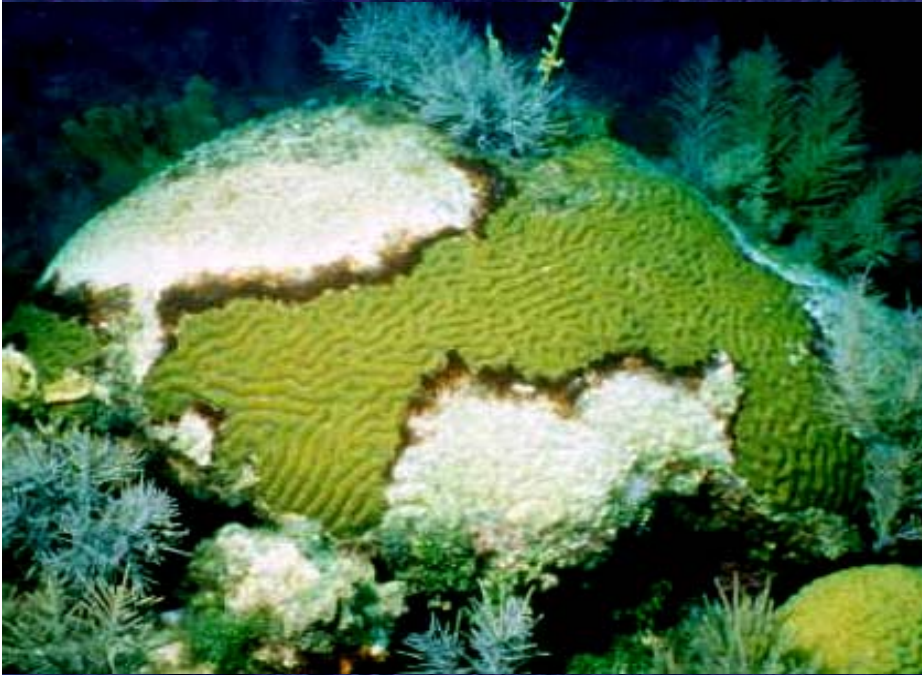


# Black Band Disease Pathogenesis and Impacts in the Florida Keys



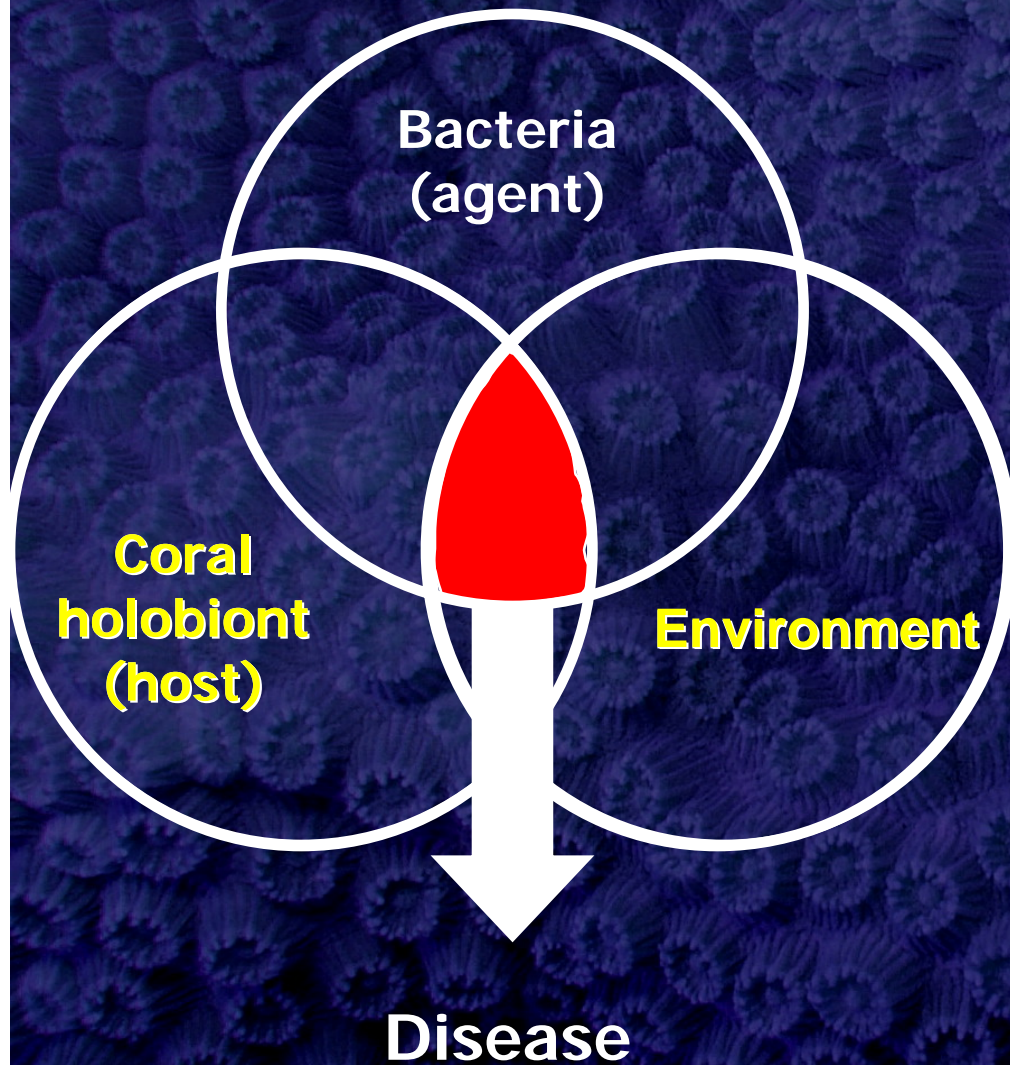
Joshua Voss, Daniel Rowan, and Sara Edge  
Robertson Coral Reef Program, CLOERT

