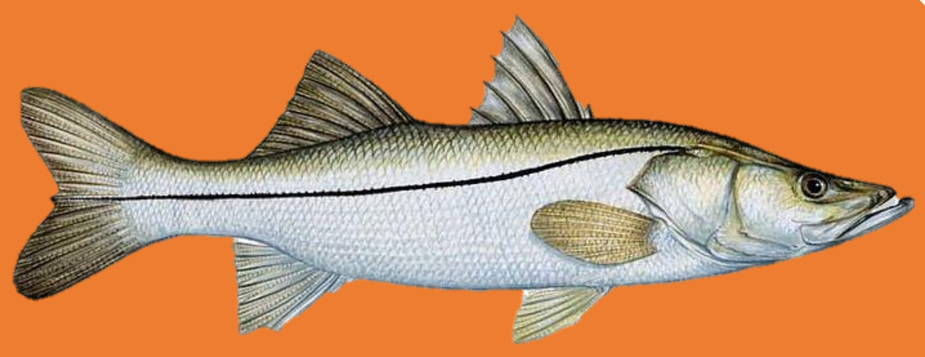

THERMAL TOLERANCE OF COMMON SNOOK BY LATITUDE AND SALINITY

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INTRODUCTION

Temperature and salinity can affect fish physiological and behavioral responses, resulting in environmentally induced variation in thermal tolerance. Such variation in ecological conditions may therefore influence species distributions across geographic ranges and habitat types. Local adaptations may account for differences in thermal tolerance to allow fish to survive in thermal refuges and thus persist in regions where environmental conditions may be otherwise unsuitable.

The Common Snook *Centropomus undecimalis* is sensitive to cold temperatures. It occupies various coastal habitats spanning from offshore reefs to freshwater rivers where they are exposed to fluctuating temperatures and salinities. Cyclical cold and warm periods have occurred throughout Florida's history, influencing the northern primary range limit of this species. Recent population expansion raises numerous questions regarding the influence of climate on distribution, habitat use, and population dynamics of Common Snook.

Objectives

- To understand how salinity affects the thermal tolerance of Common Snook.
- To understand thermal tolerance of Common Snook along a latitudinal gradient.

MATERIALS AND METHODS

Collection and Quarantine

- Common Snook (239-561 mm TL) collected using electrofishing and seines (Fig. 1).
- Fish underwent a saltwater dip, praziquantel treatment, and external health inspection.
- Fish held in a recirculating system where they were acclimated to 25˚C and salinity level (3 ppt, 15ppt, or 30ppt) for two weeks.
- Fish were fed shrimp daily.

Figure 1. Fish collection sites: Suwannee River, Chassahowitzka River, Little Manatee River, and Imperial River.

Experimental Process

- Fish transferred to recirculating experimental system and placed into individual insulated tanks (152 L) each equipped with heaters and air stones (Fig. 2).
- Fish acclimated to experimental system for one week.
- 12 fish were used per run (2 control, 10 trial).
- After acclimation and all fish actively eating, temperatures of trial tanks were dropped 1˚C per day until death observed.
    - Sensors logged temperatures in each tank every 15 minutes.
    - Fish fed shrimp daily.
    - Cessation of feeding, loss of equilibrium, and death recorded.
- Control tanks maintained at 25˚C throughout trial.

Statistical Methods

- Analysis of variance with Tukey HSD comparisons

Figure 2. The "Mastodon" at UF/IFAS Tropical Aquaculture Lab. This recirculating system is set up with a sump, chiller, mechanical filter. biofilter, and protein skimmer. Each insulated tank is equipped with a heater, air stone, and temperature sensor. This programmable system allows for controlled customization for experimentation.

