



Sea Star Wasting Disease Updates

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Sanctuary Advisory Council Meeting
December 2018

Is Sea Star Wasting Disease (SSWD) Still Around?

- Symptoms

- Twisted arms, deflated appearance
- Tissue decay, lesions
- Arm loss, often death

- Worst in 2013 – 2014

- Still present at low levels (< 20%)

- Most severely impacted:

- *Pisaster ochraceus*
- *Pycnopodia helianthoides*



Where did SSWD come from?

- Probably the North American Pacific coast
- Happened before on regional scales
 - Often coincided with El Niño or warm water
- Was present at very low levels for decades



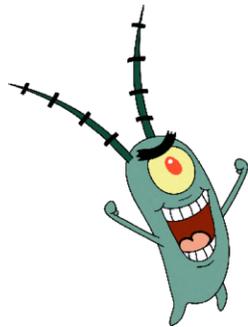
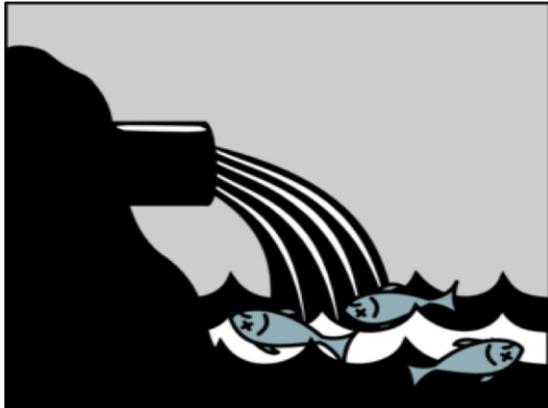
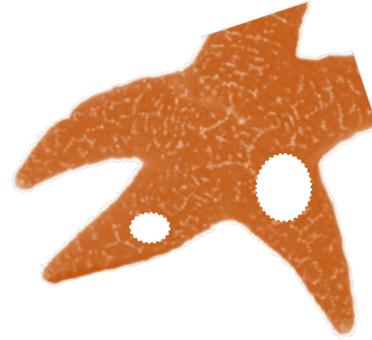
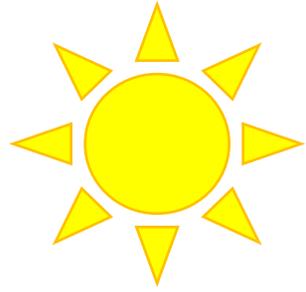
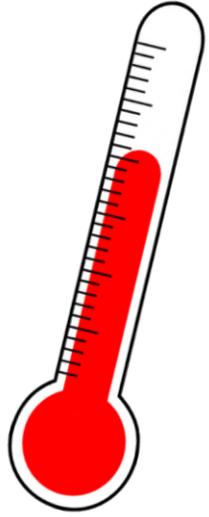
Angela
Johnson

Do we know what causes it? Pathogen search

- Unknown cause and mechanism of spread
 - Virus(es) involved?
 - Environmentally driven?
 - Stress-driven?
- Lab trials of sea star microbiome
 - No consistent pathogen found to cause lesions