**HARBOR BRANCH**

FLORIDA ATLANTIC UNIVERSITY



# Regulation of Pathogenesis



- 1) Invasion of infectious bacteria
- 2) Change in environment results in increased pathogen virulence
- 3) Change in environment reduces coral defenses
  - A. via changes in coral physiology (zoox?)
  - B. via changes in resident bacteria abundance or physiology



# Survey and Sampling Locations



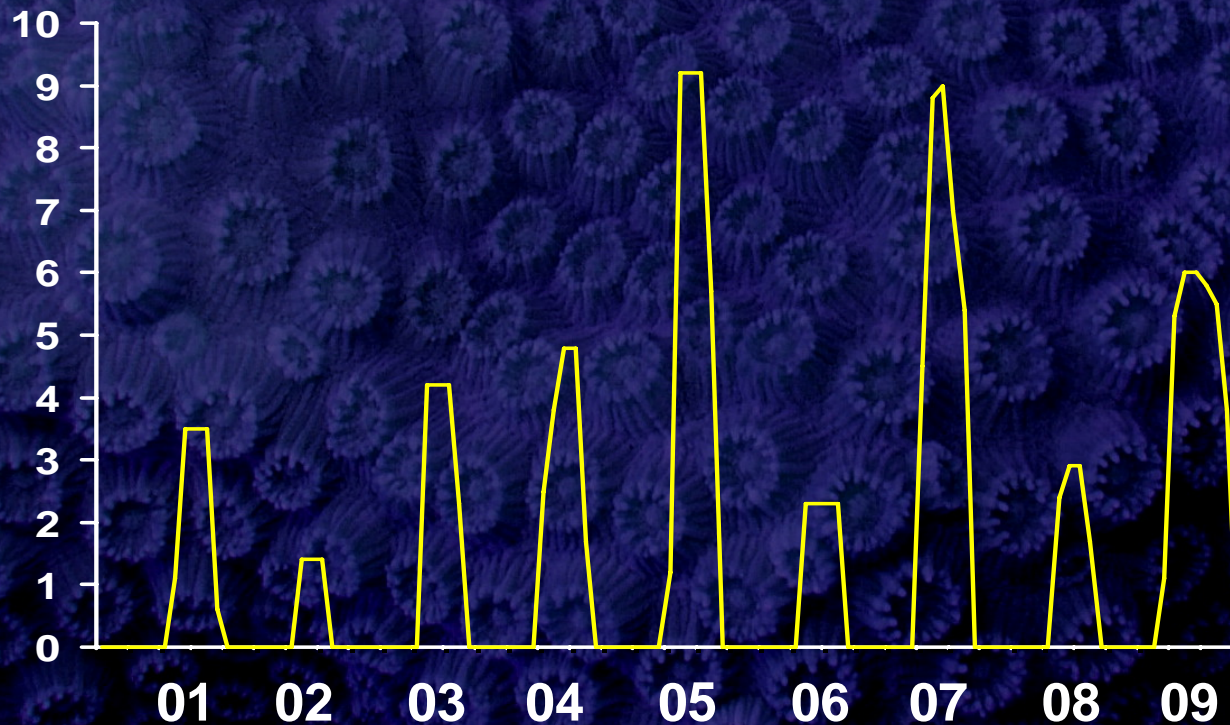
- ★ RCRP
- ★ FKNMS CDC
- ★ URI
- ★ CIOERT