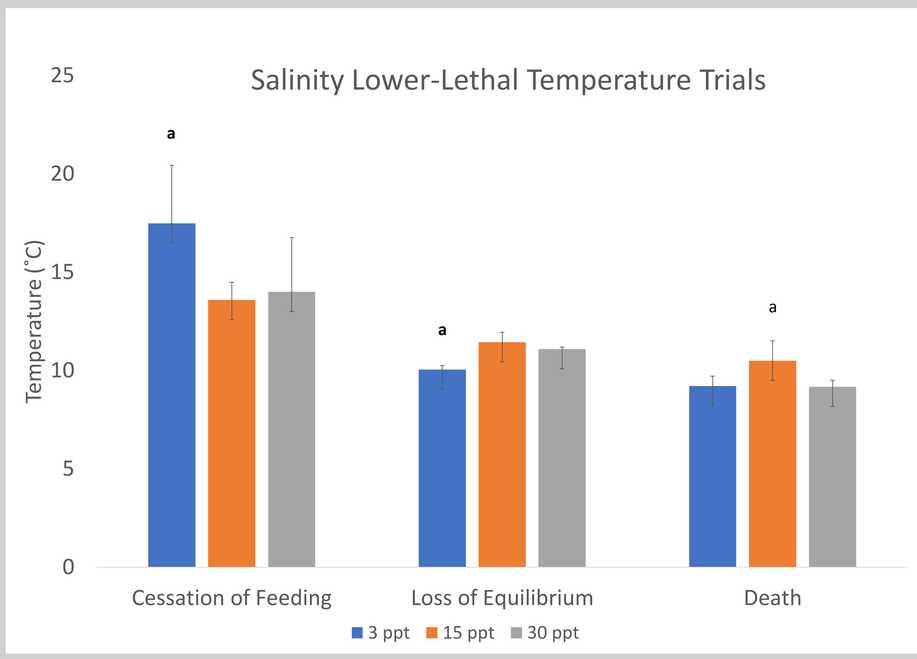

Figure 3. Critical points during the lower-lethal temperature trials by salinity. The "a" denotes treatments that significantly differed (p-value < 0.05).

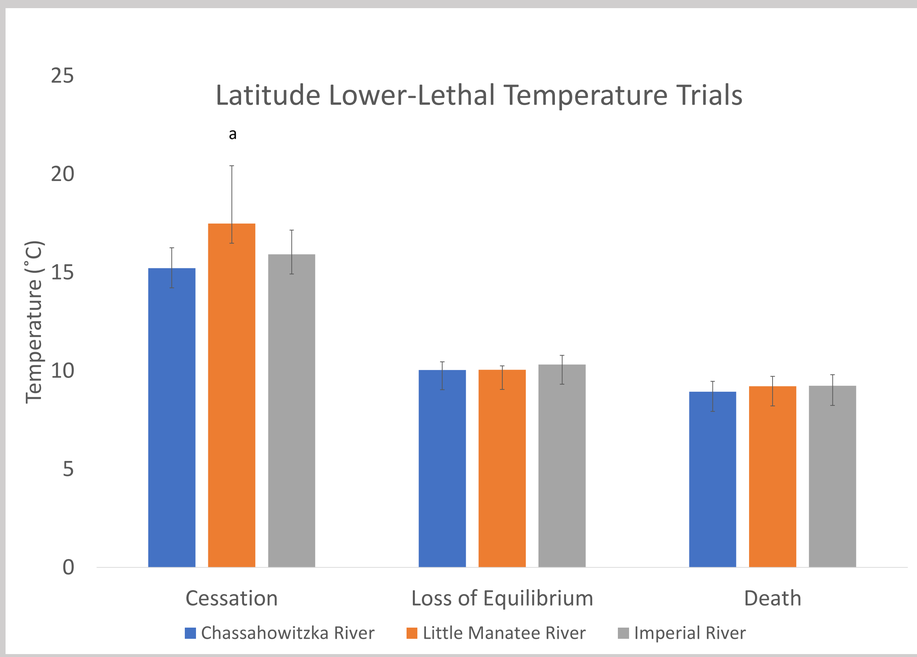

Figure 4. Critical points during the lower-lethal temperature trials by latitude. The "a" denotes treatments that significantly differed (p-value < 0.05).

RESULTS AND DISCUSSION

Salinity Trials

- The 3 ppt treatment significantly differed from the 15 ppt and 30 ppt treatments for cessation of feeding and loss of equilibrium.
- Death occurred at a significantly warmer temperature for the 15 ppt treatment.

Latitudinal Trials

- Fish collected from the Little Manatee River stopped feeding at a significantly warmer temperature than the Chassahowitzka River and Imperial River fish.
- Loss of equilibrium and death was not significant among the three latitudes.

A better understanding of thermal effects on Common Snook will have important implications for this fishery's future management. Unexpectedly, our findings showed this species is least cold tolerant when closest to being isotonic with its environment. Additionally, our lower-lethal temperature for the low-salinity treatment was must lower than published findings and suggests potential habitat and thermal refuge characteristics during cool winter periods. Furthermore, our latitudinal findings support that this species range expansion has occurred due to mild winters and the development of an overwintering behavior type.

FUTURE DIRECTION

- Latitudinal lower-lethal temperature experimentation for the most northern extent of the Common Snook expansion range (Suwanee River) is currently underway at UF/IFAS TAL.
- Additional lower-lethal temperature experimentation by size.

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Common Snook Image Credit: Diane Rome Peebles