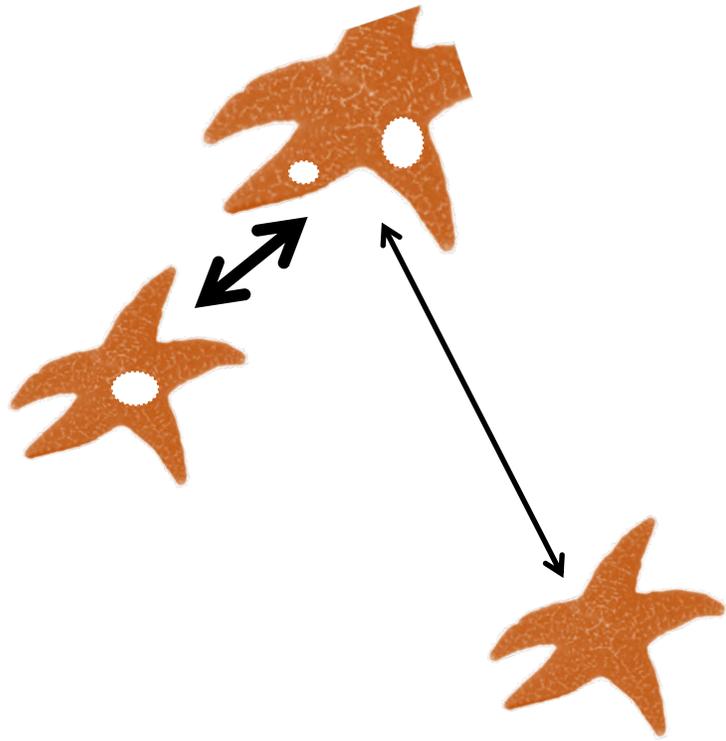


Do we know what causes it? Environmental factors

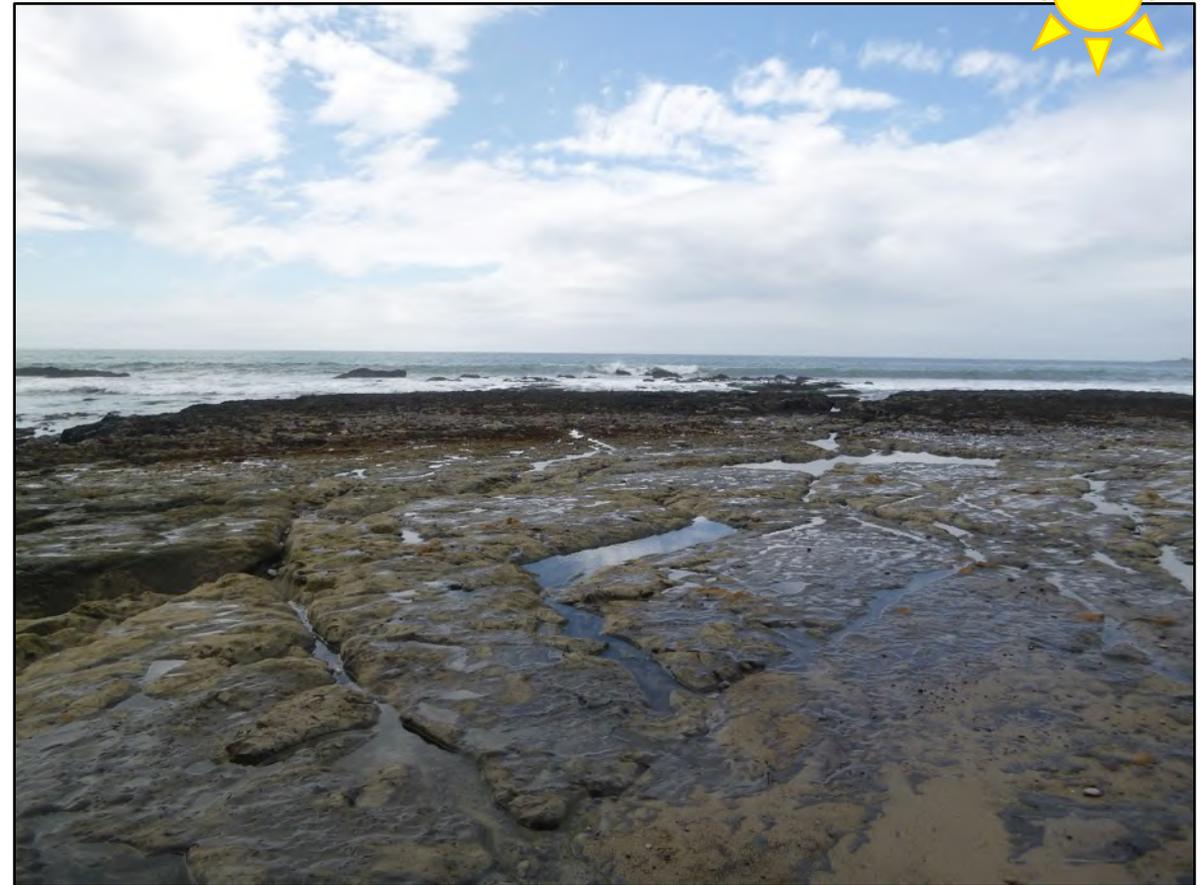


Environmental factors relevant for whole coast

↑ Proximity to nearest infected site

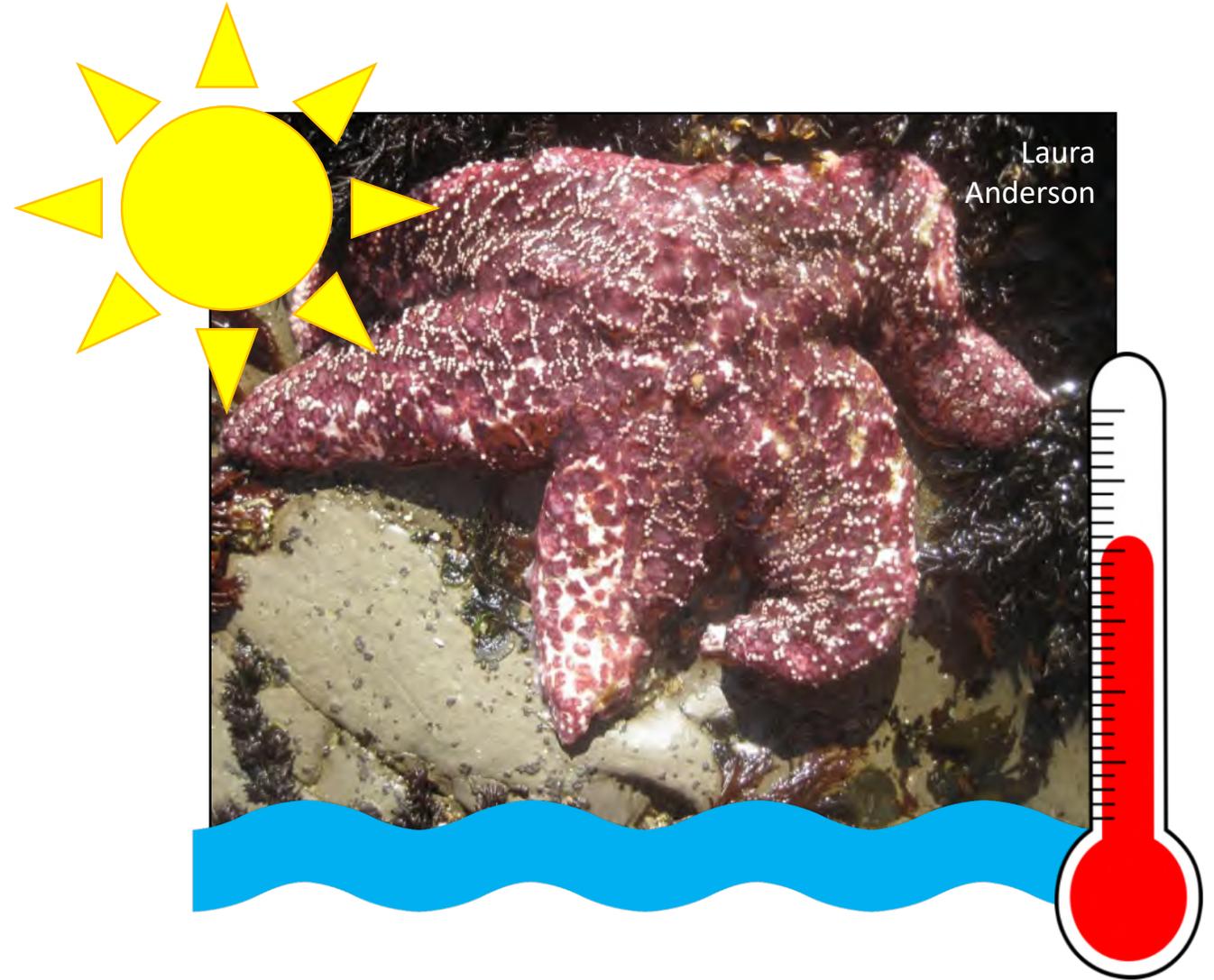


↑ Afternoon low tide exposure



No clear relationship with warm water

- No warm water pattern
 - Different from prior outbreaks
- Low tide duration
 - ↑ virulence?
 - ↑ susceptibility?
- Correlation, NOT causation



Are the surviving stars immune?

