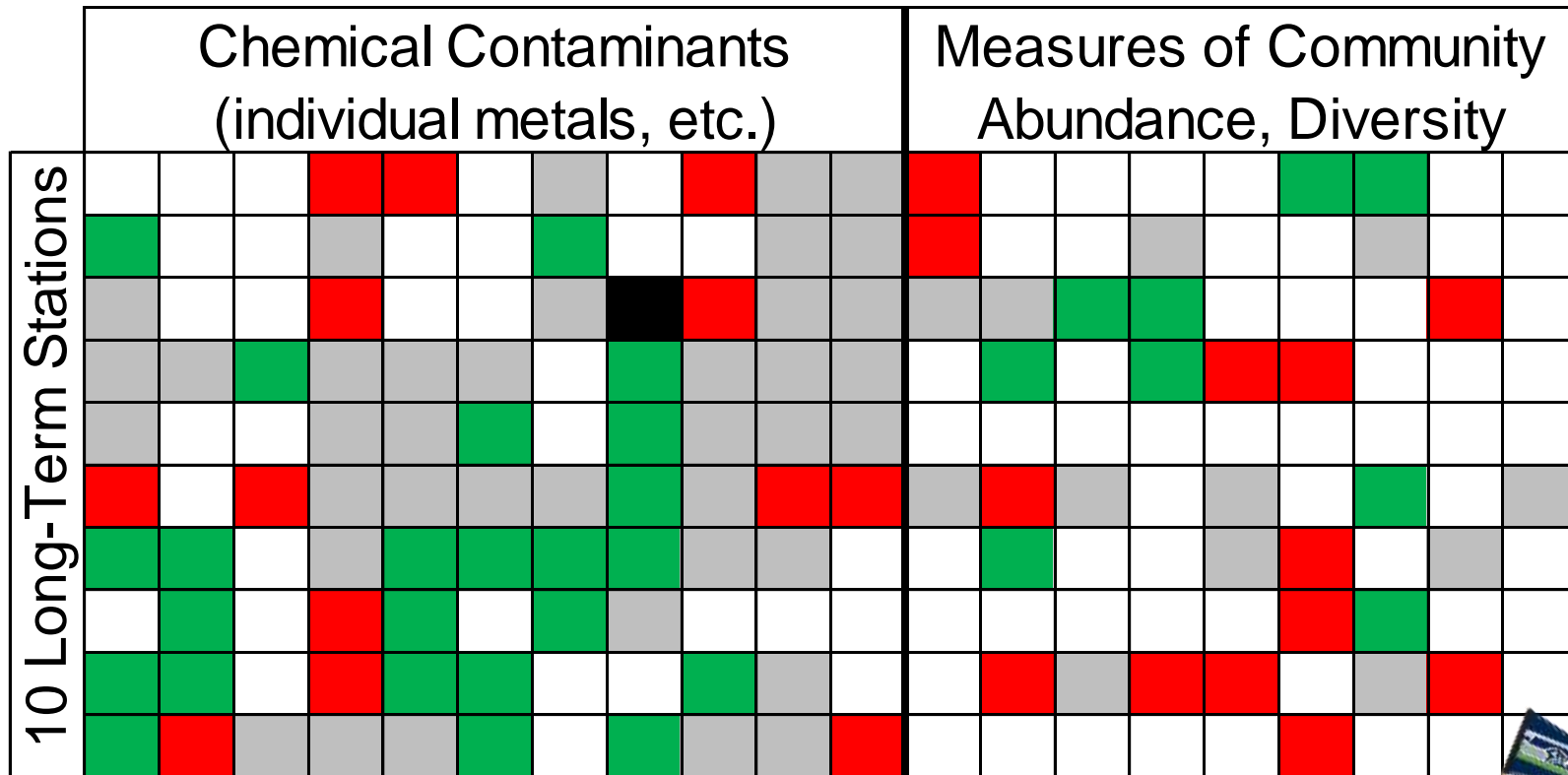
10 Long-term stations

- Sampled annually
1989 - 2015+
- Variety of habitats
 - depth
 - grain size
 - human influence
- Distinct benthic communities

What have we learned in ~30 years?

- Trends are complex
- Some communities remarkably stable; others unstable/impaired
- Context important
 - both spatial and temporal

