



## Experimental Assessment of Competition between Round Goby and Slimy Sculpin in Experimental Microcosms

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Caption: Picture of a round goby, Engbretson, Eric, Public Domain, <https://www.fws.gov/media/round-goby>

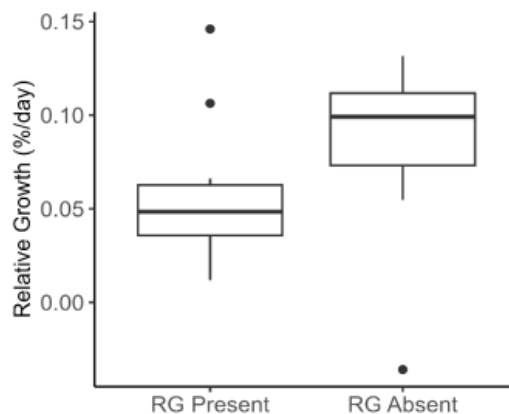
**Goal:** Experimentally evaluate potential competition between native slimy sculpin and invasive round goby to understand whether declines in sculpin populations could be related to establishment of round goby

- Objective:**
1. Assess behavioral interactions between round goby and slimy sculpin, including aggression and chasing behaviors
  2. Test the hypothesis that round goby are competitively dominant, predicting reduced shelter occupancy, growth, spawning success, and survival of slimy sculpin in the presence of round goby

**Management Implications:** Understanding the various potential drivers of slimy sculpin declines in the Great Lakes in isolation is impractical in field settings. Exploring the potential threat of round goby to slimy sculpin in laboratory conditions resolves uncertainty on the potential to conserve native benthic prey fish communities that have become a priority for preserving adaptive capacity in the Great Lakes.

- Methods:**
- Conducted controlled laboratory competition experiments at temperatures  $\approx 5^\circ\text{C}$  to simulate offshore overlap, comparing slimy sculpin pairs housed with and without round goby
  - Quantified round goby and slimy sculpin behavioral interactions and space use via video observations, measuring shelter occupancy, chasing behavior, growth, and survival
  - Analyzed treatment effects using permutation tests allowing robust inference on behavioral responses

- Key Findings:**
- Round goby presence significantly reduced slimy sculpin shelter occupancy even though direct aggressive interactions by round goby were rare
  - Slimy sculpin experience increased intraspecific aggression when round goby were present, suggesting that competition for limited shelter displaced conflict toward conspecifics rather than interspecific chasing.
  - No statistically significant effects of round goby on slimy sculpin growth, spawning, or survival were detected under cold-water laboratory conditions, although mean growth rates were lower in the presence of round goby.



Caption: Distribution of average slimy sculpin relative growth rate (% length change per day) in laboratory experiments conducted to understand the impacts of spawning shelter competition and aggressive behavior between round goby (RG) and slimy sculpin.

**Deliverables:** Hoekwater, J.C. 2025. Understanding slimy sculpin population declines in the Great Lakes. Ph.D. dissertation, Michigan State University, East Lansing. [Download here.](#)

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