- Not sure if immune or just recovered
- Possible resistance genes in *Pisaster* under investigation (UC Merced)



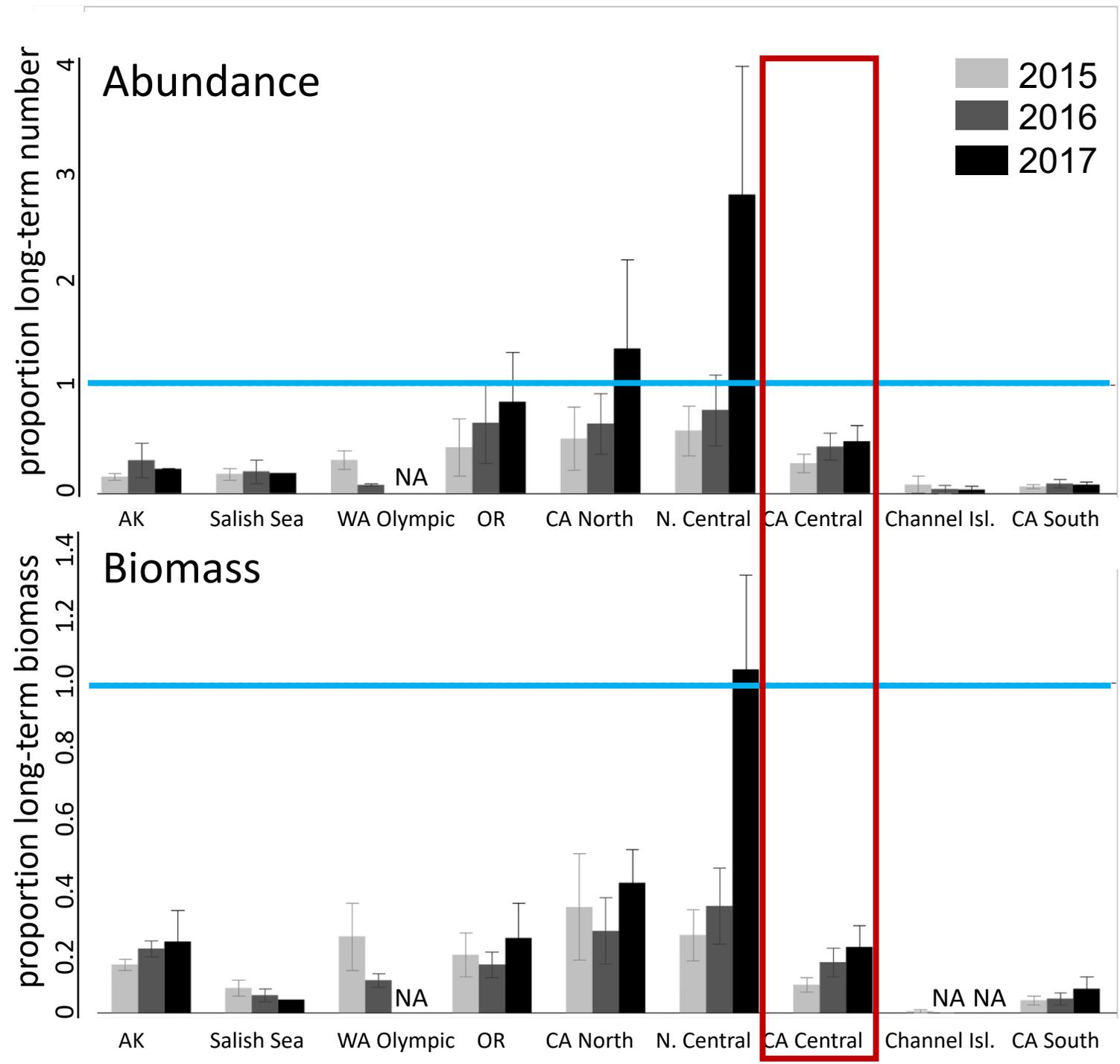
Recovery in progress for *Pisaster*, but not normal yet

- Relatively high recruitment in Sanctuary
- Shifted size structure to small individuals
- Biomass still low → low predation pressure