Complex trends over time



Each square = 27-year trend at 1 station for 1 parameter

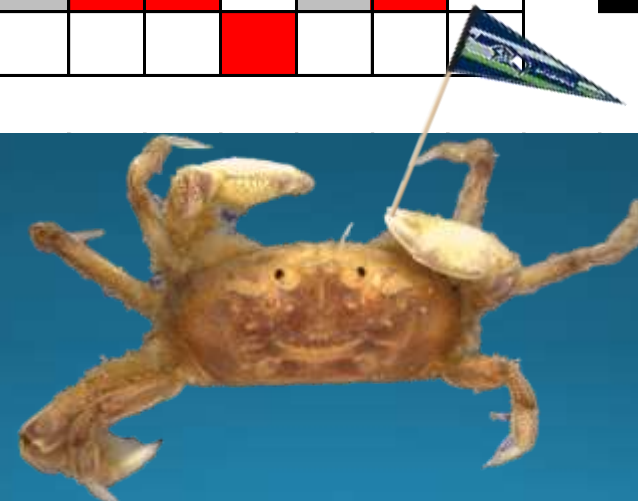
 improvement

 deterioration

 mixed up/down

 no change

 all nondetect



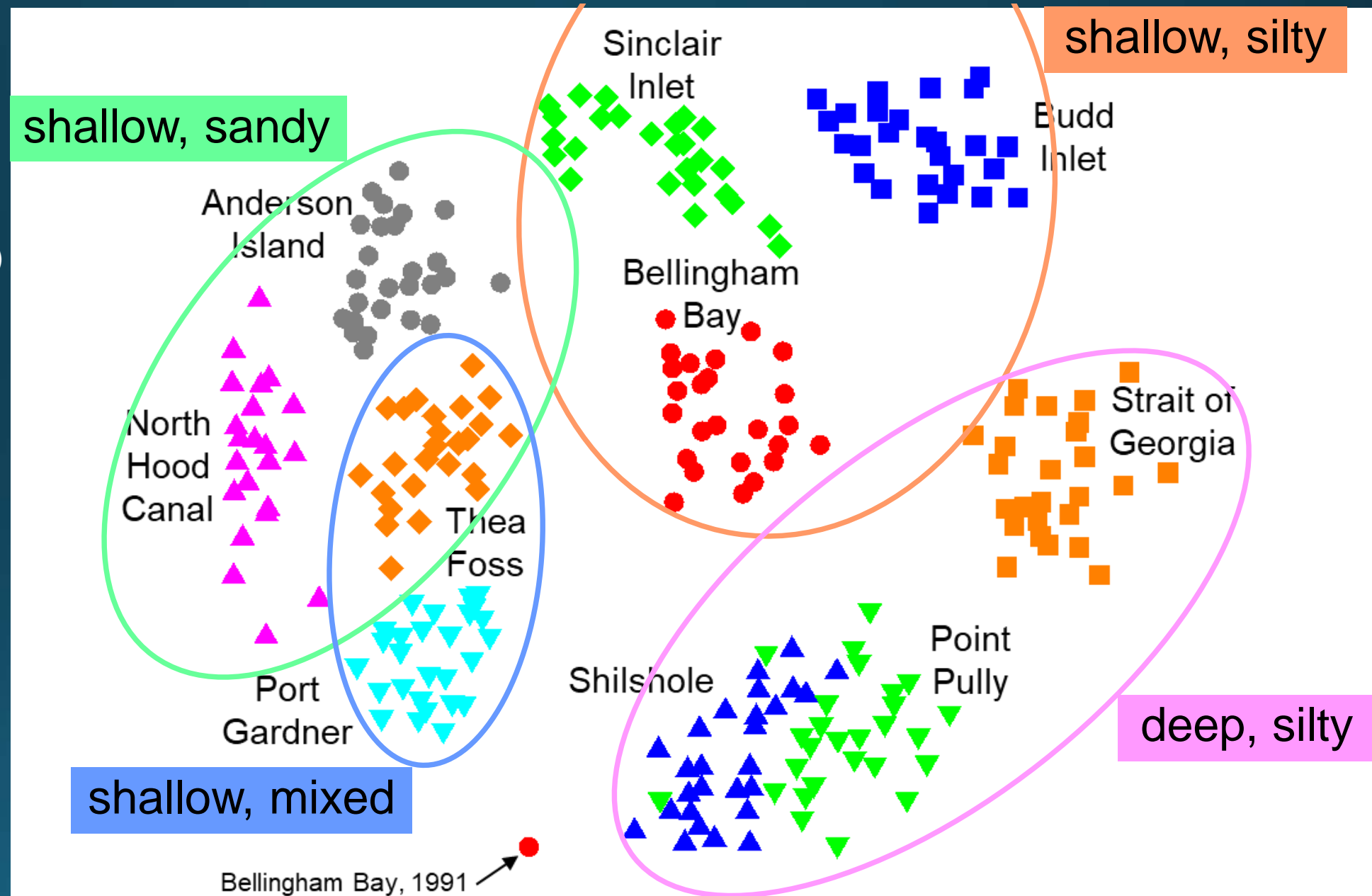
Community similarities

Each symbol =
1 station in 1 year

Closeness = similarity
(both species & abundance)

