A PROGRESS REPORT ON A METHOD OF REARING *GAMBUSIA AFFINIS* ON AN OPERATIONAL SCALE

James B. Hoy[1], Charles Beesley[2] and Craig W. Downs[2]

ABSTRACT

The strategy for finding a method of rearing 3,000 pounds of *Gambusia affinis* per year is presented. A general description of the hatchery facilities that have been constructed is given along with a brief discussion of the results to date.

INTRODUCTION.-The use of *Gambusia affinis*, the mosquitofish, for mosquito control has been hampered by an inadequate and unreliable supply of these fish. Pond culture efforts have encountered many hurdles, with mortality during the winter being one of the most important problems. This project was initiated to study methods of mass-production and rearing, utilizing close control of the fish and economies of scale.

The specific goal of our project is to develop a hatchery method that can produce 3,000 pounds of *Gambusia affinis* per year at a cost of $7.50 per pound including cost of labor and facilities. The strategy by which we plan to reach that goal has four elements: 1) fry production and growout throughout the year, 2) operation in a greenhouse with supplemental heat, 3) use of a closed system with biological filters to maintain water quality, 4) minimizing the load on the biological filters by carefully metered feeding.

MATERIALS AND METHODS.-We have constructed our rearing tanks in a 20x50 foot fiberglass greenhouse located in the corporation yard of the Contra Costa Mosquito Abatement District. Supplemental heat is provided by a propane heater capable of delivering up to 80,000 BTU's per hour. Each of the 12 rearing tanks is 8x8 feet x 16 inches deep, the walls are of 0.5 inch plywood with 2x4 inch wooden reinforcements along the top edges. Two sheets of plastic lining (20 mil vinyl under 6 mil polyethylene) hold the water and filter materials. The upper sheet protects the lower from abrasion by the gravel and sand in the filter bed while preventing the fungicide in the lower sheet from reaching the water in the system.

Water is circulated through the filterbed by the air-lift method whereby air is bubbled at the bottom of a column of water in a 3 inch diameter lift-pipe to decrease the specific gravity of the mixture in the column. The light (air-water) mixture moves upward and spills out the top of the lift-pipe. Water enters the bottoms of the lift-pipes through a grid of eight horizontal slotted 1.5 inch diameter pipes across the bottom of the tank after initially passing down through the filterbed. A high volume, low pressure supply of air comes from a blower powered by a 1.5 hp. electric motor. Air is delivered through a 3 inch diameter pipe to each tank. Two 1.5 inch diameter manifolds distribute air along the ends of each tank and into 0.5 inch diameter air lines which are inserted in each of 16 lift-pipes. All pipes are PVC plastic which has the advantages of being inexpensive, low in toxicity, and easily plumbed.

The biological filters currently in use have a bottom layer of 2 inches of pea gravel, which covers and separates the grid of horizontal pipes, and a 5 inch layer of No. 3 aquarium sand. Water depth of about 13 inches has been maintained to maximize submergence of the air line, which in turn maximizes the rate of water circulation.

An automatic feeder control system has been designed and constructed as an integral part of this project. The system and its rationale are described elsewhere (Hoy 1984). If one assumes a growth rate of 7 percent per day, which is less than one third the maximum demonstrated growth rate (Wurtsbaugh and Cech 1983), and a maximum loading of less than one half the theoretical maximum for the biological filter, 12 tanks operating throughout the year should produce approximately 3,285 pounds of fish per year. This system also can be used to control the auxillary heating of the greenhouse and to record air and water temperatures.

RESULTS AND DISCUSSION.-Using biological filters with 2 inches of gravel and 5 inches of sand at least 6 pounds of fish per tank can be supported. Furthermore, fish born in the system have reached sexual maturity in 60 days. Fish in the system were gravid through December, although only limited numbers were available.

