Reef Check California
North Coast
Baseline Monitoring Project

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North Coast Marine Protected Area
Baseline Monitoring Symposium
May5th 2017

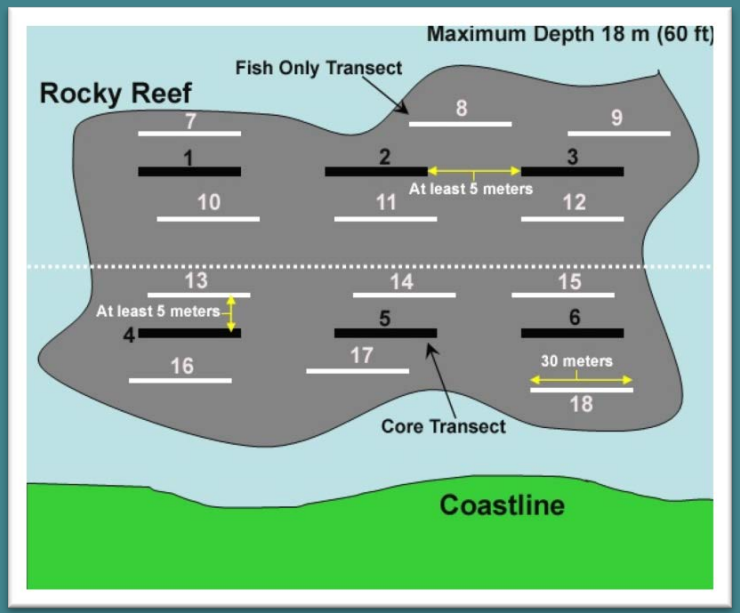
RCCA trains volunteer scuba divers to become citizen scientists

1. Monitor rocky reefs & kelp forests using standardized protocols
2. Provide data to inform marine management and policy
3. Foster an educated constituency, supportive of science–based management and ocean stewardship

Monitoring Protocol

Count and size fish, invertebrates and algae along standardized transects

- **Rocky reefs between 5-18 meters depth**
- **18 transects: 30 x 2 meters**
- **73 target organisms**
  - **ecological & economic importance**
  - **ease of identification**



Statewide Citizen Sciences Monitoring Program

10+ years of data inside and outside of MPAs

Annually:

- **~90 surveys**
- **~250 trained volunteers**

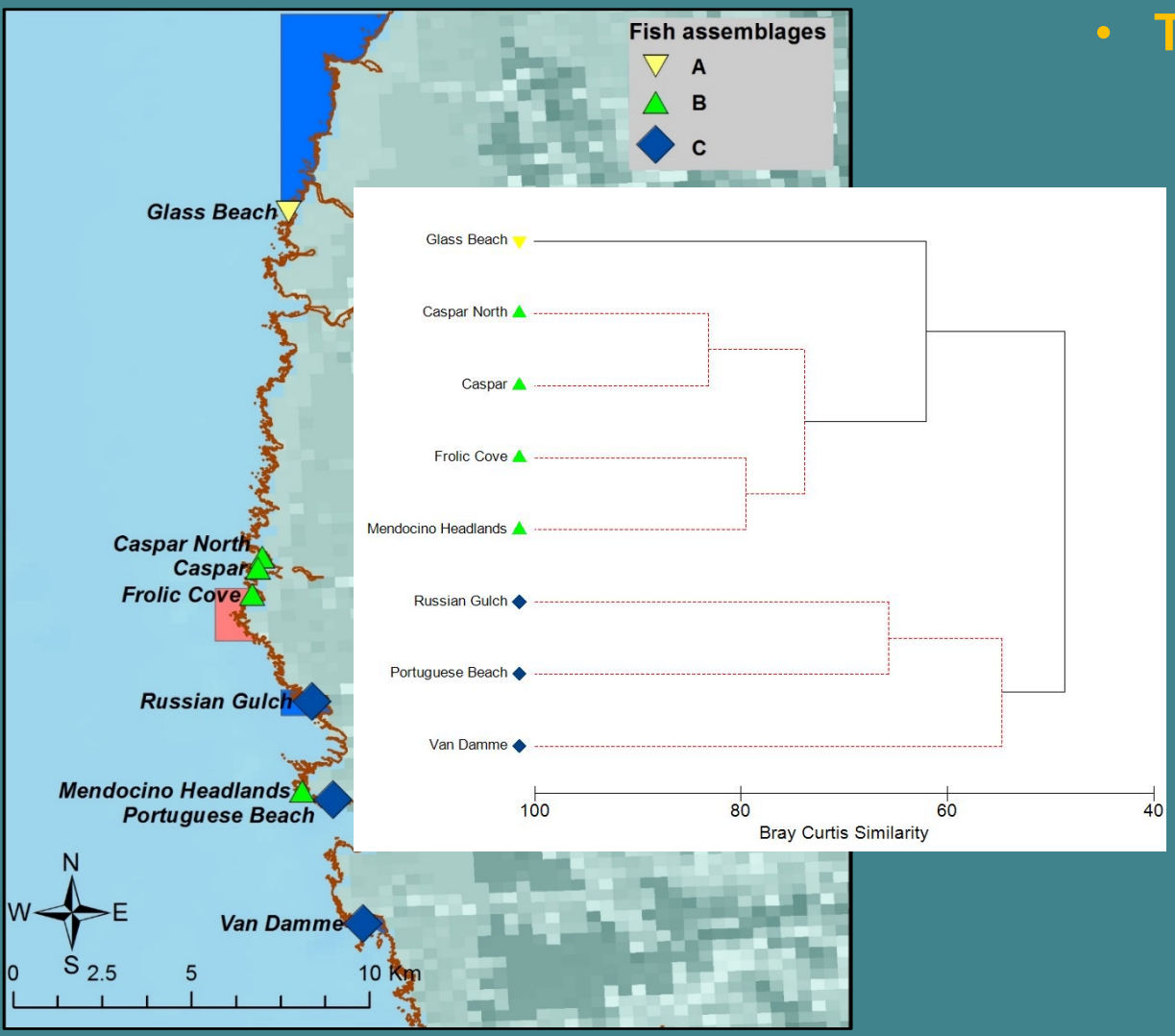
Northern California Baseline Monitoring 2014-2015

- 12 trainings and recertifications
- 140 volunteers trained
  - Community members
  - HSU students
  - UC Davis Bodega Lab
- 8 monitoring sites
  - 18 surveys
- Build capacity for long-term monitoring
  - Monitored sites again in 2016

