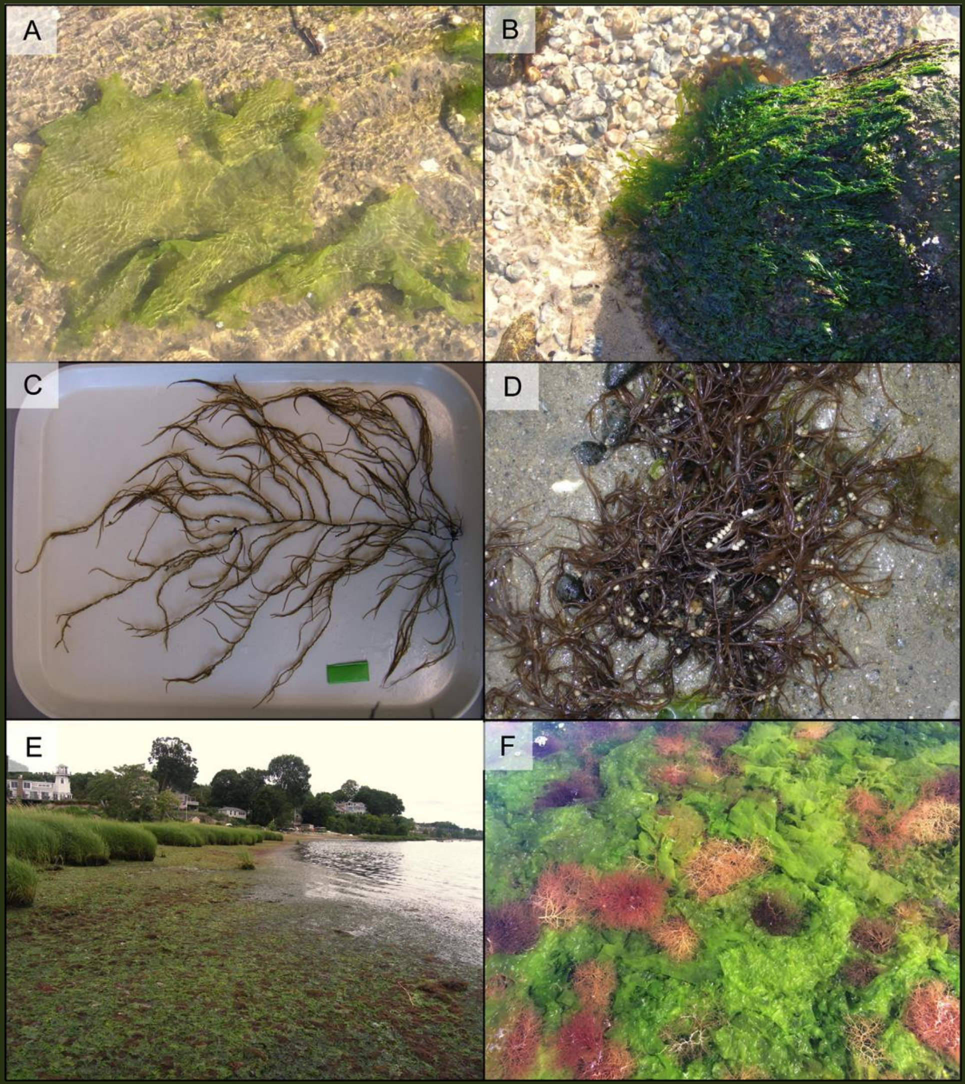
Seaweed blooms and cultivation

Carol S. Thornber[1], Michele Guidone[1, 2], Christopher Deacutis[3], Lindsay Green[1], Christine N. Ramsay[4], Melissa Palmisciano[5]

