

# Impacts of rockfish and lingcod on benthic community structure in the San Juan Islands

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Kevin Turner and Ken Sebens  
Friday Harbor Labs, UW

# Temperate seas – kelp forests

## Alaska/California

## New Zealand

Predator



Herbivore



Producer



**Top-down impact – Where predators are absent, herbivores create foraging fronts, eliminating kelp forests.**

# Temperate seas – Salish Sea

## San Juan Islands

Predator



Herbivore



Producer



**Top-down impact  
– Negligible**

**Introduction** :: Rockfish Diet :: Predator Exclusion :: Community Surveys :: Conclusion

In the absence of kelp control by urchins, is there top-down control of the community?



# San Juan predators



*Ophiodon elongatus*   *Sebastes caurinus*

# Copper rockfish diet

- Copper rockfish are the most abundant demersal predatory fishes we encounter in San Juan Channel
- What are the rockfish in the San Juans feeding on?
- How does this compare to previous studies nearby?
- Can samples be taken without killing the fish?

# Collection

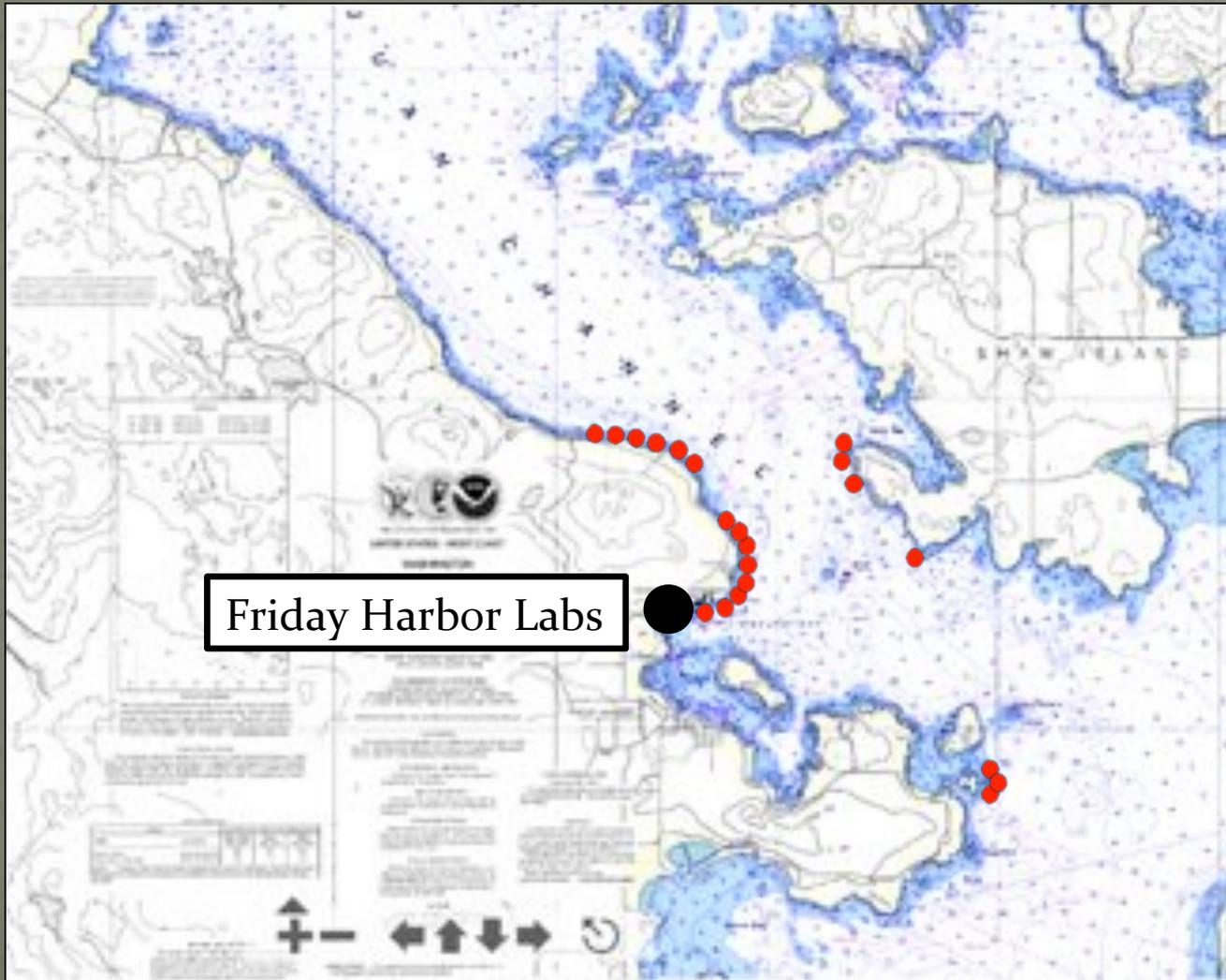
- Angling using lures with a single point barbless hook
  - Minimize capture injuries
- Tried to collect from shallower than 20m
  - Minimize barotrauma
  - Prevent regurgitation of stomach contents
- Collections from October-December 2010

# Collection

37 Individuals

29 Full stomachs

8 Empty stomachs



Introduction :: **Rockfish Diet** :: Predator Exclusion :: Community Surveys :: Conclusion

