

# EFFECTS OF PREDATION ON FOUNTAIN DARTERS STUDY

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In collaboration with Bio-West, SMARC, and Joe Veech

# Study context

- Activities associated with the removal of Fountain Darter predators (e.g., Largemouth Bass) during low flow conditions
- Is it necessary and beneficial?

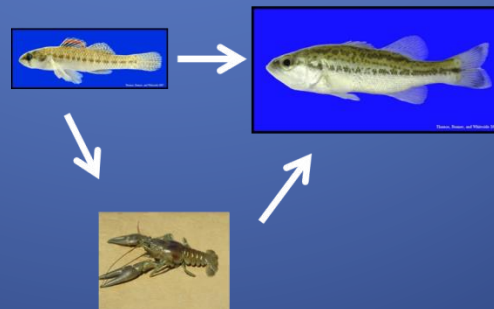


# Bass, Crayfish, Fountain Darters

- Additive model:  $P_{\text{darters}} = C_{\text{bass only}} + C_{\text{crayfish only}}$
- Synergistic model:  $P_{\text{darters}} < C_{\text{bass only}} + C_{\text{crayfish only}}$ 
  - Bass consume more crayfish and less darters
  - Optimum foraging theory
- Synergistic model:  $P_{\text{darters}} > C_{\text{bass only}} + C_{\text{crayfish only}}$ 
  - Crayfish displace darters from cover (vegetation)
  - Exploitative competition

# Remove Bass

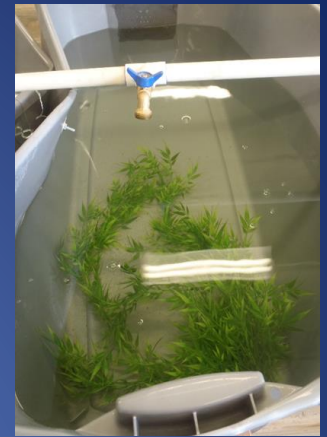
- Additive model:  $P_{\text{darters}} < C_{\text{bass only}} + C_{\text{crayfish only}}$
  - Synergistic model:  $P_{\text{darters}} > C_{\text{bass only}} + C_{\text{crayfish only}}$
- ...because  $P_{\text{crayfish}}$  by  $C_{\text{bass}}$



# Study Objectives:

- Quantify consumption of darters by bass and crayfish independently and combined
- Quantify vegetation (presence/absence) mediates predation on fountain darters
  - Assess if crayfish displace darters in the presence of bass
  - Not a test of vegetation densities effects on fountain darter predation
- Quantify across a temperature gradient (<, 23°C, > water temperatures of the spring systems)

# Methods



- Preliminary tasks:
  - Used Largemouth Bass, *P. clarkii*, and Greenthroat Darters to...
    - Assess fish and crayfish densities
    - Gape width of bass (crayfish size)
    - Duration of studies
    - Type and coverage of vegetation
    - Experimental containers, flow systems, water source

# Experimental design

- Experimental unit: 30 g container with 4 Fountain Darters (31 mm)
- Treatment 1 (Predation):
  - No predators (control)
  - Crayfish only (90 mm)
  - Bass only (260 mm)
  - Crayfish and bass



# Experimental design

- Treatment 2 (Vegetation):
  - Vegetation (artificial, similar to *Hygrophila*; 50% coverage)
  - No Vegetation

	Veg	No Veg
	N	N
Control	3	3
Crayfish	3	3
Bass	3	3
Cray & Bass	3	3

- 3 replications
- 24 units, randomly assigned a treatment
- 11 days; pond water and well water from FAB