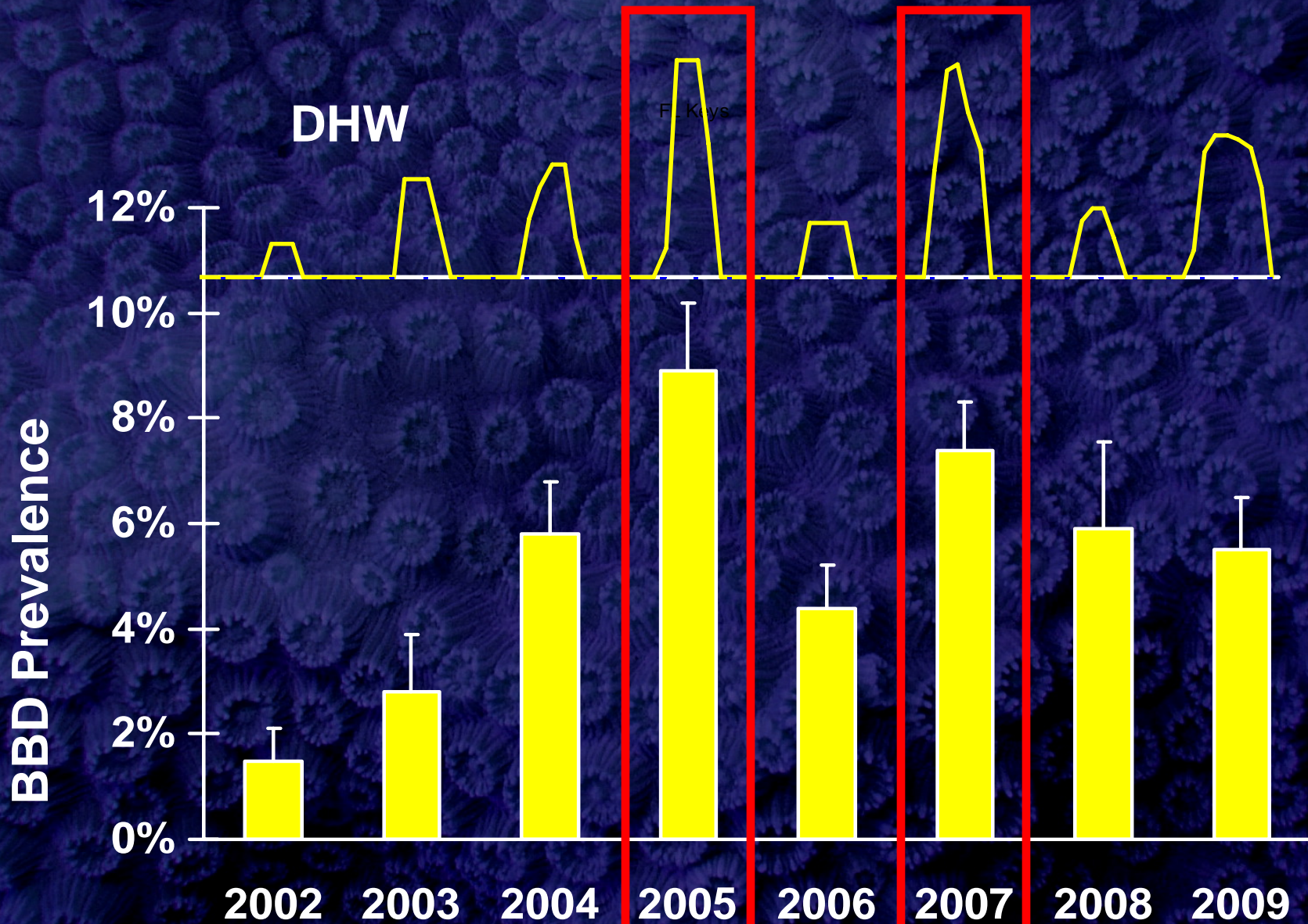
# Prolonged elevated temperature impacts coral bleaching and disease

- Maximum