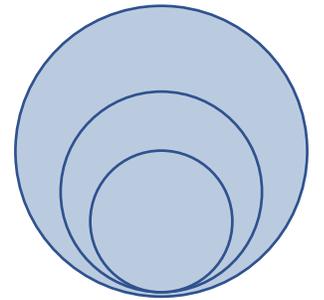
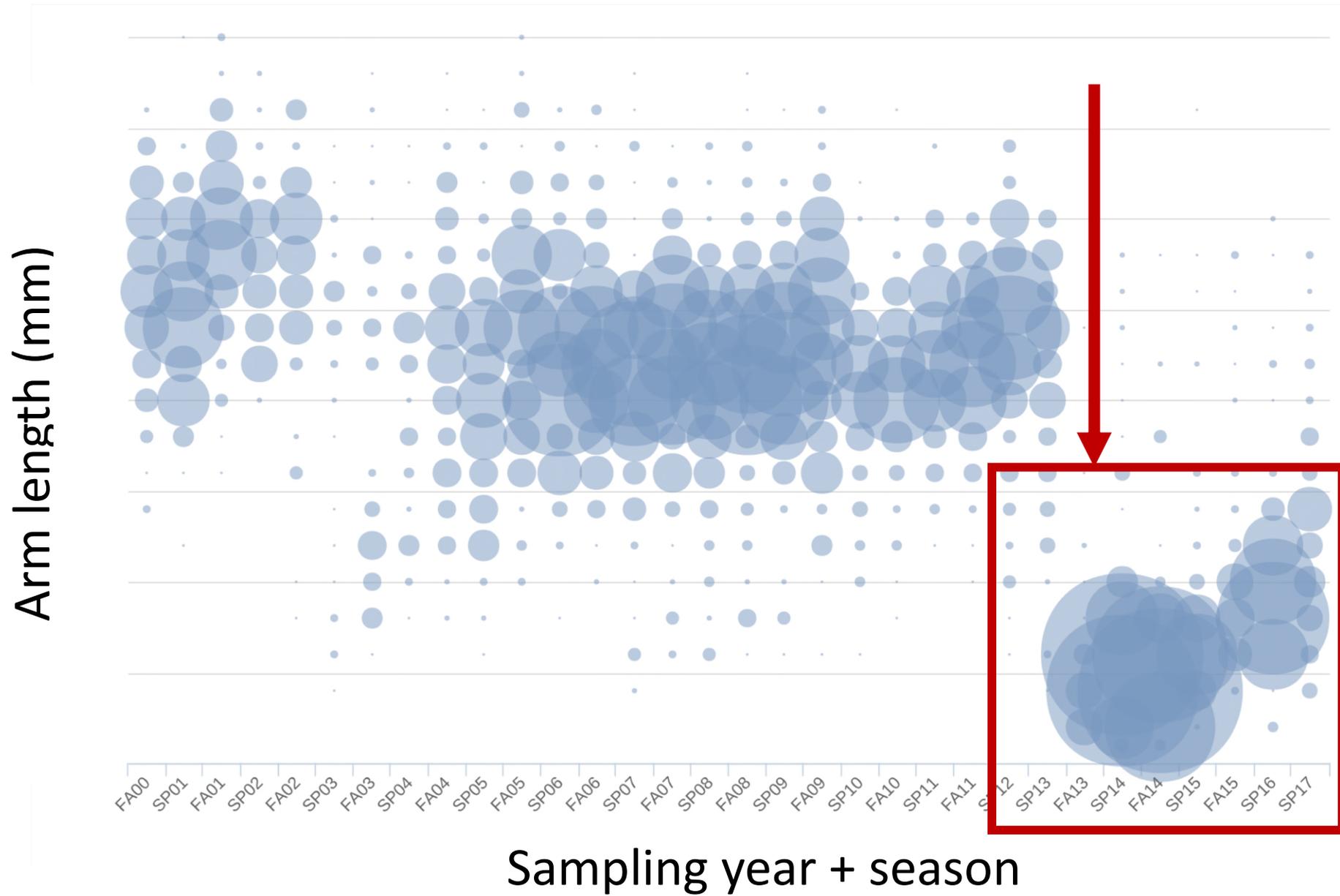


Comparison to long-term

- Most regions below long-term average abundance
- Further below long-term average biomass (predation pressure)