# Sedation in MS-222 (100mg/L)



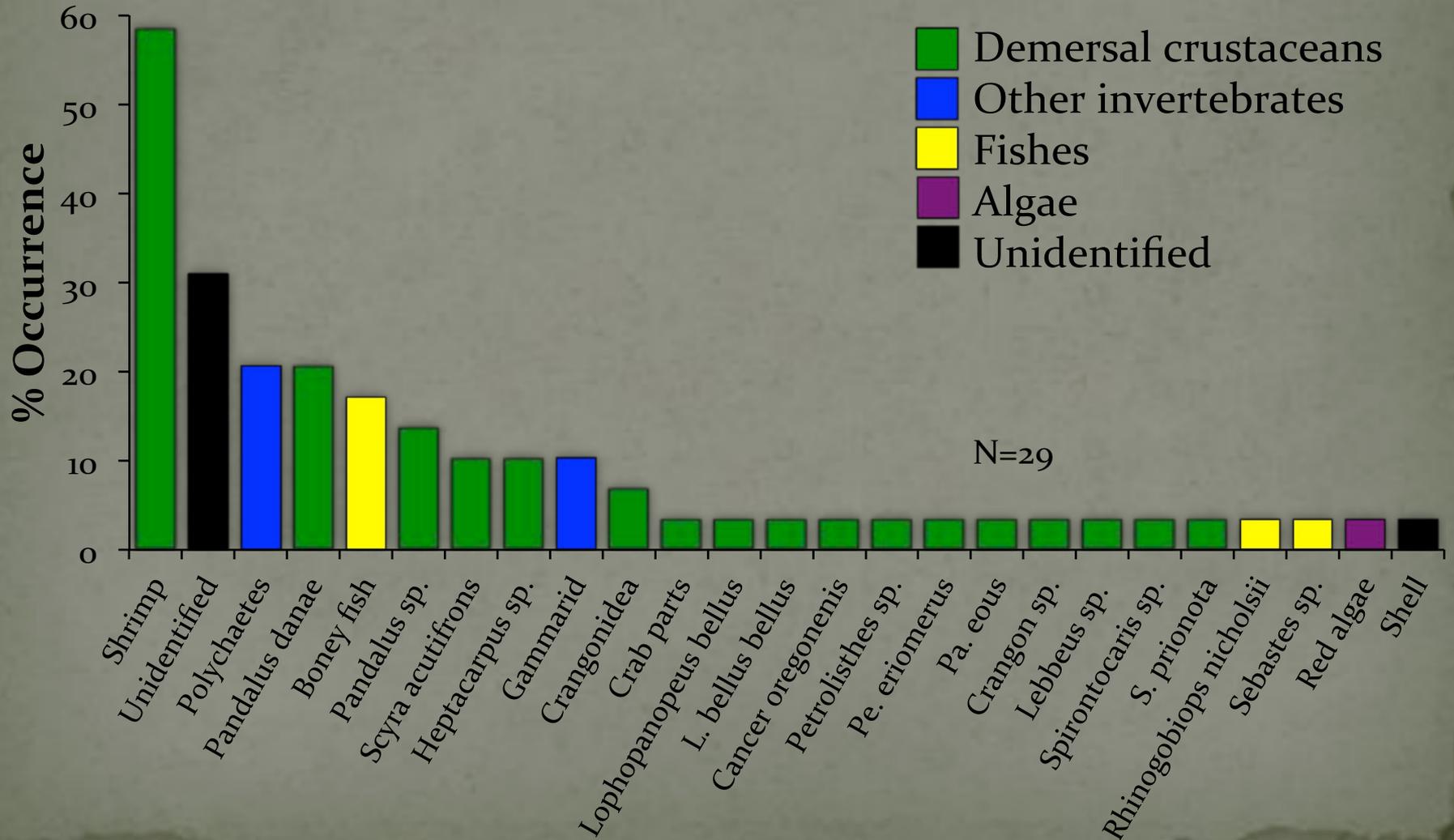




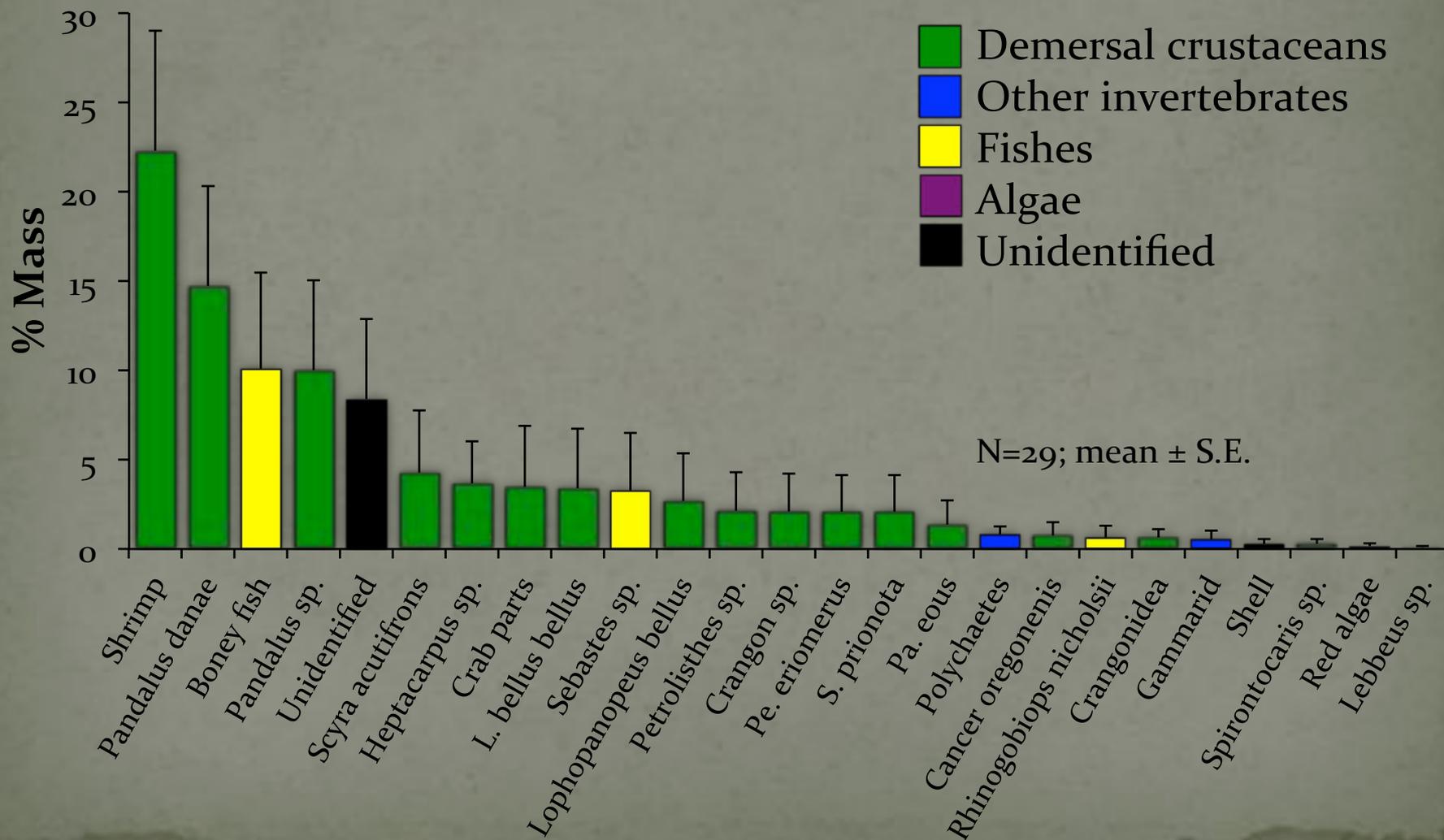
Release



# Diet – prey by % occurrence



# Diet – prey by % mass



# Compare to previous diet studies

- This study shows higher reliance on demersal crustaceans and low reliance on fishes (Patten 1973, Murie 1995)
- Season?
- Size range?
- Depth or region?



# Lavage adequately samples diet

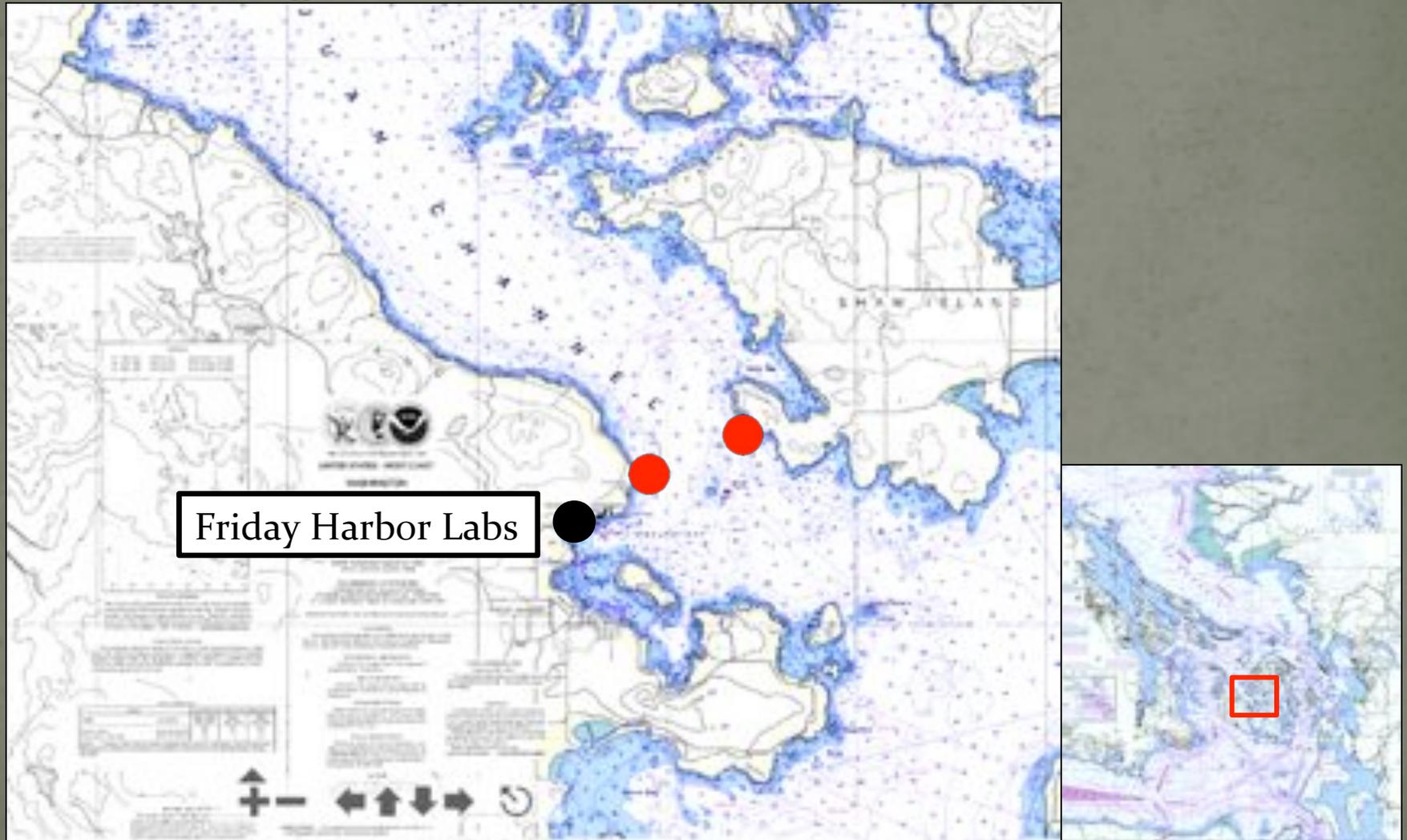
- Advantages
  - Effective – no evidence of remaining food in stomachs
  - Non-lethal – no observed mortality or significant injury
- Disadvantages
  - Must collect from <20m depth
  - Collection by angling limits sample size
  - Lengthy handling time in the field