Degree Heating Weeks (DHW)



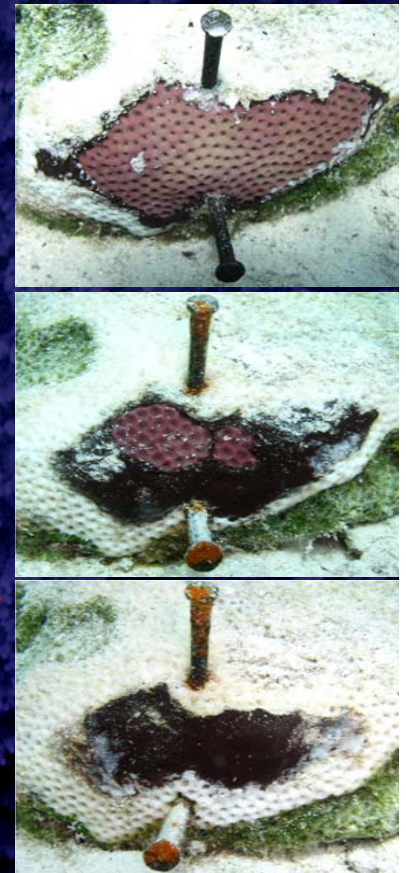
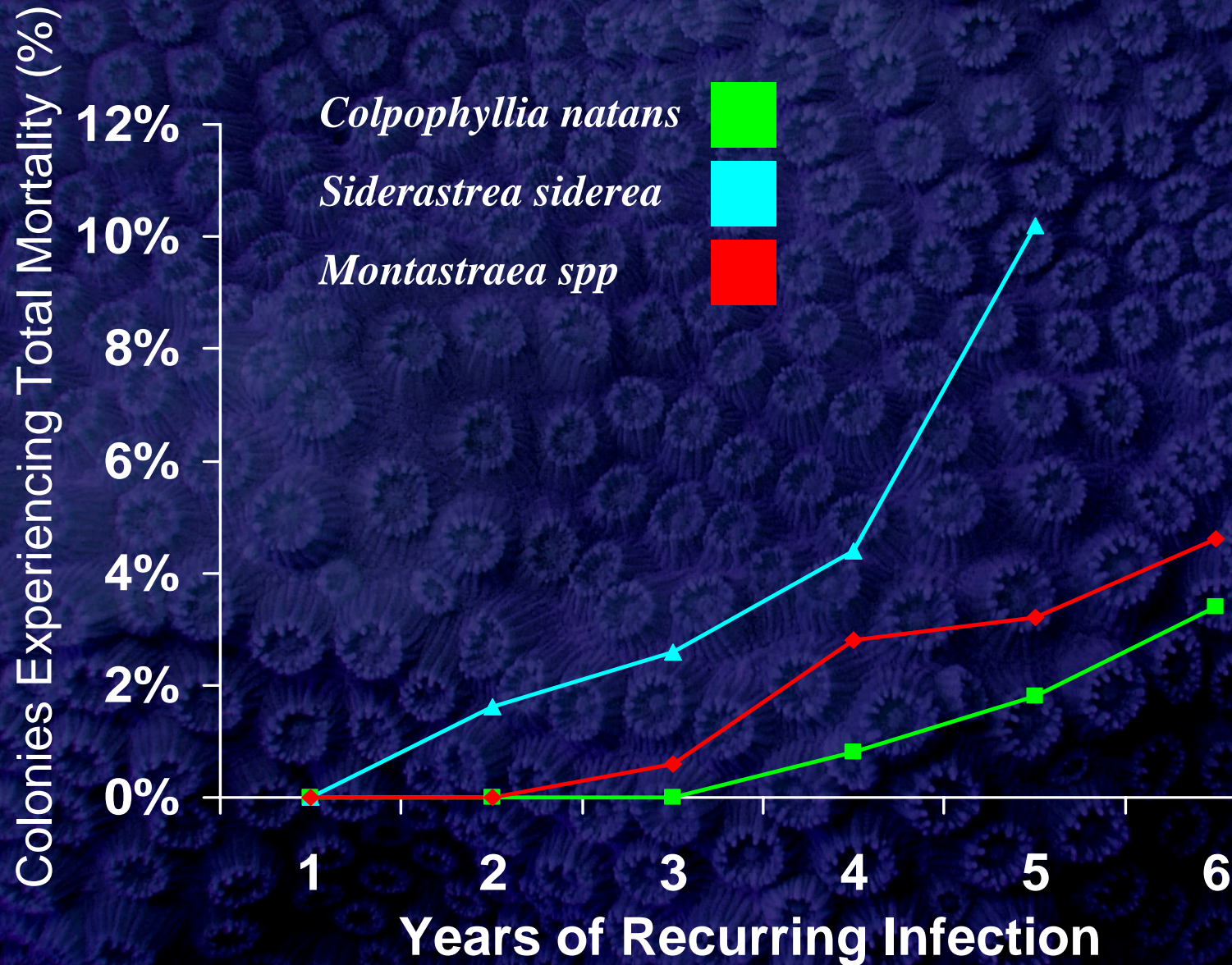