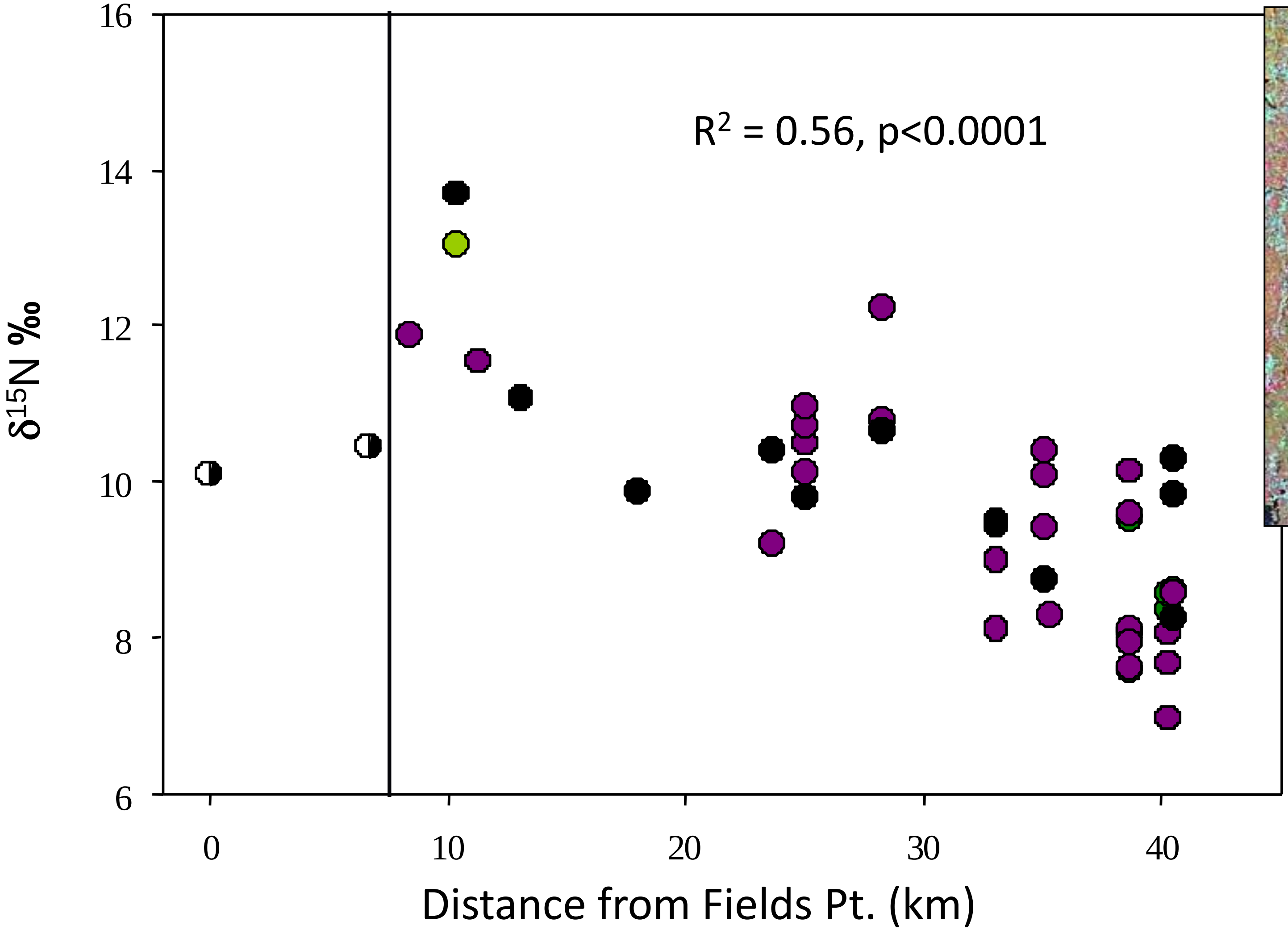
[1]Dept. of Natural Resources Science, University of Rhode Island; [2]Dept. of Biology, Armstrong State University; [3]Rhode Island Dept. of Environmental Management, Division of Fish and Wildlife; [4]Dept. of Life Sciences, Mitchell College; [5]Moss Landing Marine Labs

Bloom Key Players



- Blade-forming *Ulva* spp.
- Tubular *Ulva* spp.
- *Gracilaria* spp.

