

Lab Experiment Update: Effects of Stressors on Olympia Oysters

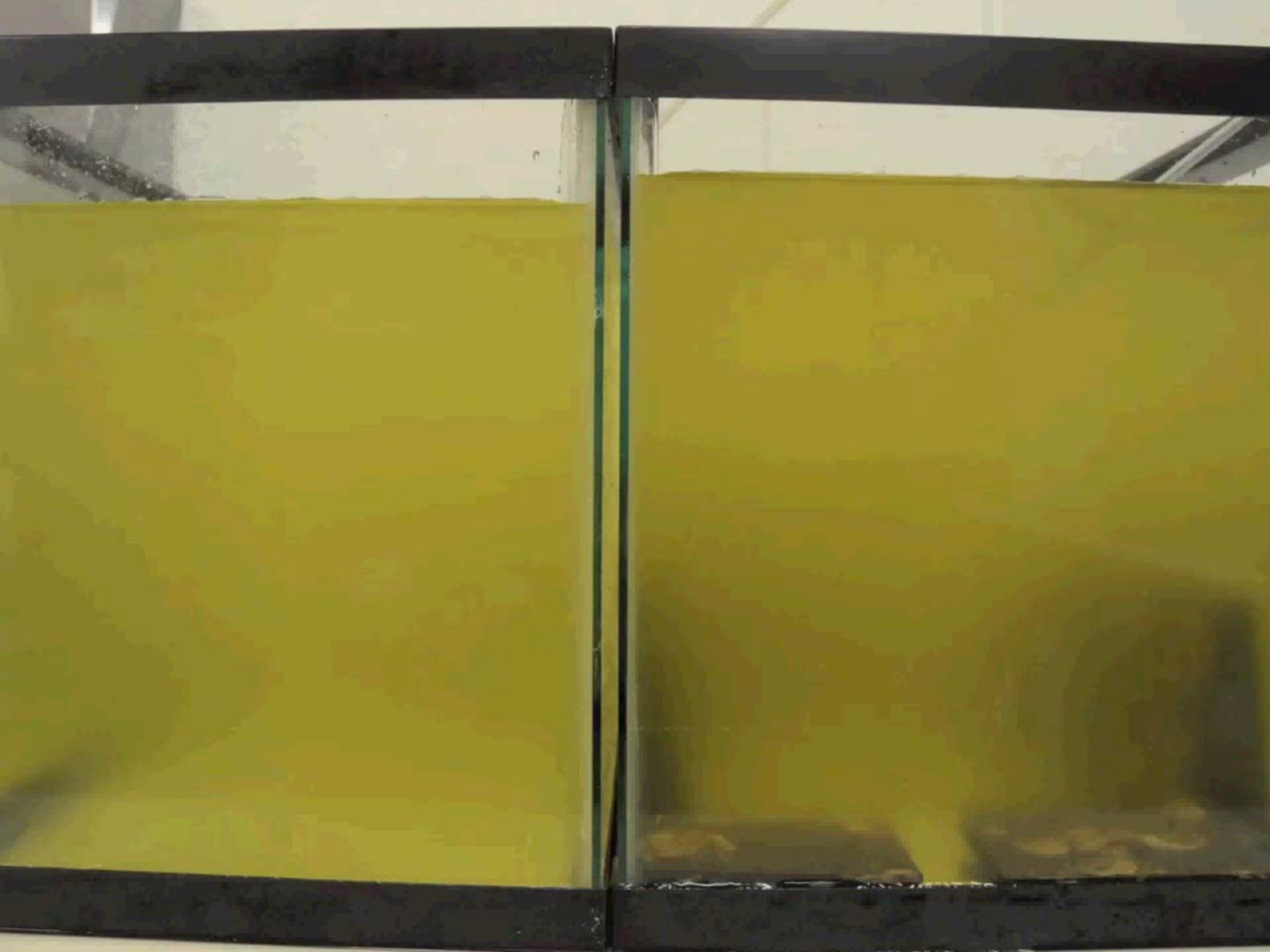
Brian Cheng

Bodega Marine Laboratory

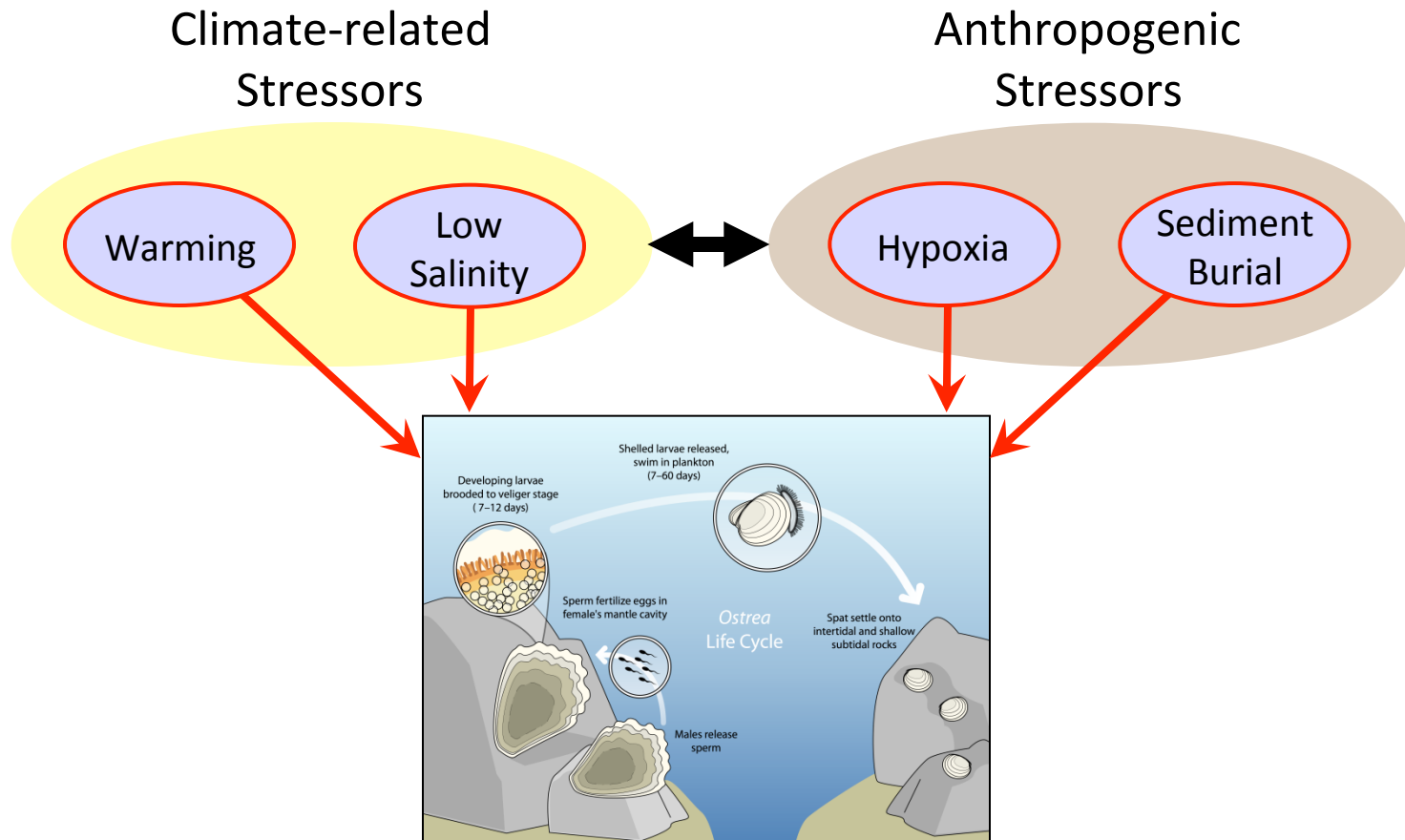
University of California, Davis

Email: bscheng@ucdavis.edu





Simplified conceptual model