Results

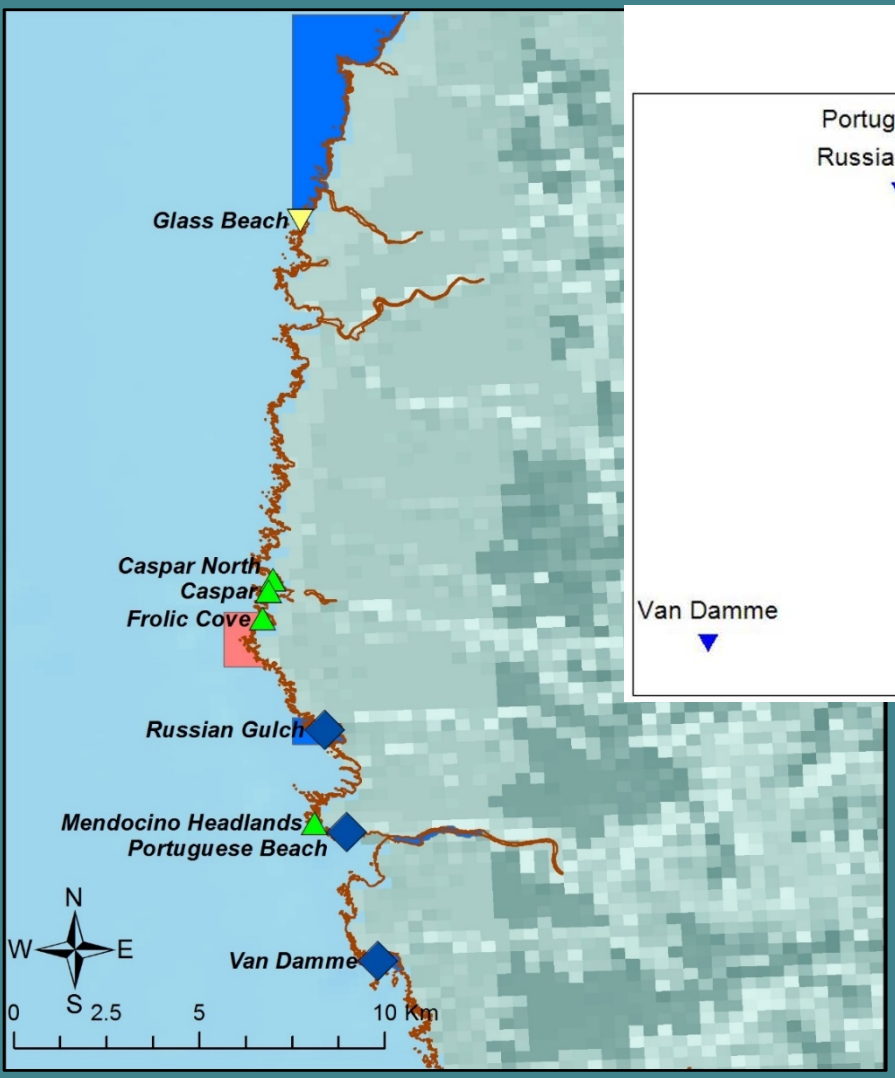
1. Community structure at study sites
2. Species density and sizes frequency at Pt. Cabrillo MPA
3. Long-term trends and community changes

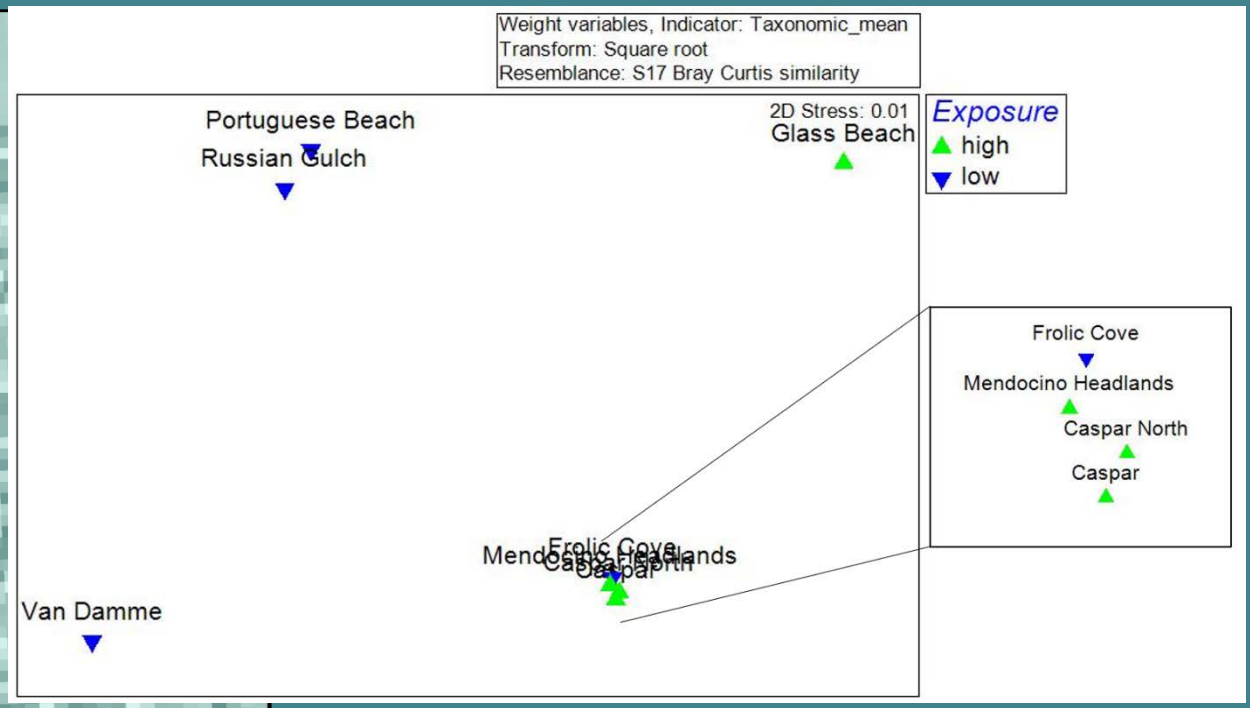
Fish assemblages



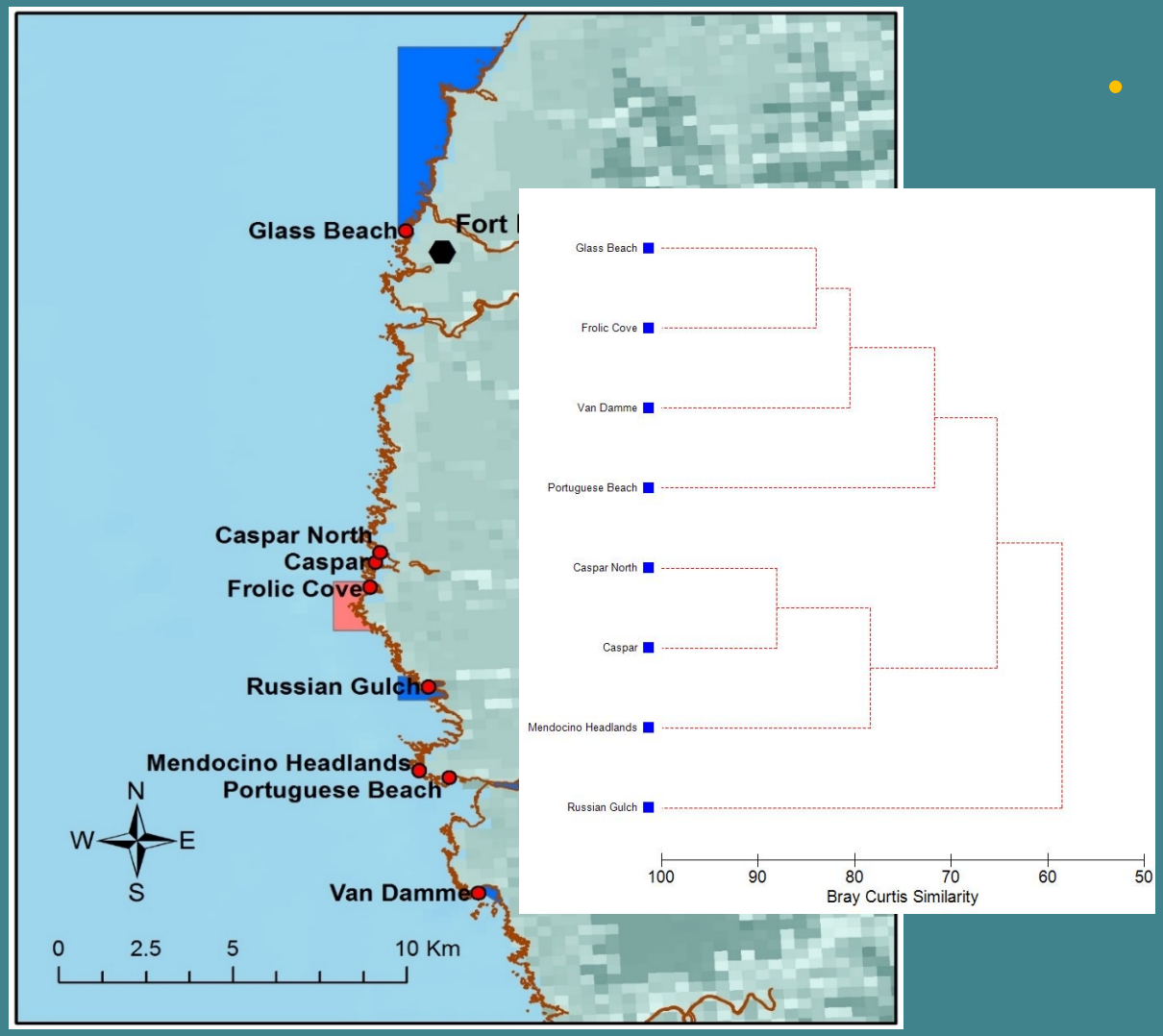
- Two main fish communities
  - Differences are driven by abundant species:
    - Black rockfish
    - Blue rockfish
    - Kelp greenling
    - Striped surfperch
- Four species are more abundant in northern assemblage
- Northern sites are more species rich than southern sites