Sewage-derived nitrogen is used by *Ulva*



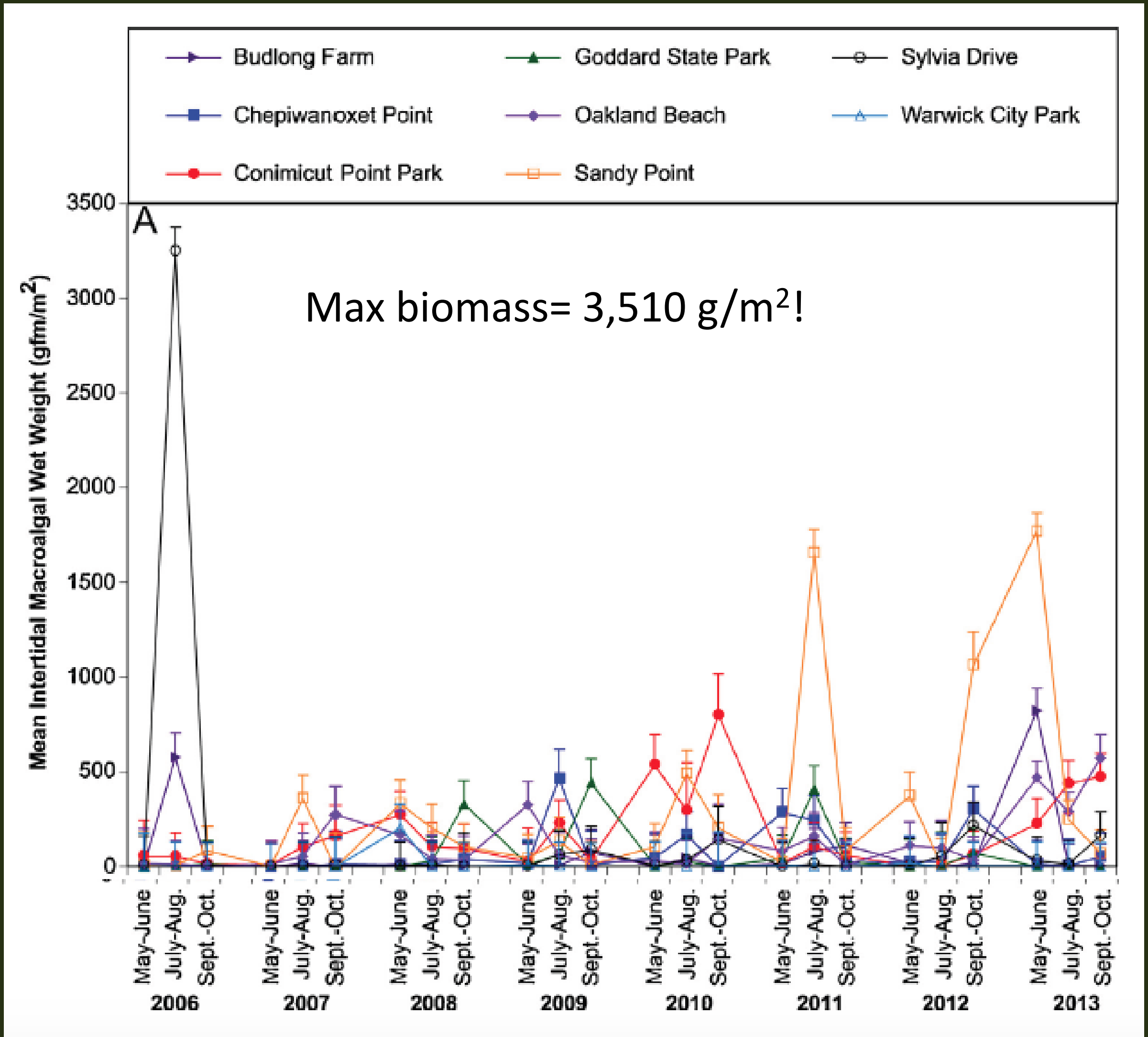
- Mean Annual DIN Concentrations for Providence River Estuary: 35-60 µM

(Oczkowski et al. 2008, Thornber et al. 2008)

Bloom Monitoring

- Macroalgal blooms
  - Aerial surveys: 2007-2012
  - Ground surveys: 2005-present (Greenwich Bay)
- Research questions:
  1. What is the spatial and temporal variability of macroalgal blooms?
  2. How will blooms change in response to N reduction from WWTPs?