Years within
stations

Stations within
habitat types

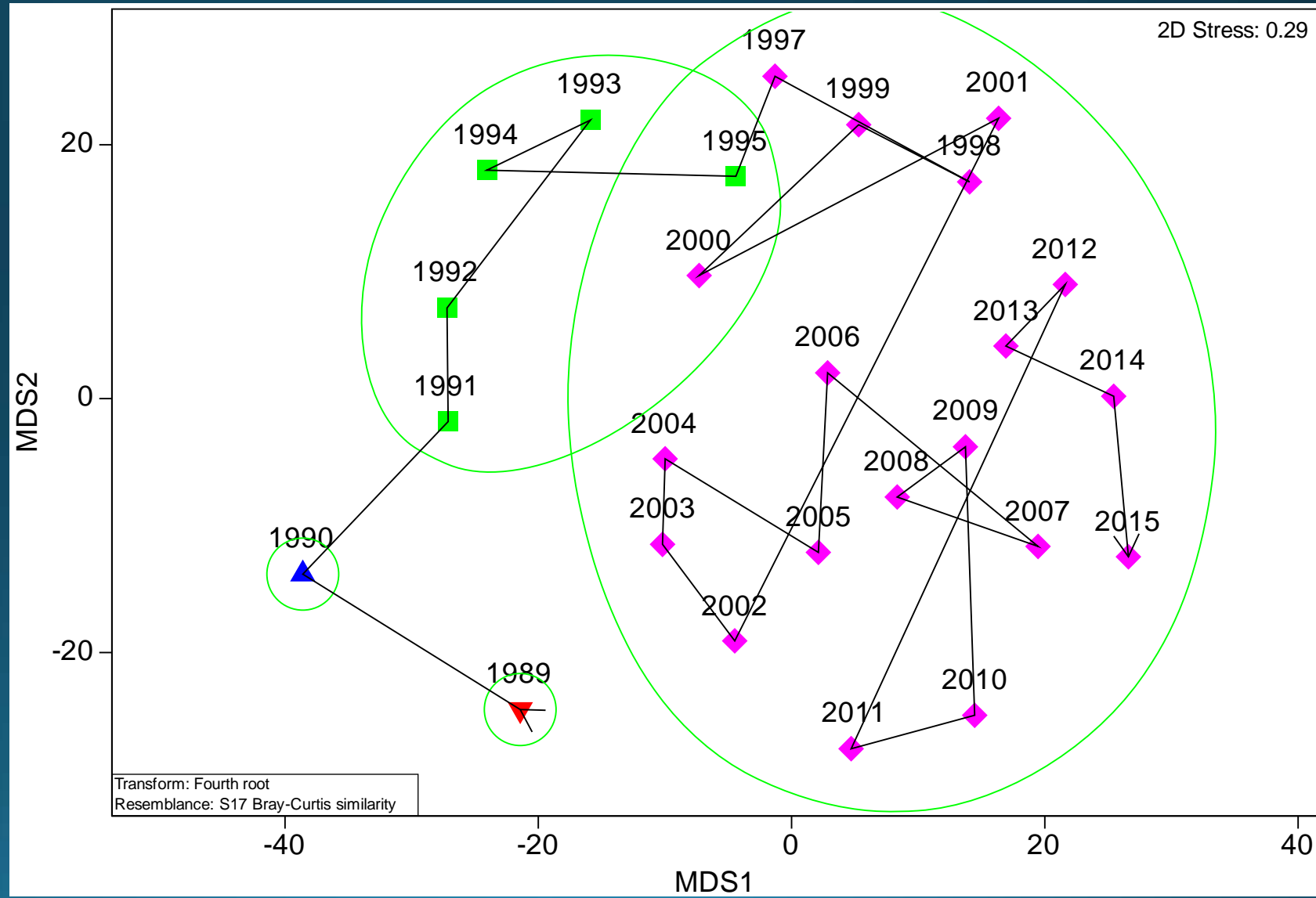


Community shifts over time

Example: Thea Foss Waterway

Statistically similar years
have same symbol

Community shifts
possibly related to
cleanups?



Functional feeding guilds - stable community

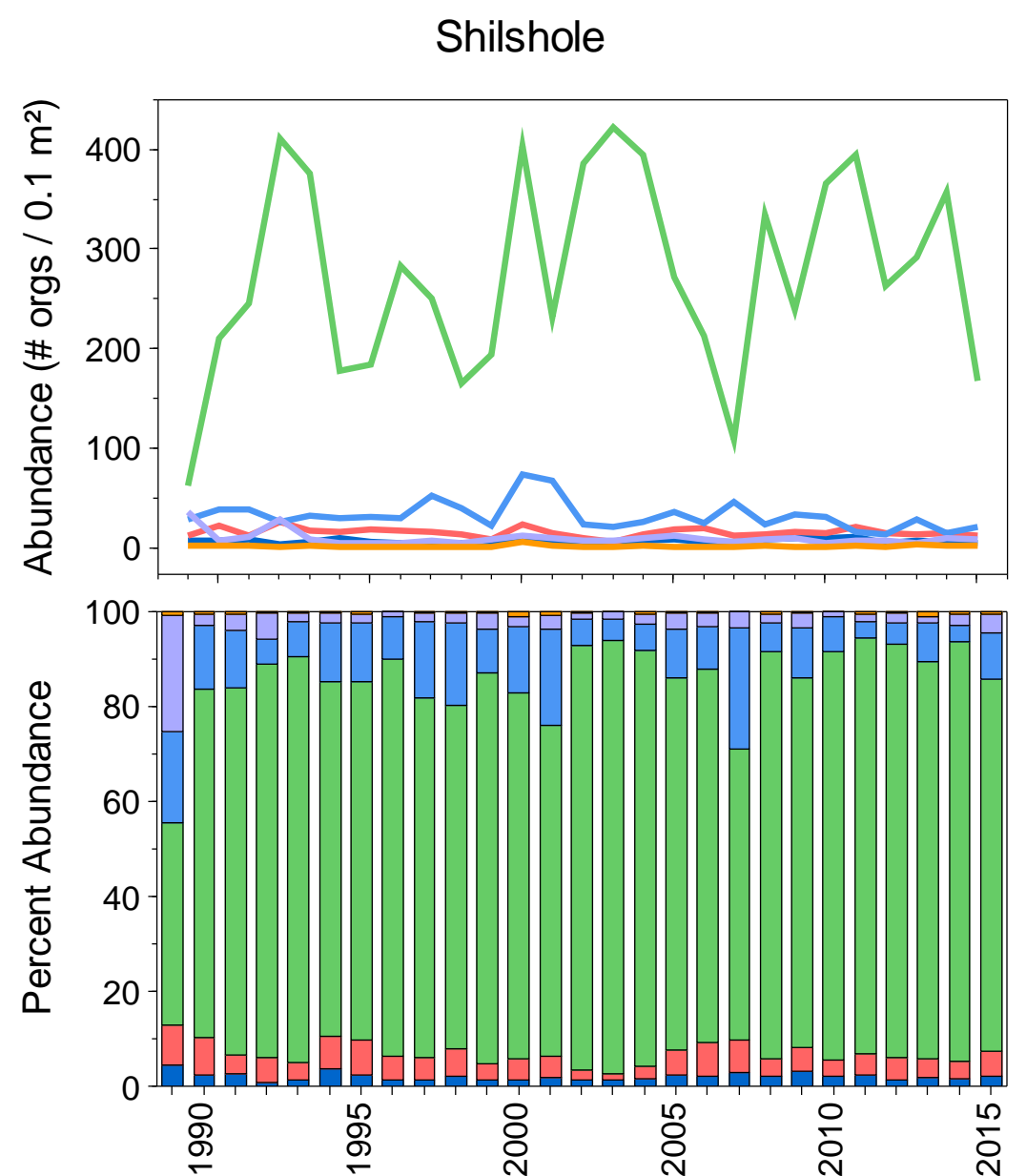
- Integrate what/where/how organisms eat
(Macdonald et al., 2010, 2012)