Fish assemblages



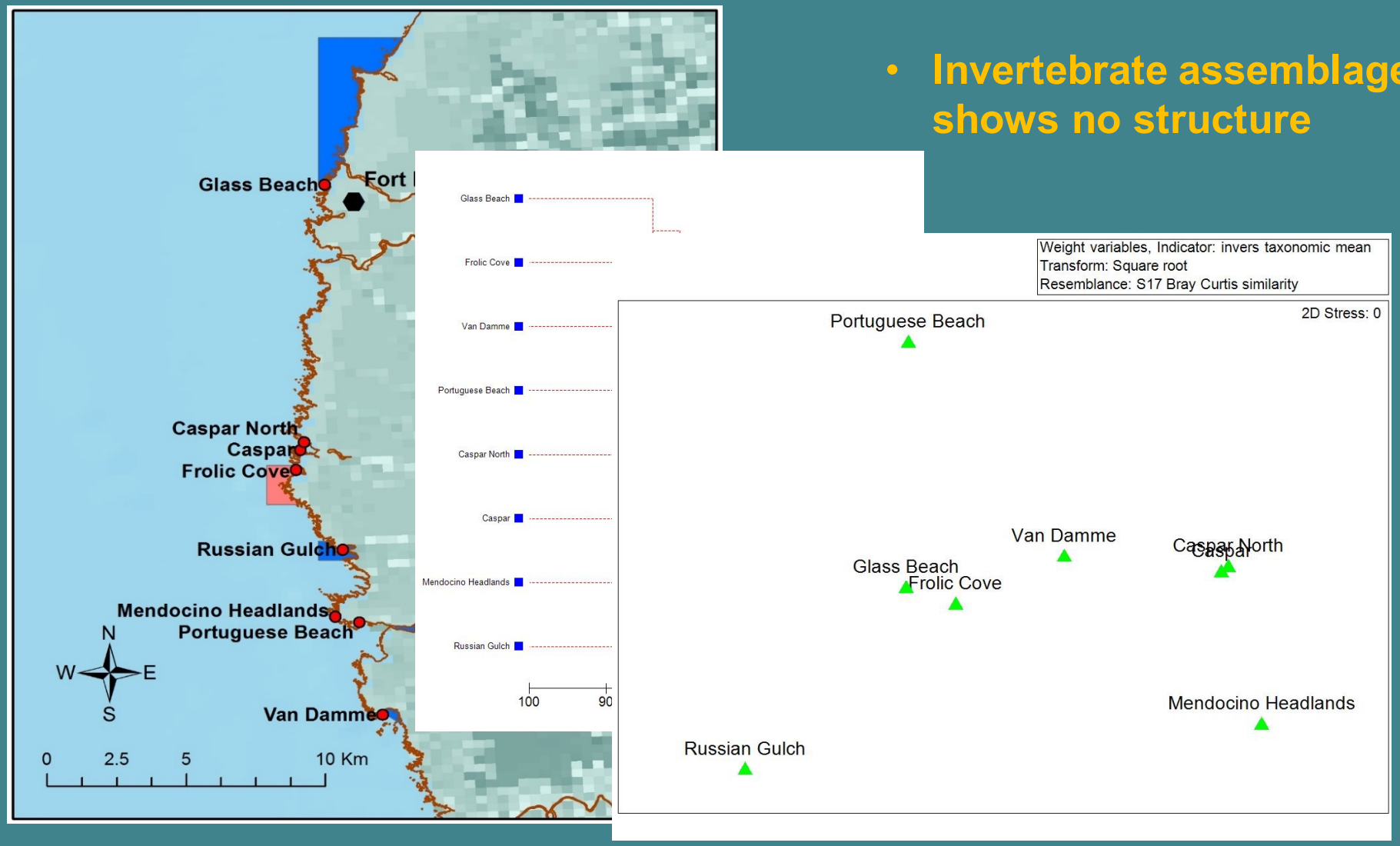


Invertebrate assemblages



- **Invertebrate assemblage shows no structure**