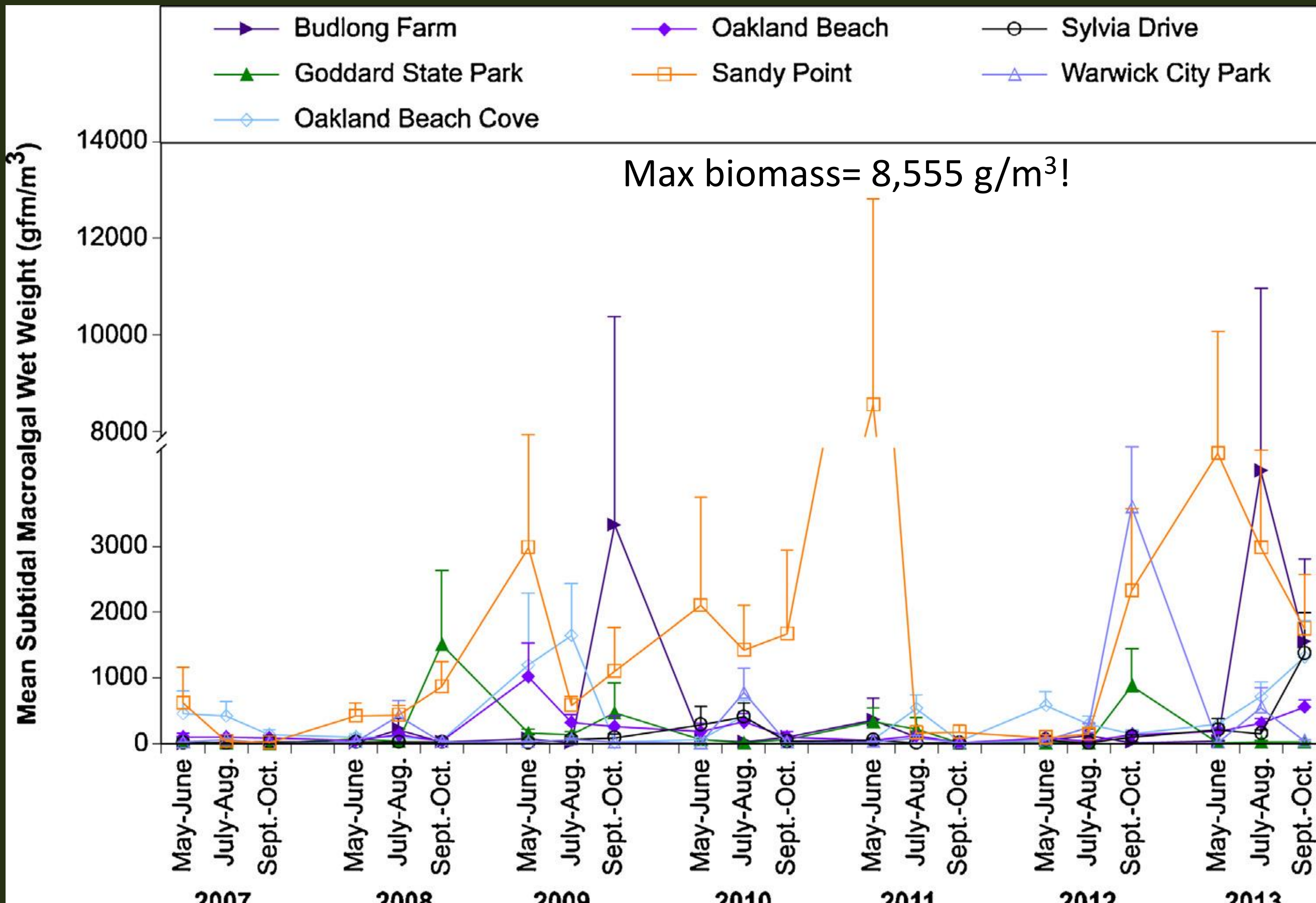
Monitoring Results: Intertidal



Huge spatial and temporal variability

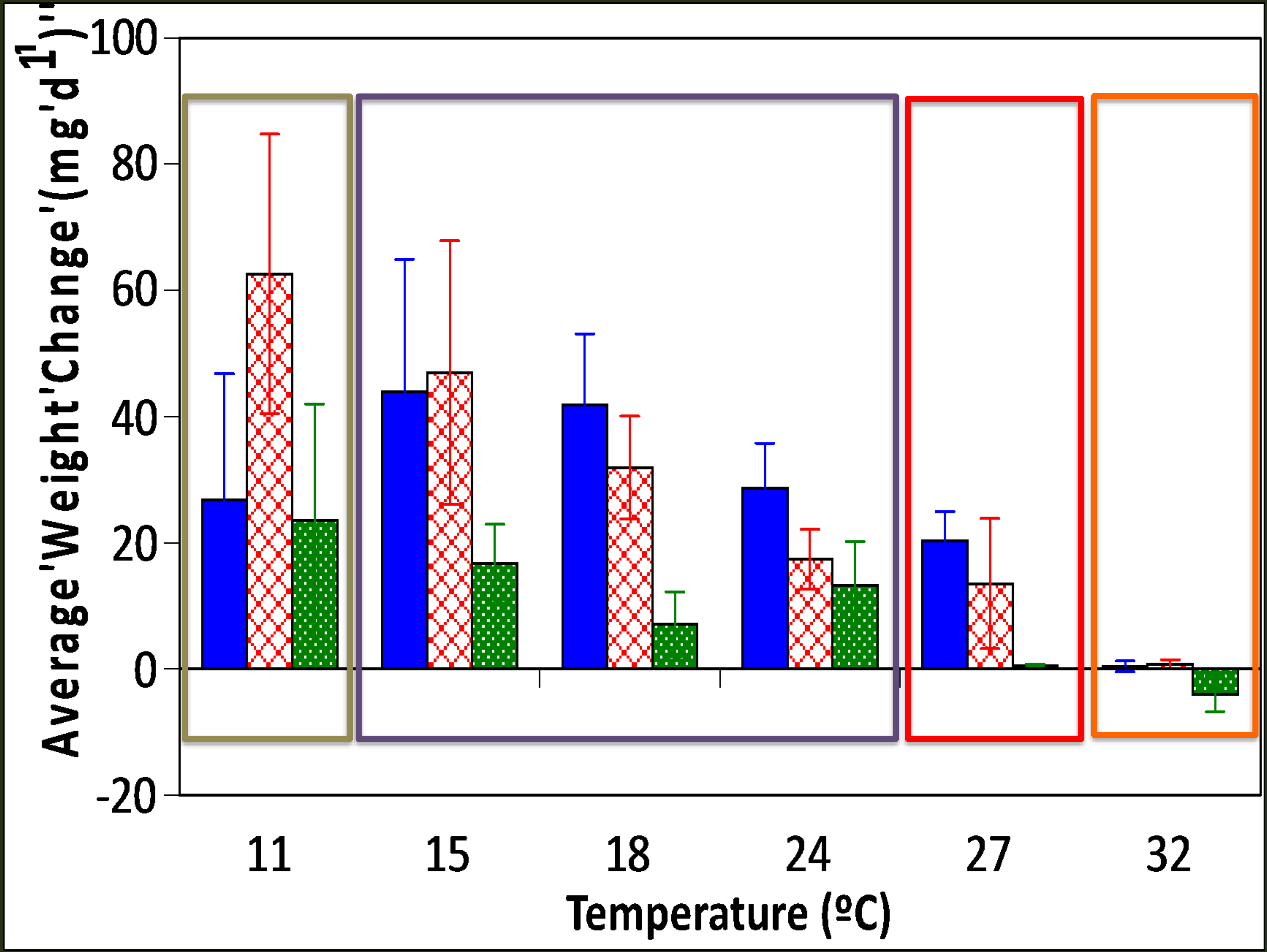
Thornber et al 2017

Monitoring Results: Subtidal