Elkhorn Slough

You are here



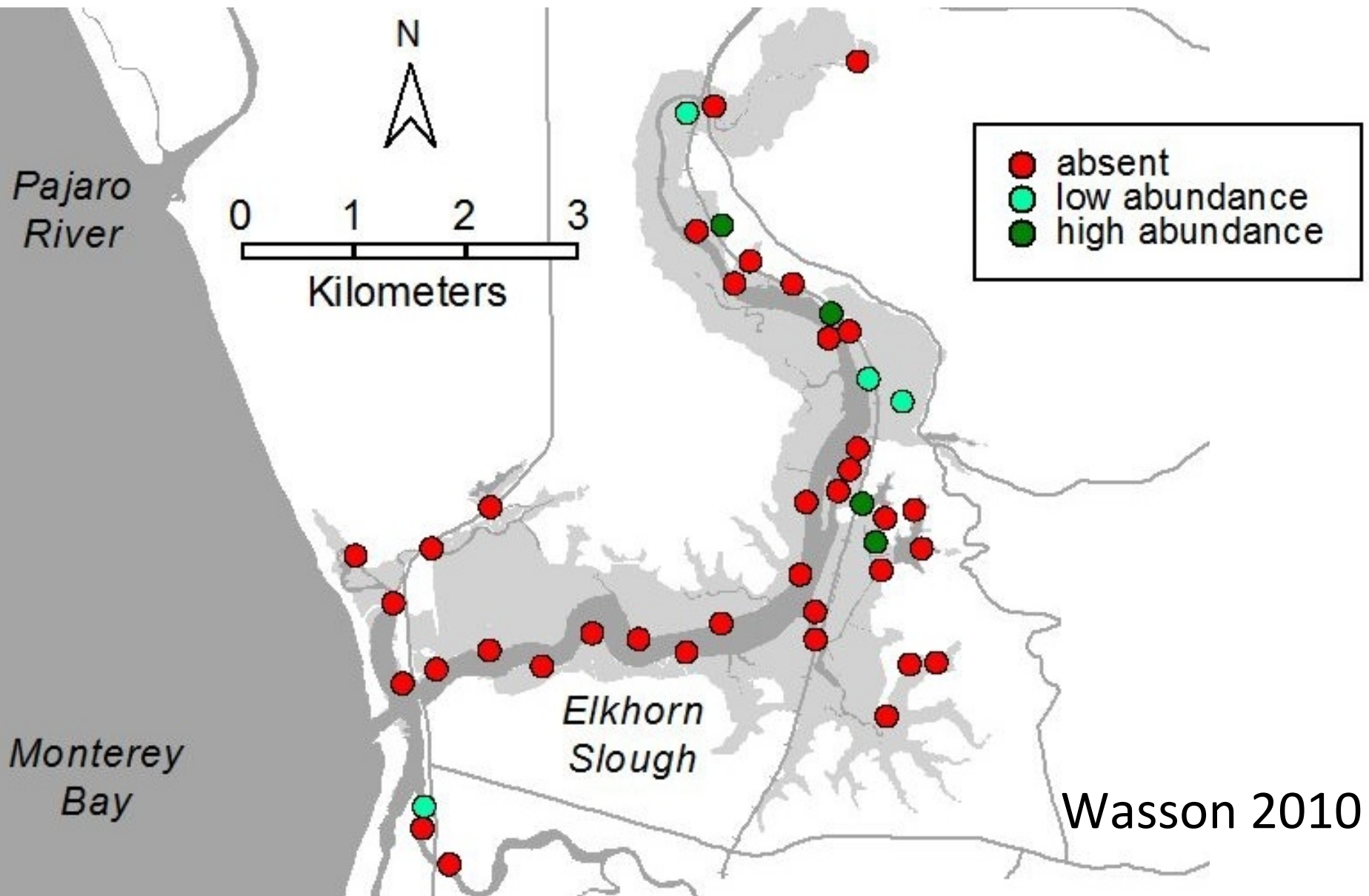
Oyster population
estimate ~ 5,000

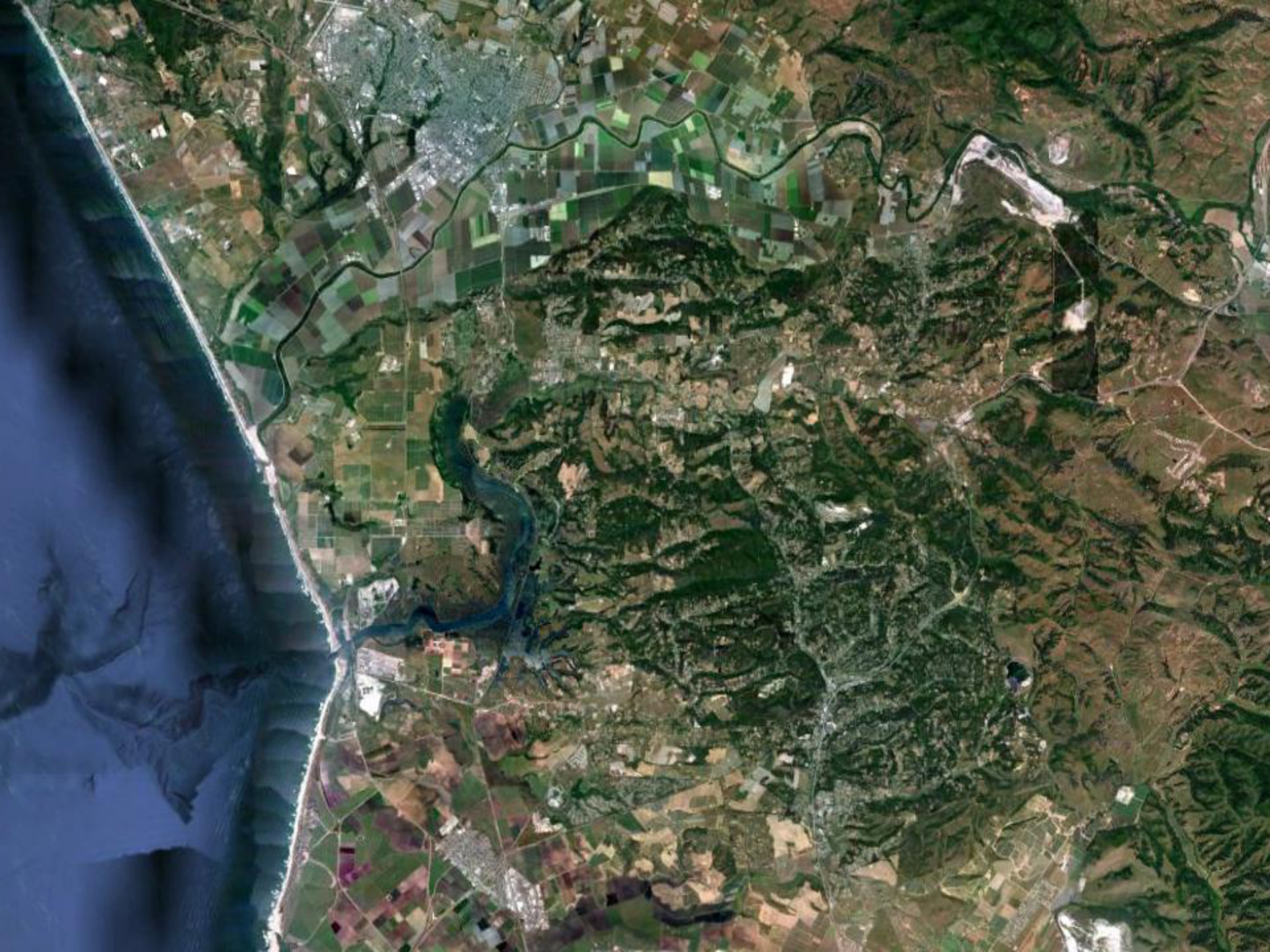
F, NOAA
etrics

GA, GEBCO

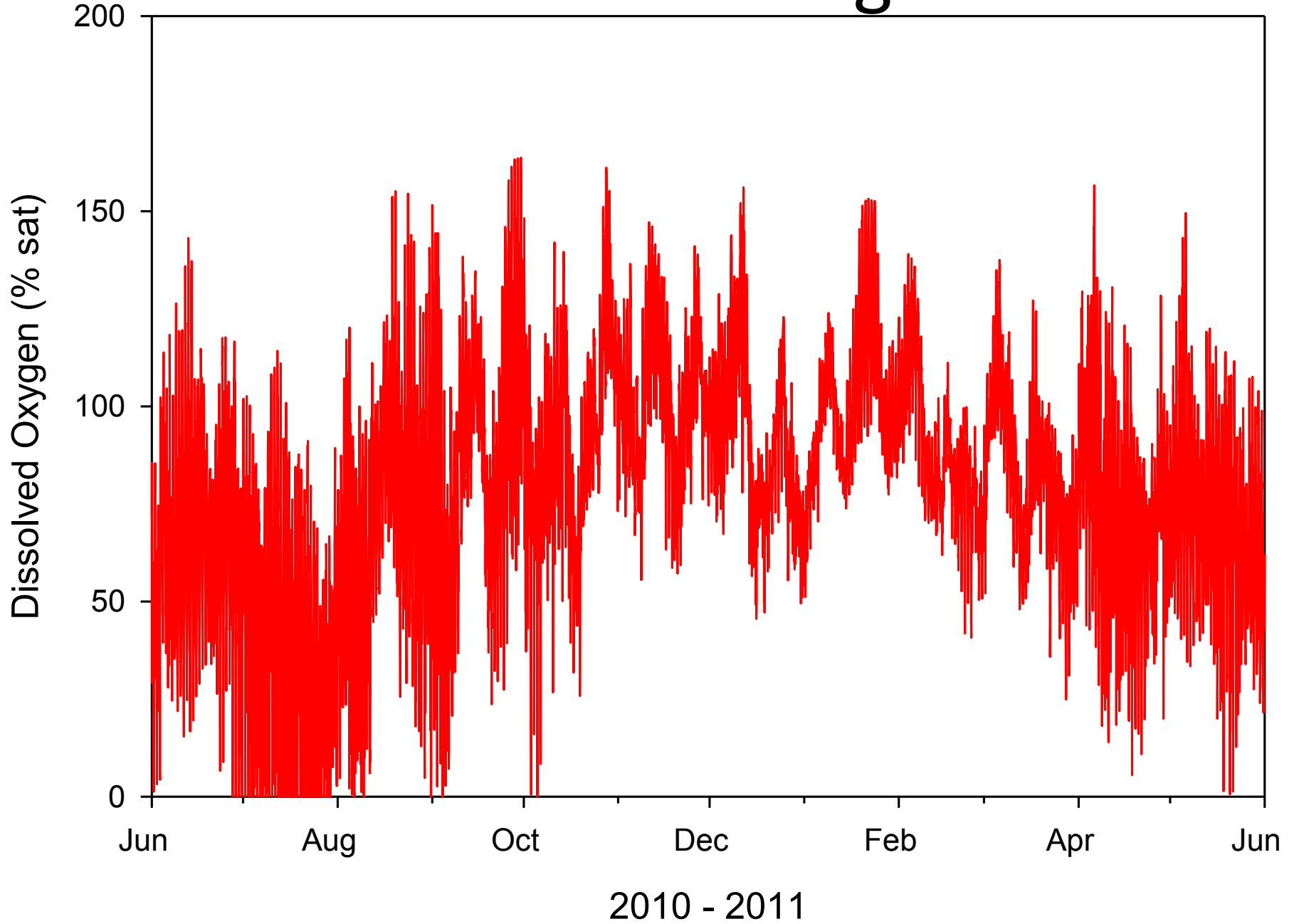
Google™ ea

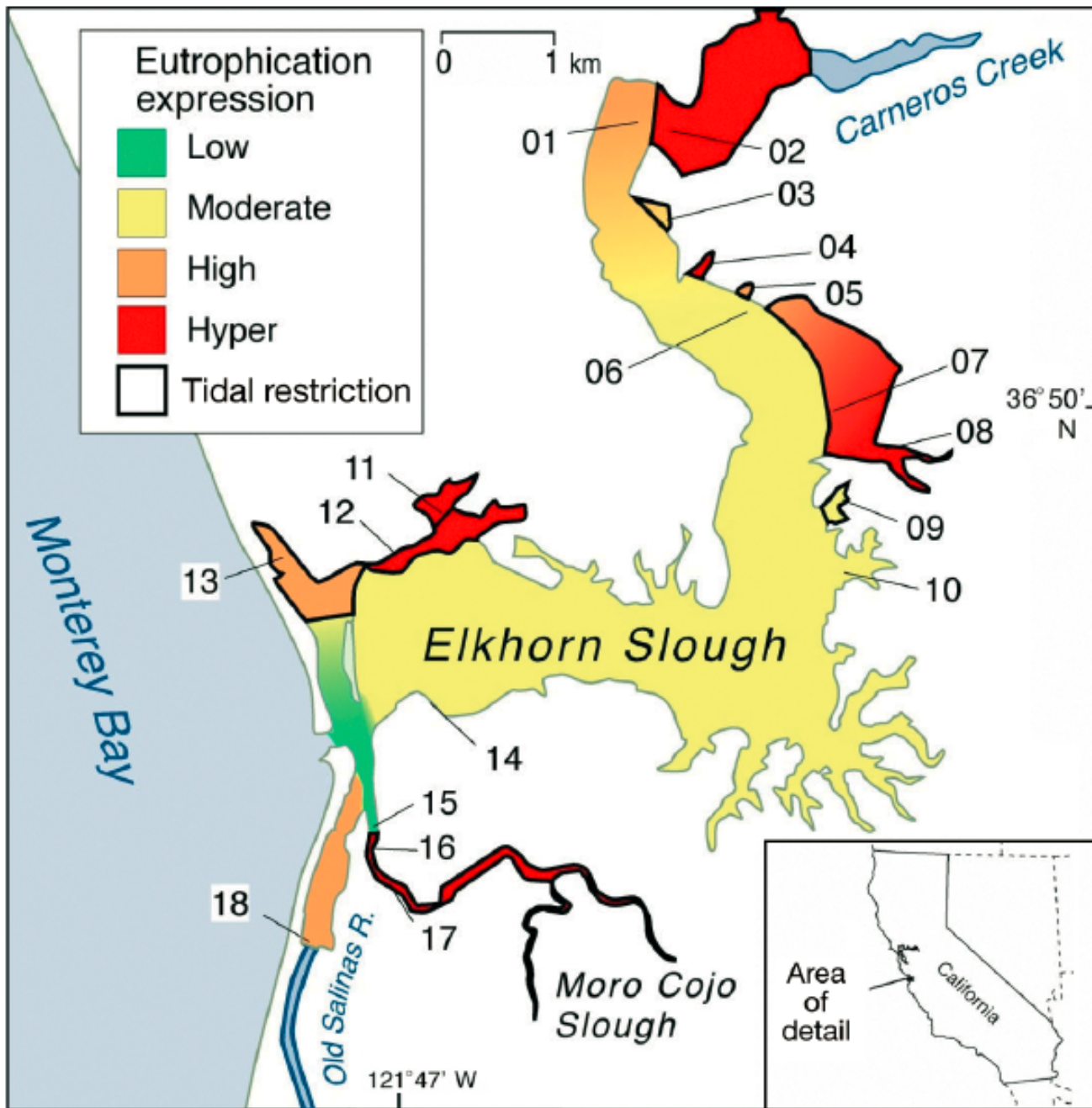