Within feeding guild

- Abundance varies
- Species composition varies

Across feeding guilds

% Abundance ~ constant
→ functions conserved



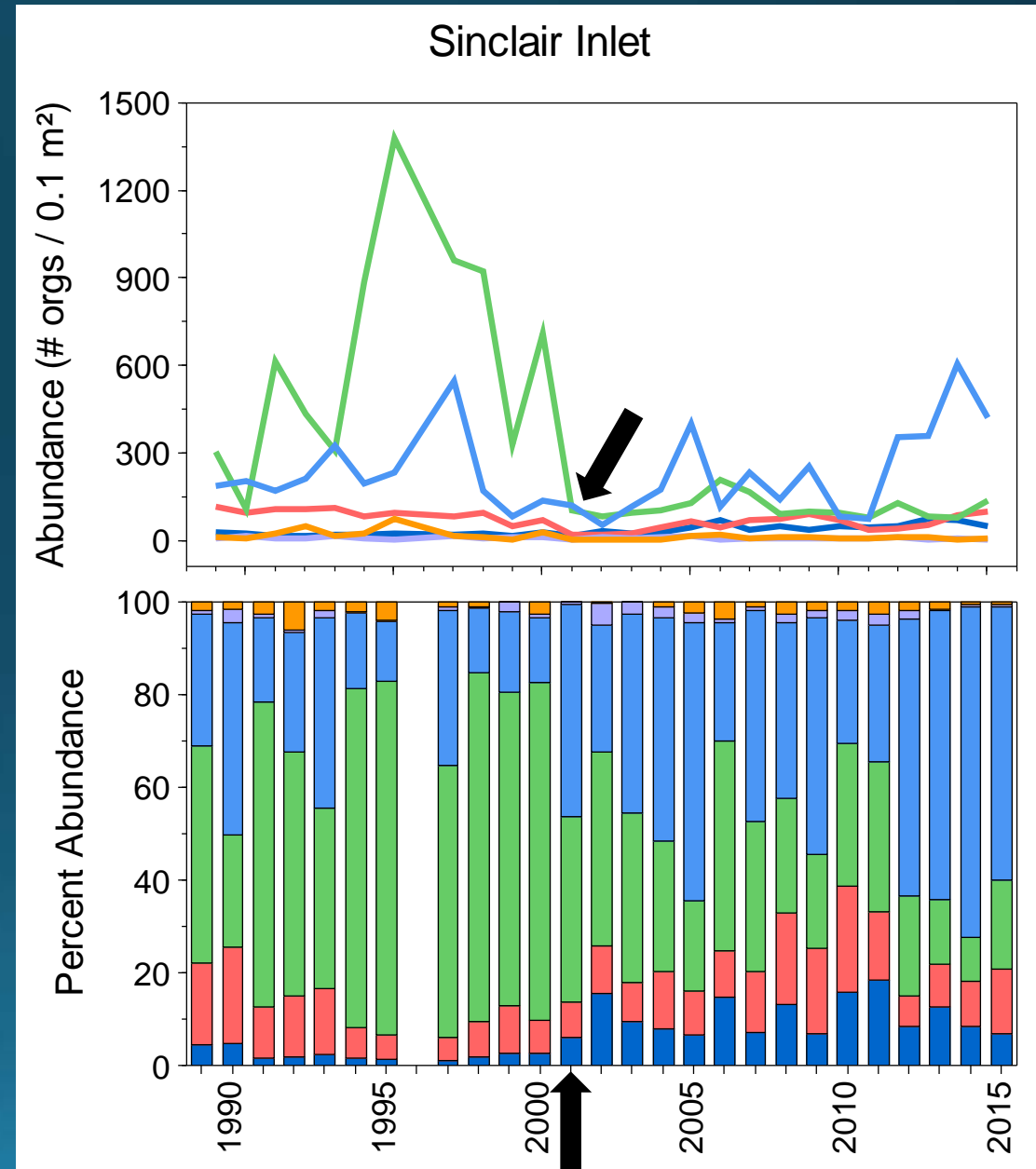
Functional feeding guilds - known impacted site

