# *Fucus distichus*: Investigating Humidity and Temperature Between Tides

**Jason Thomas[1], Andrew Chang[2,3], Julia Blum[2], Chela Zabin[2,3]**

1. University of Southern California 2. Smithsonian Environmental Research Center
3. Estuary & Ocean Science Center, SF State University

## Life in the Intertidal

- Area between high and low tide
- Wide diversity of marine life forms
- Can make for harsh conditions
  - Wave impact
  - Predation risk
  - Low-tide
    - Acute Temperature changes
    - Desiccation

## Foundational species

- Physically modify the environment and produce and maintain habitats that benefit other organisms that use those habitats.
  - Ex. Mussels (Sorte et al., 2016)
    - "Influence diversity and productivity"
- Canopy-forming species (ex. Seaweed) provides
  - Shade
  - Protection
  - Moisture retention
  - Food

## Those that May Benefit

- Olympia oyster (Ostrea lurida)
  - Populations have dropped to historic levels
  - Focus of restoration efforts

## Research Question

**"How effective is Fucus disticus at moderating temperature and humidity during low tides?"**

## *Fucus distichus* (rockweed)

- ***Phaeophyceae* (Brown algae)**
- Usually located in the littoral zone
  - Exposed to changing conditions based on the tidal height (i.e. temperature, lack of Water)
- Cellulose, Alginates, and fucans
  - Flexibility
  - Desiccation prevention

Temperature and humidity loggers (R to L); Exposed control (left) and under *Fucus* (right). Tiburon, CA. Photo: A. Haigh.

## Methods

- 3, non-consecutive days (a.m tides)
  - Measurement period
    - From recession to elevation of water level
- 4 Humidity/Temperature Loggers
  - RH (%) and Temperature (°C)
  - Taken up once exposure to water imminent
- 4 Temp Loggers (°C)
  - Paired with humidity logger
    - Back-up
- Thermal gun (w/ probe) (°C)
  - Ambient temperature
  - Canopy temperatures
- Real Time Kinematic
  - Tidal elevation of experimental replicates


Google image of experimental site, Point Chauncey, Estuary & Ocean Science Center, Tiburon, San Francisco Bay.

Taking elevation with Real Time Kinematic survey tool, Tiburon, CA. Photo: A. Haigh.

## Key Interpretations

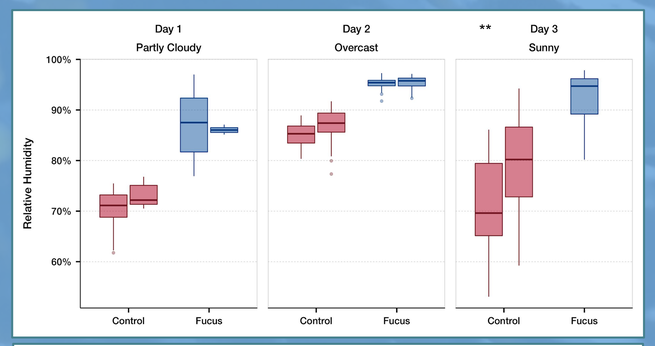
- There are differences in temperature and humidity under Fucus compared to no-*Fucus* controls..
  - Notable humidity control underneath *Fucus*.
    - Relative humidity relatively greater under canopy.
  - Better temperature moderation underneath *Fucus*.
    - Temperatures generally cooler under canopy.

## Future Considerations

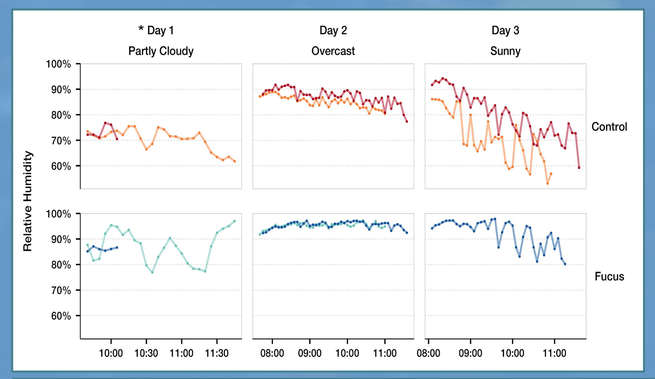
- Long-term study
  - Different weather conditions
- Different sites
  - Sunny versus shaded sites
- Test benefits to oyster
  - Growth
  - Survival
    - Now being scientifically evaluated.
      - Field experiments ongoing at Point Chauncey and at an oyster restoration site in San Francisco Bay.

## Results

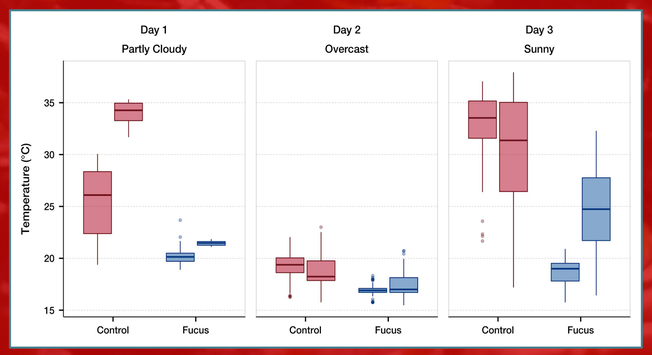
### Humidity

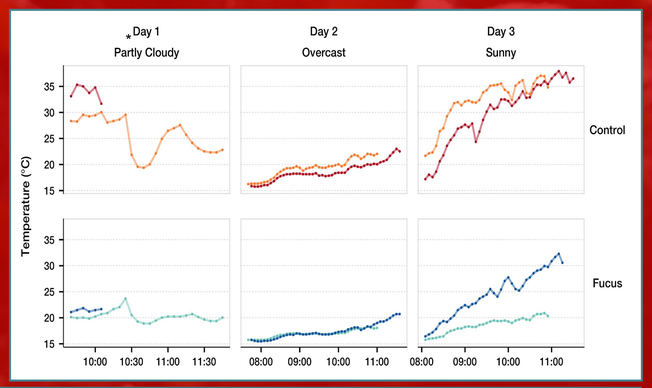



**Above: On Day 3 (**), the humidity logger under the *Fucus* canopy experienced an internal error that prevented it from logging data.**




### Temperature




**The measuring period for one set of loggers on Day 1 (*) was shortened due to impending water exposure.**

## Bibliography

- **Sorte, C.J. (2016). "Long-term declines in an intertidal foundation species parallel shifts in community composition".**

## Acknowledgements

***The 2019 STEM Teacher and Researcher Program and this project have been made possible through support from Chevron (www.chevron.com), the National Science Foundation through the Robert Noyce Program under Grant #1836335 and 1340110, the California State University Office of the Chancellor, and California Polytechnic State University in partnership with Smithsonian Environmental Research Center and Estuary & Ocean Science Center. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the funders.***