

Raising Mosquitofish in SBAE to Combat Mosquito-borne Disease in Local Communities

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Introduction

School-based Agricultural Education (SBAE) programs can offer unique and relevant learning experiences to students through community partnerships and engagement (Hastings, Barrett, Barbuto, & Bell, 2011). Learning experiences that challenge students to think critically and offer solutions to complex issues in local environments provide many benefits to both students and community members (Ernst & Monroe, 2006; Powers 2004). In central Florida, mosquito-borne diseases such as West Nile virus, Eastern equine encephalitis, and St. Louis encephalitis cause concern (University of Florida Extension, 2009). Agencies across Florida have worked to eradicate mosquito-borne diseases by controlling for mosquitos through cultural, biological, and mechanical methods. Public education on mosquito control has also been identified as a solution to increased community awareness and acceptance of control methods. The Roosevelt Academy of Leadership and Applied Technology agriculture program in Polk County, FL bridges STEM education and community involvement through a partnership with the Polk County Division of Mosquito Control. The SBAE program raises *Gambusia affinis*, commonly known as Mosquitofish or Gambezi, to distribute to community members as a biological control for mosquito larvae residing in ornamental fish ponds.

How it Works

The Roosevelt Academy SBAE program has a long history of teaching fish production as an academic subject. The program, led by agriculture teachers Ray Cruze and Tim Bean, includes students in grades six through 12. The public school is designed for both exceptional student education (ESE) students and non-ESE students that desire a smaller learning environment. The aquaculture program includes a greenhouse with four 1,000-gallon tanks and concentrates on raising Tilapia for food and as a nutrient source for growing hydroponic vegetables on their school farm. The idea for raising Gambezi was sparked through discussion with the county's division for mosquito control which raises the fish as a biological control for mosquitos, a common approach to eradicate mosquito larvae in freshwater aquariums and small outdoor ponds in the southern half of the United States.

Gambezi are extremely easy to breed and are prolific breeders. In fact, they are the only North American fish classified as a livebearer, and are similar to the common guppy. Gambezi are small in comparison to many freshwater fish. Adult females reach a length of 2.8 inches while males are smaller, reaching a length of 1.6 inches. The smaller fish can be raised in any version of aquaculture tank, but tanks require modified filters so the fish can't swim through them. The Roosevelt Academy SBAE program uses a simple, 500-gallon tank to raise Gambezi within their greenhouse. The 500-gallon tank will hold 3,000 fish. Because Gambezi are cannibalistic and will feed on their own fry, an artificial structure must be placed in the tank as habitat, offering protection for young fry. A standard fish pellet mix can be used as the food source. The fish will reach maturity in roughly two months and will begin reproducing at that time. Each female will give birth to around a dozen fry three to four times per year.

Results/Implications

The Roosevelt Academy SBAE program is in the early stages of raising Gambezi. To date, they have raised 2,000 Gambezi and are in the process of raising 3,000 more. The partnership with the Polk County Division of Mosquito Control will assist with public awareness of the program. The fish will be given freely to members of the community who seek the fish for biological control in their ornamental ponds. The quick-breeding fish offers a sustainable and regenerating population that will allow the operation to be economically efficient. The waste from the fish is used as a nutrient source for many types of vegetables grown on the school farm.

Besides offering a community service, this project yields great impact on student learning outcomes. Students are exposed to a curriculum that explores characteristics of the fish and production of the fish. Furthermore, STEM is integrated into components of the curriculum, challenging students to identify problems and provide solutions to the production system. In a broader topic, students learn how biological controls can be used in Integrated Pest Management plans, as identified by the local county's mosquito control plan.

Future Plans

The agriculture instructors at Roosevelt Academy are excited about sharing this program to SBAE programs in Polk County and beyond. According to Ray Cruze, this type of aquaculture system is inexpensive, readily available, and provides unique learning experiences to students while meeting a community need. The instructors are eager to meet with agriculture teachers from across the county and to offer guidance on establishing Gambezi breeding tanks. A networking and support system could be created by teachers utilizing this project within their classrooms or FFA programs. Furthermore, for schools that do not have SBAE programs, this project could be utilized in science and environmental education curricula.

The Roosevelt SBAE is also investigating ways to conduct social marketing that raises community awareness on mosquito-borne diseases and the use of control methods to combat changing mosquito populations. Future plans could be setting up an informational stand at local events or reaching out to media about the program.

Costs/Resources Needed

The total cost of the Gambezi aquaculture system was \$1,900. The system includes a 500-gallon tank, heater, thermostat, filter, and aerator. The Gambezi fry were provided free of charge by the local mosquito control district. Fish food is relatively inexpensive and a 5 lb. bag of 3/16" floating pellets can be purchased for less than \$15. It is important to note that this system, although basic compared to larger aquaculture systems, is still designed for large-scale production of Gambezi. Much smaller versions, even small fish aquariums, can be used as a demonstration tool for teaching about biological controls. Partnering with local agencies, such as a local division for mosquito control, provide an important resource for raising Gambezi. Local and state laws and permit requirements must be investigated before attempting to raise and distribute Gambezi. In some states, special permitting must be obtained before raising any fish through aquaculture and in some locations it may be unlawful to release Gambezi as a biological control.

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