Disturbance →
community changed

- abundance
- species

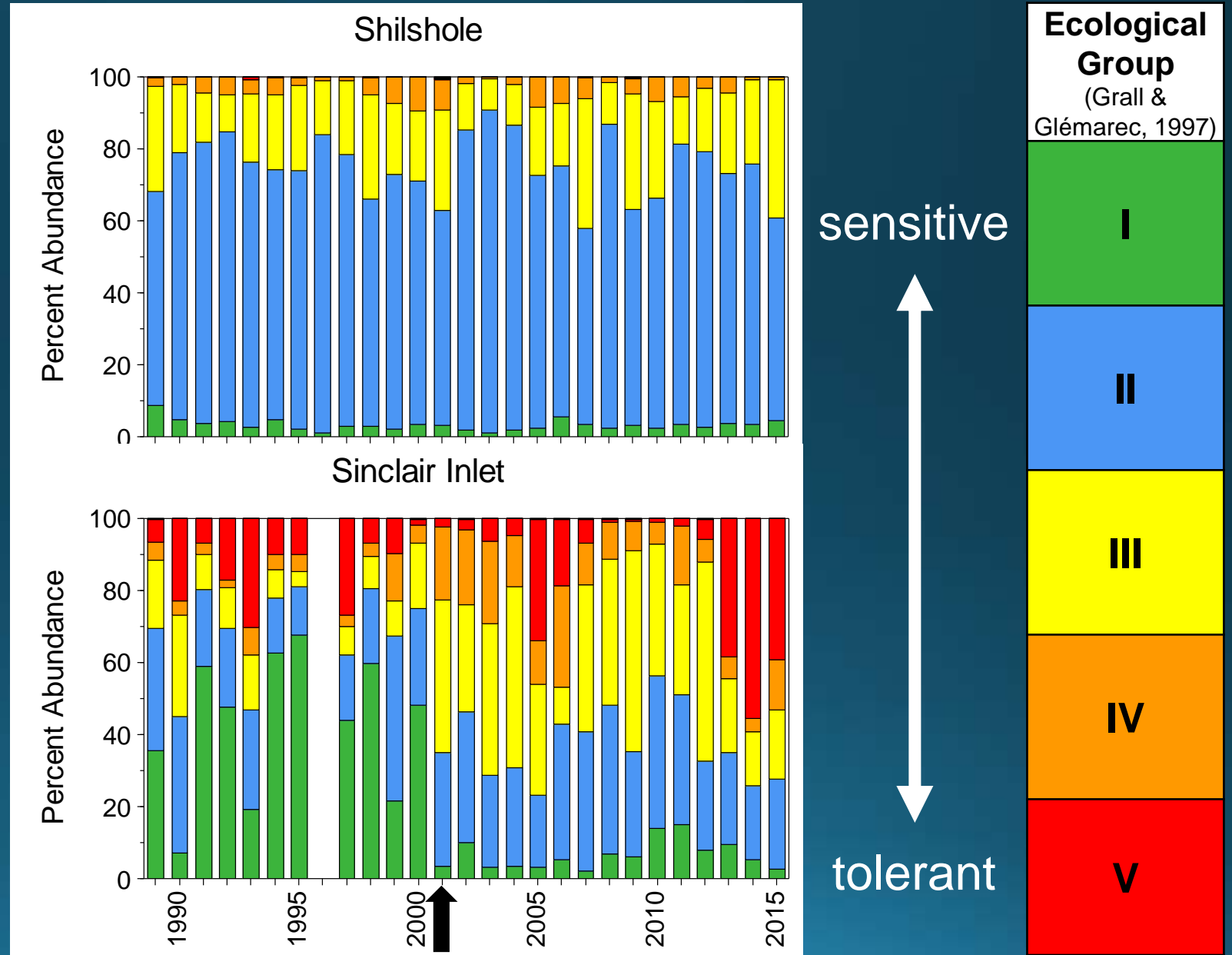
→ Feeding guilds
continue to change

→ Functions impaired



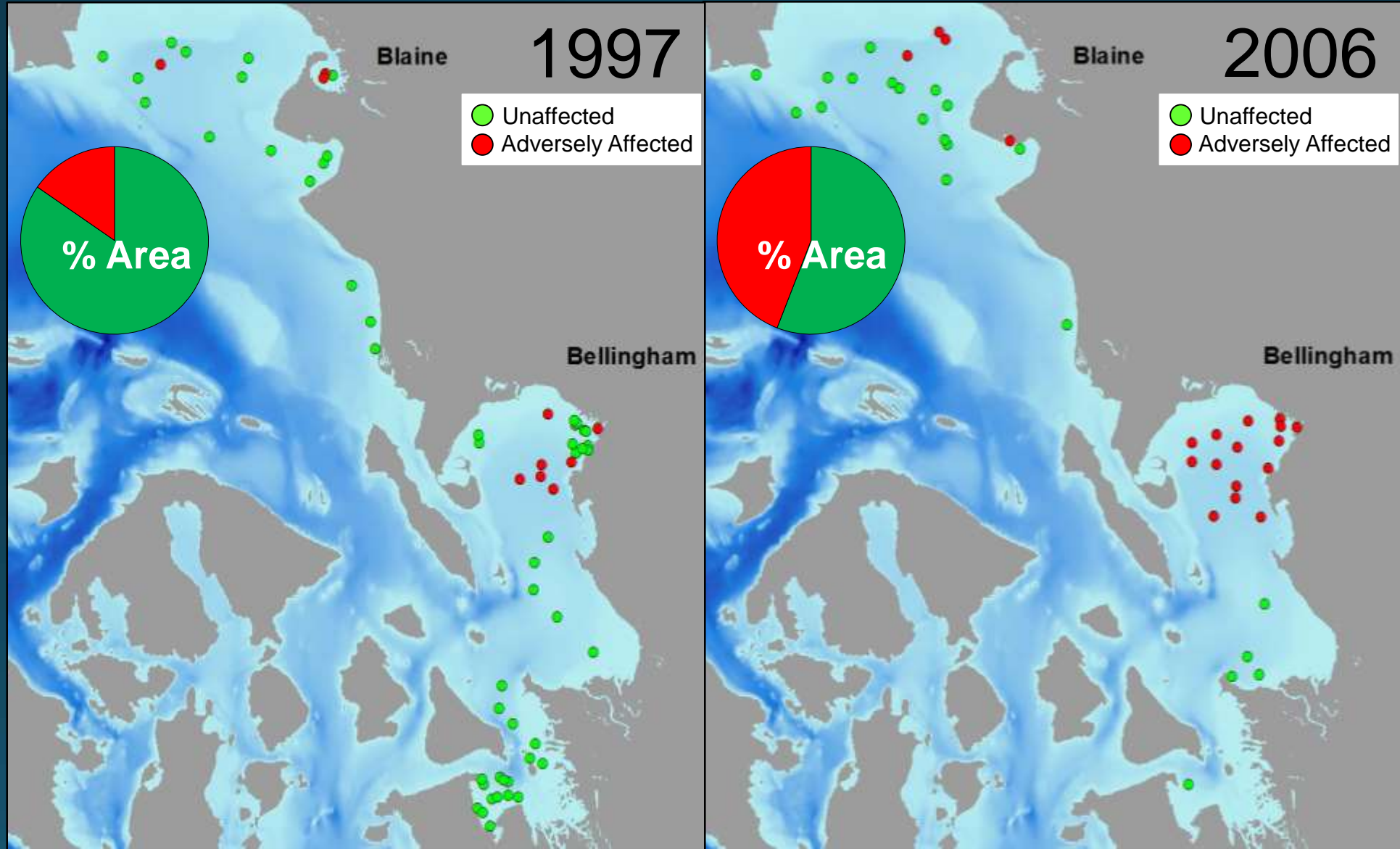
Sensitive – Tolerant Taxa