Oysters absent from most of estuary





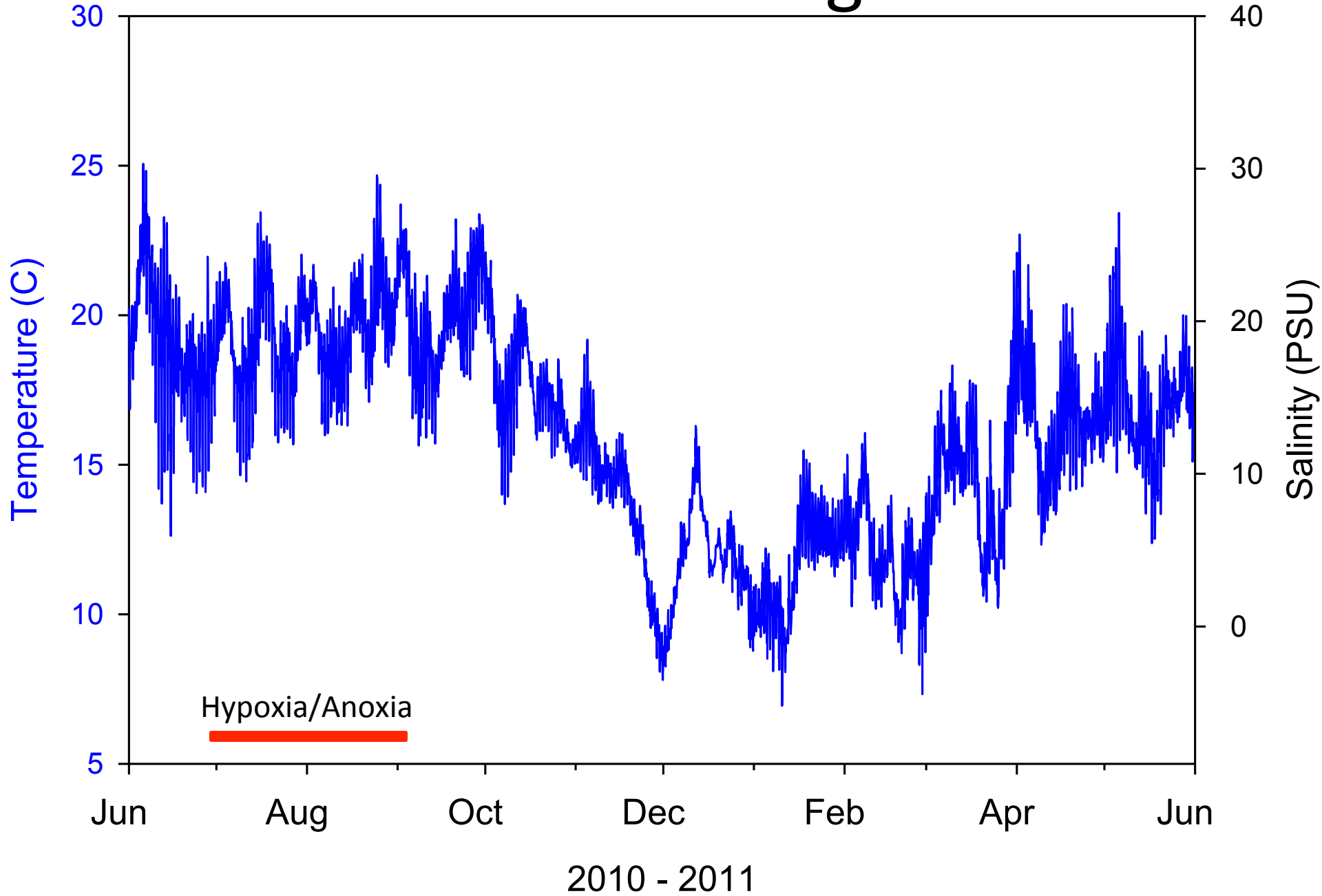
Elkhorn Slough



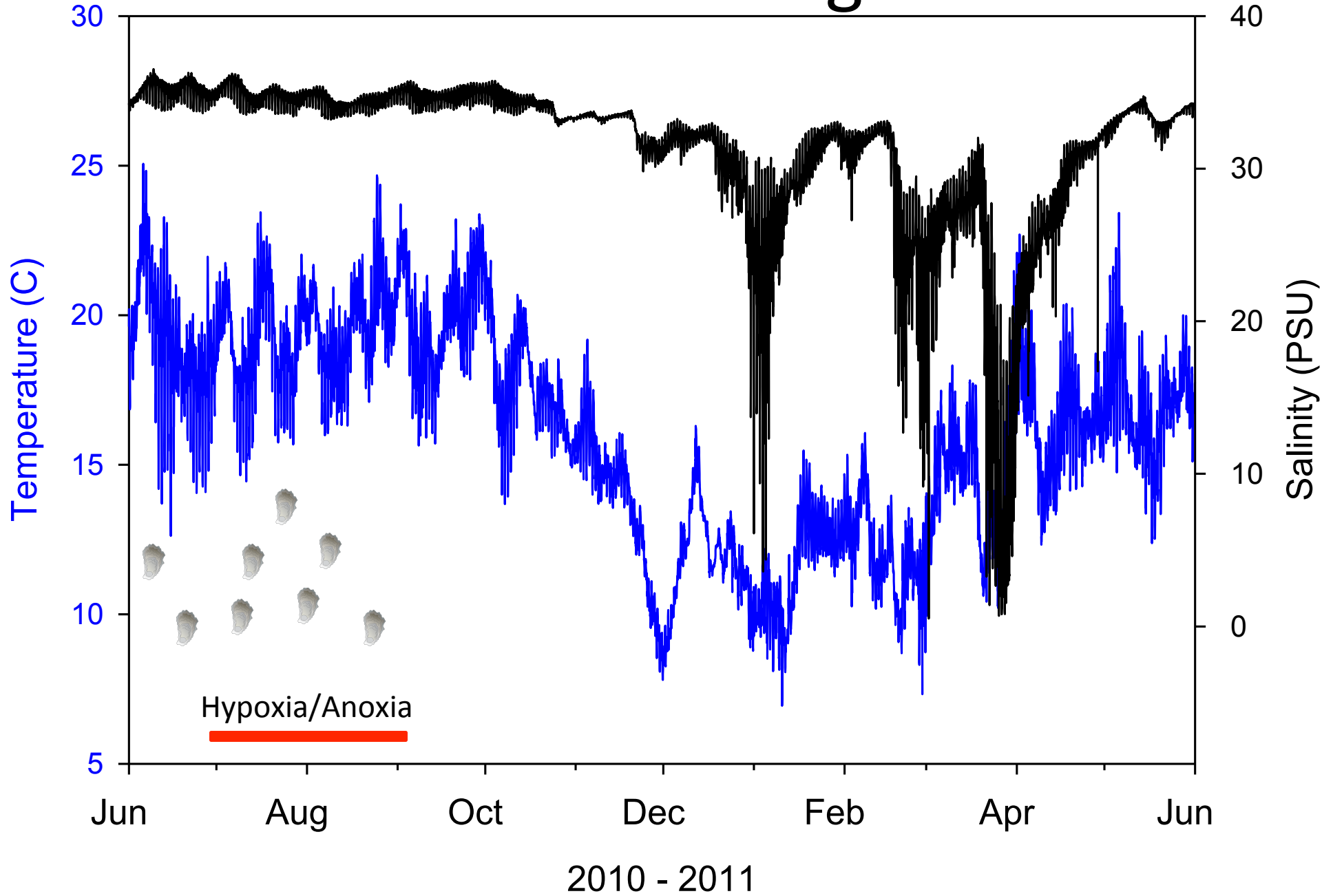


Hughes et al. 2011

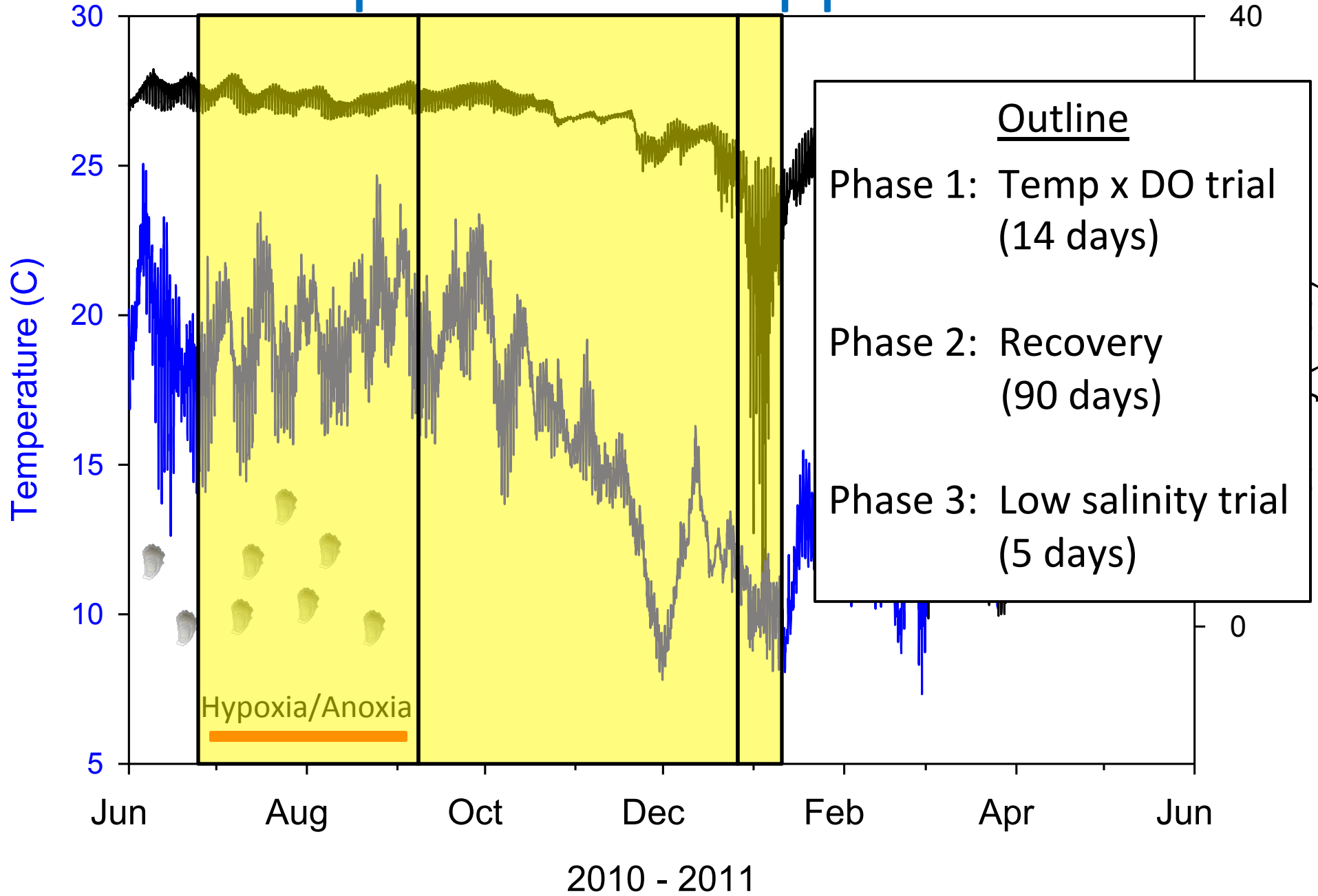
Elkhorn Slough



Elkhorn Slough



Experimental Approach