To reach our goal of a system that can produce 3,000 pounds of fish per year, the depth of the biological filter will probably need to be increased to the maximum depth, i.e., 12 inches. Furthermore, the circulation through the filter may need to be higher than the rate we are currently using. Therefore, to date our goal seems to be attainable.

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[1]Division of Biological Control, University of California, Berkeley, CA 94720.

[2]Contra Costa Mosquito Abatement District, 1330 Concord Avenue, Concord Avenue, Concord, CA 94520

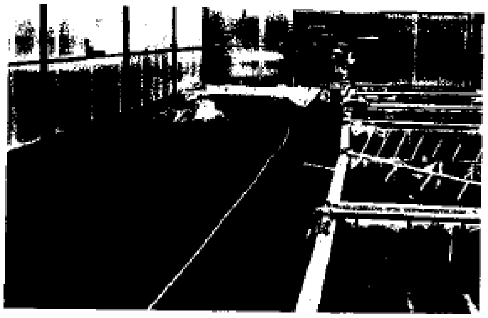

Figure 1. Plywood fish tanks. Note sheet plastic liners uncovered grid of pipes in the bottom of the tank, and reinforcement along the tops of the tanks on the right.

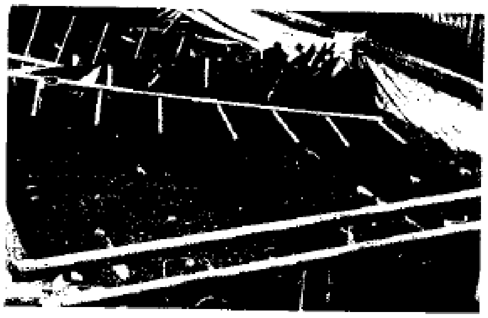

Figure 2. Exploded view of the air-lift manifold, showing the horizontal 1.5 inch manifold with eight 0.5 inch air lines.

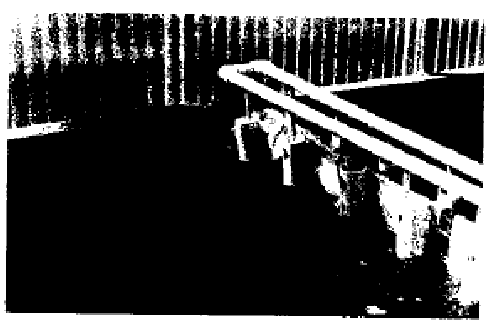

Figure 3. Assembled manifold and lift-pipes.

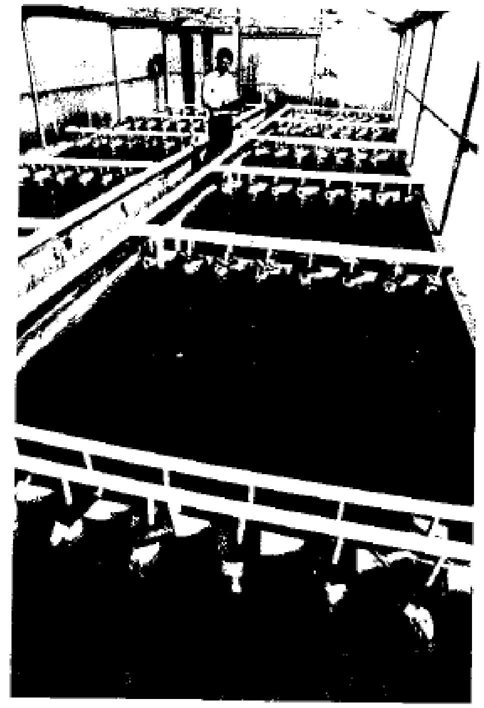

Figure 4. Completed system. Note 3 inch manifold running the length of the system and wooden splash guards covering each lift-pipe.

more, many members of the staff of Contra Costa Mosquito Abatement District have been of assistance. The student volunteer assistance of Shon Lewis was timely and helpful.

REFERENCES CITED

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