# Predator exclusion experiment

- Lingcod and rockfish feed on smaller fishes and demersal crustaceans
- Does this predation impact the benthic community...
  - Sculpins and shrimp
  - Mobile mesofauna – amphipods, worms, snails
  - Epibenthos – sessile invertebrates, algae

# Two high-fish locations



# Predator exclusion cages

- 5 blocks at each site
  - 1x2m Caged
  - 1x2m Uncaged
  - 1x2m Control
- Blocks installed at ~20m depth

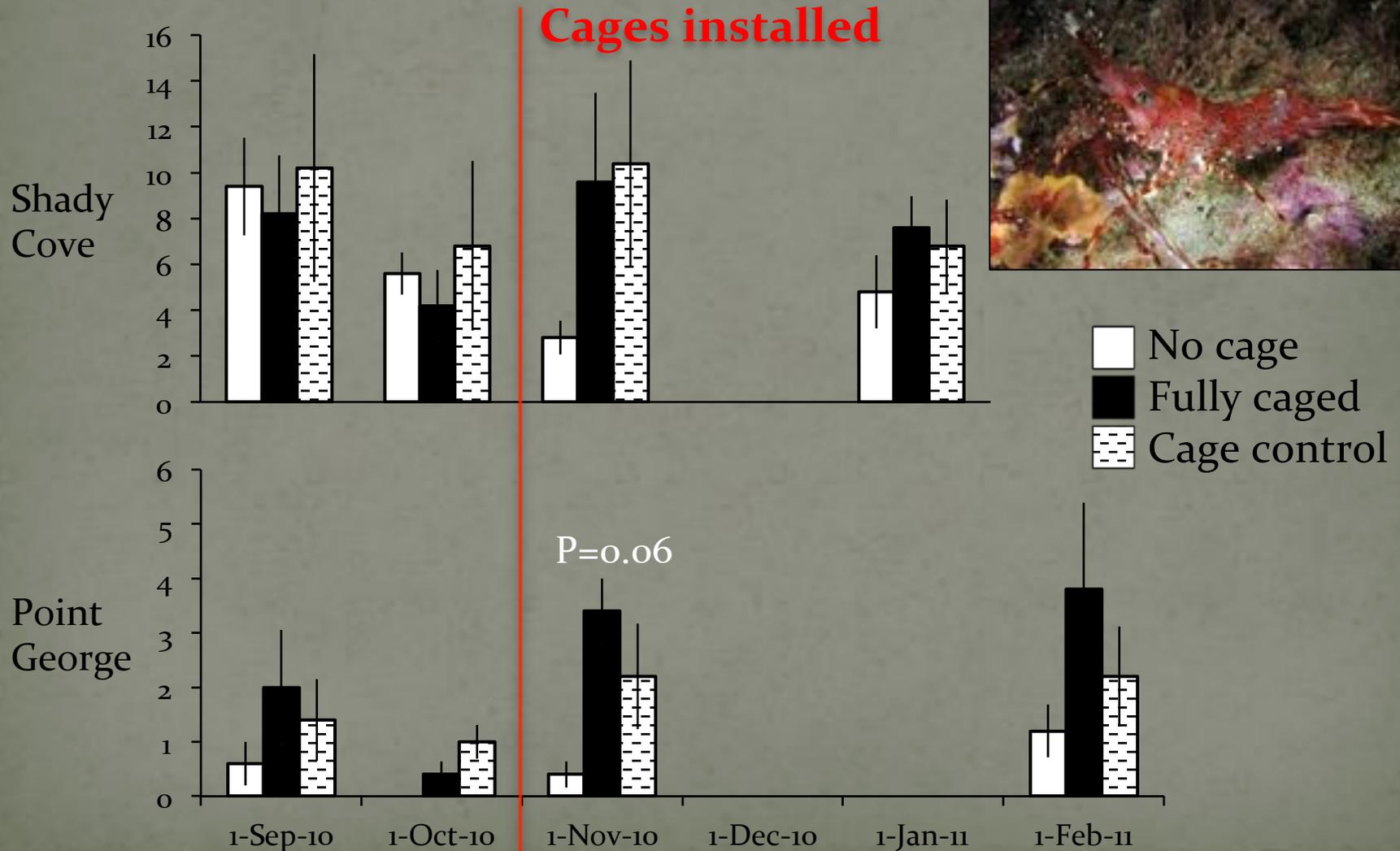


# Methods – different guilds

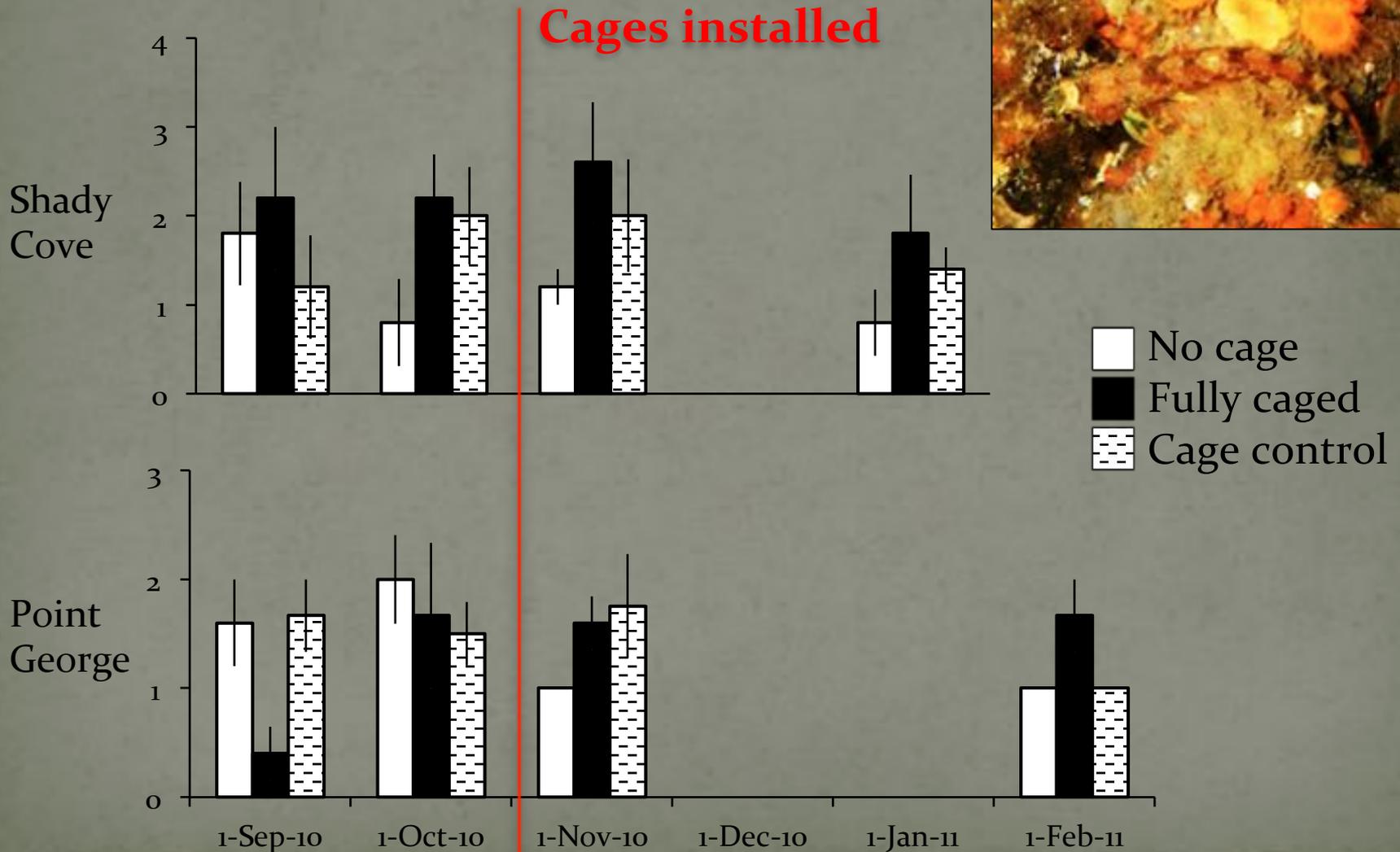
- Counts for sculpins, shrimp, large mobile inverts
- Suction samples for mobile mesofauna
- Photoquadrats for epibenthos