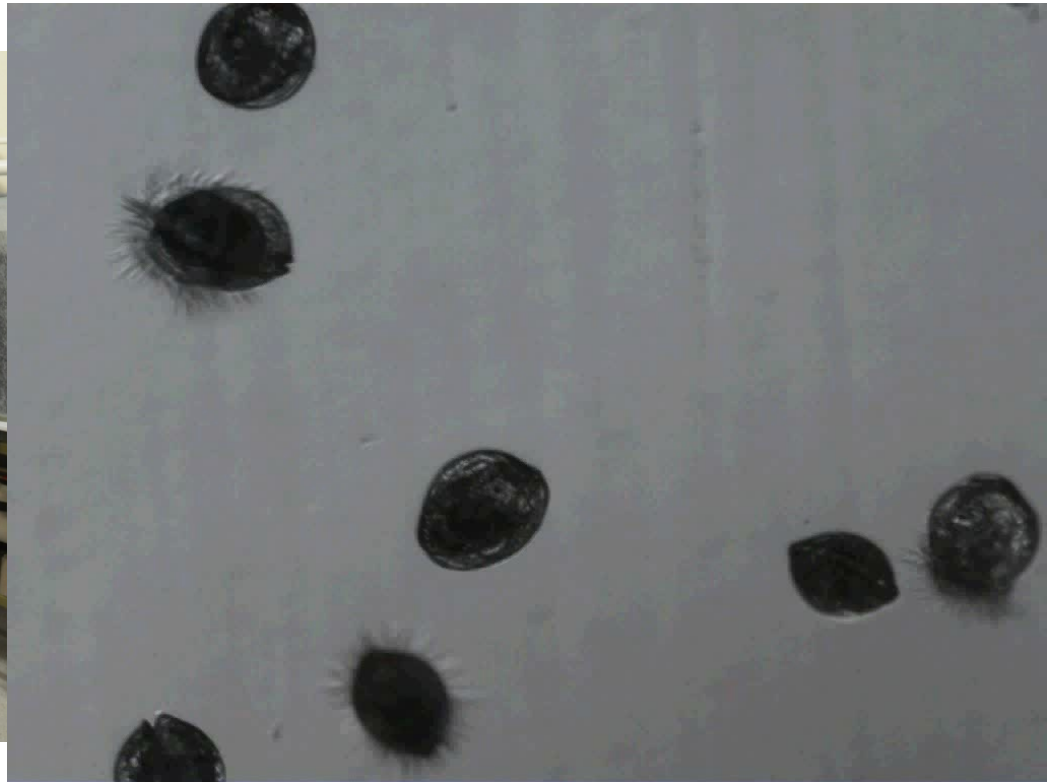


Questions

1. How do multiple simultaneous stressors affect oysters? (temp x DO)
2. Are oysters capable of recovering from these stressors over time?
3. Does early stress affect performance at later stages in response to low salinity? (latent effect?)

