Competitive Interactions Between Creek Chub (Semotilus atromaculatus) and Brook Trout (Salvelinus fontinalis) under the Influence of Rising Temperatures

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Conservation efforts acknowledge that increased thermal stress can negatively impact Brook Trout (*Salvelinus fontinalis*) within their native range, as they will be being pressured out of their native cold headwater range by Brown Trout, a species with a slightly higher thermal tolerance.

As stream temperatures continue to rise, Brook Trout are predicted to suffer increased competition with more warm water species such as the Creek Chub (*Semotilus atromaculatus*) (b).

Increased thermal stress can negatively impact feeding behaviors, growth rates, social behaviors, and species phenology.

Brook Trout will be less capable of competing with warm water species such as Creek Chub within their native range, as they will be subjected to increased stress.

Conservation efforts acknowledge that temperature is one of the top threats to Brook Trout populations and focus on habitat for sustainable production, and developing populations resistant to environmental variation (a).

**Introduction**

- As climate change continues to raise global temperatures, the temperatures of typically cold headwater streams will rise as well.

- Brook Trout (*Salvelinus fontinalis*) are already being pressed out of their native cold headwater range by Brown Trout, a species with a slightly higher thermal tolerance.

- As stream temperatures continue to rise, Brook Trout are predicted to suffer increased competition with more warm water species such as the Creek Chub (*Semotilus atromaculatus*) (b).

- Increased thermal stress can negatively impact feeding behaviors, growth rates, social behaviors, and species phenology.

- Brook Trout will be less capable of competing with warm water species such as Creek Chub within their native range, as they will be subjected to increased stress.

- Conservation efforts acknowledge that temperature is one of the top threats to Brook Trout populations and focus on habitat for sustainable production, and developing populations resistant to environmental variation (a).

**Hypothesis**

- We predict that at higher temperatures Brook Trout will consume less pellets and that Creek Chub will interfere with pellet consumption causing further reduction of pellet consumption.

- We also predict that Creek Chub will interfere with Brook Trout, thereby feeding more at higher temperatures and showing increased aggression, intimidation, and spatial displacement of Brook Trout.

**Methods**

- Behaviors of Brook Trout and Creek Chub in dyad pairs for all combinations of species (Brook Trout/Brook Trout, Brook Trout/Creek Chub, Creek Chub/Creek Chub) were measured with a GoPro camera mounted above the dyad. Data recorded was feeding latency, feeding rate, aggressive behaviors, and position within the water column to approximate exploitative or interference competition.

- Ten trials under each temperature (18, 20, 22°C) using similarly sized fish (average ~135 mm) were performed.

- Fish were given a day to acclimate to temperature changes in between measurements.

- Experimental design used is a 3x3 (between-within) subjects design with three species grouping. Photo shows actual tank area for testing (22” x 22” x 18” deep).

**Results**

**Implications**

- Trout fishing is a billion dollar industry and a very popular recreational activity in Pennsylvania.

- Invasion of native Brook Trout streams would restrict their ranges and decrease the available habitat for them to live in, thus decreasing fishing opportunities for Brook Trout as well as altering the stream community.

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**References**