# RCRP and FKNMS Coral Health Cruise Data: BBD Prevalence among Susceptible Species



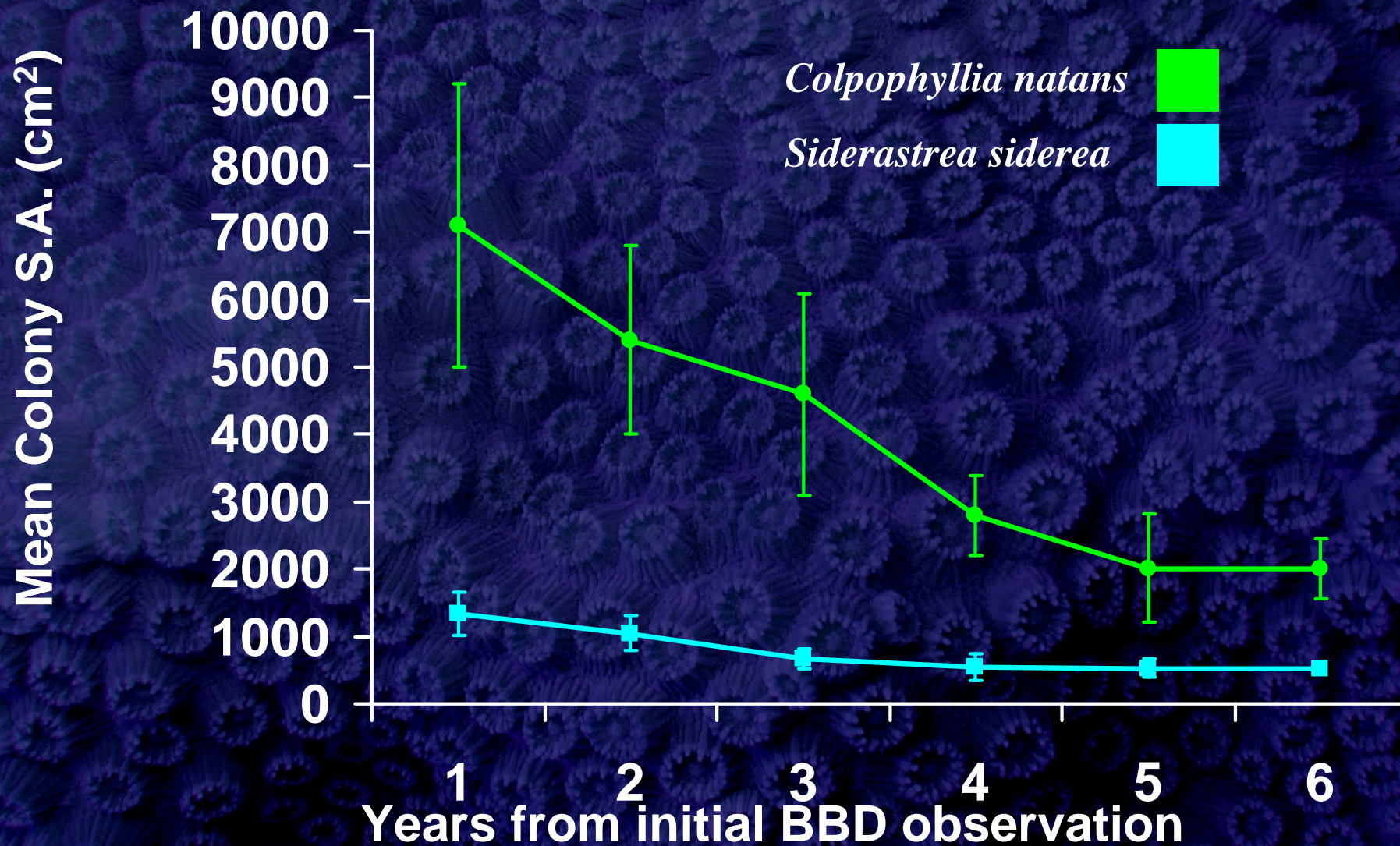


# Likelihood of total colony mortality due to BBD



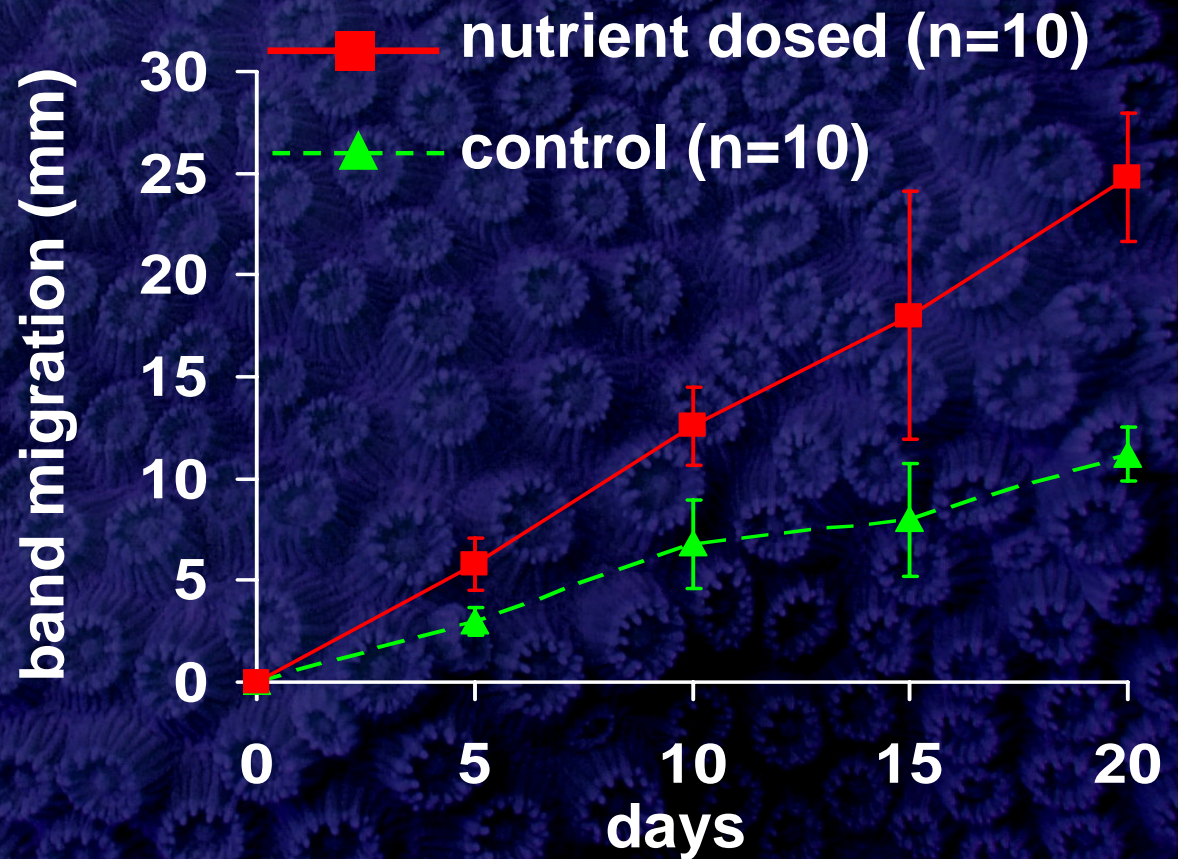
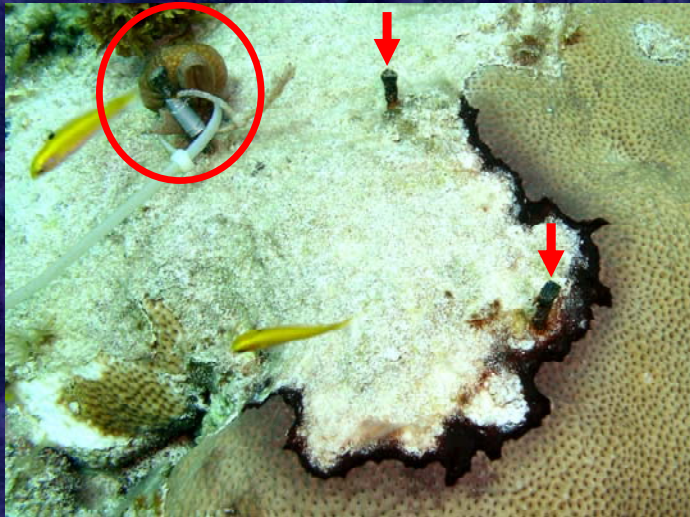