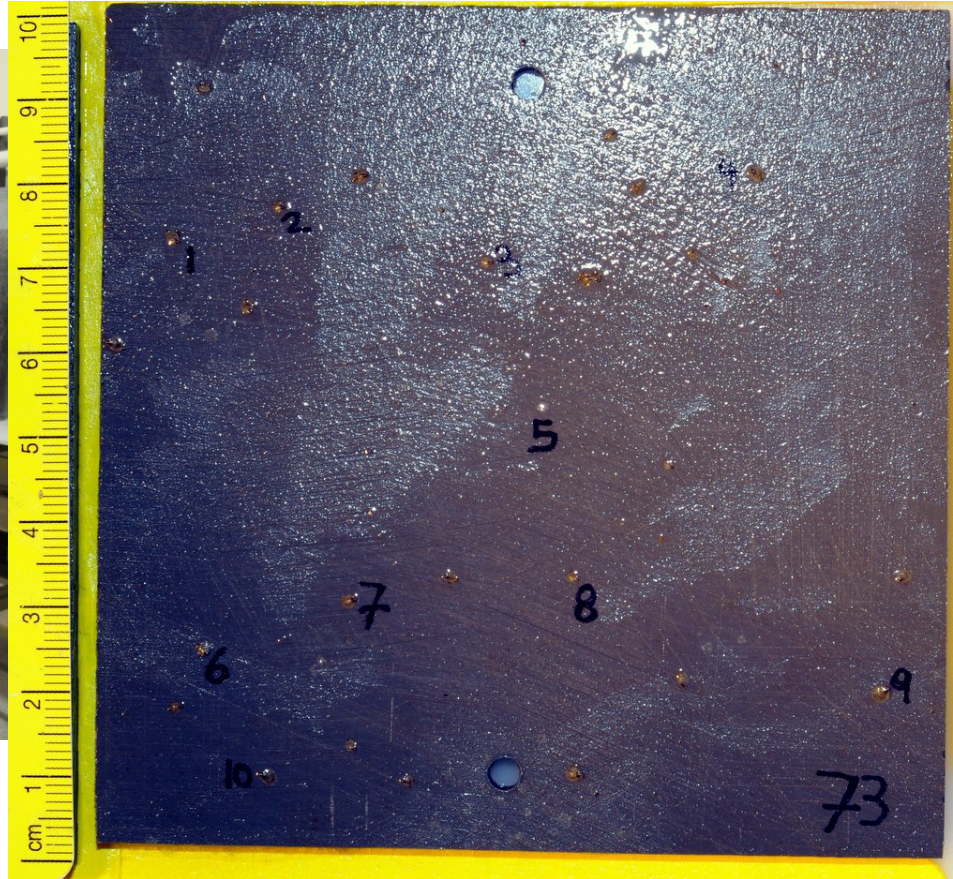
Methods

- Spawned oysters from San Francisco Bay adults (6 collection sites)



Methods

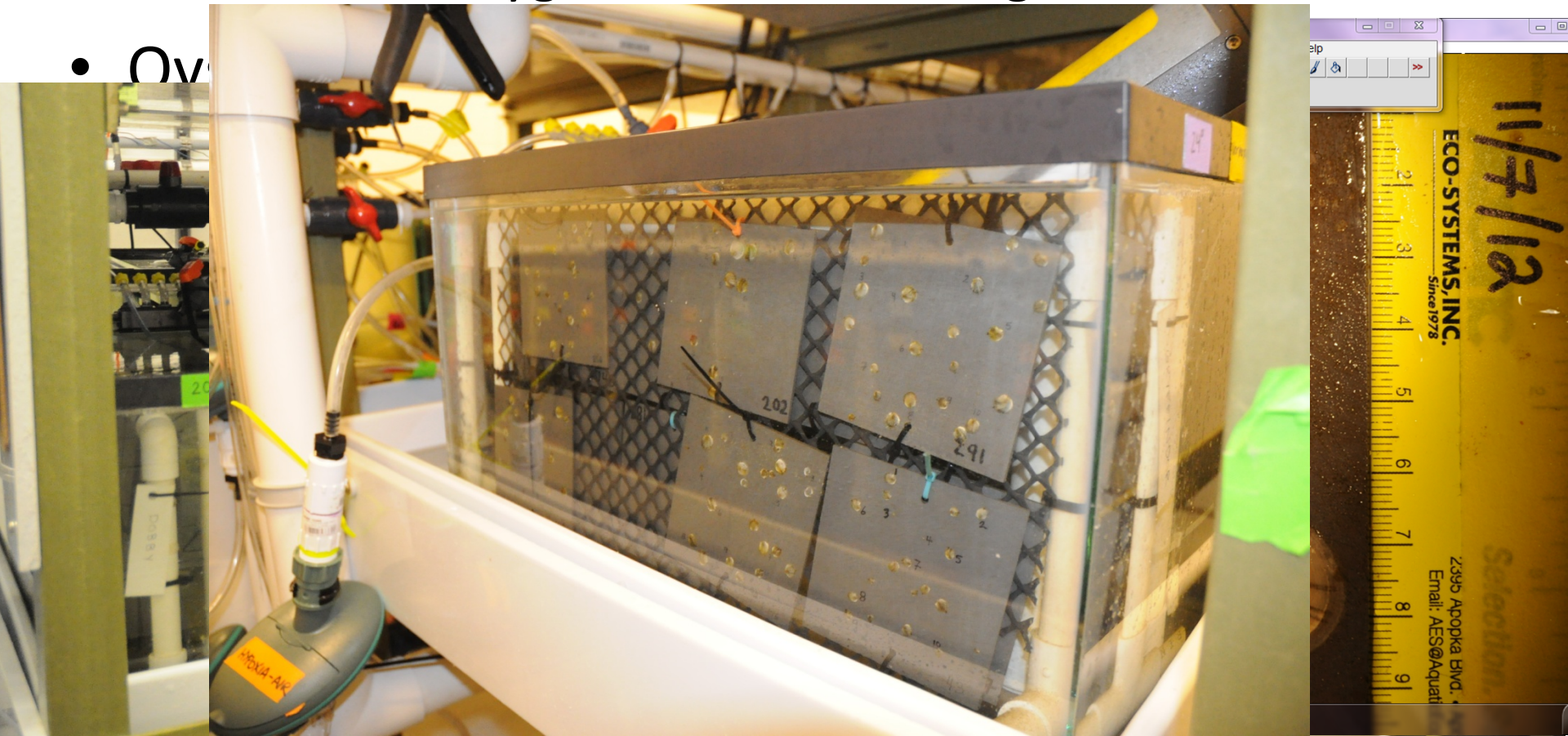
- Spawned oysters from San Francisco Bay (6 collection sites)



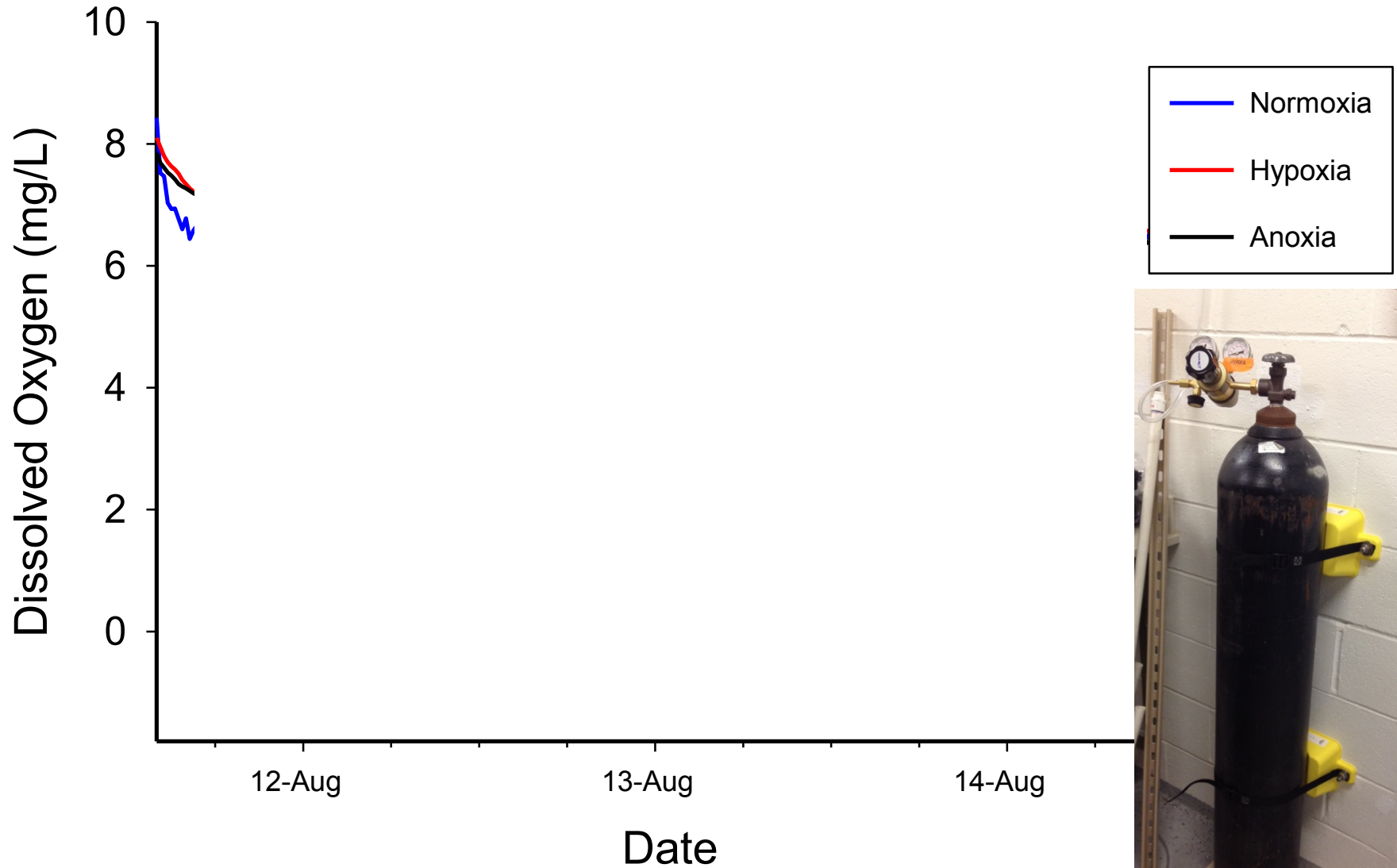
Methods – Phase 1

- Subjected newly settled oysters to
 - Temperatures: 20/24° C
 - Dissolved oxygen: 0.6, 2.0, 6.5 mg/L