Lower °C:  $17.6 \pm 0.92$  SE

Spring °C:  $22.2 \pm 0.02$  SE

Nitrate, Nitrite, Ammonia, Conductivity, pH, and dissolved oxygen were monitored

# Results

## Lower Temperature (17.6°C)

2 Factor ANOVA

Pred \* Veg

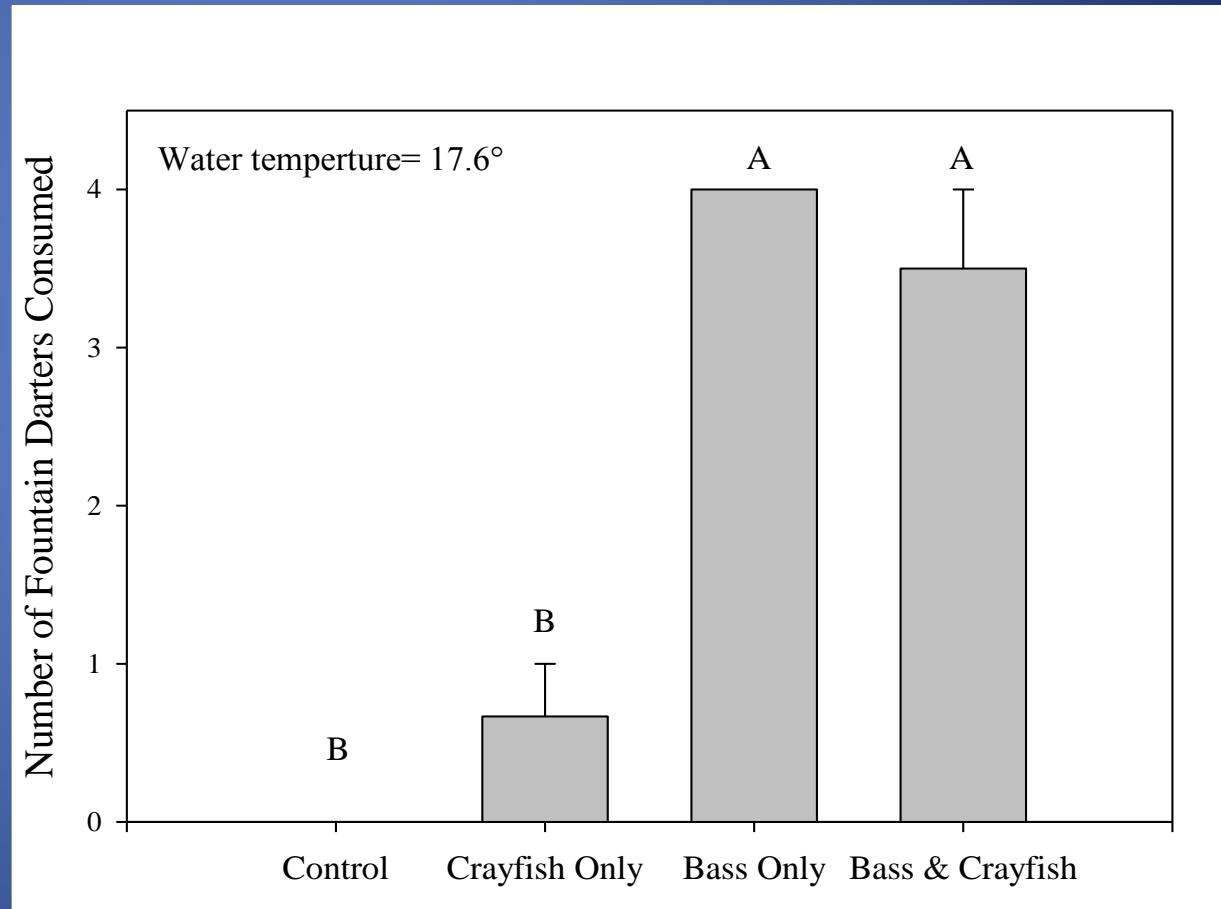
Interaction:  $P = 0.57$

$F_{4,19} = 35.49, P < 0.01$

Veg:  $P = 0.17$

Predation:  $P < 0.01$

Crayfish consumption = 2.1



# Results

22.2°C (water temperatures of springs)