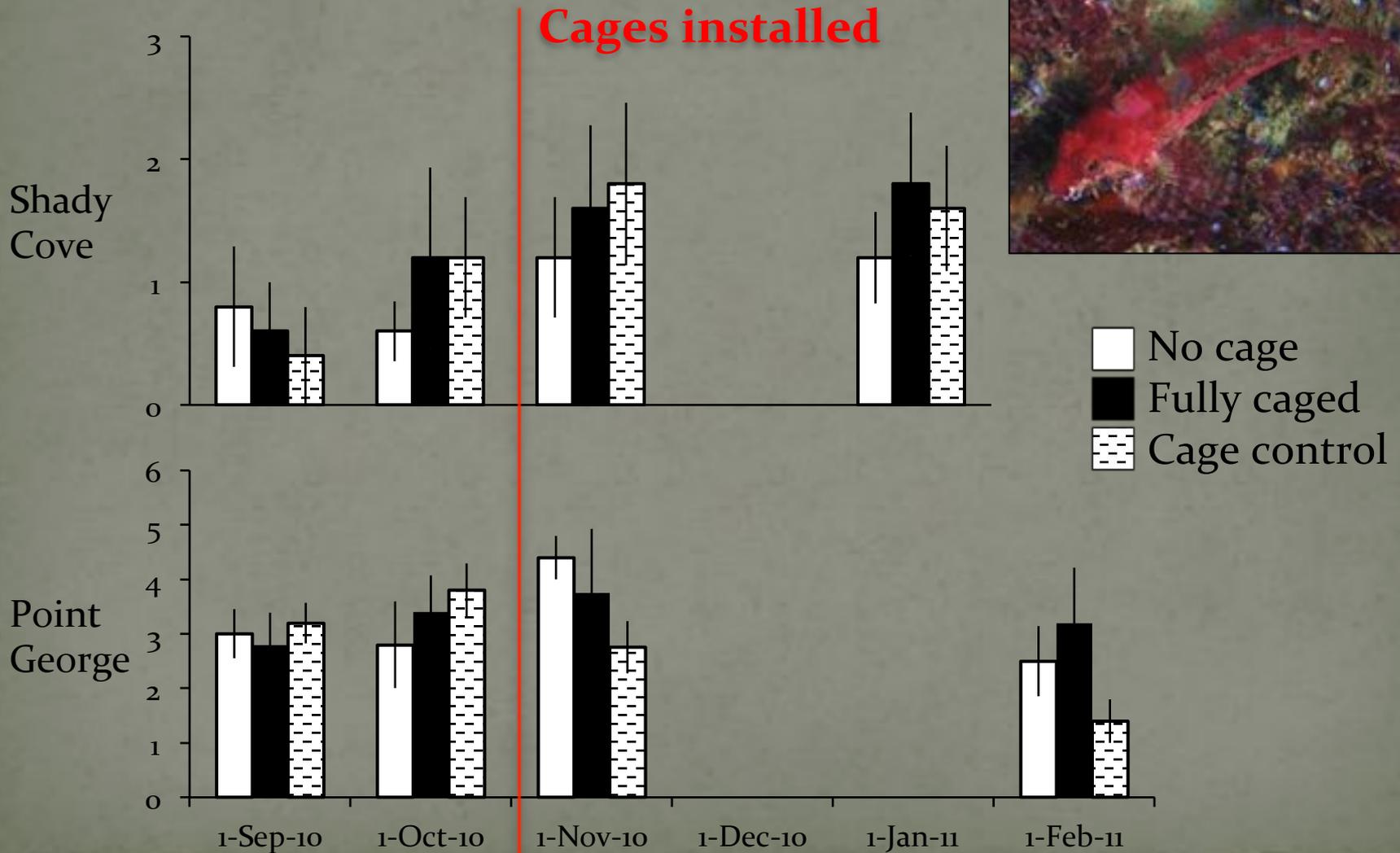
# Results – shrimp



# Results – *Jordania zonope*



# Results – *Arteidius harringtoni*



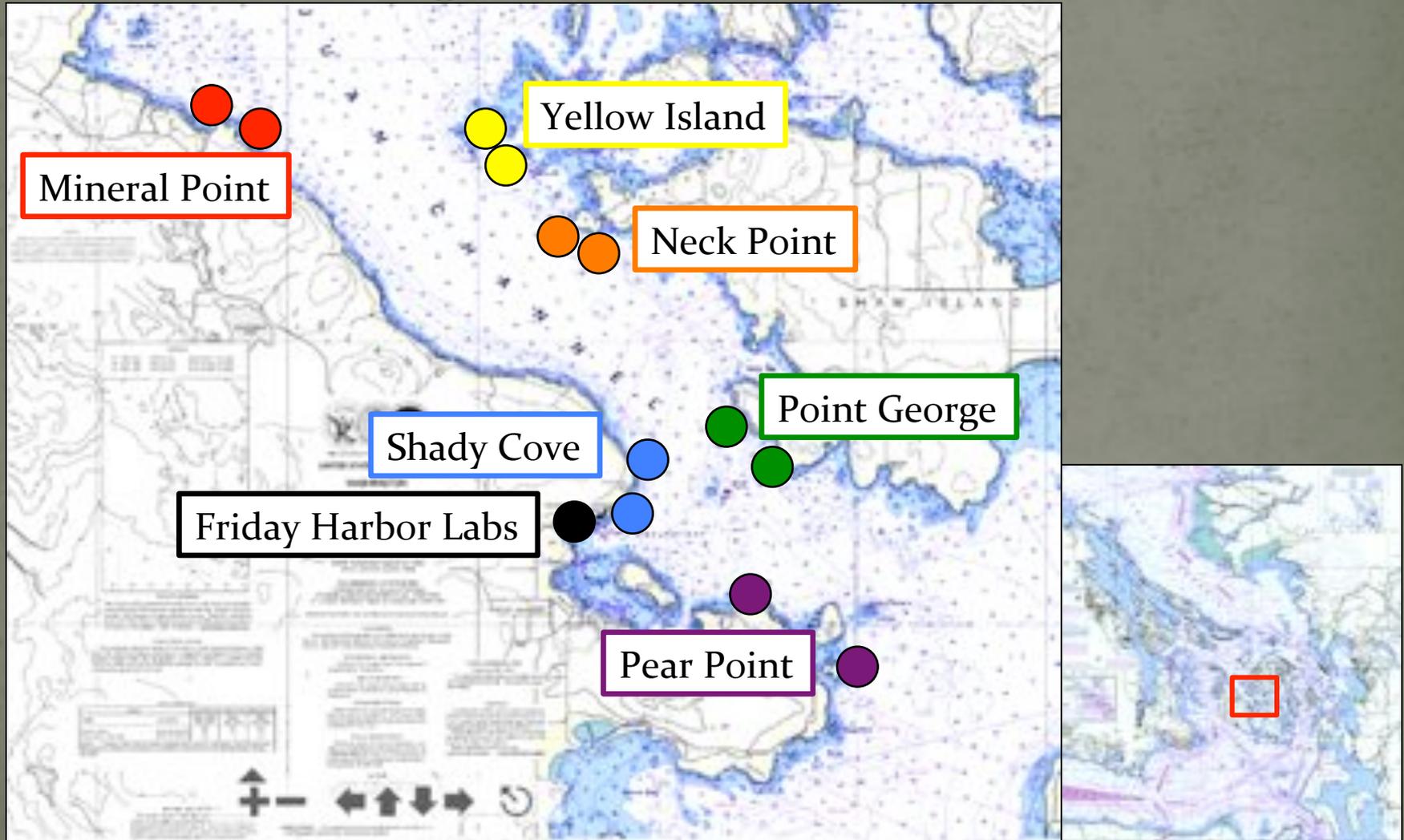
# Few rockfish → more shrimp

- In fully caged areas shrimp abundance increased after 1 month, at 1 location
- As rockfish recover in the San Juans there is potential for a decrease in shrimp abundance
- 6- and 12-month visitations are planned
- What other effects on the community occur?
- Track shrimp identity (Frid and Marliave, 2010)

# Community surveys

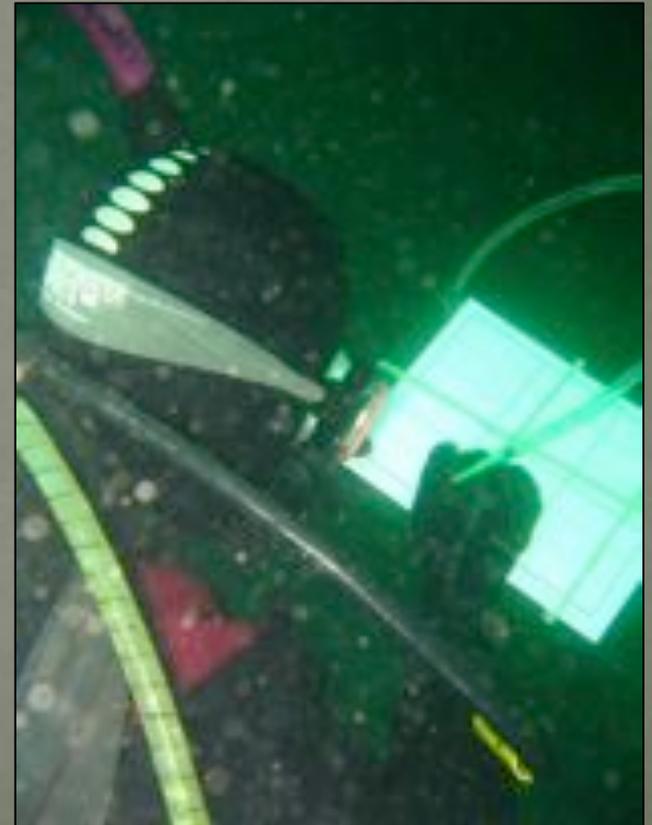
- How do regions around San Juan Channel vary in community structure in response to rockfish and lingcod abundance?