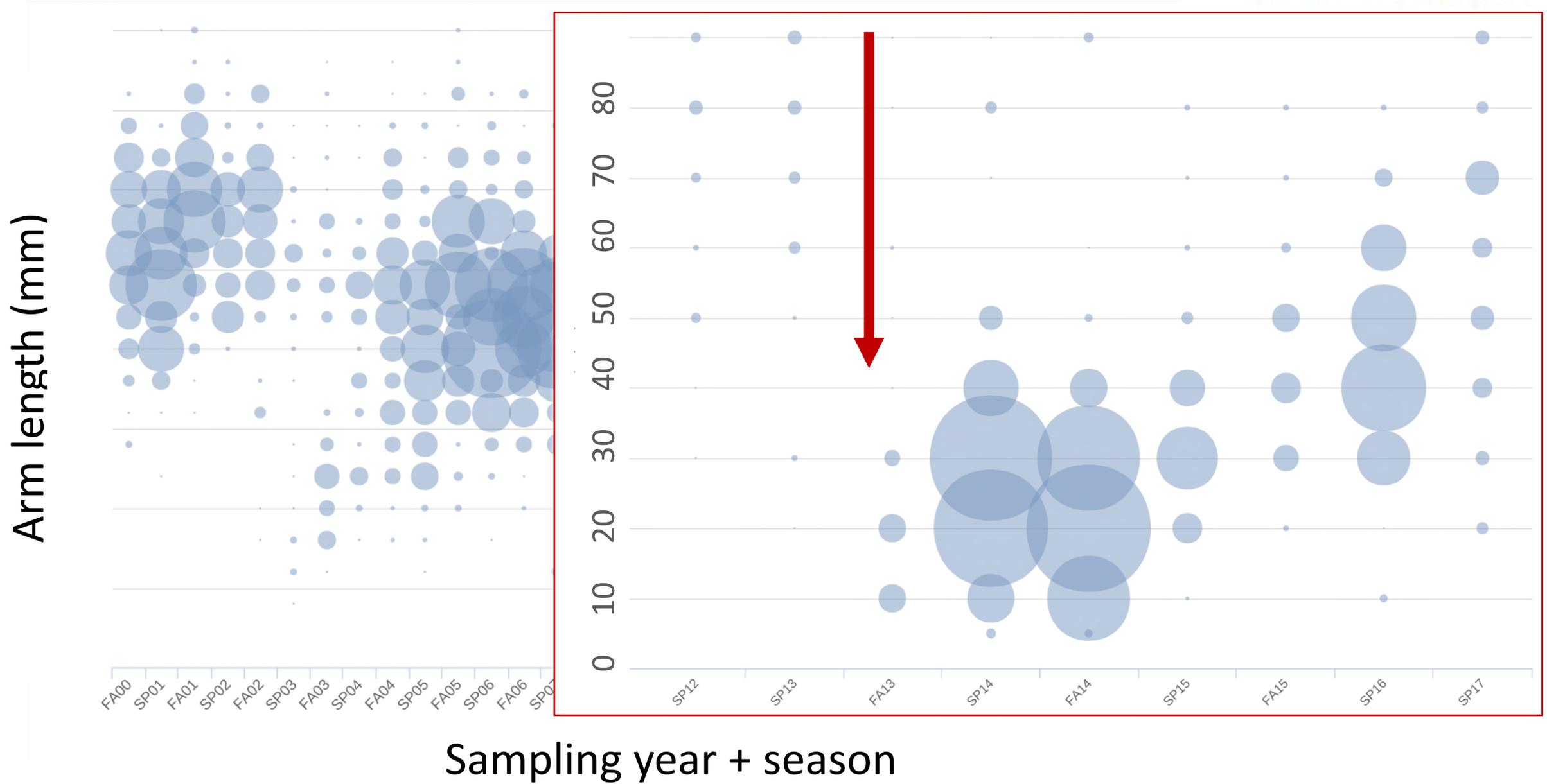


Pisaster ochraceus sizes, Long Marine Lab, Santa Cruz

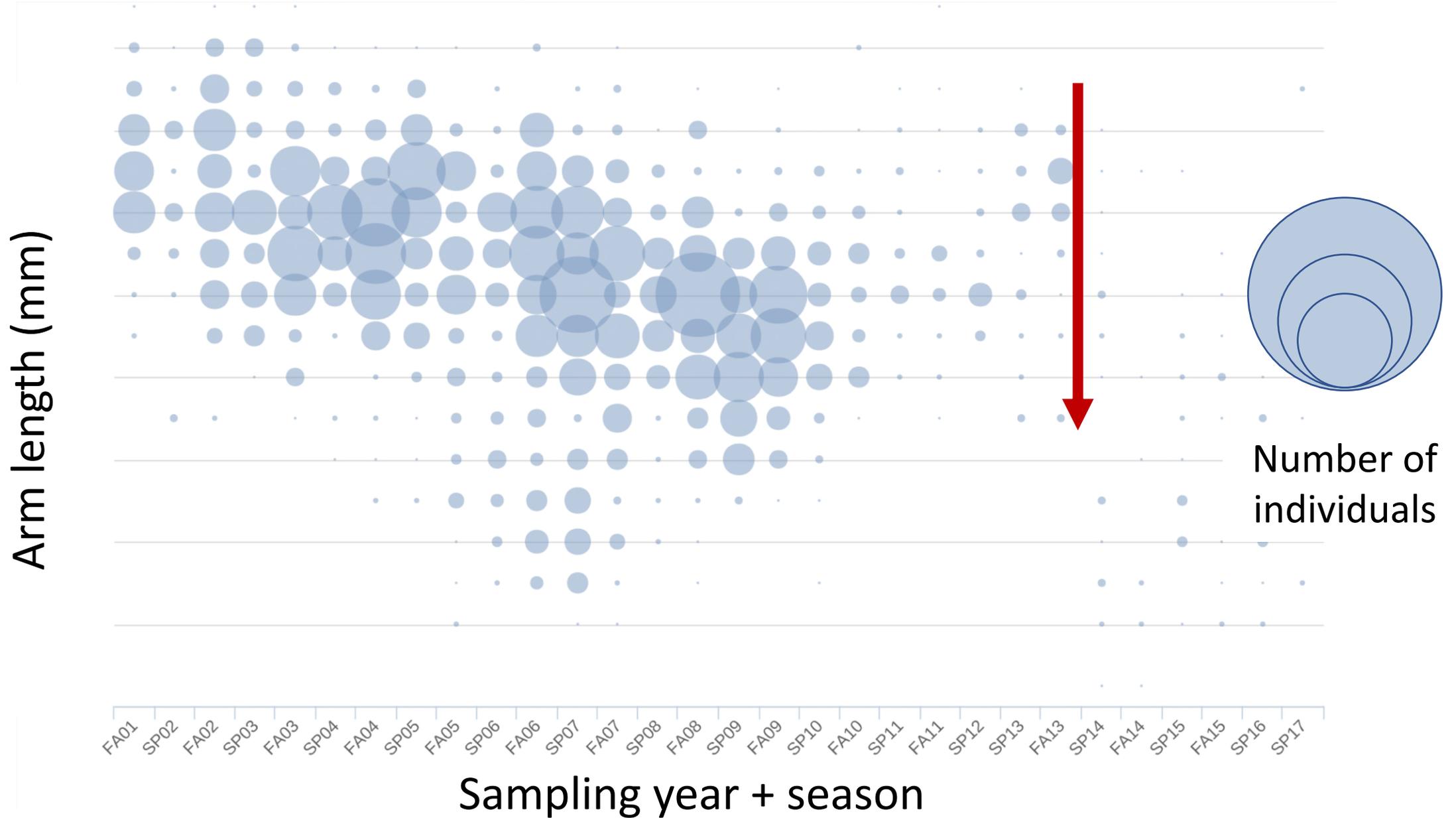


Number of individuals

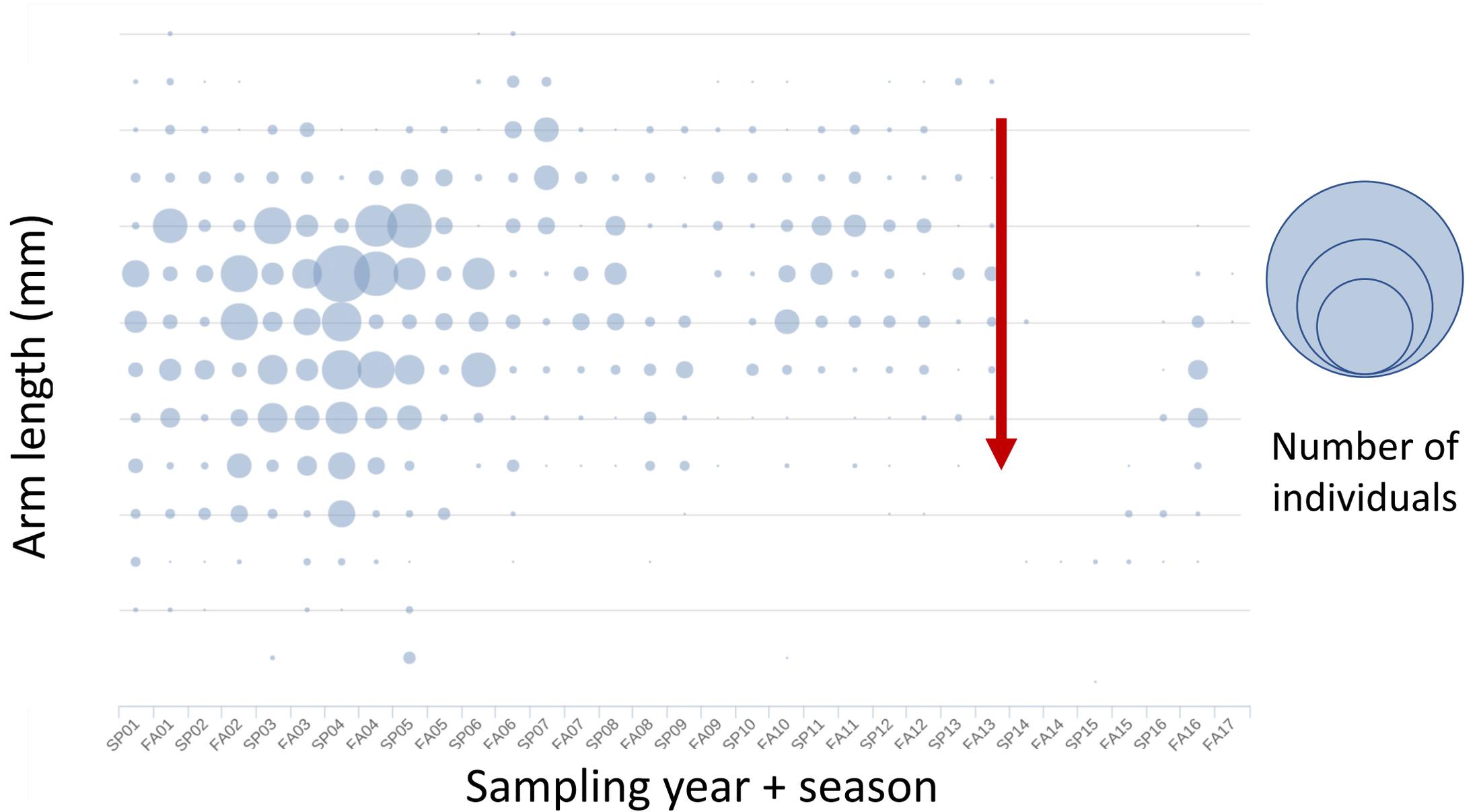
Pisaster ochraceus sizes, Long Marine Lab, Santa Cruz