2 Factor ANOVA

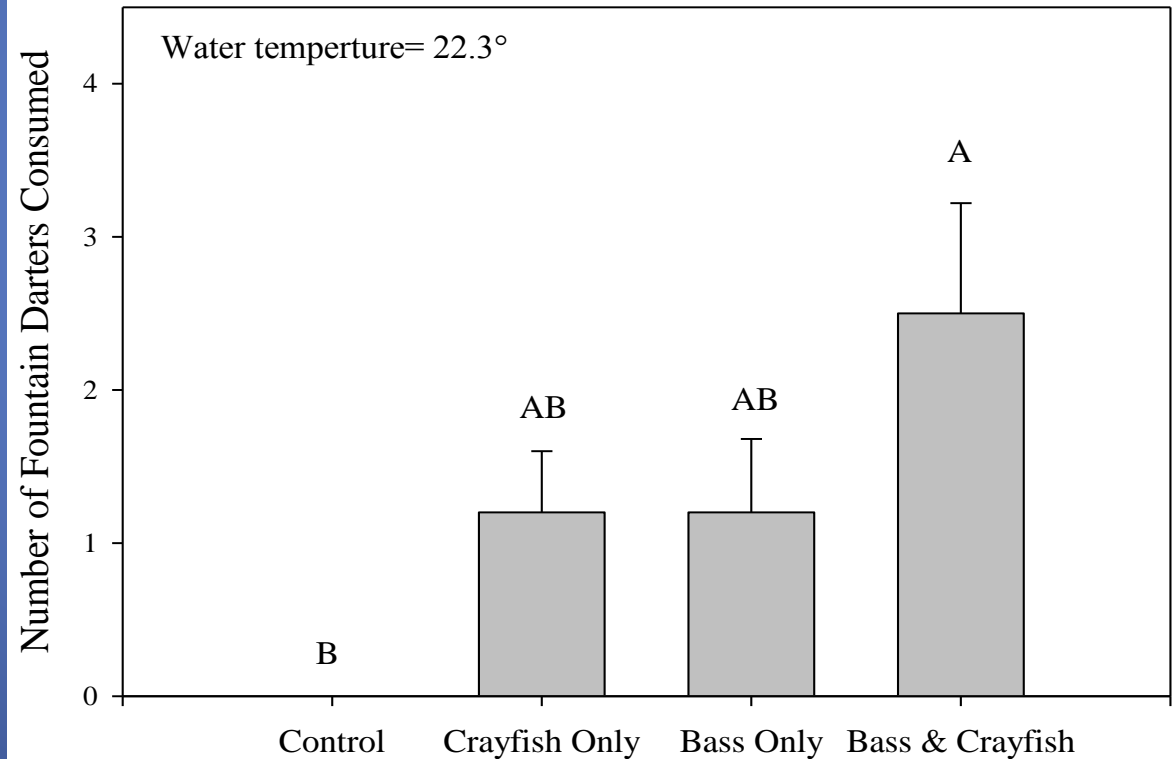
Pred \* Veg

Interaction: P = 0.43

$F_{4,19} = 3.4, P = 0.03$

Veg: P = 0.61

Predation: P = 0.02



# Conclusions

- Predation on darters:
  - Bass > crayfish
- So far, supports additive model
  - Supports management option of bass removal during periods of low flows
- ...But high temperatures and energy demands on the bass?
  - Repeat this summer with warmer pond water



# Results

## Lower Temperature (17.6°C)

2 Factor ANOVA

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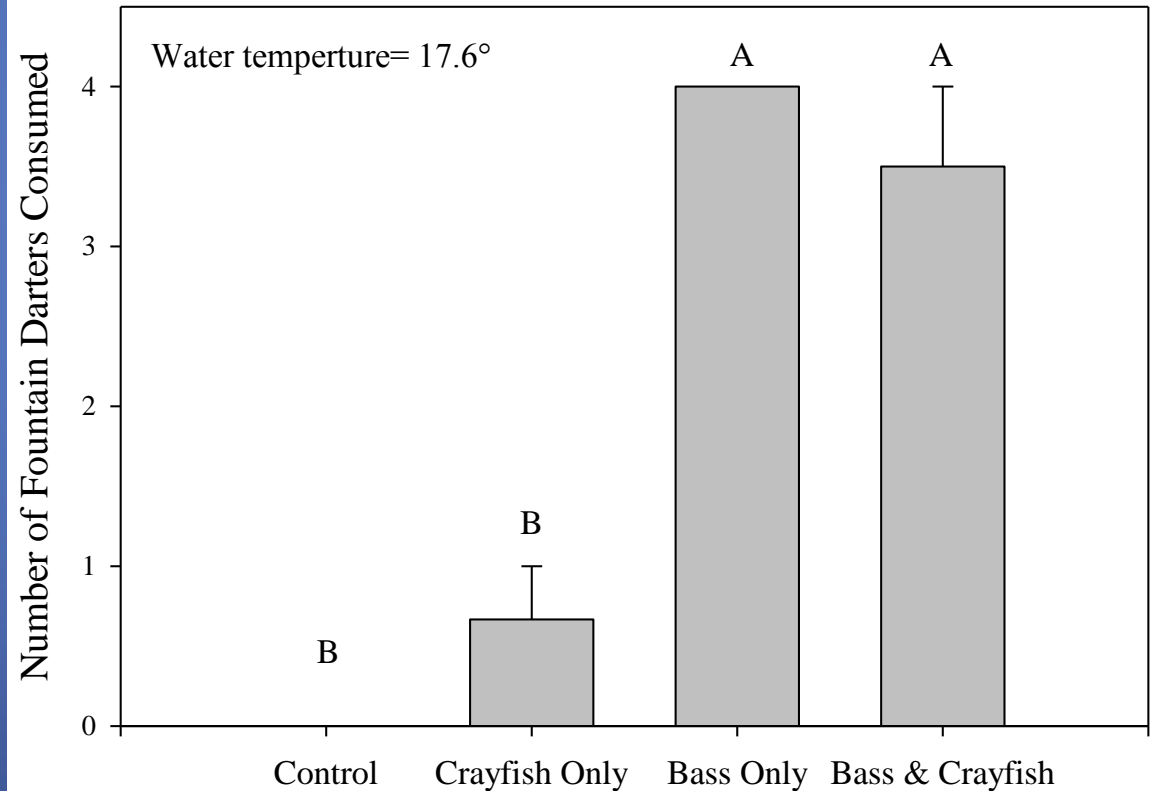
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# Literature Cited

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A photograph of a fish, possibly a bass, swimming in an aquarium. The fish is positioned in the center-left of the frame, facing right. It has a greyish-brown body with a lighter underbelly. The aquarium is filled with numerous bright green, artificial-looking plants that resemble bamboo or reeds. The background is a solid, light blue color, likely the water or the back of the tank. The lighting is even, highlighting the texture of the fish's scales and the vibrant green of the plants.

Questions?