# Sites throughout San Juan Channel



# Methods – different guilds

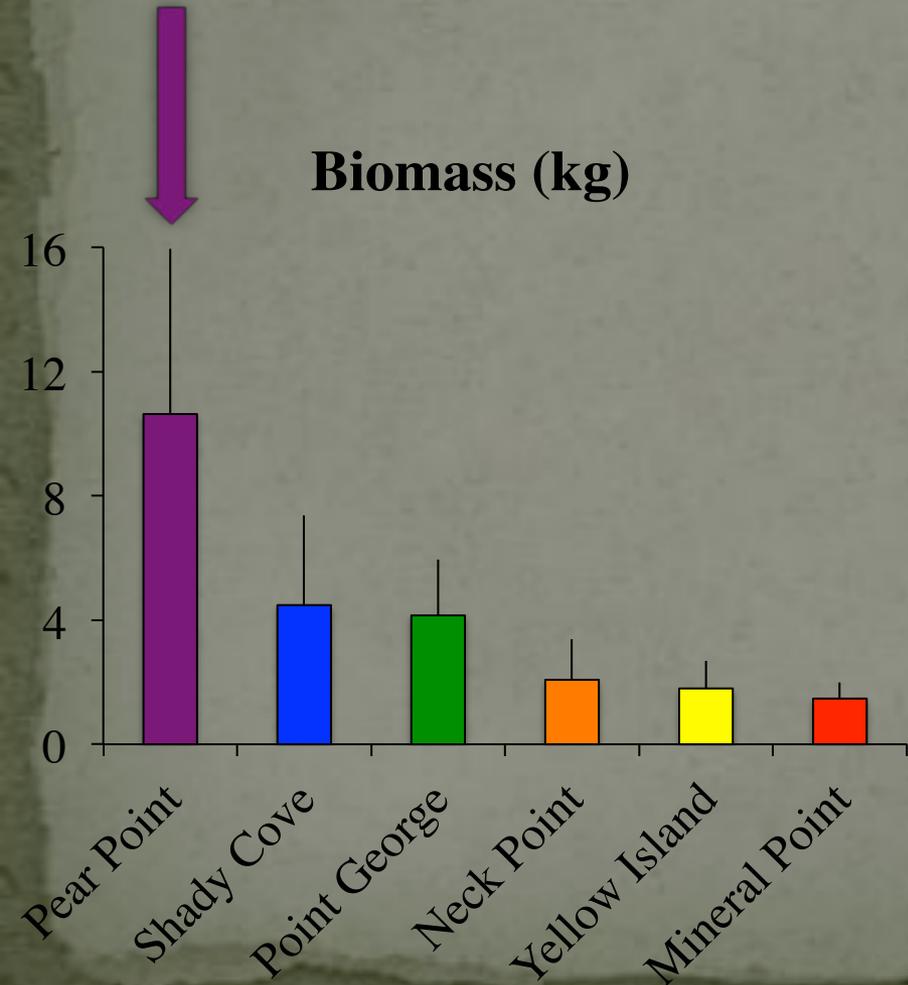
- Counts for lingcod, rockfish, other large fishes
- Counts for sculpins, shrimp, large mobile inverts
- Photoquadrats for epibenthos