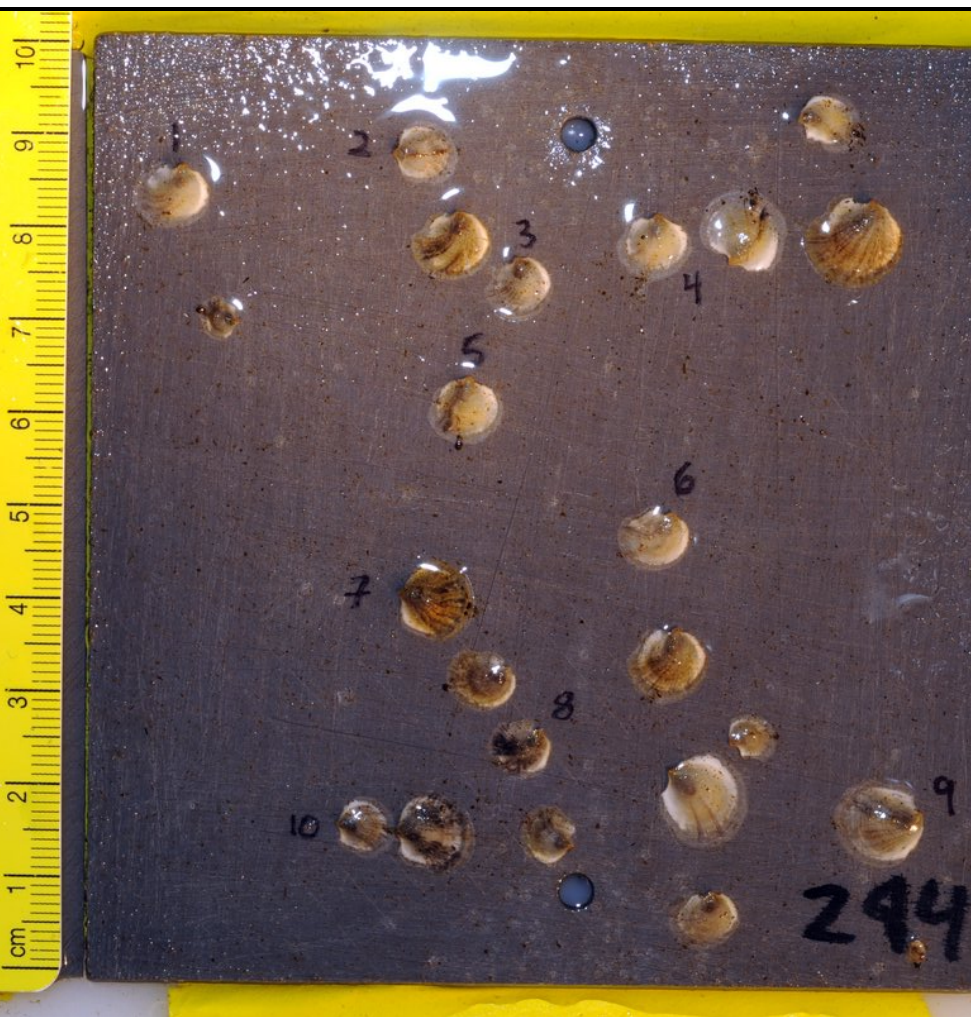
- Over



Trial conditions



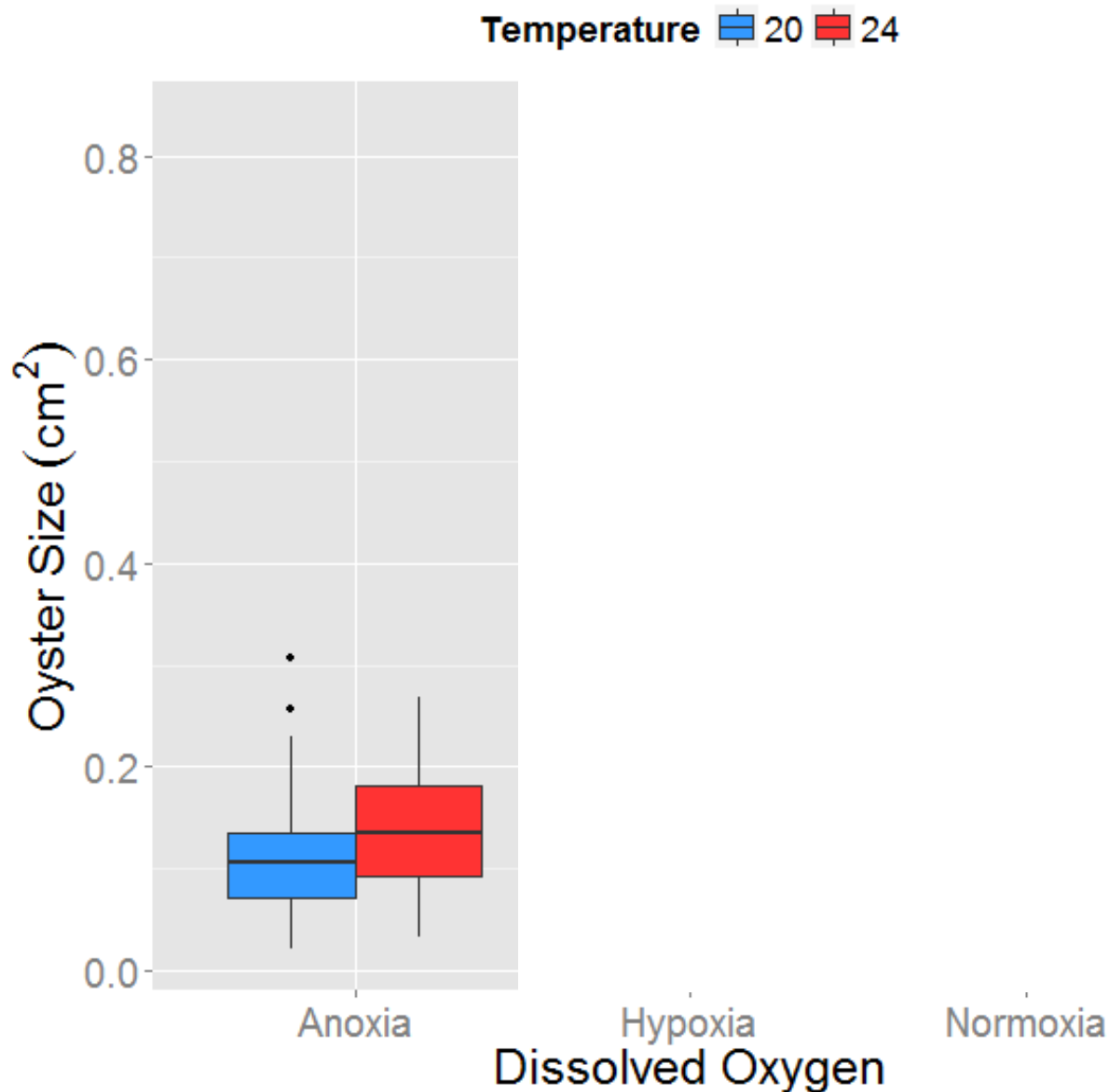
24° C Normoxia



24° C Anoxia



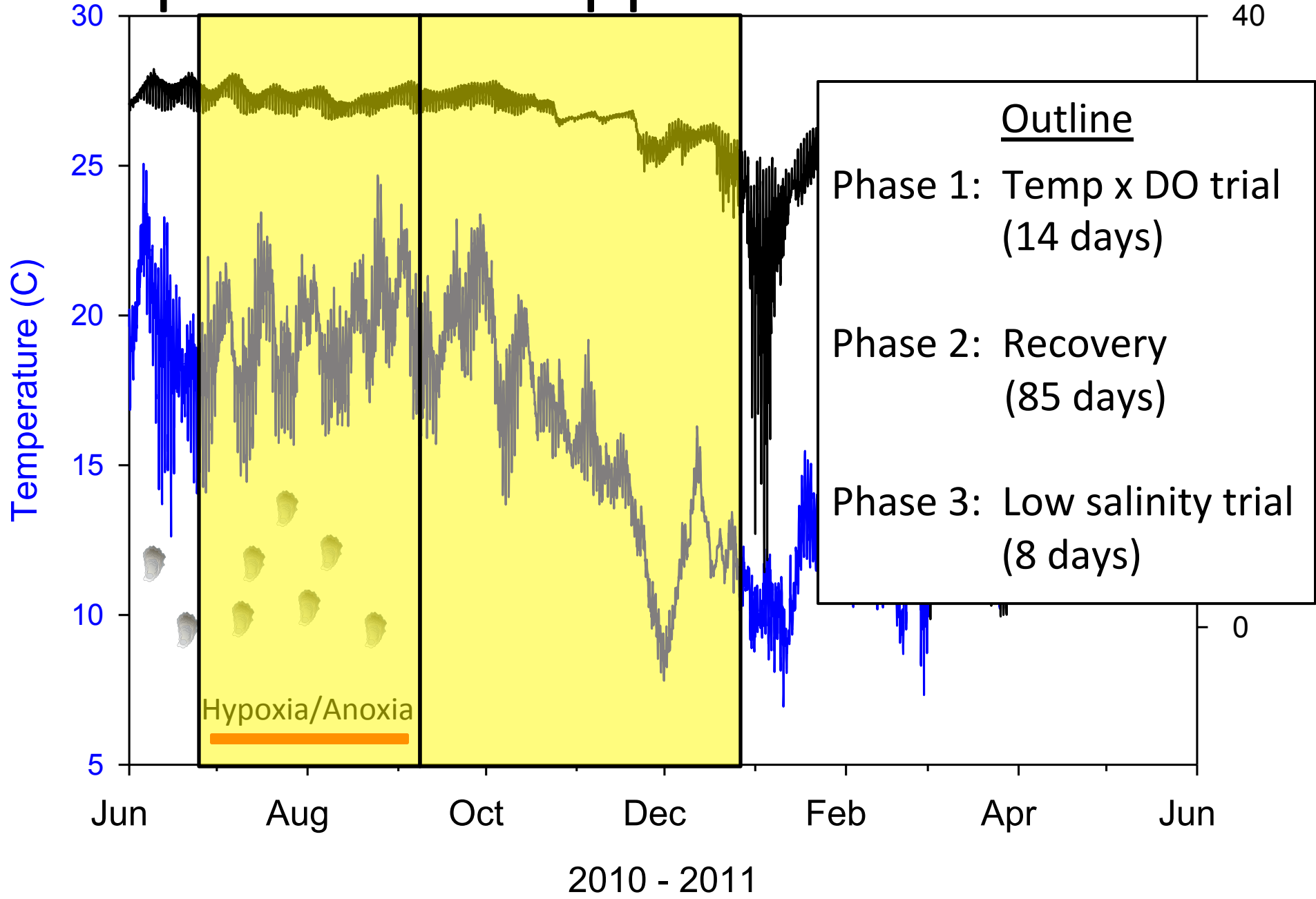
Phase 1: Oyster Growth at 2 weeks



Both DO and Temp
have an effect on
growth (insert
effect size here)