- Basis of multi-metric indices (e.g., AMBI)
- No change where community stable
- Sensitive taxa ↓ , tolerant taxa ↑ in impaired community

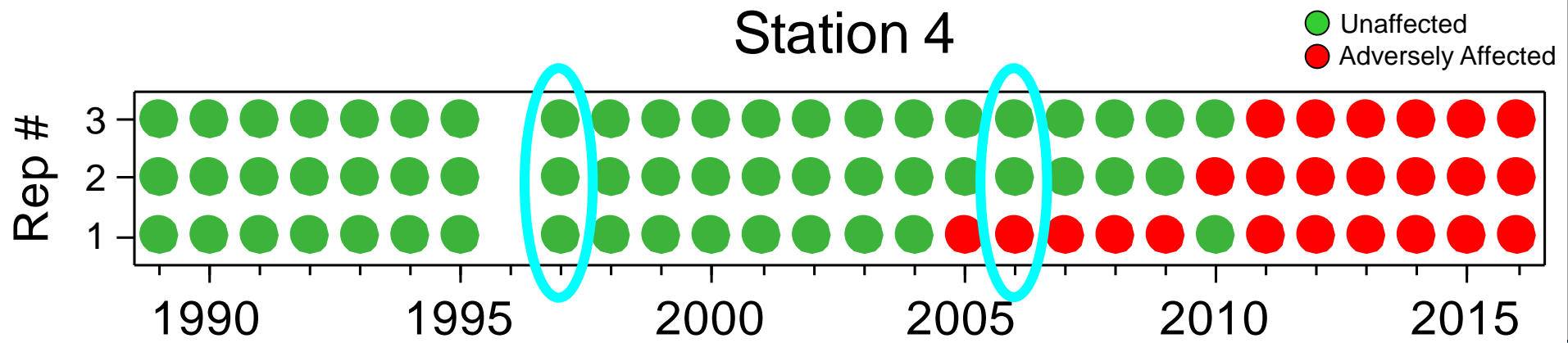
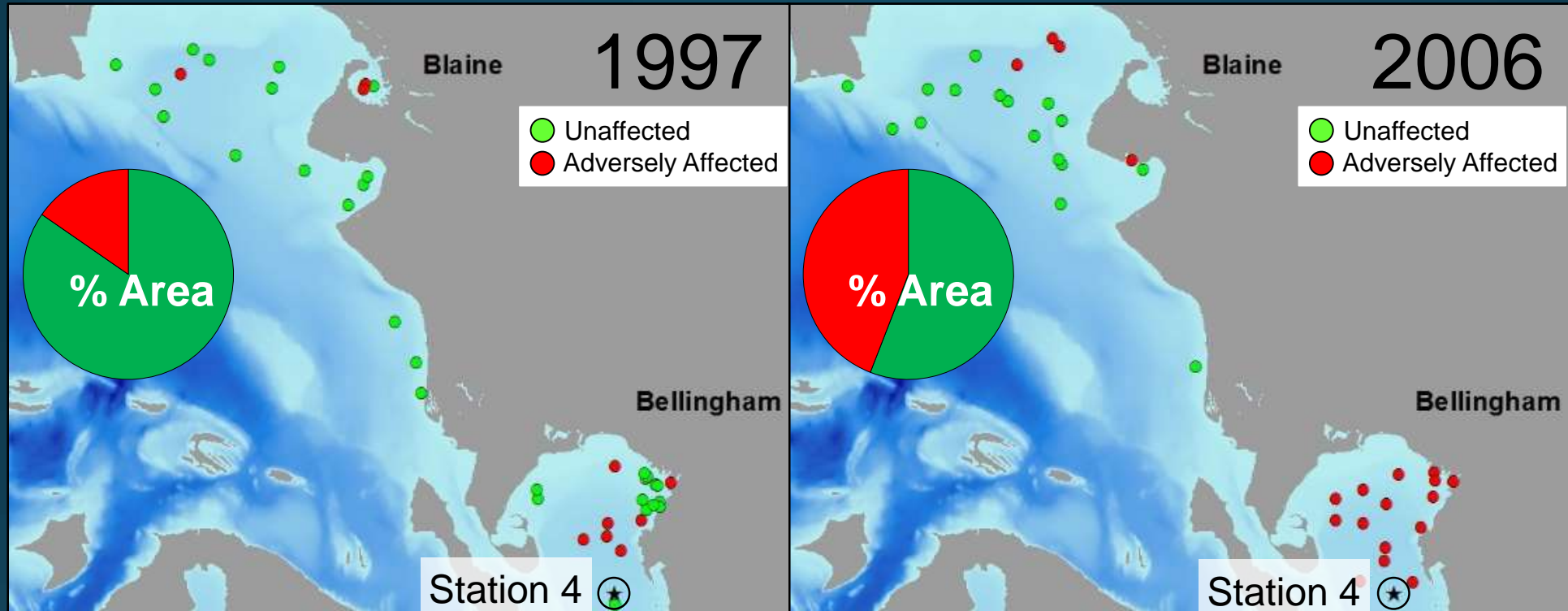