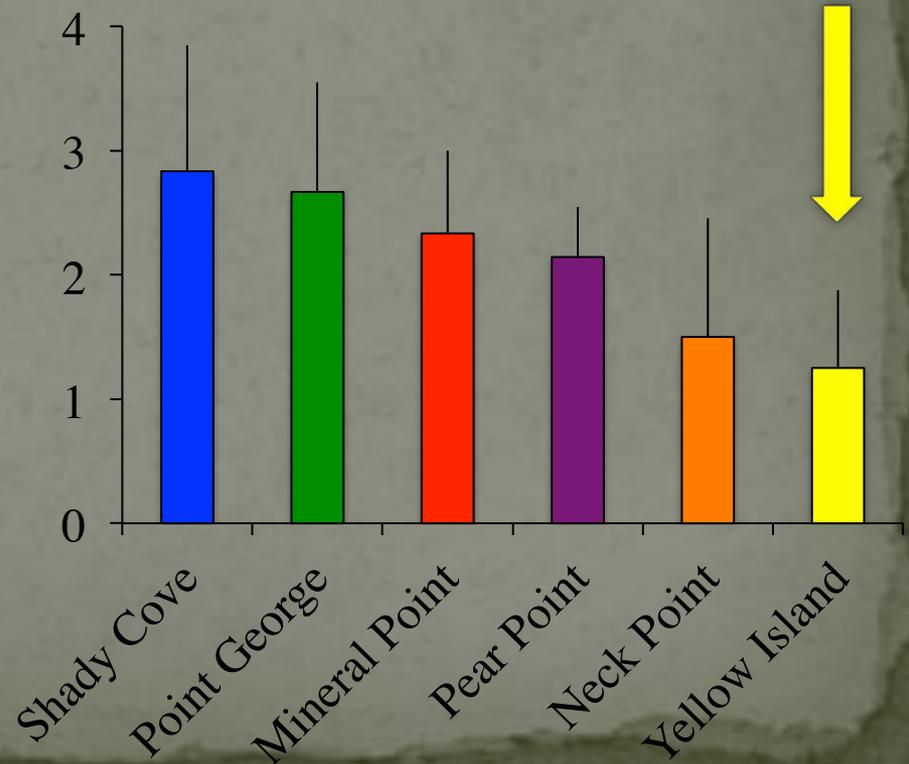
# Results – lingcod



**Biomass (kg)**



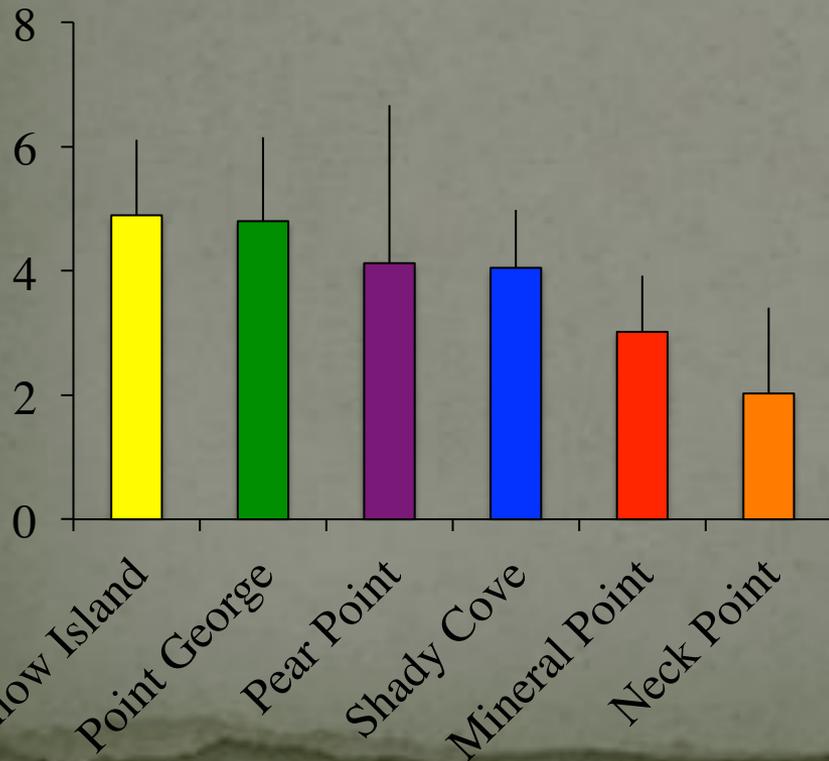
**Abundance**



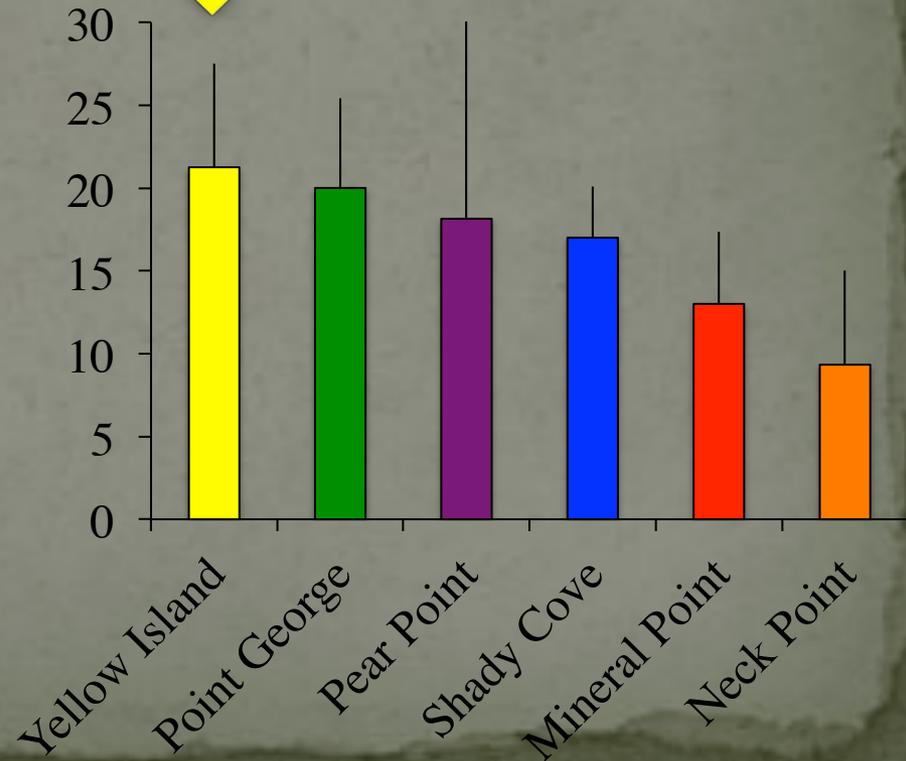
# Results – all rockfish spp



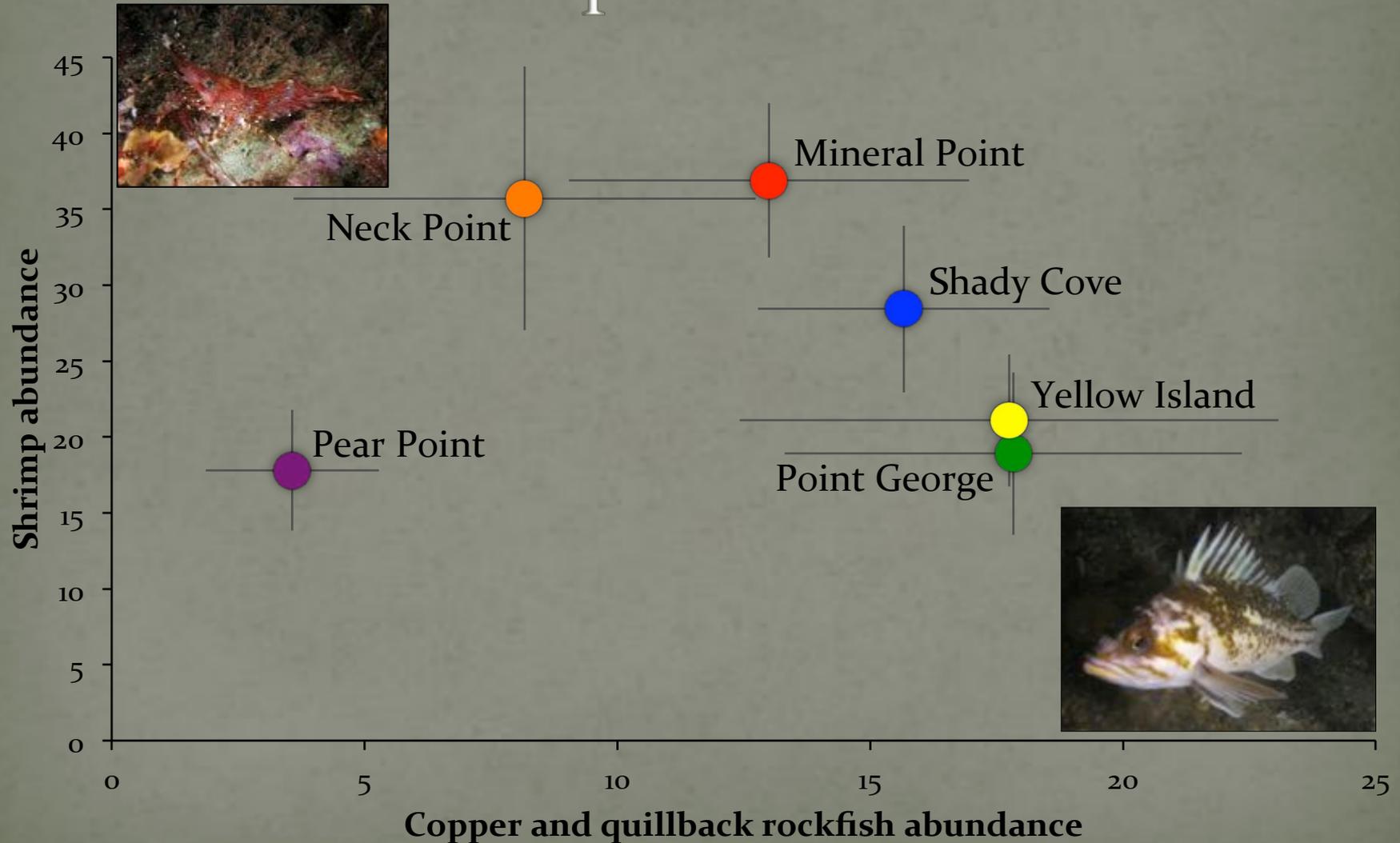
**Biomass (kg)**



**Abundance**

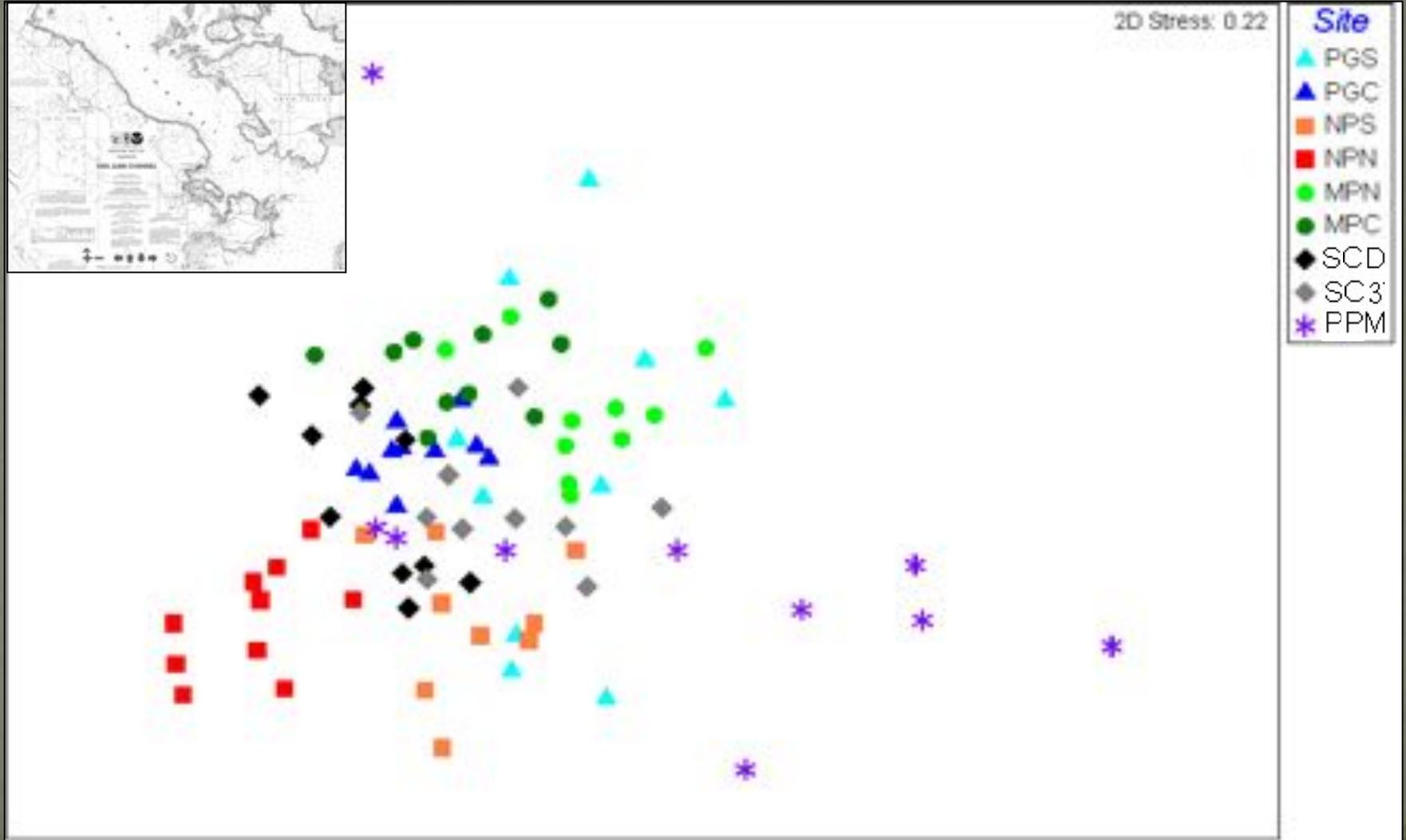


# Results – shrimp vs. rockfish



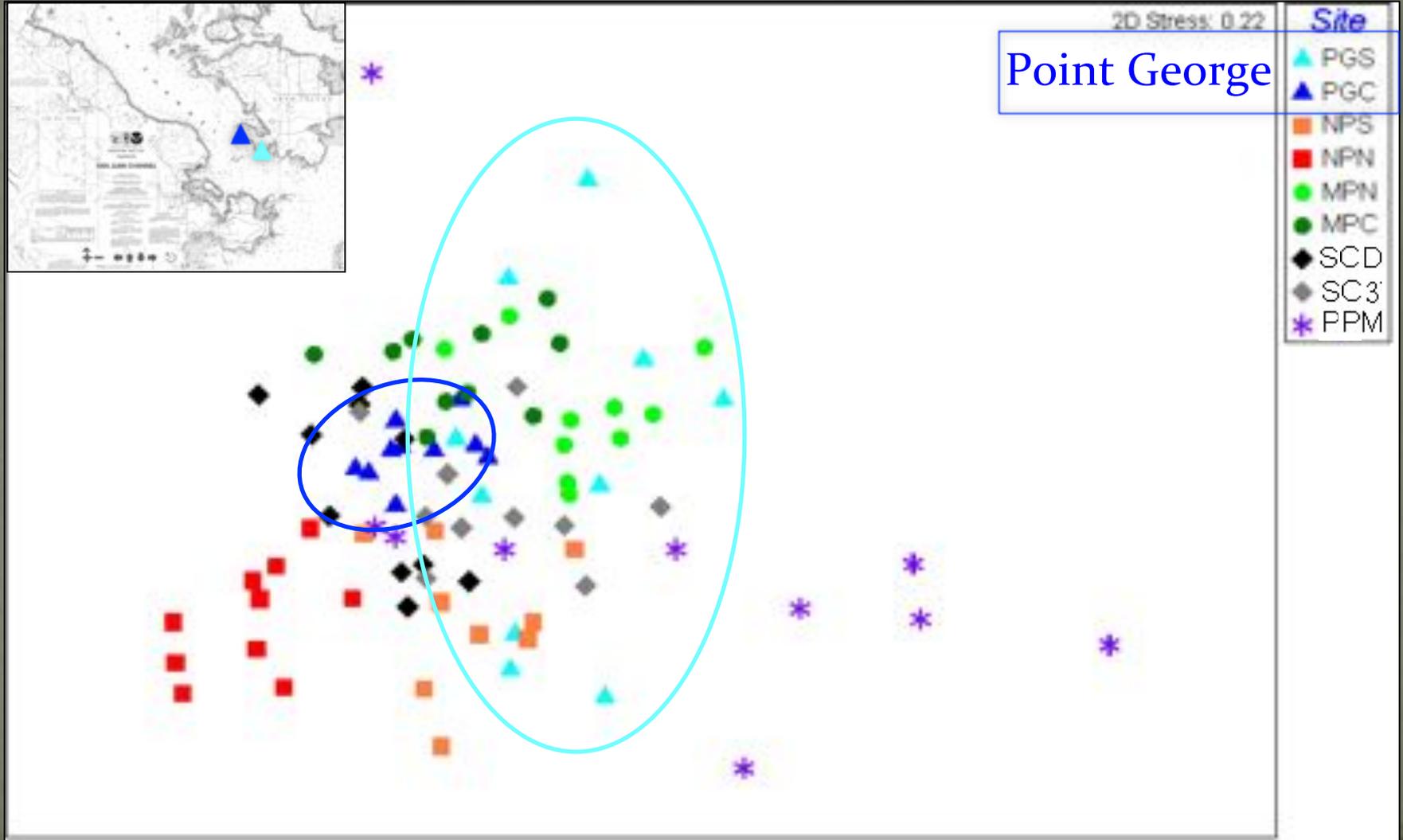
# Results – sessile organisms

ANOSIM,  $p < 0.01$