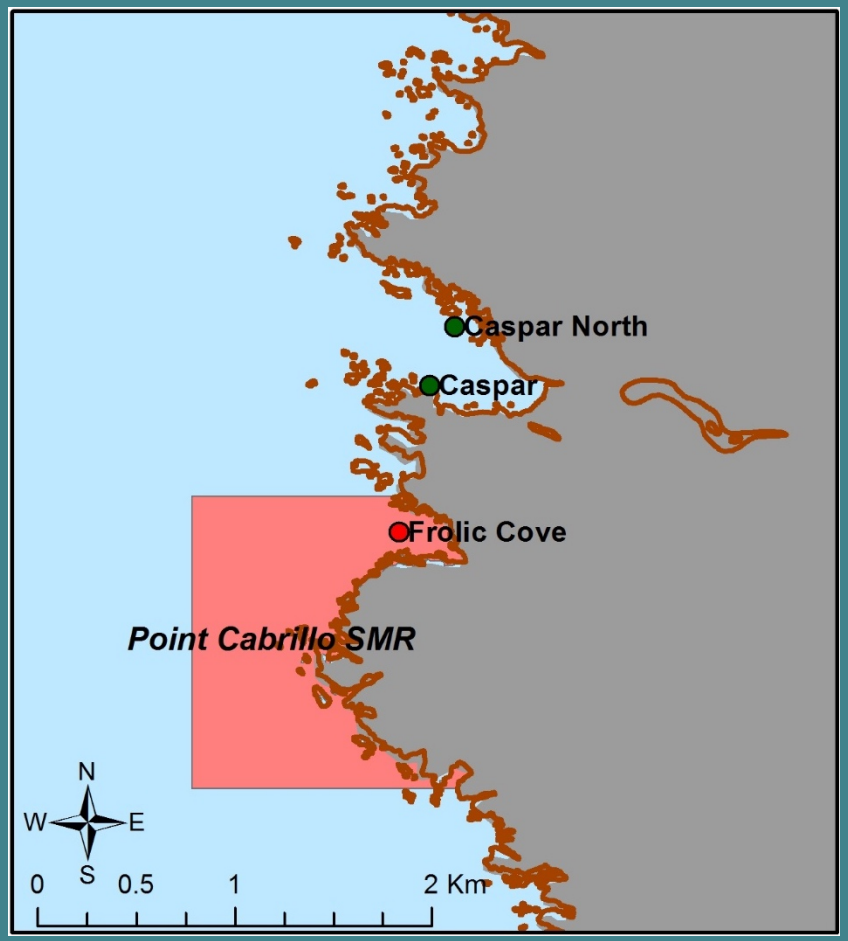
Invertebrate assemblages



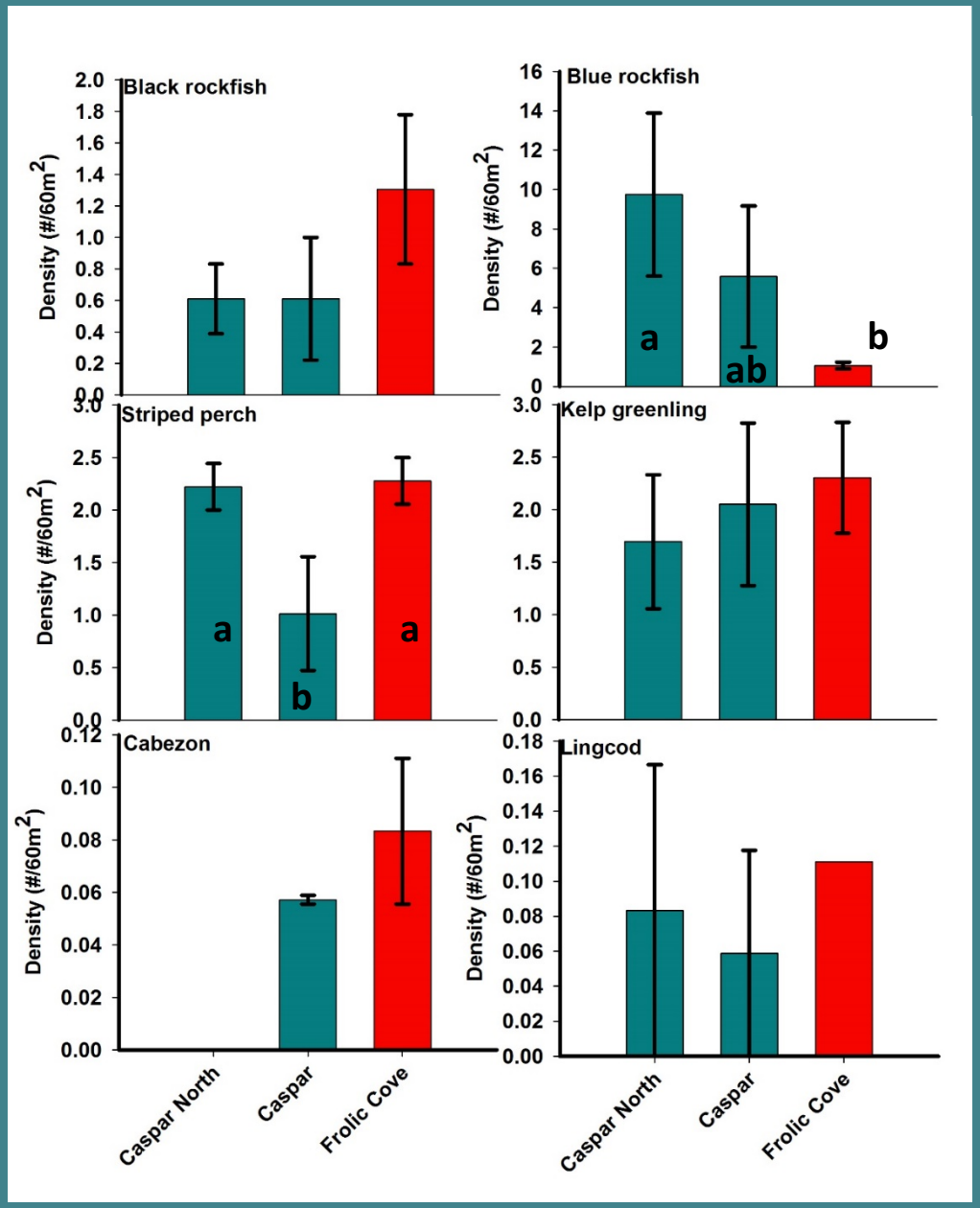
- **Invertebrate assemblage shows no structure**