Pisaster ochraceus sizes, Hopkins Marine Station, Pacific Grove



Pisaster ochraceus sizes, Point Sierra Nevada, San Luis Obispo County



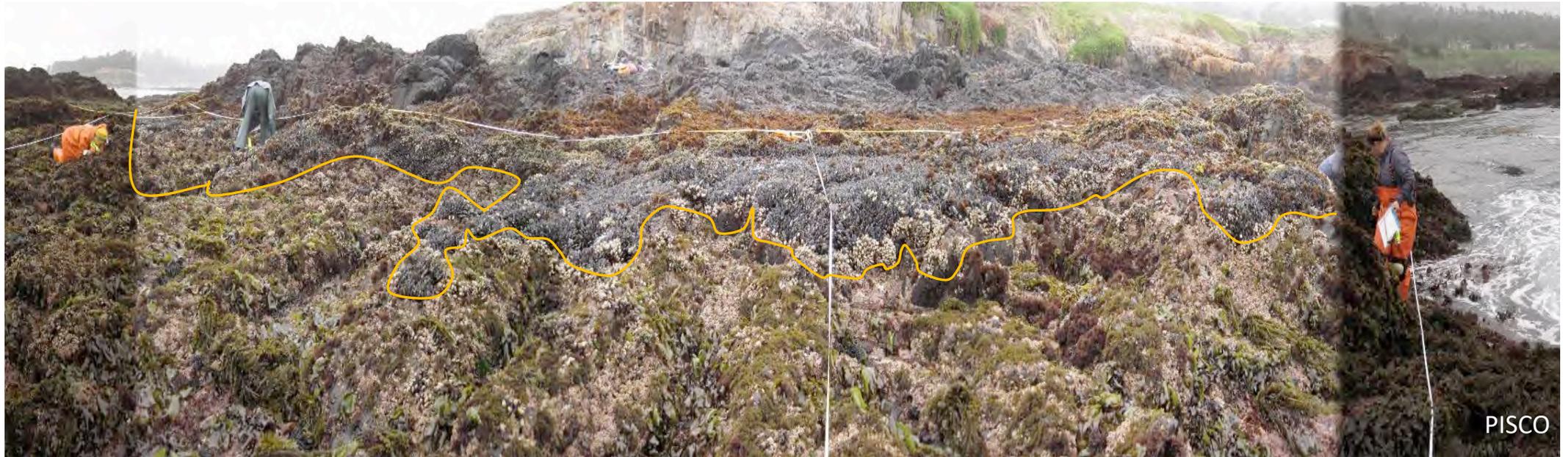
Pycnopodia not recovering

Sunflower stars → urchins (mostly purple) → kelp



Intertidal community effects of low *Pisaster*





Stillwater
Cove
Spring 2014



Stillwater
Cove
Spring 2015

Asilomar,