DO has larger
effects

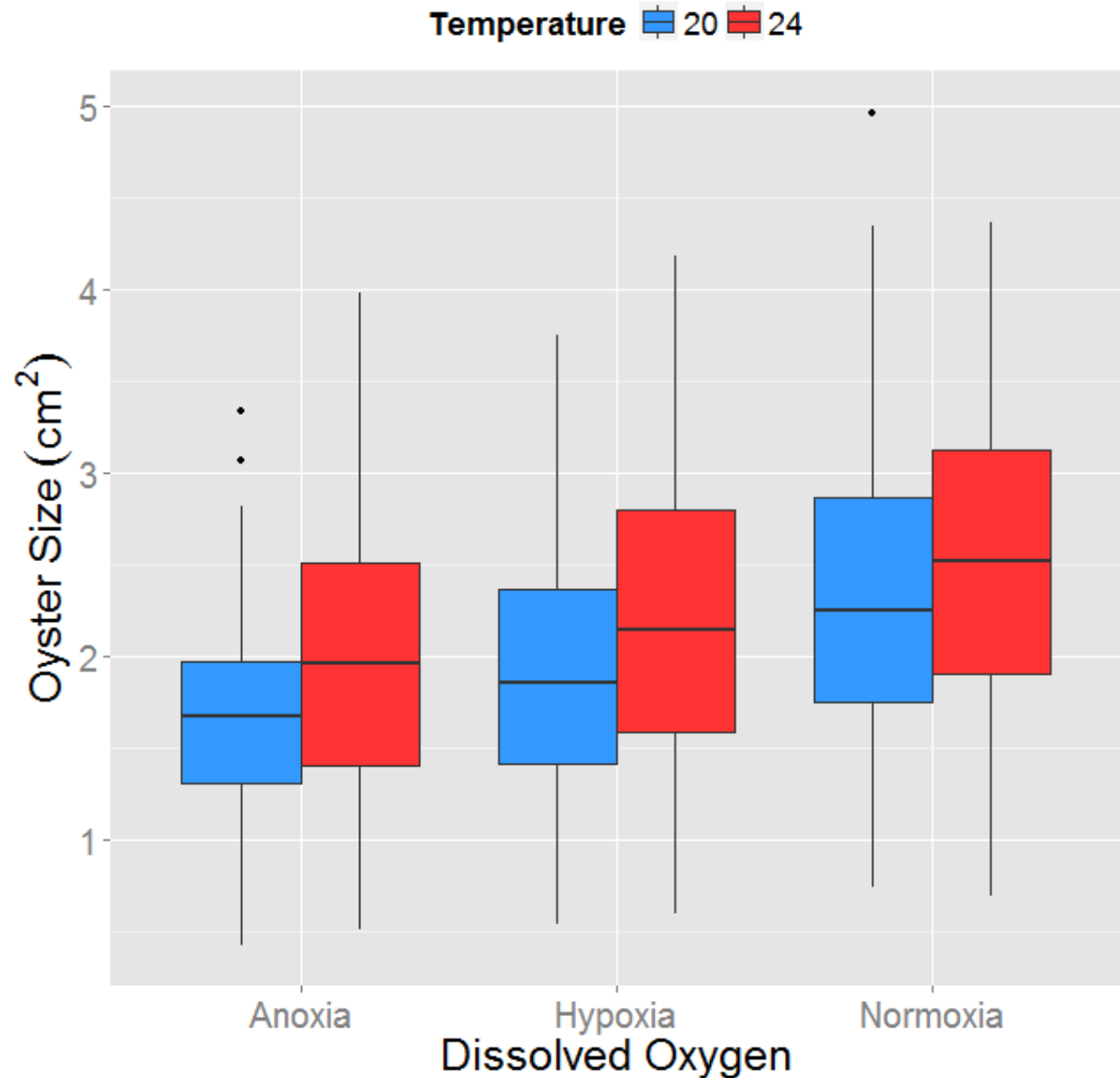
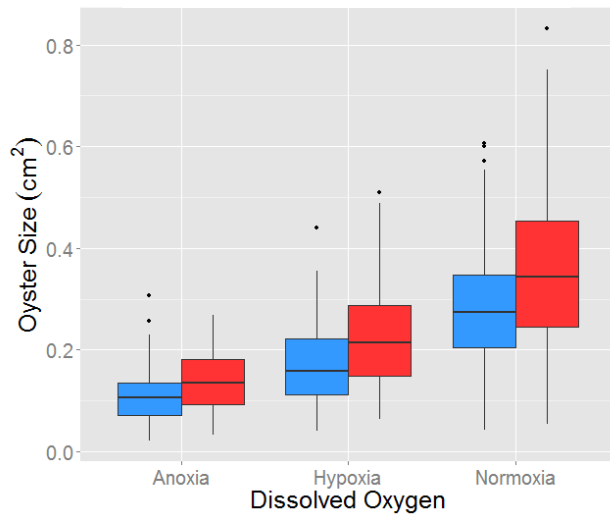
Experimental Approach



Phase 2: Oyster Growth at 14 weeks

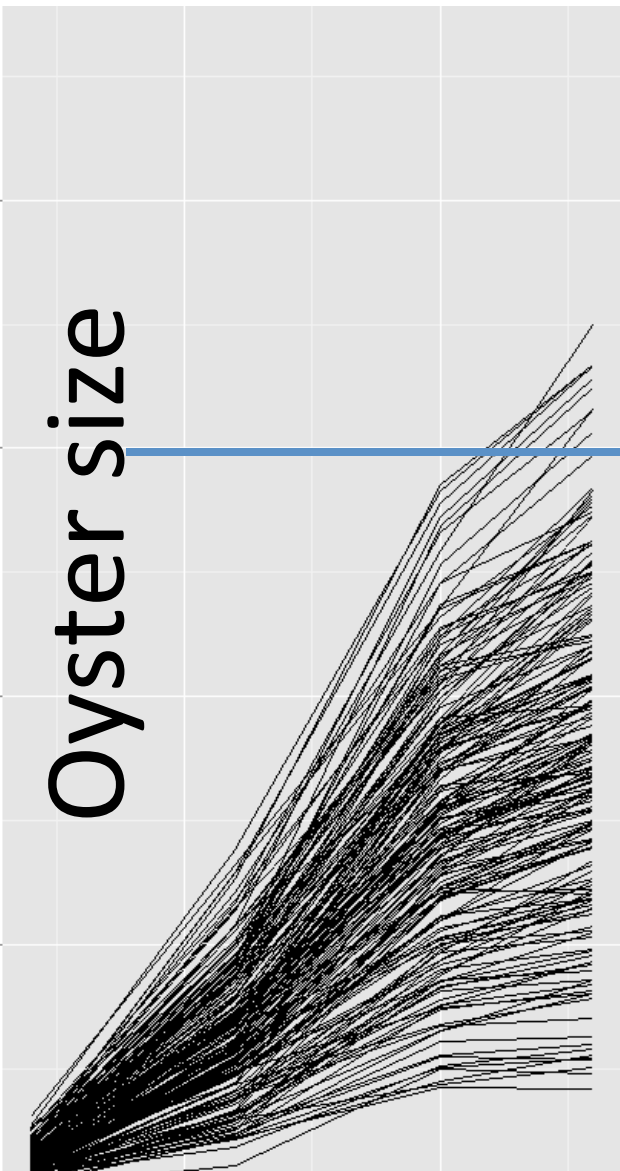
Brian will insert text
on changes in
effect size