Pt. Cabrillo SMR

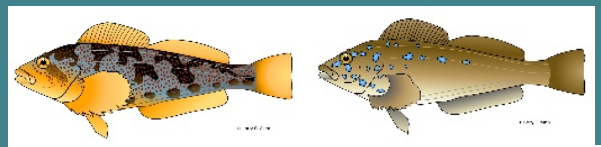
Species densities & size structure

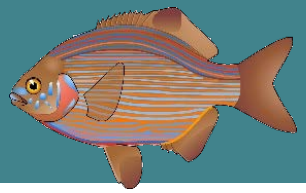


Fish densities

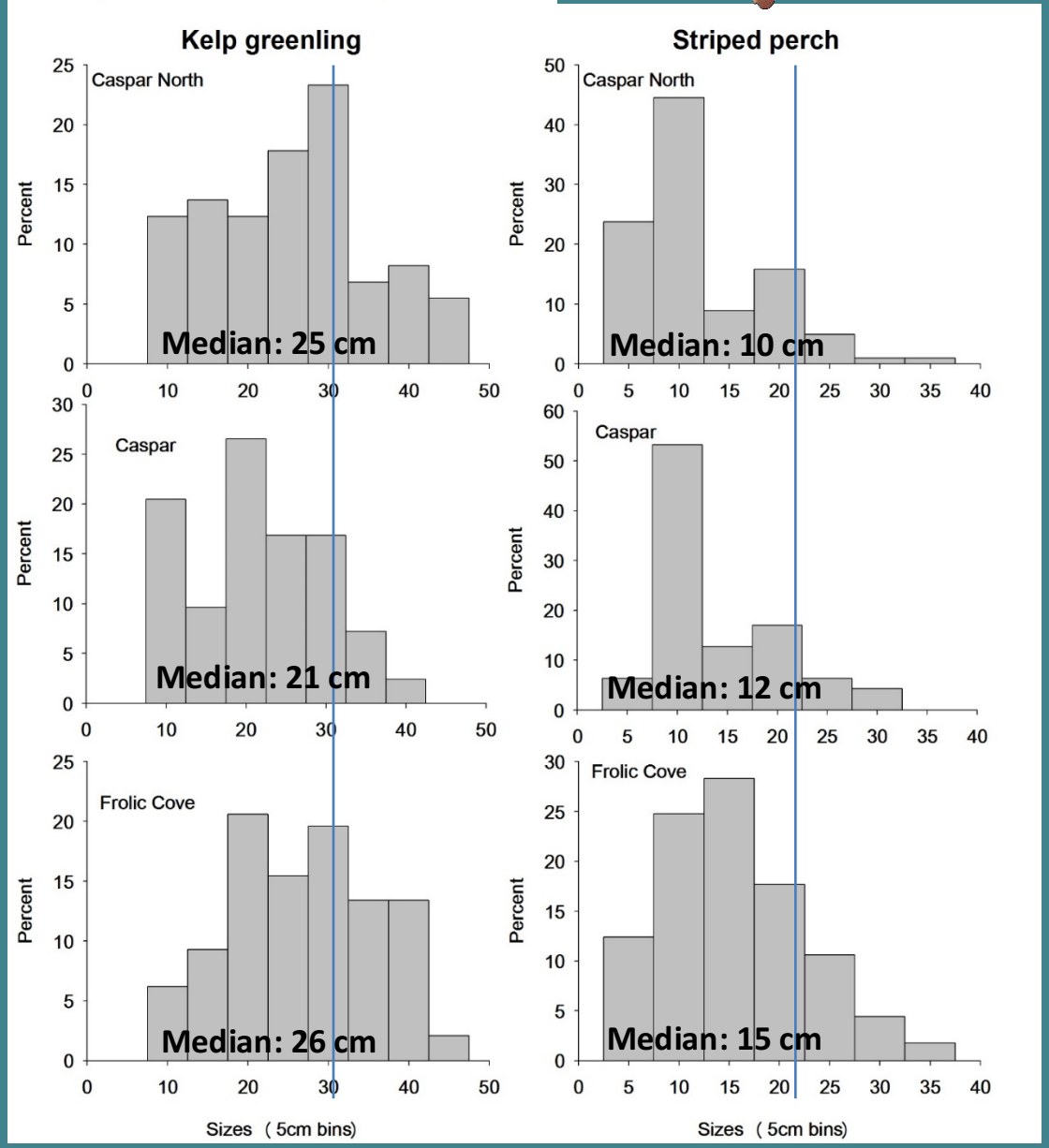


- Densities in 2014/15
- Densities inside and outside of SMR are similar

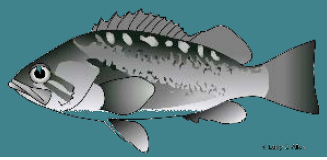




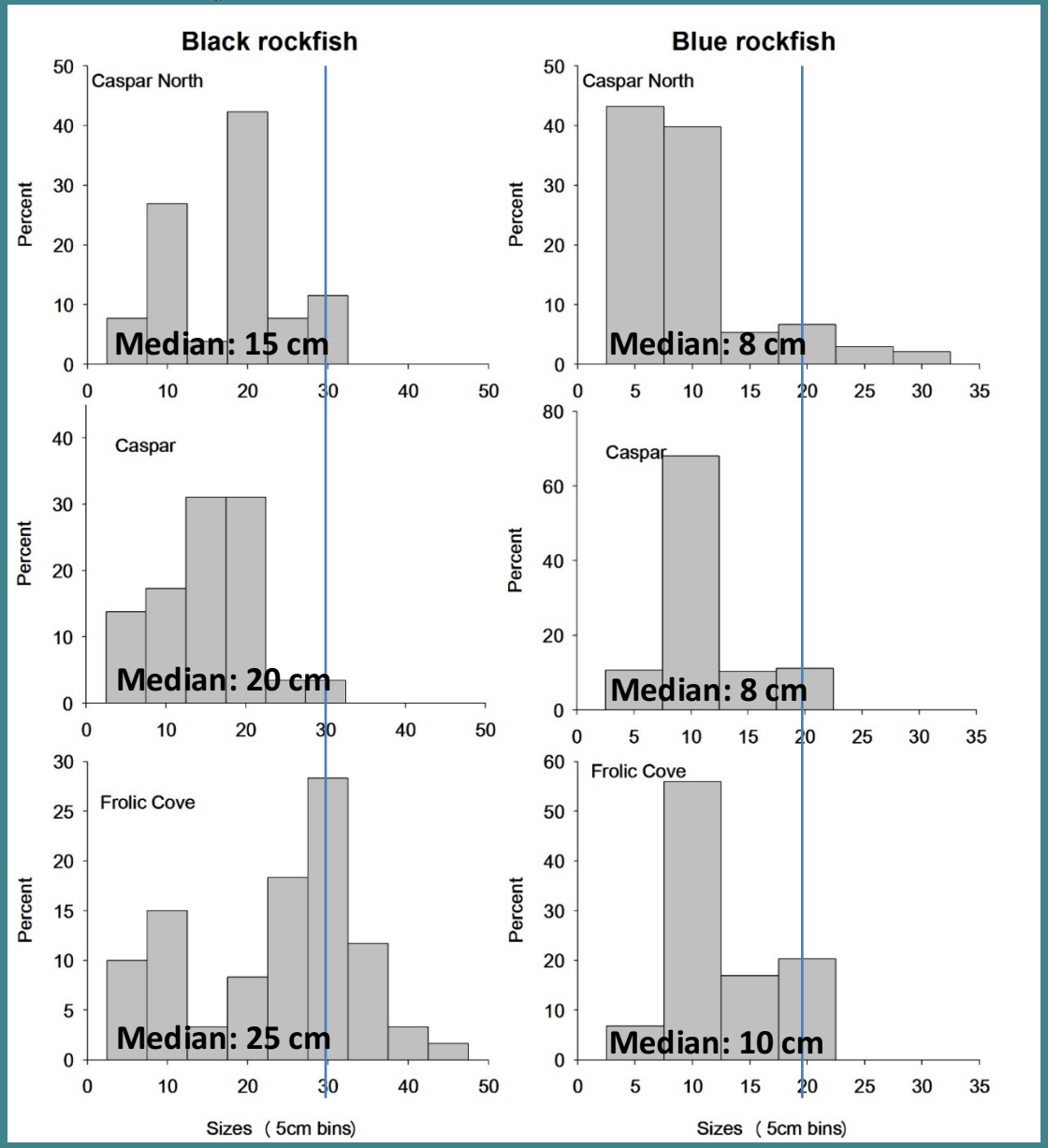
Fish sizes



- Size frequencies of abundant fish species (2014/15)
- Kelp greenling significantly larger in SMR than at fished sites ($p<0.0001$)
- Striped surfperch are larger in SMR than at fished sites

