Factors Controlling Invasive Mussel Distribution in Arizona

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Background

Dreissena bugensis, known commonly as the Quagga mussel, is an invasive mollusk species that was introduced to North America from its native Ukraine in 1989 by way of Lake Erie. Since then, the species has spread throughout the great lakes and in 2007 was first found in Lake Mead. Quagga mussels continue to spread in the Colorado River basin and can now be found in Lake Havasu, Lake Pleasant, and the Central Arizona Project canal system. The mussels are extremely disruptive to the natural ecology of North American freshwater ecosystems. Although adults are only 20-25 millimeter in diameter, each individual mussel can filter up to a liter of water per day and remove essential phytoplankton, zooplankton, and algae that make up the base of the food chain in a freshwater ecosystem[9]. Additionally, the mussels also pose a threat to human water use by attaching to and damaging water intake valves at power and water treatment plants. They can also hurt the recreation industry by damaging boats, buoys, docks, and beaches. *D. bugensis* larvae, known as veligers, have been found in Salt River Project canals as well as the CAP canals, yet for a currently unknown reason have not been able to establish adult colonies in canals carrying SRP water. Presently the only known way to safely eliminate *D. bugensis* is through manual removal of adult mussels. Although edible to humans and many aquatic animals, the mussels accumulate toxins which are passed up the food chain to fish, birds, and potentially humans.

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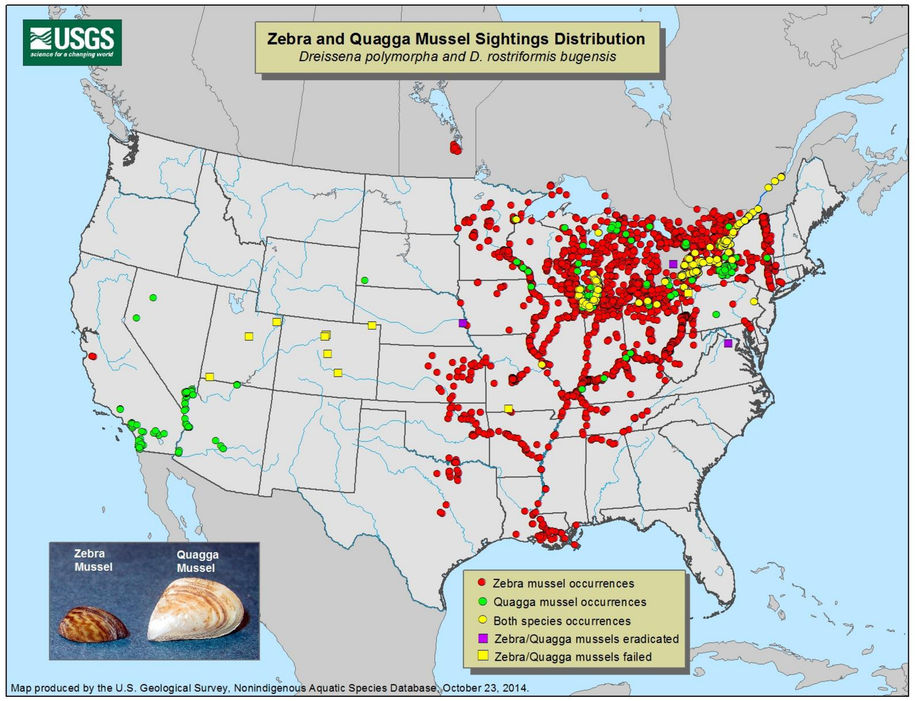

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Project Goals

- Identify factors which are preventing *D. bugensis* populations from establishing within the SRP reservoir/ canal system.
- Investigate under laboratory conditions the survivability of D. *bugensis* with varied DO concentrations and temperature profiles.
- Preform spawning experiments to better develop an understanding of the conditions necessary for reproduction.

Procedure

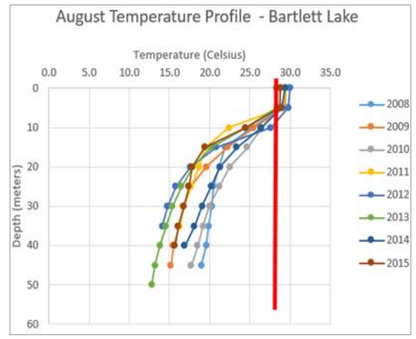
D. bugensis specimens are being collected from the Lake Pleasant Marina in Peoria, Arizona. Plate traps will be laid out which the mussels will attach to and grow on. Once collected, the mussels will be transported to the lab and placed in an aquarium where dissolved oxygen levels will be reduced through the addition of organic material which will consume the oxygen in the water. The survival of adult mussels will be observed. Further research will include observation of survival rates of adult mussels in CAP water with changing water quality parameters. Potential examples are:

Dissolved Oxygen – Dissolved oxygen concentrations less than 4 mg/l have shown to be inhibitory to veliger settlement. Regional water quality sampling has shown average D.O. concentrations to be higher in Lake Pleasant (CAP system) than Saguaro Lake (SRP System) with summer averages near/below the threshold respectively[5,7].

Temperature - Exposure to temperature levels above 31˚ Celsius for more than 5 days are considered to be the upper limit of survival for D. *bugensis* with a 50% mortality rate normally occurring at approximately 29.3˚ Celsius [7,10]

Recent Findings

- A correlation between survival and the temperature and DO profiles of non infested lakes suggests that during spawning months there are two conditions necessary for survival which are not met.
- Calanoid copepod predation has been ruled out as a factor as none were located in non infested waters yet were identified in infested waters.
- Water chemistry and turbidity have been ruled out due to laboratory testing using water from non infested sources as well as the addition of simulated turbidity. Both of these parameters yielded a 98% survival rate among adult D. *bugensis* specimens. [10]



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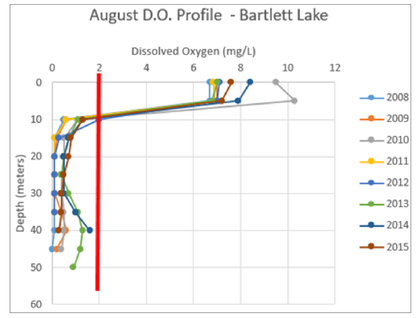

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Acknowledgements

- Funding provided by the Salt River Project
- Cooperation with the Central Arizona Project and Arizona Game and Fish Department
- Special thanks to Scott Bryan

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