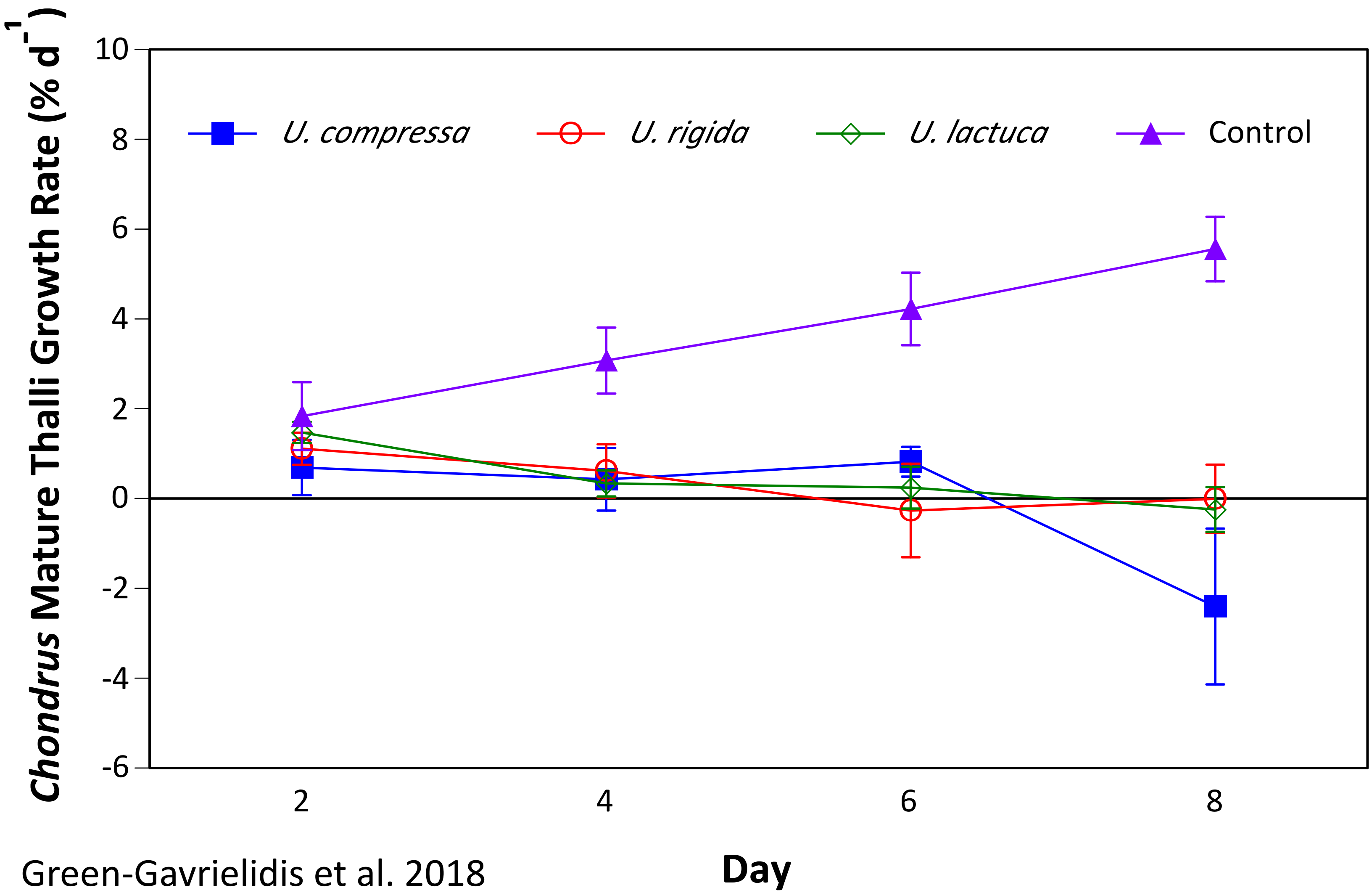


Thornber et al 2017

Ulva will grow at higher temperatures



Ulva inhibits the growth of oyster larvae, other seaweeds



Green-Gavrielidis et al. 2018

Ongoing work