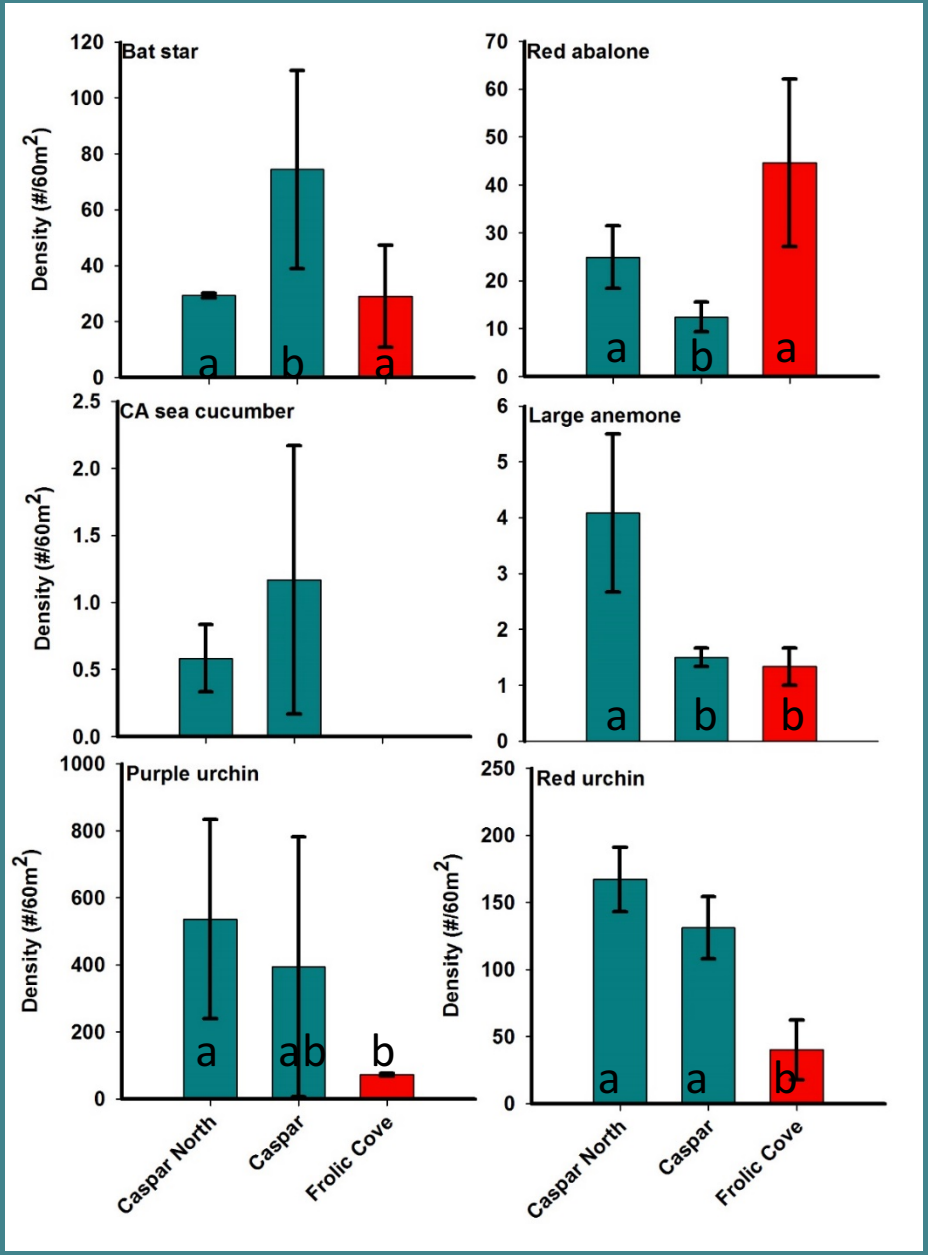


Fish sizes



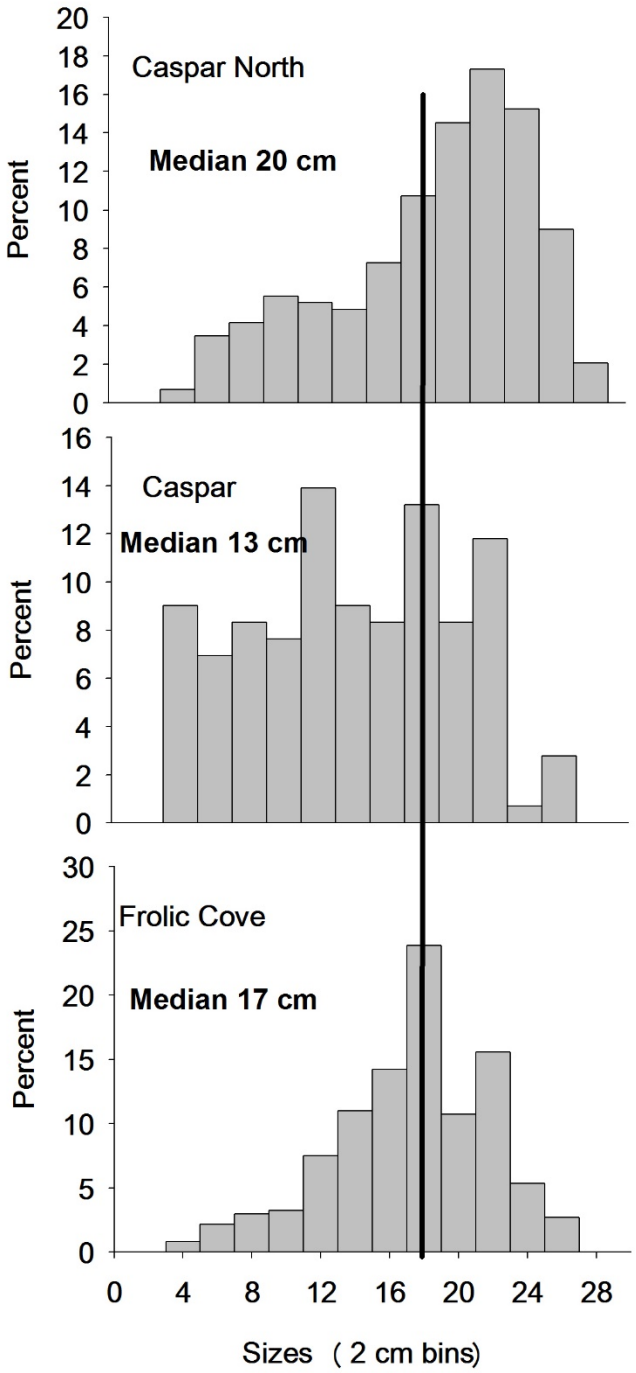
- Black rockfish significantly larger in SMR than at fished sites ($p<0.0001$)
- Blue rockfish mostly juveniles at all sites

Invert densities



- Densities in 2014/15
- Red abalone more abundant in SMR
- Urchins less dens in SMR

Abalone sizes

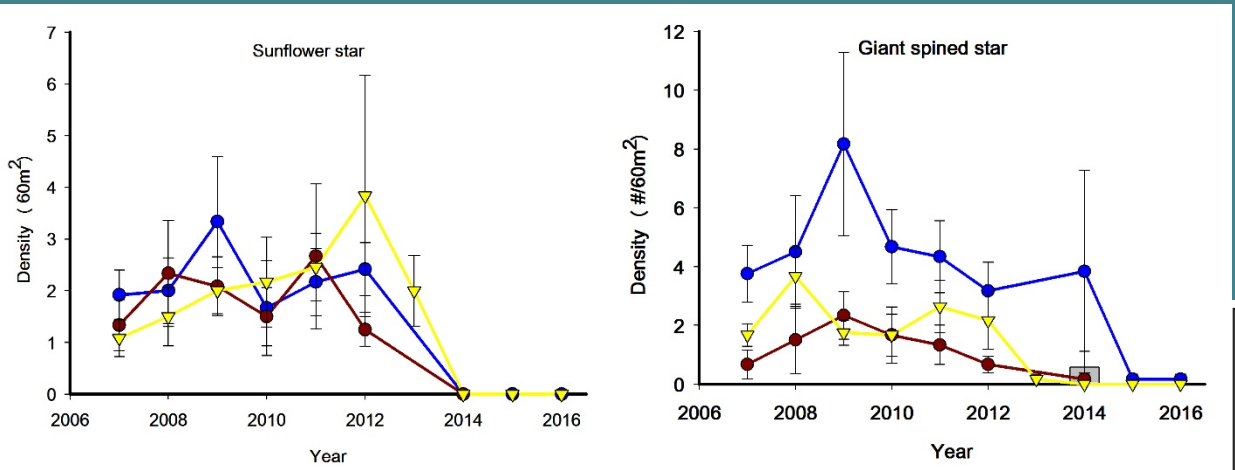


- Significant size differences between all sites
- Abalone largest at Caspar North site

Long-term trends

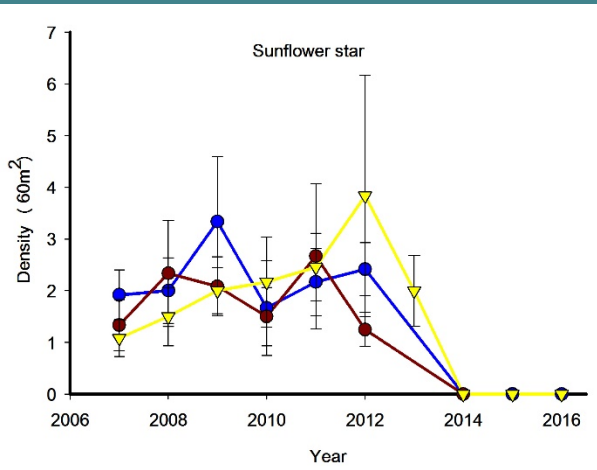
- How do the 'baseline' years compare to years prior to these events?
- Unusual events
  - "warm blob"
  - Sea star wasting disease
- 3 sites monitored since 2007