# Effect of BBD on Coral Tissue Surface Area





# Effect of nutrient enrichment on BBD migration *in situ*



Voss and Richardson 2006, *Coral Reefs*



# Ex-situ experiment: temperature, light, and colony effects on BBD pathogenesis



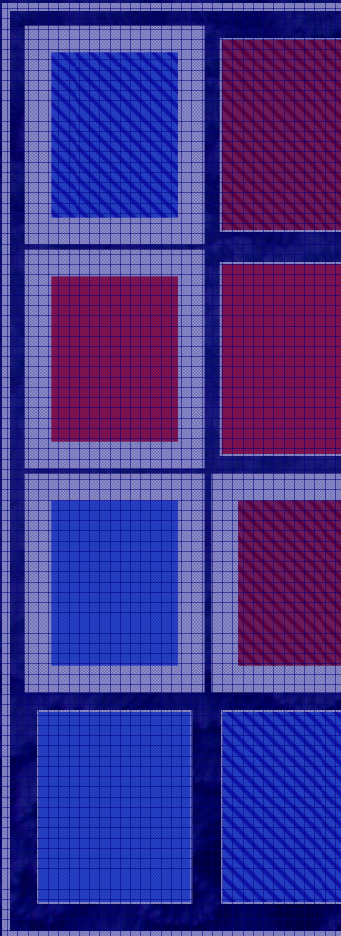
- 1) **progression rates of BBD**
- 2) composition of the bacterial communities of the host coral mucus and BBD
- 3) gene expression of coral and zooxanthellae
- 4) immune activity of coral (Mydlarz)



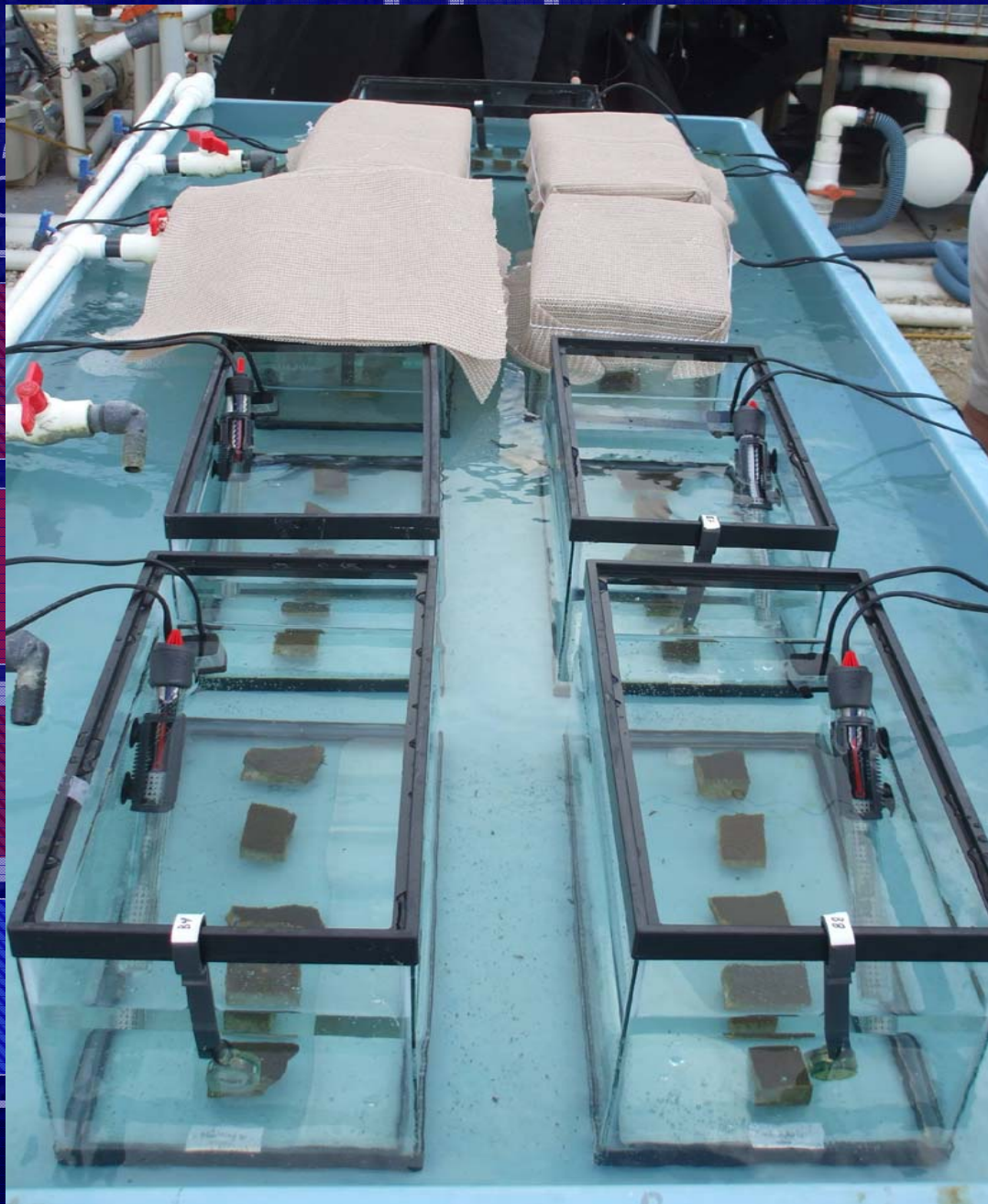


# Temp

- Amb. (27)
- Elev. (30)