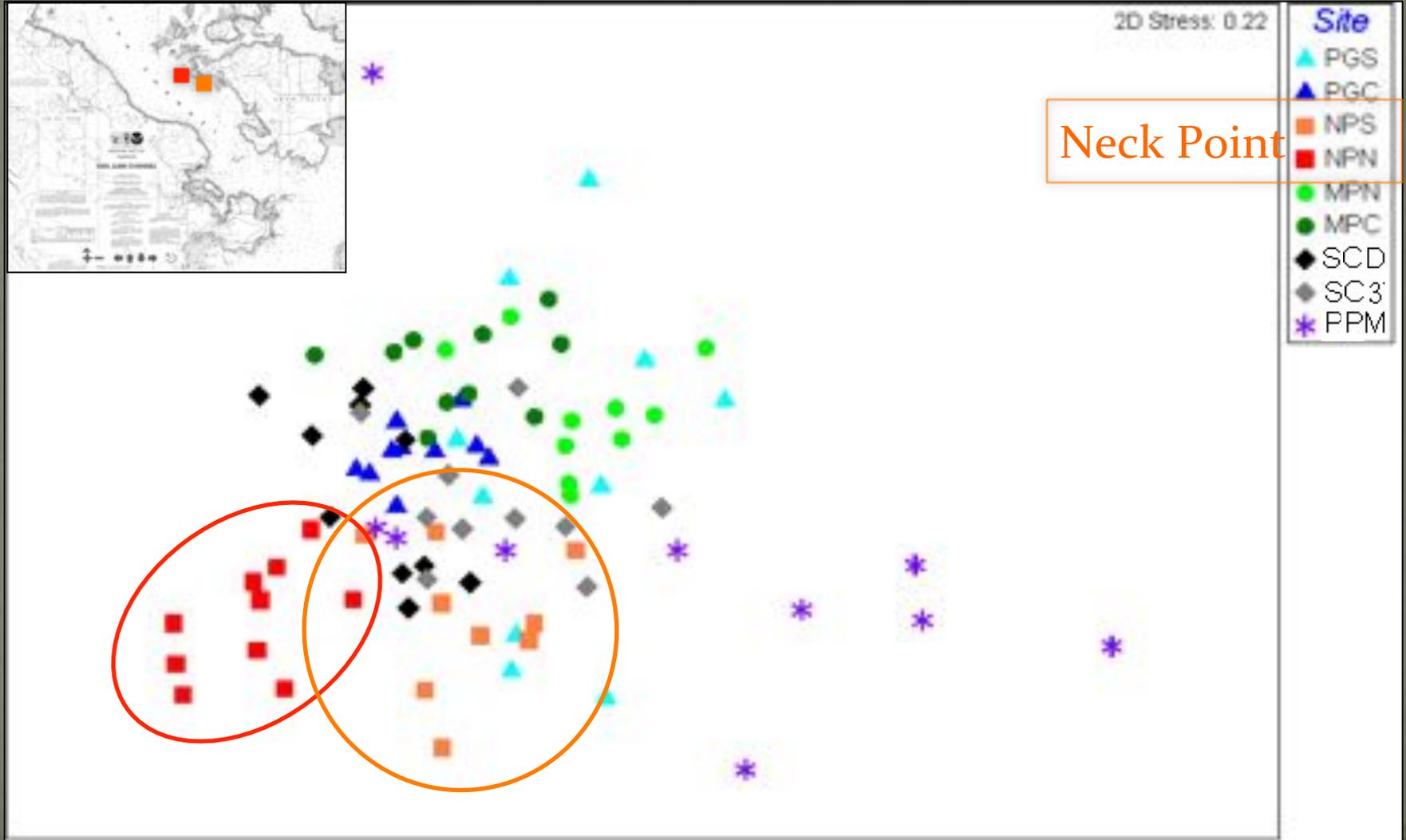
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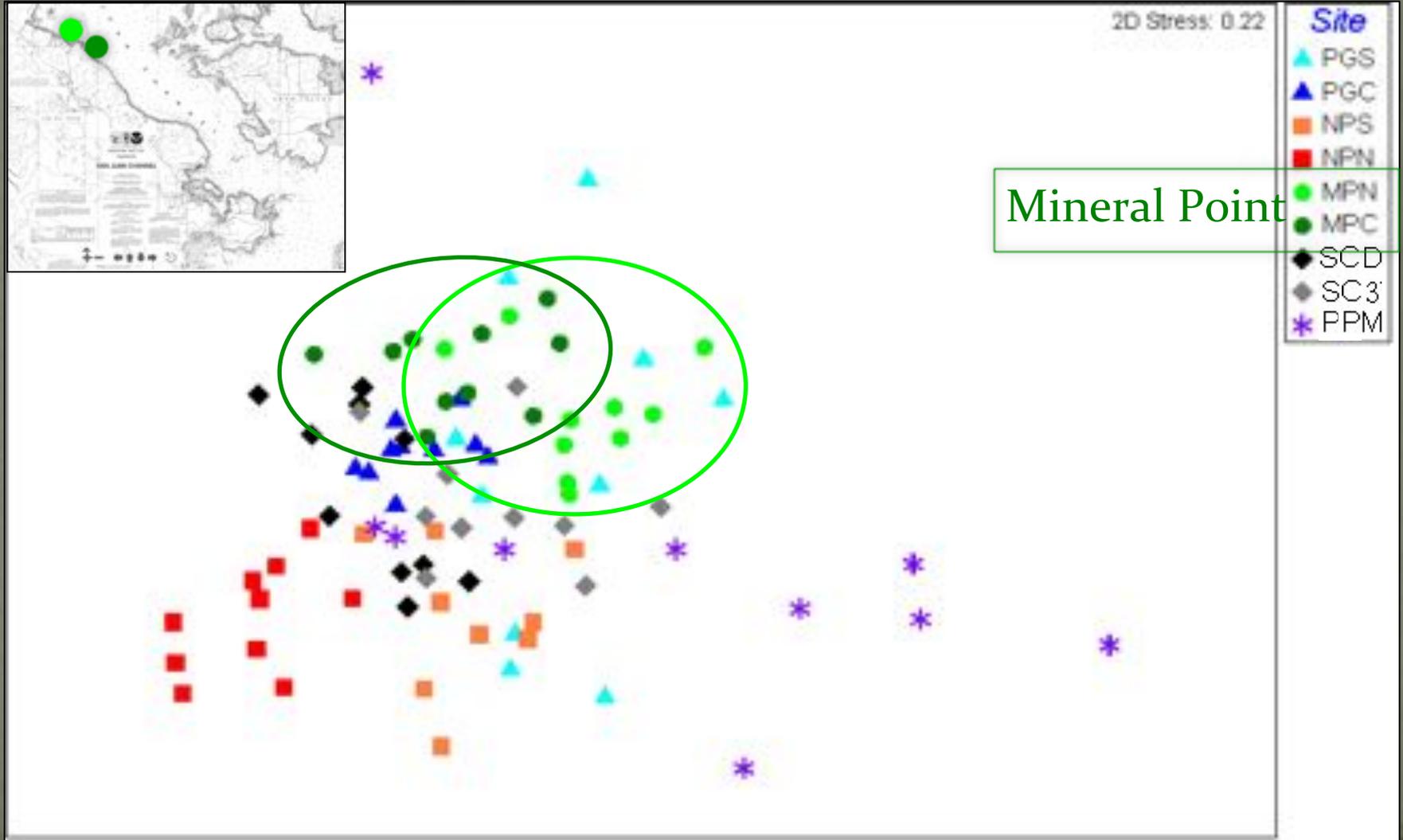
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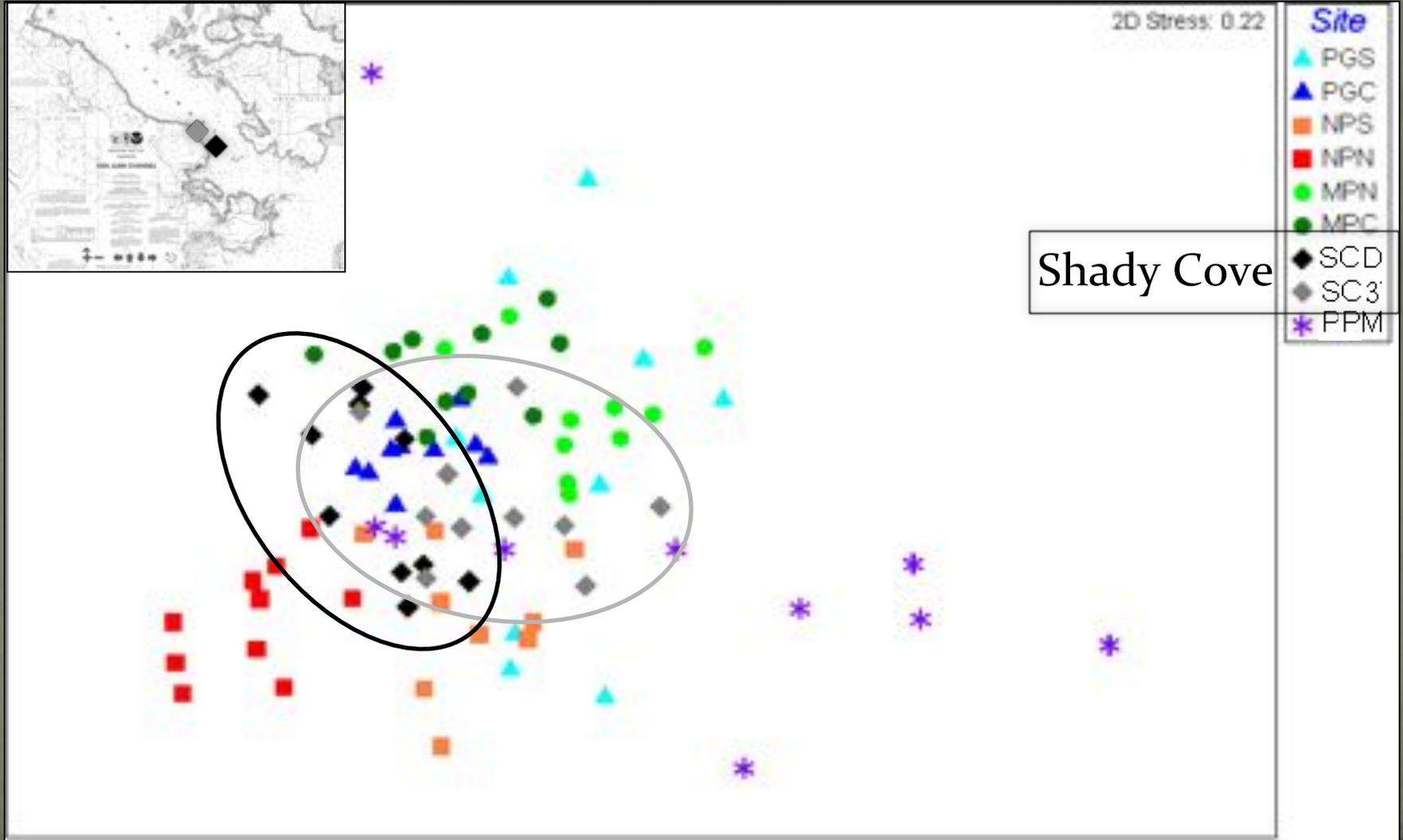
# Results – sessile organisms

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# Impacts on shrimp

- Copper rockfish feed largely on shrimp (and crabs)
- Reducing predation by rockfish (and lingcod) may lead to an increase in shrimp abundance
- Locations with higher demersal rockfish abundance have lower shrimp abundance

# Impacts on the full community

- Epibenthic communities show site-specific variability, but no clear responses to predators
- Mobile mesofauna results to come
- Is there evidence of trophic cascades in the San Juans?

# Thank you



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NSF Bio Ocean OCE0850809

UW Friday Harbor Labs

Autumn Turner

Heidi Wilken

Walt Rung

Tim Dwyer

Ali Rhodes

Breckie McCollum

Robin Elahi