April 2014



Asilomar,
April 2015



Asilomar,
April 2014



Asilomar,
March 2018



Perspective on mussel bed change





Questions?
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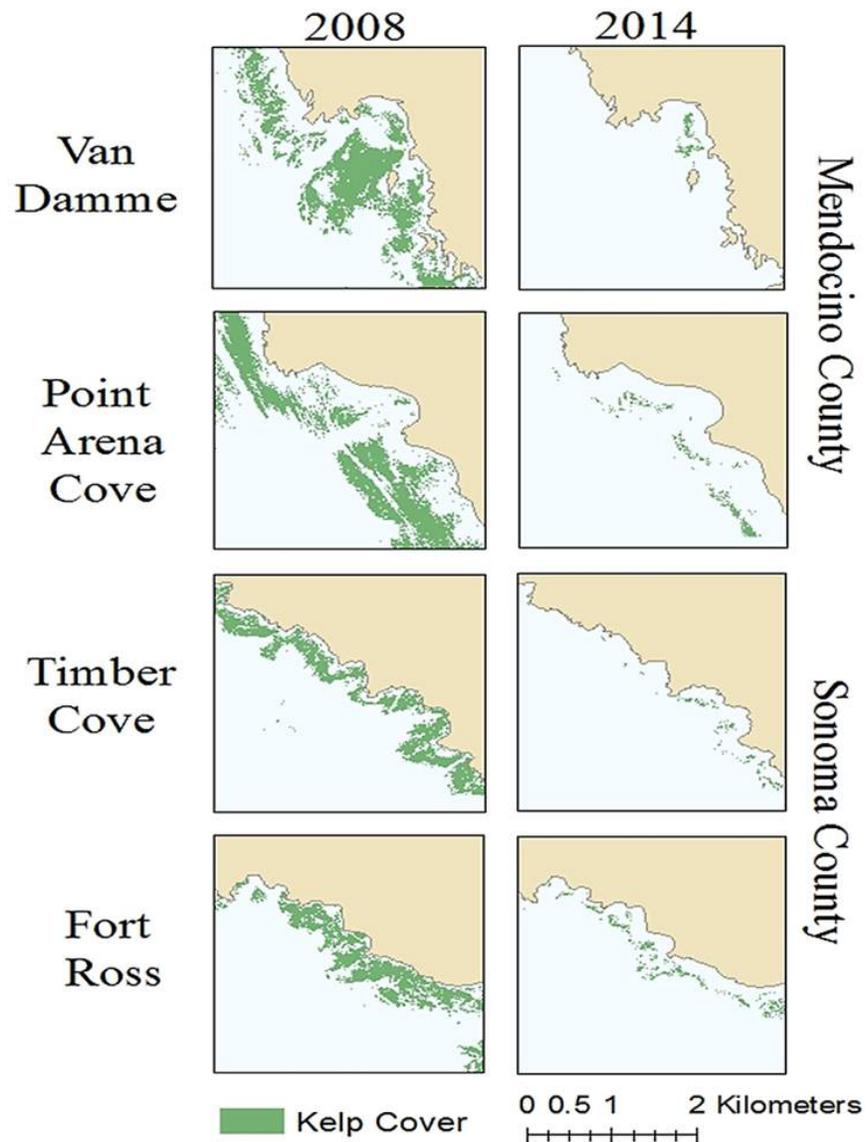
Davenport Landing,
April 2014



Davenport Landing,
May 2017

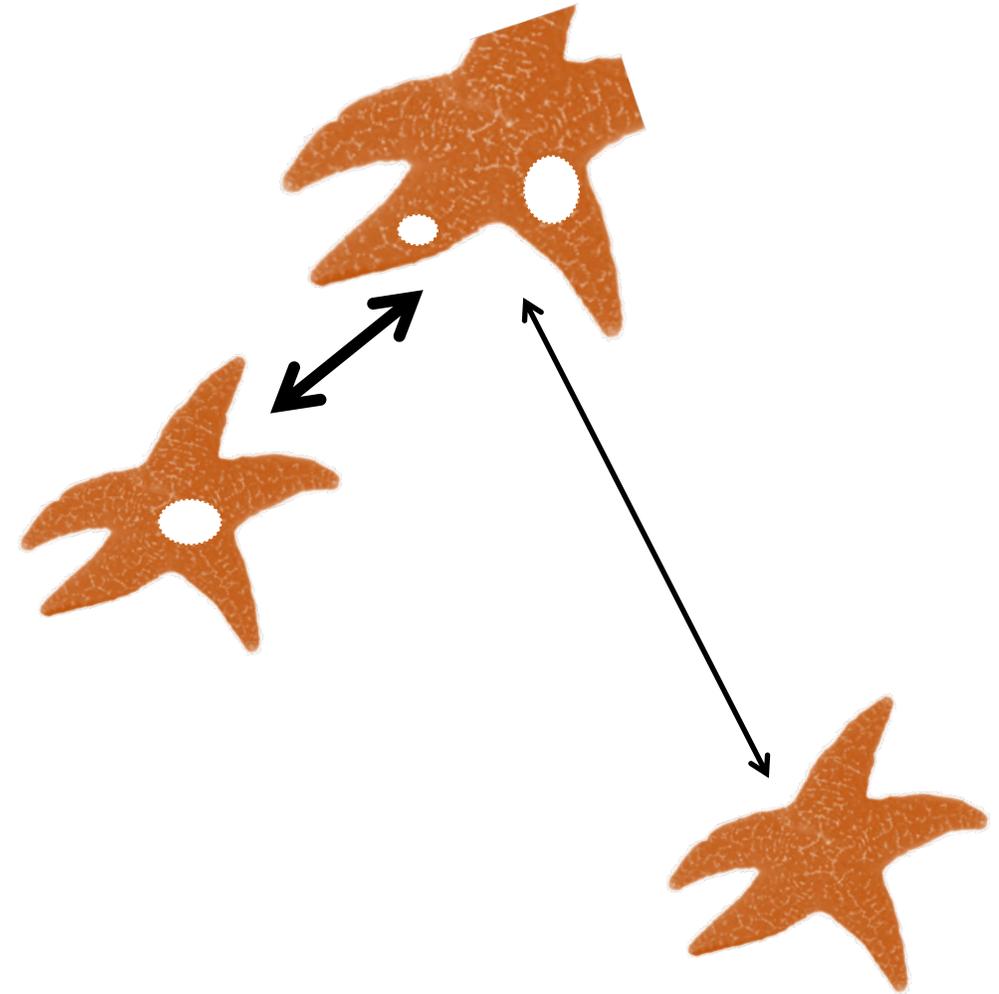
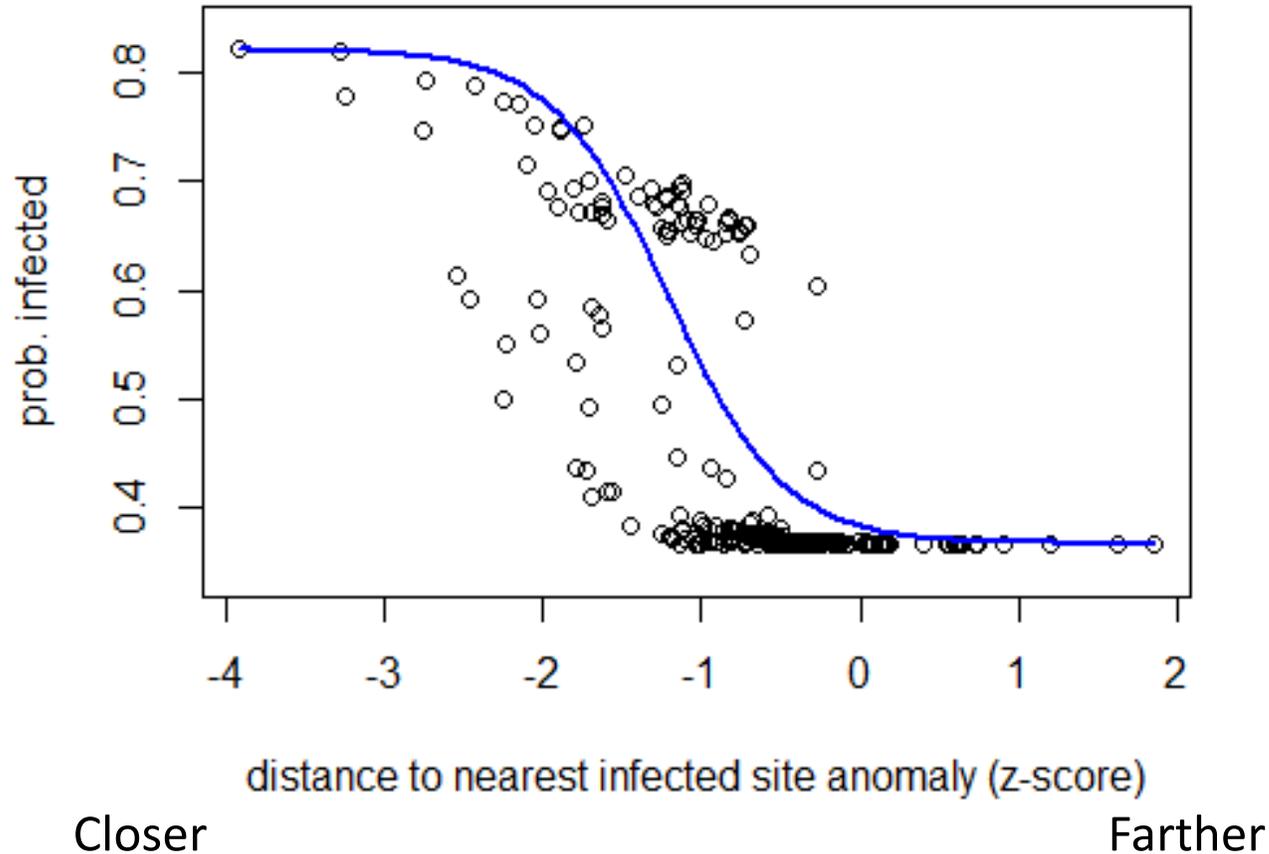