Growth at 2 weeks



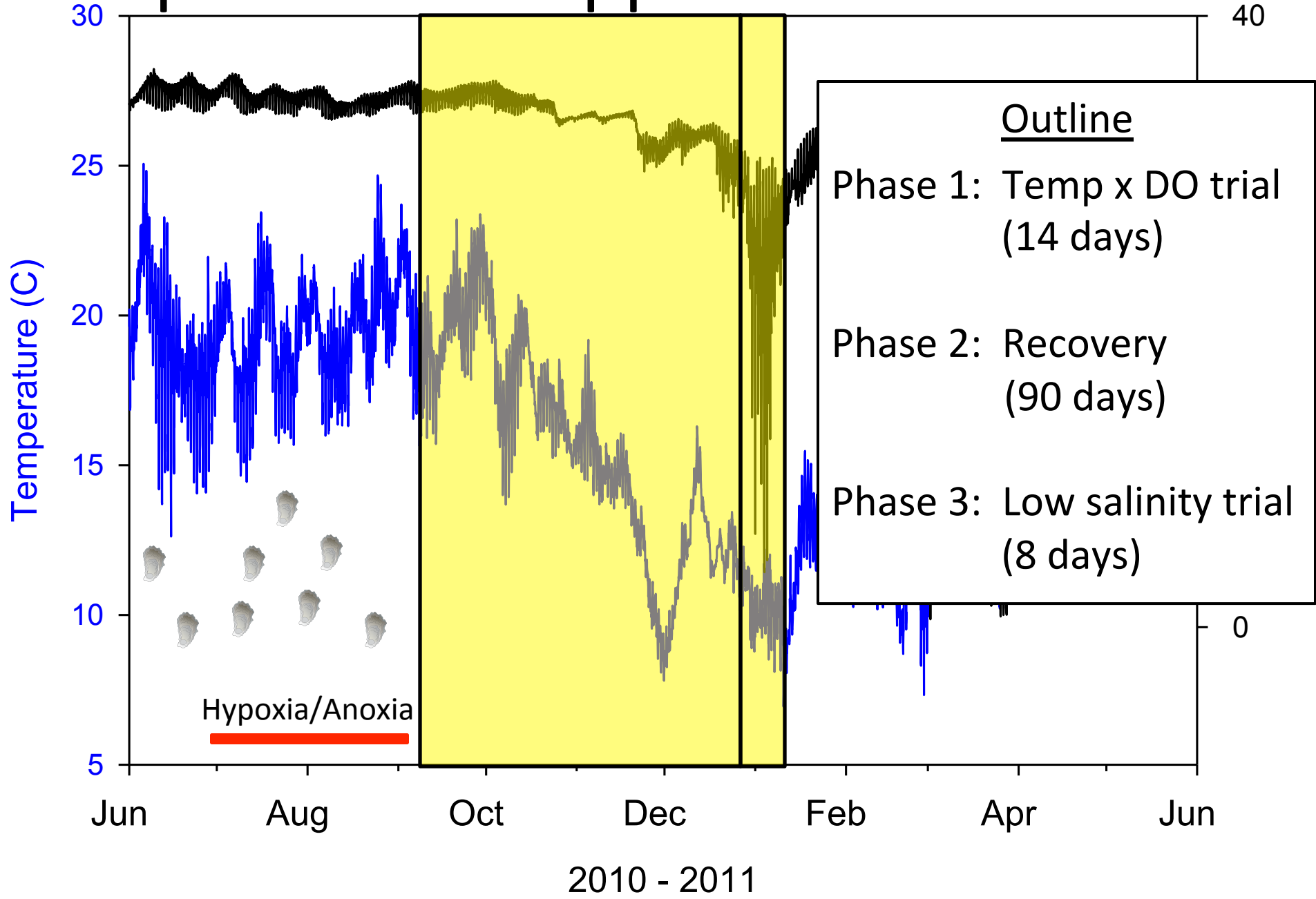
Anoxia

Oyster size



Time

Experimental Approach

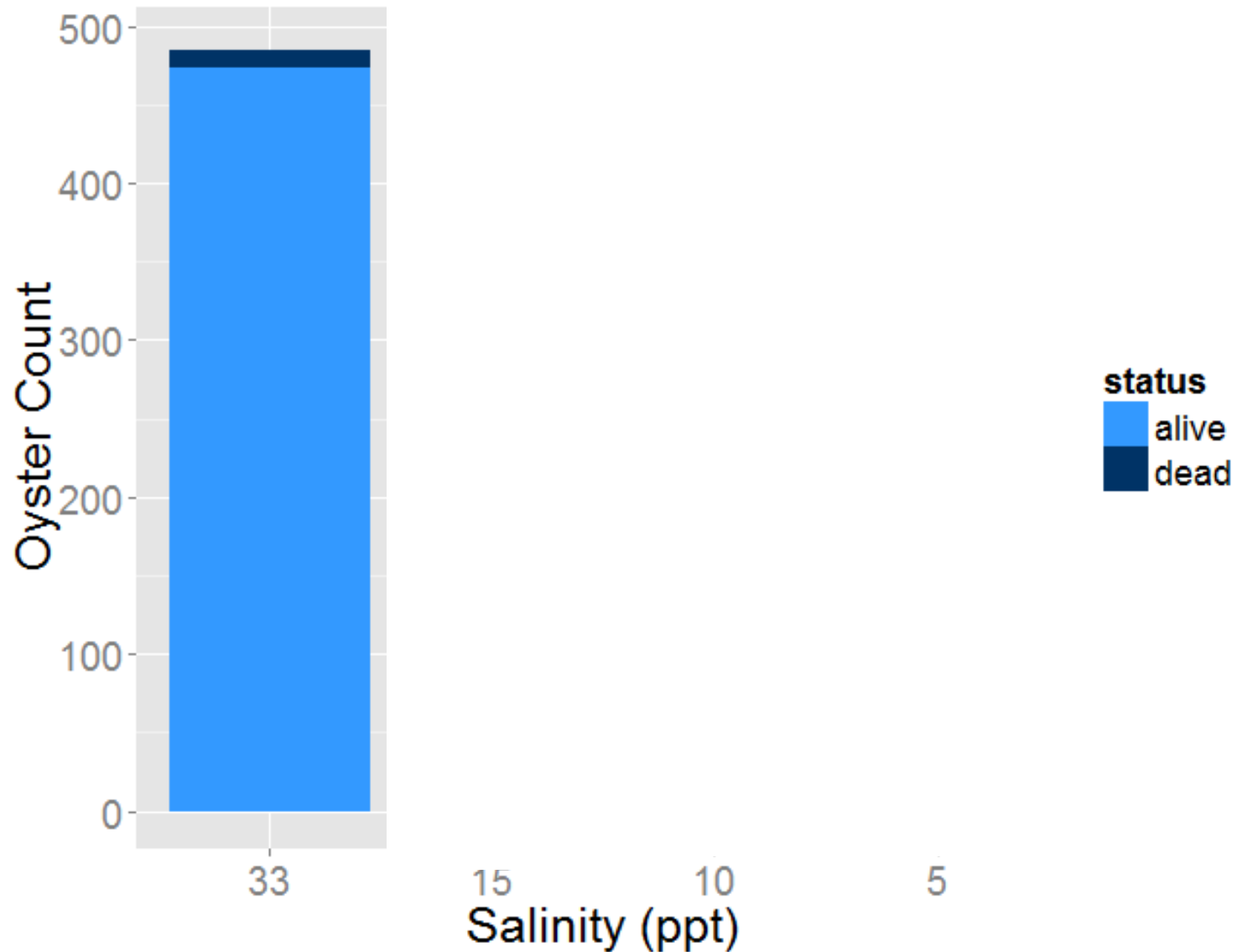


Methods – Salinity Tolerance

- At end of experiment:
salinity decreased 5 ppt/day
- Target salinity for 8 days: 33, 15, 10, 5 ppt



Phase 3: Salinity Tolerance



Questions

1. How do multiple simultaneous stressors affect oysters?

Additive effects – DO larger impacts

2. Are oysters capable of recovering from these stressors over time?

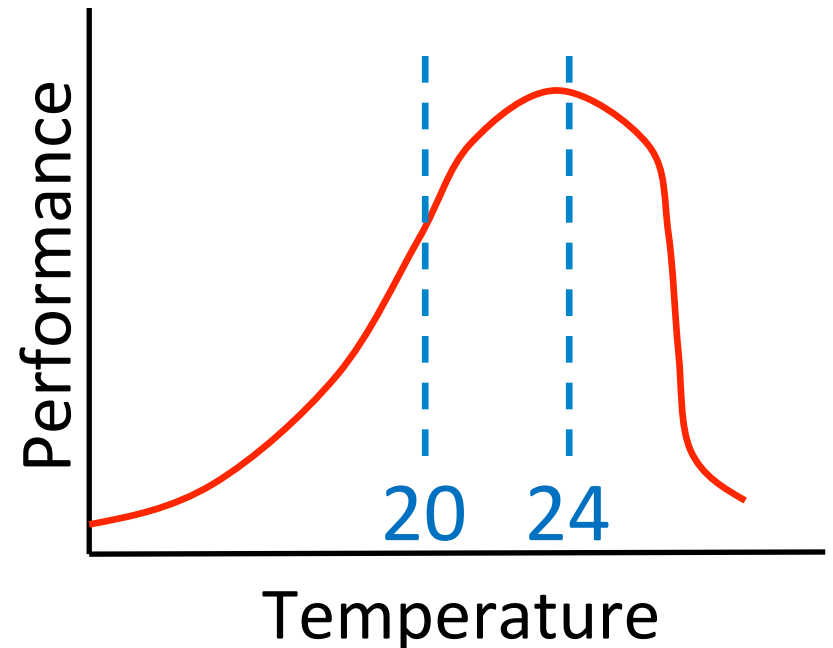
Partial recovery possible

3. Does early stress affect performance at later stages in response to low salinity?

No link between early life DO stress and salinity tolerance

Summary

- Multiple stressors are common and timing of stressors with life stage is important
- Low DO results in lower oyster growth (sub-lethal effect)
- Low salinity has lethal impacts
- Warming may be beneficial up to a point



Implications

- Restoration success depends on understanding relevant stressors (know your site!)
- Restoration success is likely estuary dependent
 - Elkhorn Slough: DO
 - SFB: salinity
- Other stressors can have large impacts



Future Experiments

Current/Planned Experiments:

- How do adult oysters respond to low salinity events?
- How do juvenile oysters respond to low salinity and high air temperature?

Proposed Experiments:

- How will oysters tolerate burial by sediment?



Acknowledgements

Technicians

Charlie Norton

Chris Knight

Emily Seubert

BML

Joe Newman

Karl Menard

Philip Smith



NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM

A black dog, possibly a pit bull mix, is standing on the deck of a blue boat. The dog is wearing a bright orange life vest with black straps and a grey reflective strip. The dog is looking out over a large body of water towards a distant shoreline with trees and buildings. A speech bubble is positioned above the dog's head, containing the text "Thank you!".

Thank you!

Brian Cheng
bscheng@ucdavis.edu