- Past collaborations with RI DEM
- Recently published in Harmful Algae with additional online resources available at

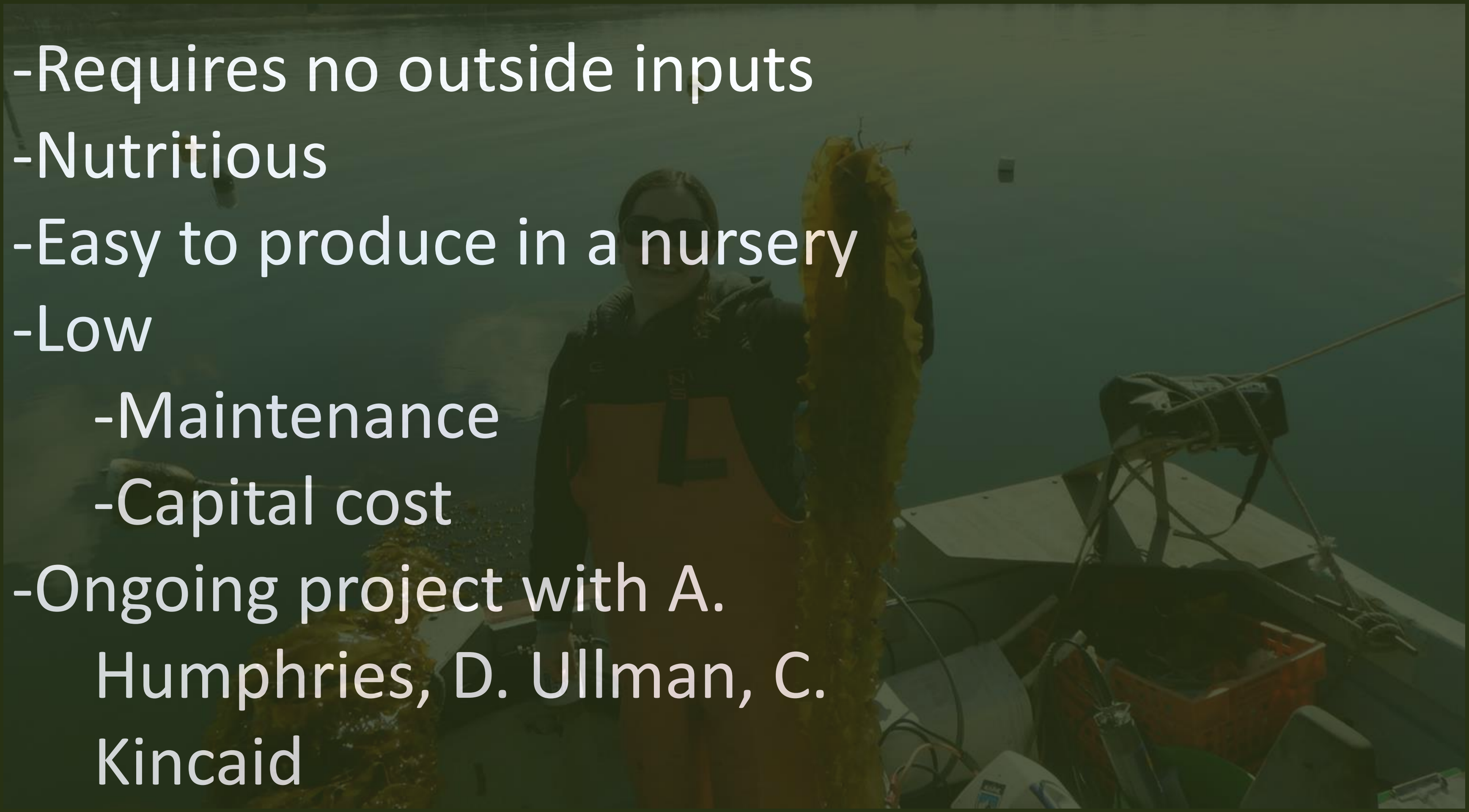
http://nbep.org/publications/NBEP-17-179.pdf