Regional results comparison

Example: Strait of Georgia region



...and Long-Term station



Regional changes vs. long-term trends

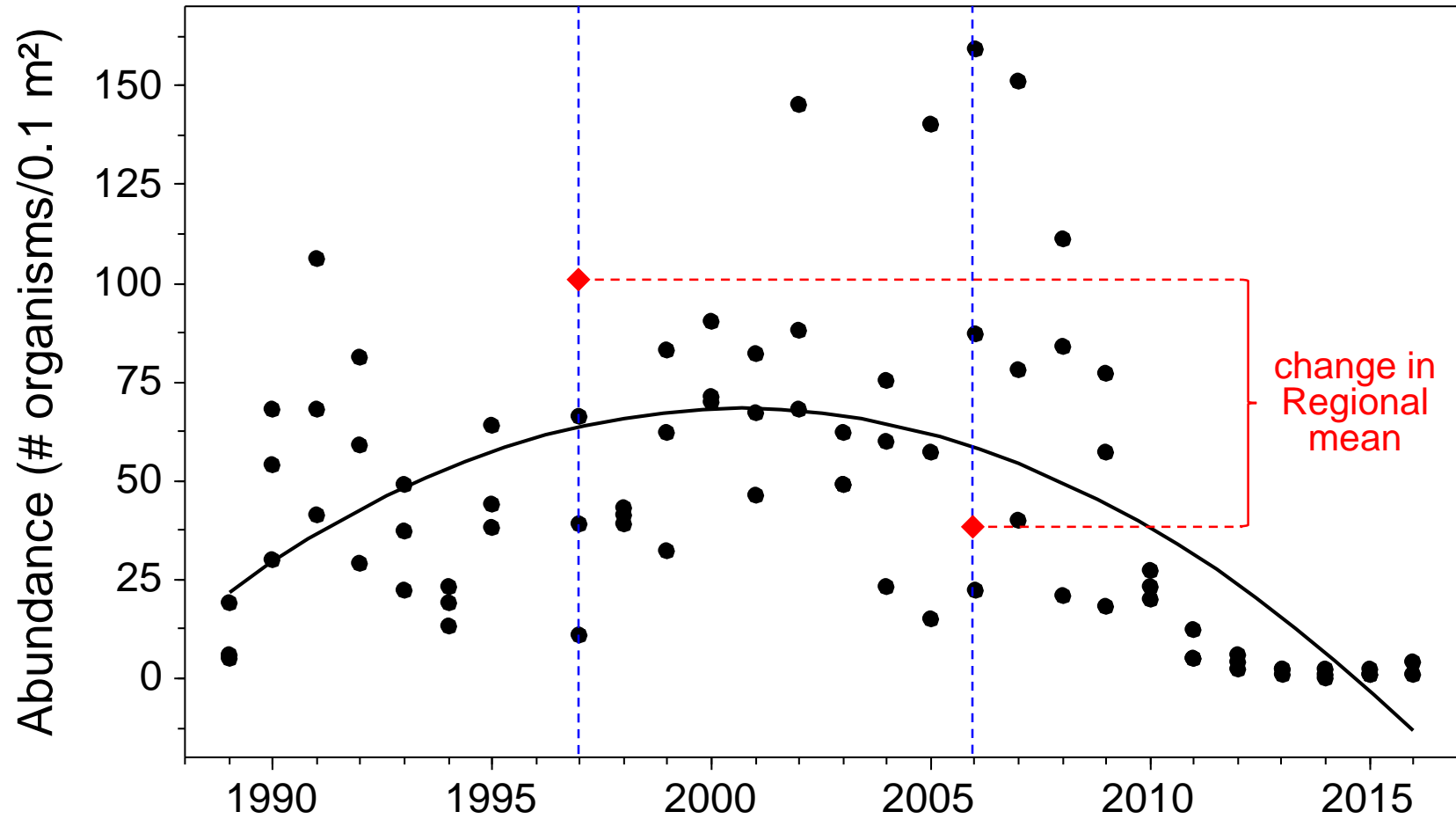
Measures of abundance & diversity

Sometimes different picture

	CHANGE	TREND	
	Str Georgia region 1997 vs. 2006	Bellingham Bay station 1989-2015	
Total Abundance	▼	▲	■ improvement
Taxa Richness			■ deterioration
Evenness	■		□ no change
Dominance	■	■	■ mixed up/down trend
Annelids	▼		▲ increase
Arthropods	■		▼ decrease
Echinoderms	■	■	