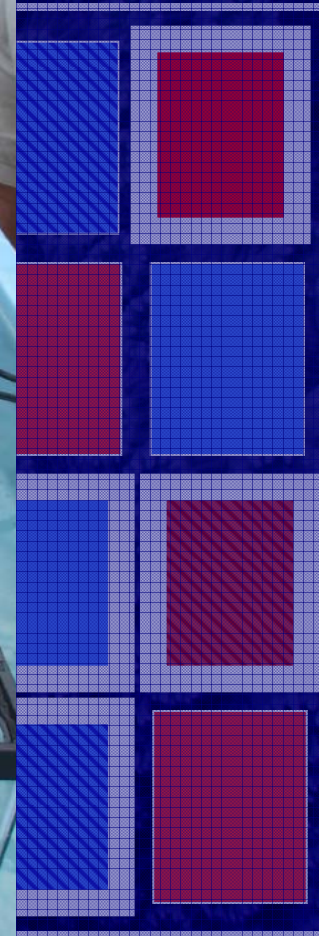


Raceway A



# BBD

- Infected
- Control



Raceway C



# BBD Progression

Day 1

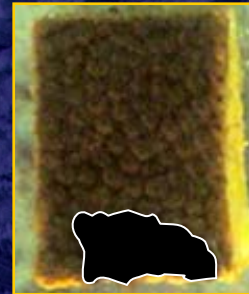
Day 4

Day 7

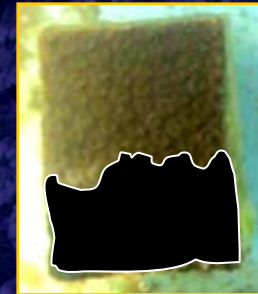
Elev Temp  
35% Light  
Colony - A



0 mm



3 mm

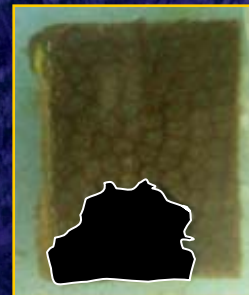


13.2 mm

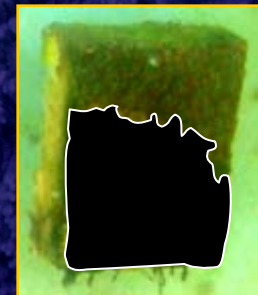
Ambient Temp  
35% Light  
Colony - A



0 mm



9 mm



24.2 mm

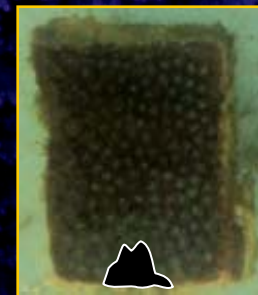
Ambient temp  
35% Light  
Colony - C



0 mm



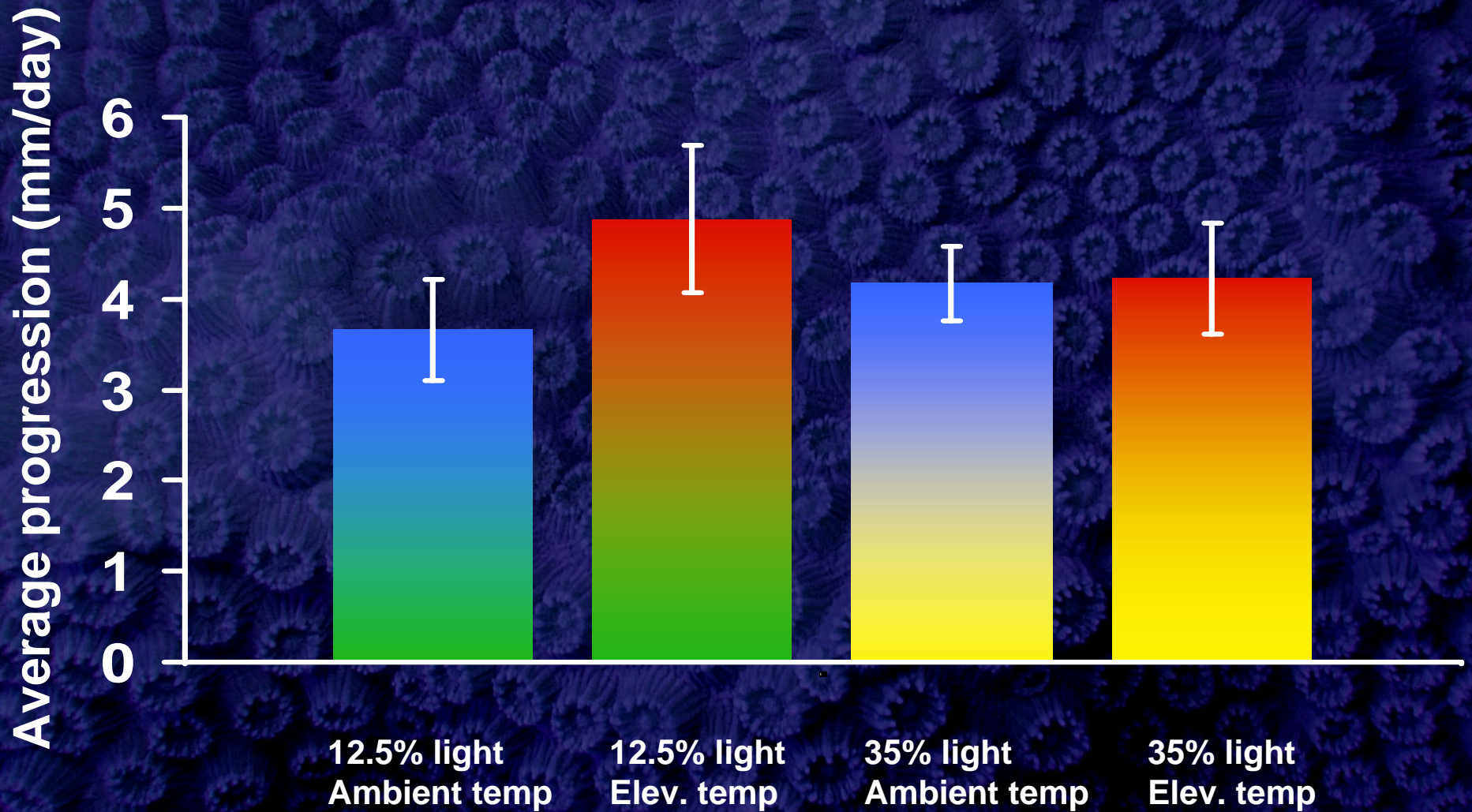
3 mm



6.8 mm

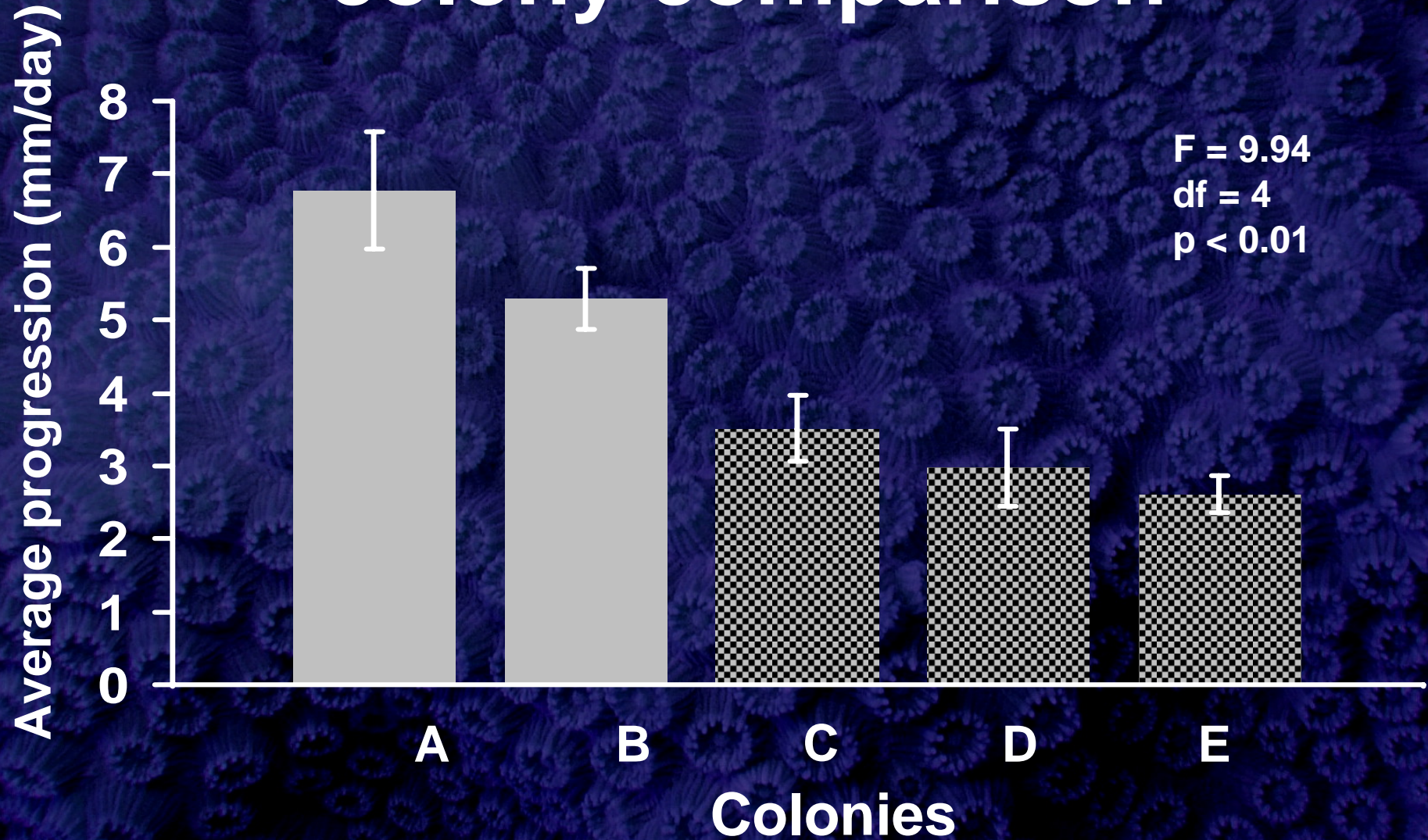


# BBD progression rates in light and temperature treatments





# BBD Progression colony comparison





# Are Corals Tough Enough?

- Not just who...but why
- Are certain areas or coral populations more resistant to disease in the Florida Keys?
- Are particular coral or zooxanthellae genotypes more resistant to disease?
- Do resistant corals harbor different bacterial assemblages than susceptible corals?
- Do any of the above change when environmental conditions are altered?



# Summary

- **Annual BBD recurrence common (20-55%) in FL**
  - increased coral tissue lost and an improved likelihood of total colony mortality
  - excess nutrients exacerbate BBD infections
- **Temperature experiment indicates upper threshold to BBD enhancement effects**
  - severity vs. prevalence
- **Coral disease susceptibility varies among colonies within and between species**
  - Are these patterns predictable?
  - How might this impact restoration activities?
- **Diagnostics and training to quantify coral health beyond measures of mortality**
- **Improved techniques to identify susceptible populations or regions**



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