Biotic Resistance of the Caribbean Lionfish Invasion

Serena Hackerott
Biology Major
Chemistry and Marine Science Minor
Advisor: Dr. John Bruno (Biology Dept)
Lionfish Invasion

Lionfish Background
- The first marine fish to successfully invade the Caribbean
- “Piscivores”, or predatory fish that eat other fish, native to the Pacific
- First appeared in the Atlantic in 2000 (released from an aquarium)

Caribbean Invasion
- Lionfish have rapidly spread throughout the Caribbean
- Success of invasion: lack of natural predators and “prey naiveté”
  - Prey naiveté: native prey are vulnerable to invasive predators because the prey species do not recognize the novel predator

Ecological Issues
- Lionfish prey on a wide variety of reef fish including juvenile herbivore and predator species.
- Increased predation within reef ecosystems can cause a decrease in the already low predator biomass or a decline in coral coverage.

Project Goals

Hypotheses
- Top Down: Lionfish vs Predators - Lionfish fitness will be reduced on reefs with high predator abundance due to predation or competitive pressure from native predators.
- Case Study: Belize vs Bahamas - Compare lionfish fitness between two regions and discuss the factors that may contribute to any differences in fitness.

Methods
- Site Native Species Composition: Transect Surveys
- Lionfish Fitness Measurements
  - Stomach Weight (g)/Length (cm) Ratio to access satiation
  - Otolith Analysis to calculate growth rate **Otolith analysis is in progress (Fall 2012)**
Top-Down: Lionfish vs Predators

Plotted Site Large Predators (>40cm)/Transect vs Stomach Weight(g)/Length(cm) Ratio for Belize Lionfish
- Linear Regression R squared value: 0.0762
- Exponential R squared value: 0.0679
- Conclusion: No relationship

Case Study: Belize vs Abaco, Bahamas
- Null Hypothesis: No difference between Stomach Weight(g)/Length(cm) Ratio (S/L) of Belize and Bahamas samples
- T-Test P-value: 0.01266 (Two-tailed test)
- Conclusion: Significant Difference
- Mean S/L Ratio Belize: .2508 is greater than Mean S/L Ratio Bahamas: .1717

Discussion: The significant difference between Belize and Bahamas samples could be attributed to many factors. Lionfish have more recently invaded Belize (2009) and could be more successful due to a higher degree of prey naiveté than is currently seen in the Bahamas where lionfish have been present since 2005. However, lionfish education and fishing derbies have also been occurring for longer in Abaco, Bahamas so increased fishing pressure could account for the decreased fitness. Other environmental factors that differ between the regions could also contribute to the difference in fitness.