MICROSCOPY OF LARVAL FISH

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I described the spawning of the Eastern Mudminnow (Umbra pygmaea) in the July/August issue of American Currents. The fish I raised from this spawning have themselves produced eggs and I was fortunate to be able to follow the development of these eggs by microscopy. My conclusions from this study are simple. If you ever spawn any fish, try to buy, borrow, beg, or steal a microscope. It is absolutely fascinating to observe the newly hatched fish. My training and profession are those of a biochemist, with the emphasis on the chemist part, so the following description may not be strictly scientifically correct; however, the main point of the article is not "science," but "natural history."

I was able to obtain the use of a low-power binocular dissecting microscope giving magnifications between This was ideal for the mudminnow, since the eggs are about 1.5 mm in diameter, and the newly hatched fry are 6 mm long. Obviously higher magnifications would be better for smaller eggs and fry.

For observation, the eggs were placed in about 5 mm of water in a Petri-dish. I first observed the eggs just before I expected them to hatch. The embryo fish were clearly visible, with a large head, clearly distinguishable eyes, and a long thin body wrapped around the yolk sac. Although some movement was visible within the eggs, it was not clear what this movement was.

While making these observations, one of the eggs apparently "burst," and the head and front half of the yolk sac penetrated the shell. I originally thought that this resulted from either the light or the heat of the microscope lamp, but since the emerged fry survived and the other eggs hatched over the next few hours, I concluded that it was a genuine hatching.

After escaping from the shell of the egg, the larval fish was an ideal subject for microscopy. The first feature to be seen was the beating of the heart. This was situated in the "throat" of the fish beneath a clear membrane between the head and the yolk sac. A pulsating movement of the blood was observable along the length of the body. The return flow was much smoother, with most returning along the body of the fish, but a significant fraction flowed through clearly defined channels in the yolk sac. These various channels all combined at the heart, and the whole process started again.

Over the next few days, the yolk sac gradually diminished in size. Pigmentation increased until the circulation system was invisible. At the same time, the fish stopped lying on their sides, and eventually became free-swimming.

The microscope that I used had a camera attachment, so I was able to photograph this sequence of events. Apart from the red heart, no color was visible, so I used a black-and-white film--Tri-X. Although the exposure is determined by the equipment and lighting used, I obtained the best results at 1/8-second. The fish generally remained completely stationary, so that except for the beating of the heart, this long exposure time gave no problems. When the fry were disturbed, however, they were capable of rapid movements.

Mudminnows proved a fortunate choice for following egg development; the whole process takes many days, and so can be followed at a leisurely pace. My mudminnow fry became free-swimming about 12 days after hatching when maintained at a constant temperature of 15° C (59°F).