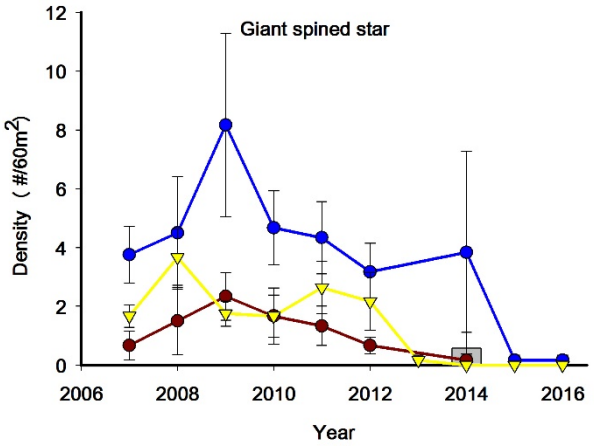
Long-term trends

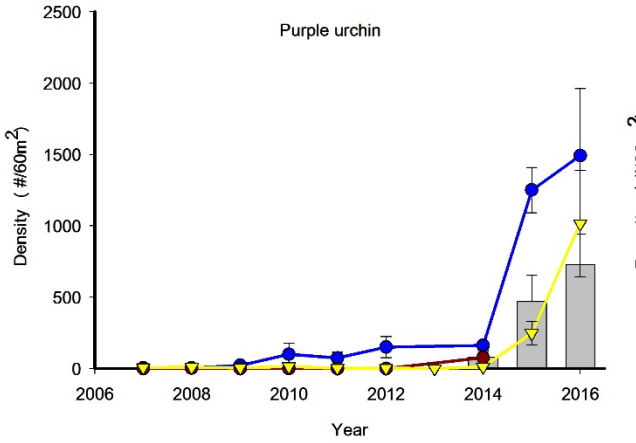


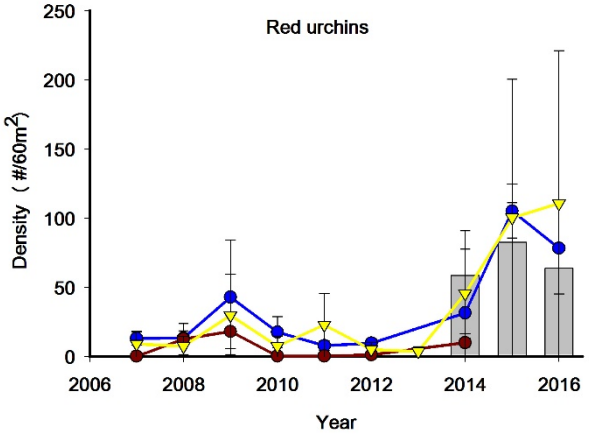
- **Sunflower stars & Pisaster absent during baseline years but abundant prior to baseline**

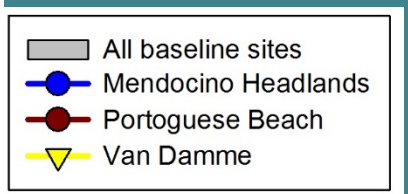
Long-term trends





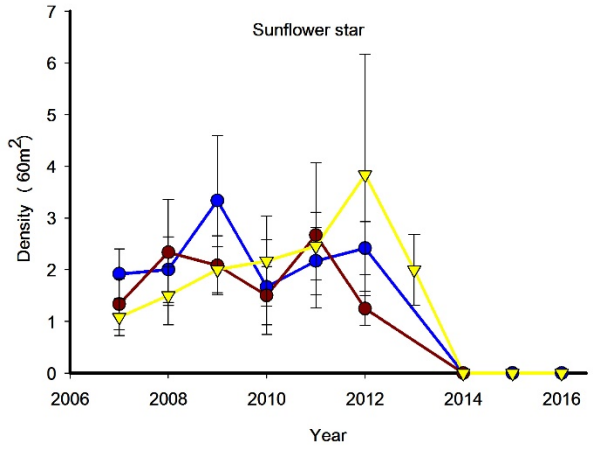


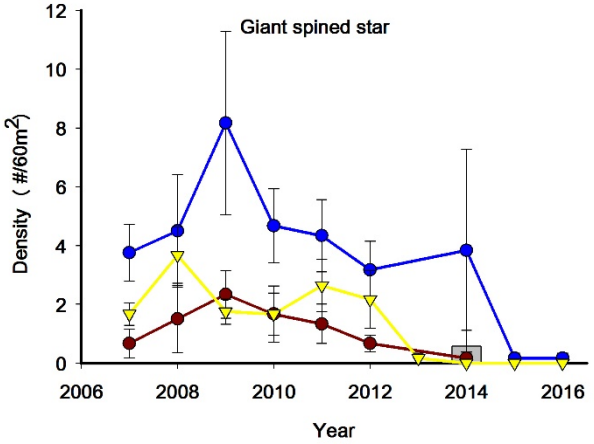


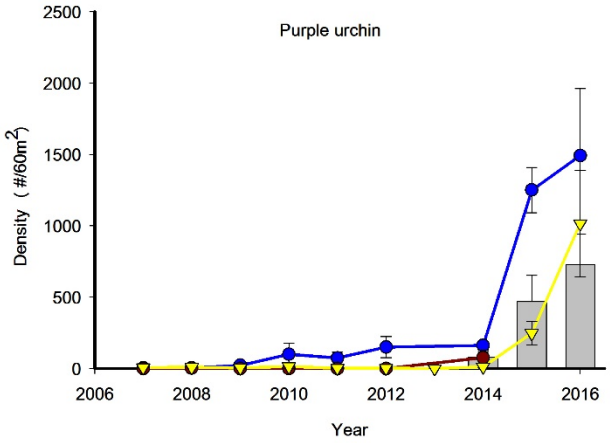


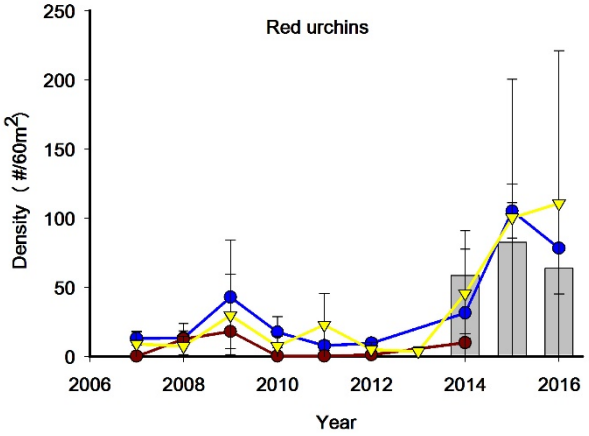
- 2007-2014: very low urchin abundances
- Purple urchins are less common than read urchins
- Baseline years: >100fold increase in urchin densities
- Purples > reds