Kelp loss and urchin barrens



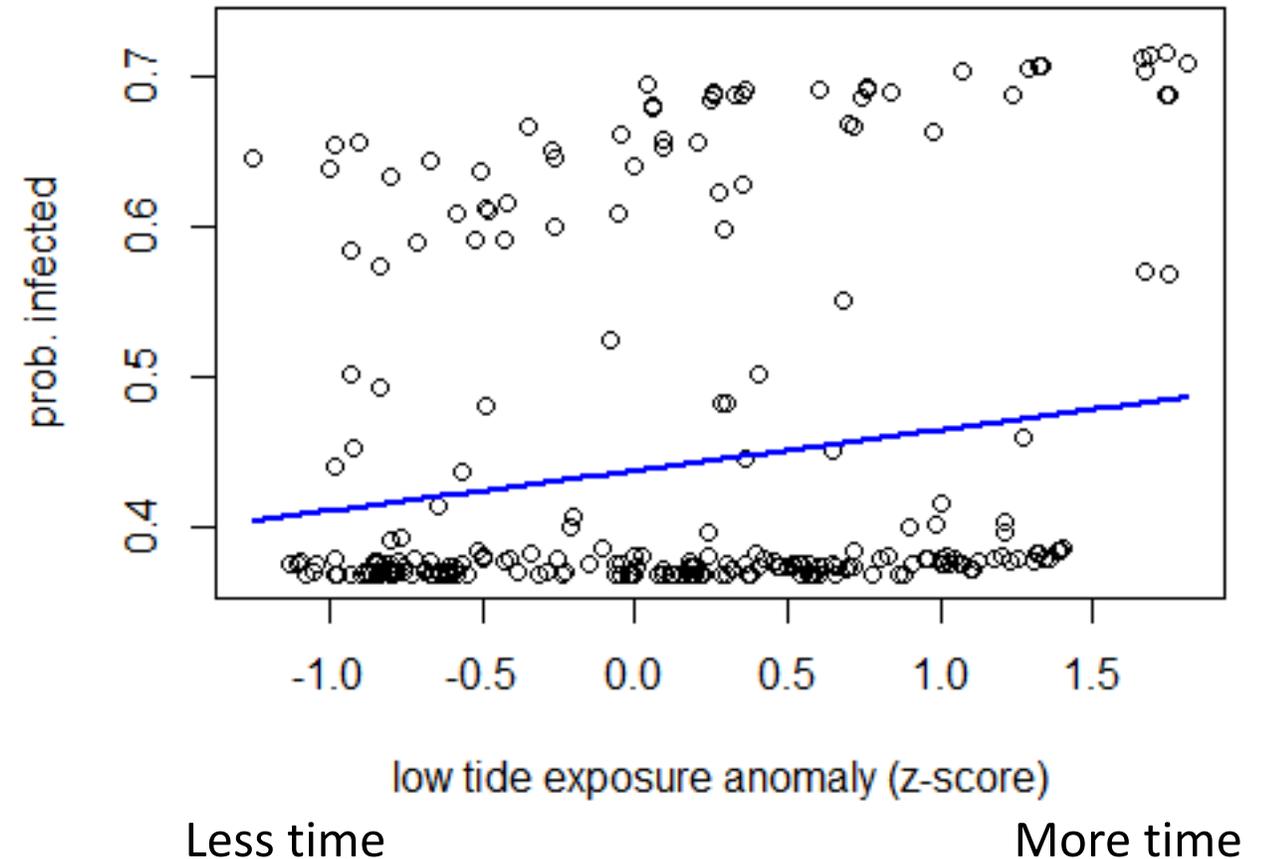
Results: Whole coast patterns – neighbor sites and low tide duration

- ↓ Distance from nearest infected site



Results: Whole coast patterns – neighbor sites and low tide duration

- ↑ Afternoon low tide exposure



Skewed size structures

