

SUSTAINING PLAINS AQUATIC ECOSYSTEMS FORT COLLINS

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PROJECT INTRODUCTION

My internship focused on competition between the native Plains Topminnow (PTM) and invasive Western Mosquitofish (MSQ) that is prevalent on the eastern plains of Colorado due to intense agriculture. MSQ have been introduced as a mosquito control agent and have rapidly invaded outcompeting native fish. They are originally native to the Mississippi river basin but have been introduced globally on every continent except Antarctica. With lab experiments, we studied how at different temperatures and densities the two species compete for preferred habitat.

Additionally, we conducted critical thermal maxima experiments at different salinity exposure levels at the CPW Aquatic Toxicology Lab. This was done to further understand how competition between native and invasive species may be influenced by salinity tolerances in the South Platte Basin coupled with other environmental factors and impact native fish conservation.

INTERNSHIP GOALS

- Better understand aquatic sustainability issues of the South Platte Basin, particularly regarding native and non-native fish competition
- Receive lab and field experience spanning a wide range of skills necessary for aquatic research
- Develop a storyboard for outreach video to be recorded primarily in Summer 2022

Figure 1.



Plains Topminnow fish collection with seine. From left to right: Jon Salerno, Sam Lewis, Kelley Sinning

WHAT YOU DID



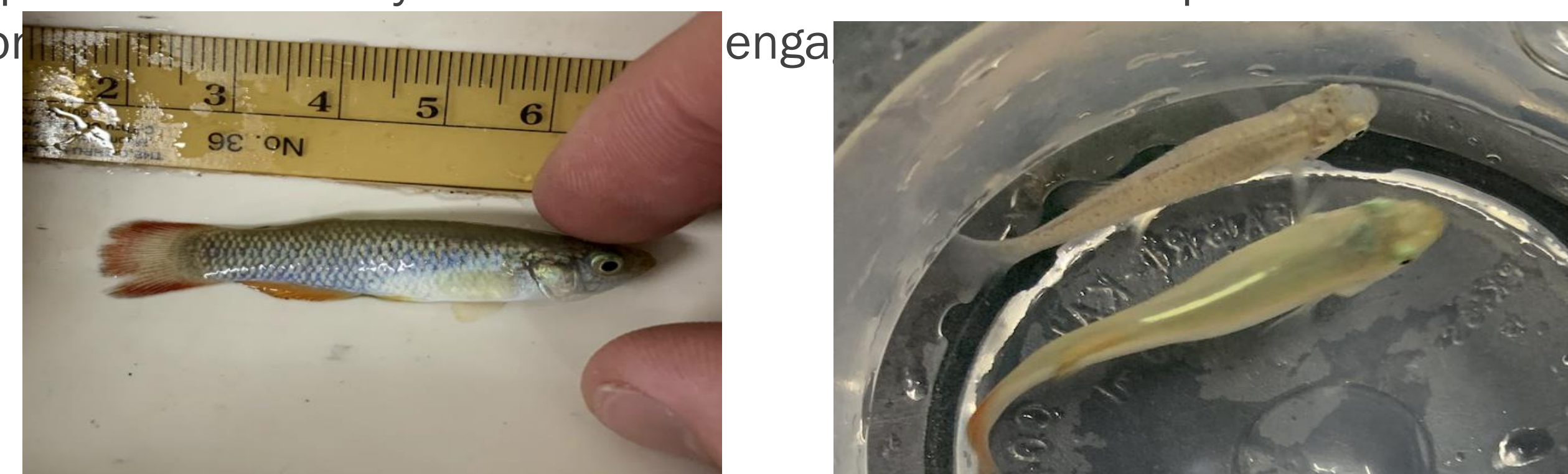
The goal of the experiment was to study how habitat displacement occurs in competition between Plains Topminnow (PTM) and Mosquitofish (MSQ). Methods included:

- Using 3 600-gallon tank mesocosms constructed on campus to mimic upstream and downstream flow
- Allopatric and sympatric (1:1 ratio) experiments at hourly intervals
 - Rotating densities and temperatures
 - 16, 22, and 28 Degrees Celsius
 - Day 1 of each week starts at 40 fish density, each day 20 fish added, end the week with a 120 fish density.
 - At the lowest (40), middle (80), and highest (120) density, lengths of fish were taken to see if size played a role in what habitat was used
 - Collected data on fish movement with different variables present.

In addition to the allopatric and sympatric experiments, we ran a salinity study at Colorado Parks and Wildlife Aquatic Toxicology Lab.

- 2 salinity exposures and a control that were equally distributed to dilute amongst 12 containers of PTM and 12 containers of MSQ, each containing 15 fish.
- On the 4th, 10th, and 30th day of exposure we did Critical Thermal Maxima (CTM) tests to see how temperature interacts with different salinity levels at sublethal concentrations and may influence competition.
- Collected data frequently on water quality and mortalities between tanks

In between field and lab work, I designed a storyboard for an outreach video on aquatic sustainability in the South Platte Basin that incorporates the research done



WHAT YOU LEARNED

- Outreach planning with a communications team
- Experimental methods/data collection
 - How to calibrate and use different tools, such as the toxicant diluter, salinity sensors, and temperature regulator.
 - How to run CTM experiments, in addition to taking daily salinity measurements and frequent water quality parameters.
 - Fish collection using seines, dip nets, and electrofishing via backpacks and a tote barge
 - Data recording (e.g. weights, lengths)

Figure 2.



To better understand habitat preference and movement between PTM and MSQ, we spent a week observing intraspecific and interspecific competition. This involved watching tanks for 10-minute intervals and taking note of nipped fins or chasing between fish of the same and different species.

HOW DOES THIS APPLY TO YOUR EDUCATION

As a Junior in the Fish, Wildlife, and Conservation Biology major I have plans to pursue graduate school after completing my B.S. For a career, I want to specialize in aquatic ecology research, with particular interests in toxicology and anthropogenic disturbance. The skills I have learned from this internship and in working closely with a graduate student have given me tremendous insight into the process of research.

NEXT STEPS

Next steps will involve working on putting content together and planning for an outreach video that will engage stakeholders and highlight research on native species conservation and water sustainability in the South Platte Basin. Also, we will continue to collaborate on writing a paper for the salinity study at CPW.