Molluscs			
Misc. Taxa			

Regional changes vs. long-term trends

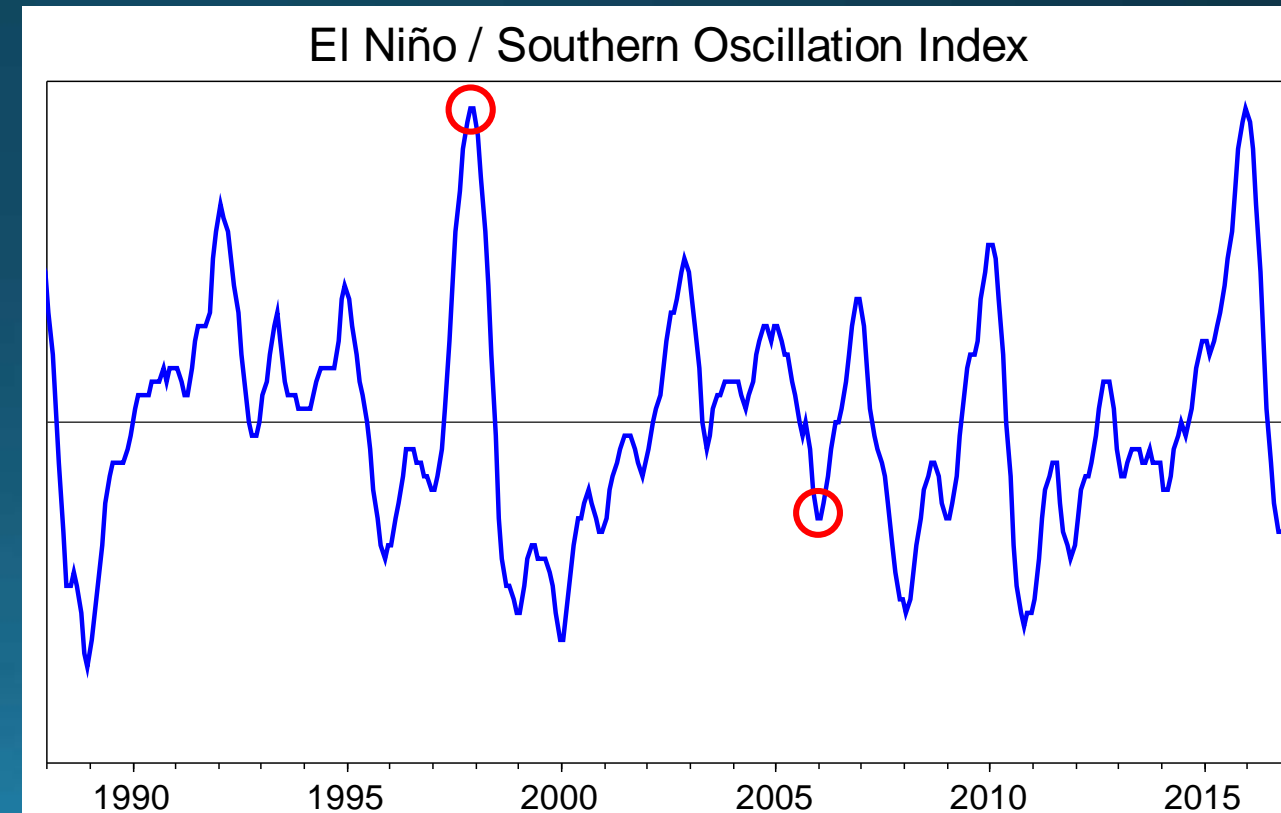
Echinoderm Abundance, Bellingham Bay station



Regional changes vs. Long-term trends

- Sample sizes
 - local variability
- Timing
 - natural cycles
 - before vs. after bloom
- Confounding
 - spatial
 - temporal

	Region	LT Station
Space	40+	1
Time	2	27
Replicates	1	3



A few more thoughts

- Regional vs. Long-term
 - Complement each other
 - Best of both → new design
- Unique, very important dataset