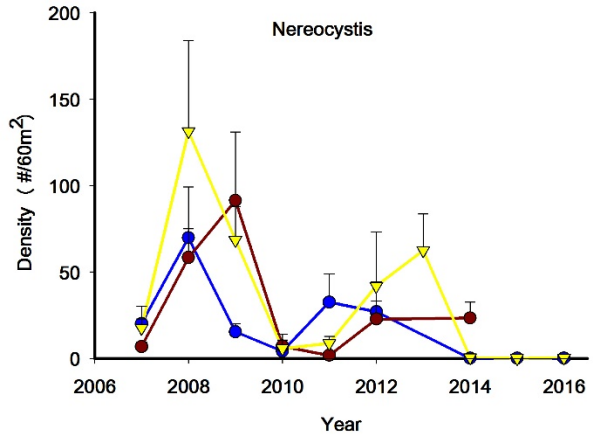
Long-term trends

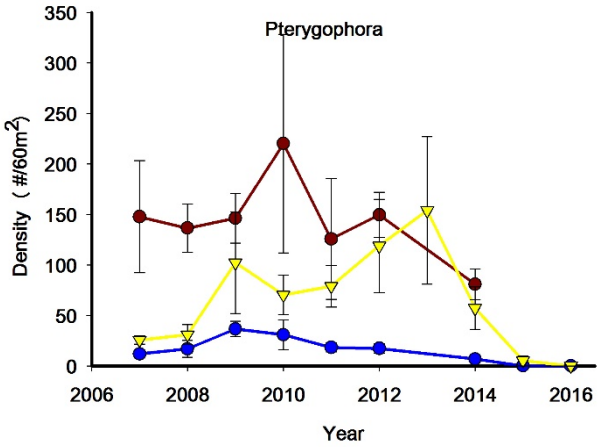


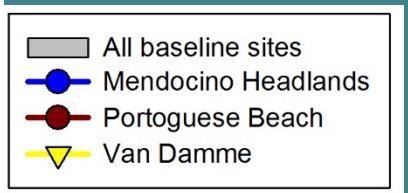




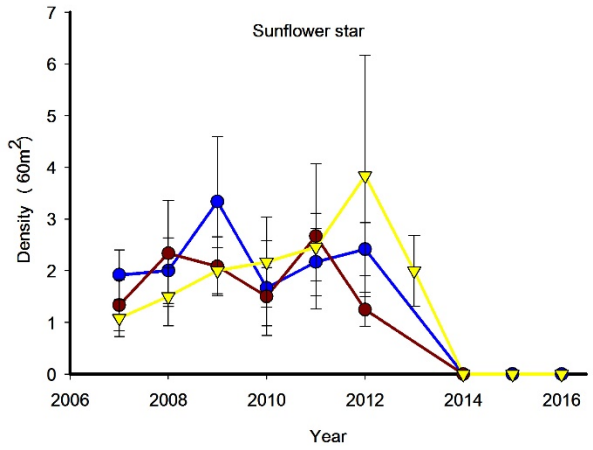


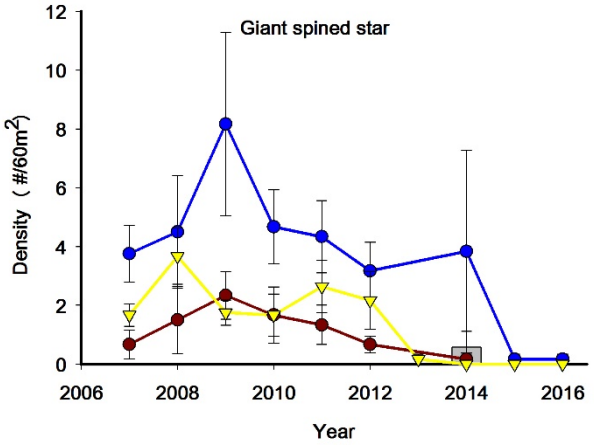


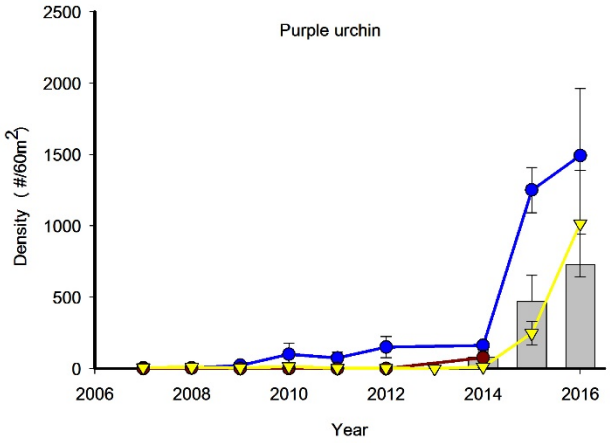


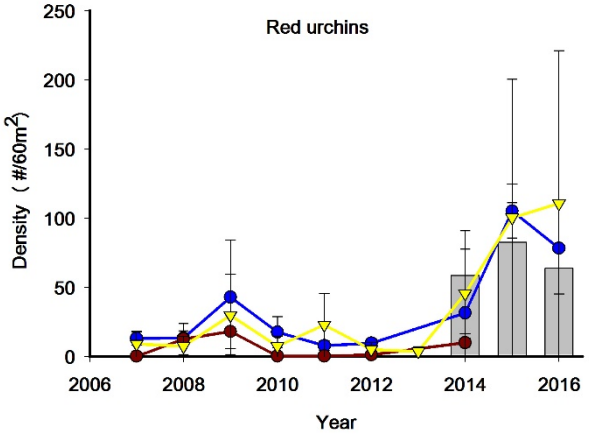


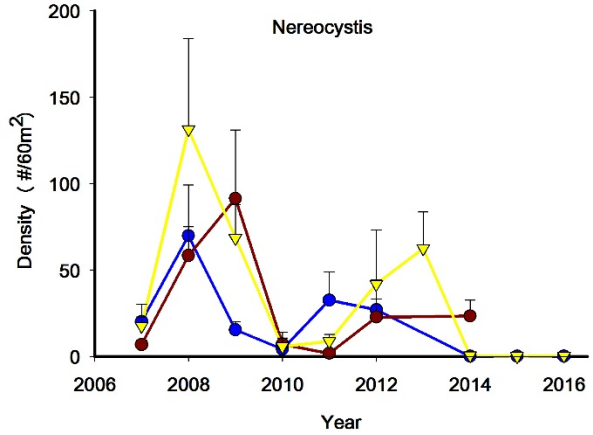
- 2007-2014: abundant kelps
- Decline in sub-canopy follows loss of bull kelp
- Baseline years: urchin barrens
- No recovery in 2016

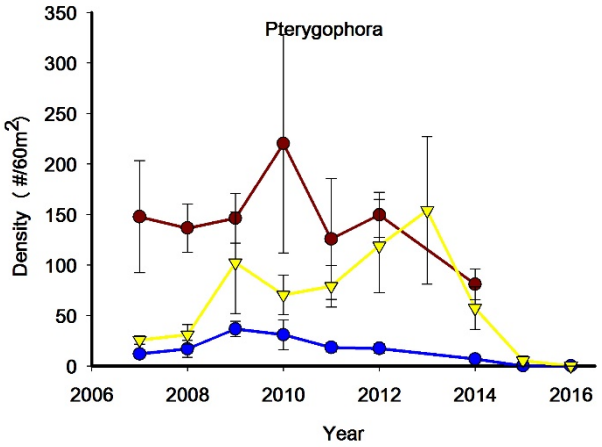

Sunflower star
Density (60m2)
Year


Giant spined star
Density (#/60m2)
Year


Purple urchin
Density (#/60m2)
Year


Red urchins
Density (#/60m2)
Year


Nereocystis
Density (#/60m2)
Year


Pterygophora
Density (#/60m2)
Year

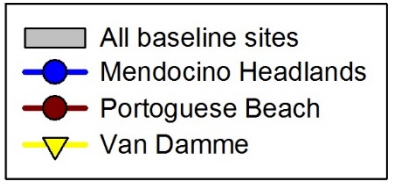

All baseline sites
Mendocino Headlands
Portoguese Beach
Van Damme


Photo David Horwich

Summary

- Kelp forest communities are structured along the north coast
- Larger fish in marine reserve than at fished sites
- Urchin densities seem to be lower in MPA than outside
- Kelp forests communities during baseline years were very different from previous years
  - Kelp forests turned into urchin barrens

Going forward:

- RCCA built citizen science monitoring capacity in NCSR and will continue to monitor MPAs
- Long-term, annual monitoring is necessary to understand MPA effects, climatic change, disease and invasive species
- Integrate NCSR MPA monitoring with long-term monitoring state-wide

Acknowledgements

Citizen Scientist Volunteers

Thank you!

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