- Monitoring continues in order to understand changes as a result of climate change and N reductions

Kelp cultivation…

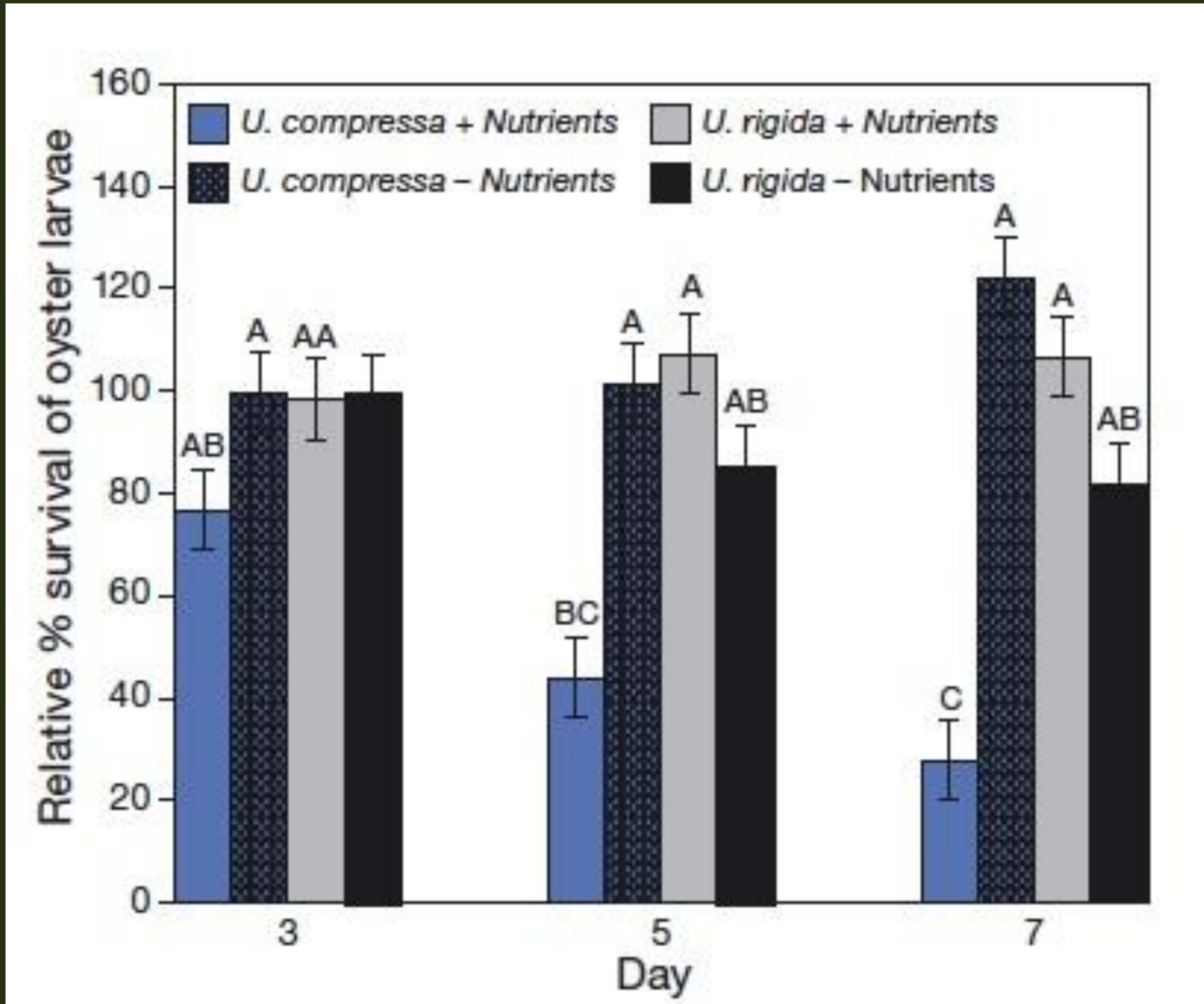
Photo credit: L. Green-Gavrielidis

Kelp cultivation…



- -Requires no outside inputs
- -Nutritious
- -Easy to produce in a nursery
- -Low
    - -Maintenance
    - -Capital cost
- -Ongoing project with A. Humphries, D. Ullman, C. Kincaid

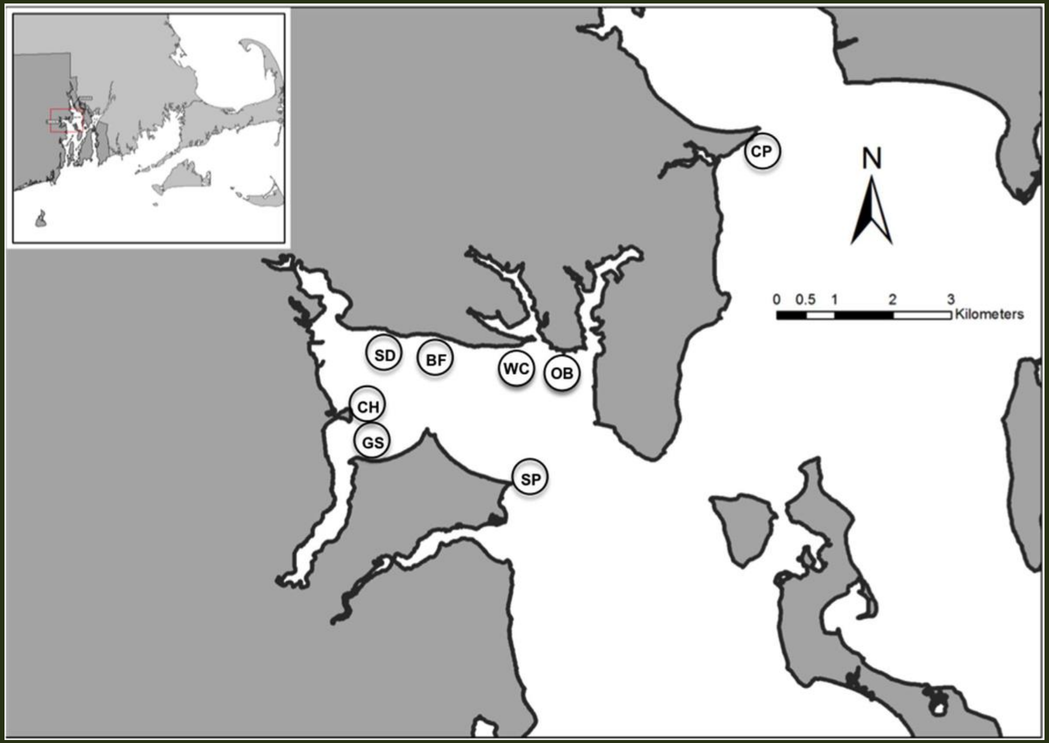
Questions? thornber@uri.edu



U. compressa + Nutrients
U. rigida + Nutrients
U. compressa – Nutrients
U. rigida – Nutrients
Relative % survival of oyster larvae
0
20
40
60
80
100
120
140
160
AB
A
AA
BC
A
A
AB
C
A
A
AB
3
5
7
Day

METHODS

- Intertidal
  - 2 transects/site
  - 10 quadrats (0.25 m^2) per transect
  - % cover, biomass
- Subtidal
  - 10 “scoops” per site
  - Individual species biomass



Current and Predicted Temperatures

Before bloom-forming season: 11°C

During bloom-forming season: 15° C, 18° C, 24° C

Predicted increase: 27° C

Predicted anomaly: 32° C