

SUCCESSFULLY SPAWNING AND RAISING THE GREEN SUNFISH
(Lepomis cyanellus)

by Peter R. Rollo, Secane, Pennsylvania

In mid-June of 1992, while on a Southeastern Pennsylvania fishing trip, I was able to observe Bluegill, Pumpkinseed, and Redbreast Sunfish performing their spawning rituals. I verified the spawning species by catching a few of the fish on my fishing rod. The males were guarding their nests against all intruders. The nests were constructed in water less than 12" deep and closely spaced (the edge of each nest touching adjacent ones). To initiate spawning, females approach the males and the pairs circle each other with fins fully extended. After a short time, the pair stops circling and the female tilts her body to a 45° angle. The eggs are released and simultaneously fertilized by the male. The females rarely spawn with only one male. They generally move on to other males to complete spawning while the males remain on their nests to guard the eggs.

Throughout the summer of 1992, I collected several juvenile Green Sunfish for my aquarium. Some had to be returned to their original body of water due to conflicts with the other sunfish already in the tank. Eventually I was able to collect two individuals of the same size that got along with minimal fighting. A third juvenile Green Sunfish and a Brown Bullhead found in a local pet shop were also added. Amazingly, all four fish got along. I had no way of accurately sexing the sunfish, but I hoped that I had captured a pair.

In Pennsylvania, my understanding is that sunfish can be legally collected with a fishing rod and valid fishing license. Instead of taking them home to fillet, they accidentally found their way into my aquarium. As long as the fish are cleanly hooked in the mouth, they suffer no ill effects and are feeding by the first or second day. (Fishing with a barbless hook will lessen risk and hasten recuperation. It's also more truly sporting.)

I maintained the fish all summer in a "community"-style 20-gal.-high aquarium in my outdoor shed. The shed is equipped with a thermostatically controlled exhaust fan to prevent heat buildups. The average summer temperature of the aquarium water was about 80°F with a pH of 7.0. I made no attempt to alter water chemistry. Filtration was provided by a Fluval 3 internal power filter connected to a spray bar and a Penn-Plax Clear-Free corner filter (Model CF-1). Driftwood, small rocks, a flower pot turned on its side, and about an inch and a half of gravel were provided along with the aquatic plants Vallisneria, Ludwigia, Sagittaria, Bacopa and, Elodea (Anacharis). Anacharis grows wild in the waters where I caught the sunfish. The plants do moderately well in the

summer, but really thrive and grow quickly in the winter when the water temperature is below 50°F. The tank is enclosed in a plywood box with removable lid insulated with styrofoam. An air space of about 4" surrounds the sides and top of the tank. Minimal heating is provided, using a voltage regulator connected to heat tape. The heat given off by the heat tape warms the air space. This warm air is pumped into the tank by the air pump and effectively prevents freezing or major temperature drops. The heat is manually controlled and used only when excessively cold.

In the summer, the sunfish are fed fairly heavily every second or third day, and in the winter, they are fed sparingly every three or four days whenever the water temperature rises above 50°F. I am trying to recreate their natural environment, and minimal feedings in the winter is part of it. The foods offered include fresh-frozen Mummichogs, grass shrimp, Atlantic Silversides, grasshoppers, crickets, nightcrawlers, chicken heart, freeze-dried krill, freeze-dried daphnia, freeze-dried shrimp, dry cichlid pellets, and any insect I can catch. The Mummichogs, grass shrimp, and Atlantic Silversides were caught with a minnow trap and net while vacationing at the beach. These foods are their staple winter diet when the regular live foods are not available.

There are no provisions to chill the water in the summer. The fish endure an average summer temperature of 80°F and an average winter temperature of about 40°F. Forty-percent water changes are generally made once a week in the spring and fall but usually every few days in the summer. Twenty-five-percent water changes are made about once a month in the winter (when water temperatures are consistently below 55°F). Don't be lax with water changes. These fish have big appetites and produce large amounts of waste. This group of fish were overwintered as naturally as possible in the hope that they would be properly cold-conditioned and ready to spawn in the spring.

As soon as the weather began to warm, another 20-gal.-high spawning tank was set up in the shed. Except for the gravel and sponge filter, the tank was kept bare. A chiller unit was utilized to maintain an optimum temperature (70°F) for spawning and raising fry during the hot summer months. In April, 1993, as the water temperature slowly increased, two of the sunfish began to swell with eggs but the remaining sunfish did not exhibit any male behavior or female egg development. By the end of June, 1993, I decided to release that fish to its native waters and attempt to capture another fish in the hope that I could find a male. Fishing was poor the day I went out and I was only able to catch one beautifully colored juvenile Green Sunfish. I was hoping its bright coloration meant it was a male, because none of the other fish I captured showed such color. As the fish matured

(he more than doubled his size in three months) I realized it was a male and hoped it could be induced to build a nest and spawn.

October approached, and by this time I was becoming frustrated, because I had already put a year and a half of effort and a lot of money into this experiment. I didn't want to wait till next spring to see if spawning would occur. November began and there still was no sign of interest in spawning. The beginning of November was warmer than normal, and the temperature in the community sunfish tank spiked about 8°F in a short time period.

The male sunfish began excavating gravel in all areas of the community tank. When male sunfish are ready to spawn, their colors intensify, they excavate a nest in the gravel, and they await a receptive female. Even though the male sunfish appeared to be excavating a nest. His colors were brighter than normal, but I paid no attention to what he was up to. On November 15, 1993, I checked on them at 10 p.m. and everything seemed normal.

When I went out to check on them at 10 next morning, the male was stationed in the middle of the nest. It had pinned all the other fish in the opposite corner of the tank and would not let any of them out. I thought this behavior odd, but still did not realize what had occurred. I looked at the larger female, who had been loaded with eggs the night before, and saw that she was as thin as a rail. When I quickly looked back at the male I noticed eggs, hundreds of eggs. They had spawned overnight, and the male was protecting the eggs. The fertilized eggs were adhesive, perfectly round, colorless, and approximately 1/16" in diameter.

I quickly removed all the fish except the male and put them in the spawning tank. The spawning female was a bit ragged, her fins torn, but the other fish were all in good shape. The Fluviat filter and spray bar were removed and replaced with an air-driven sponge filter to ensure that none of the eggs or fry would be sucked into the filter. Air flow was high enough to cause a light current in the aquarium. The current prevented any harmful material from settling on the eggs and wigglers. I also made a 25-percent water change. On November 17, I noticed that any eggs kicked up by the male were quickly eaten, so I took him out and put him in with the other fish. I now anxiously waited for the eggs to hatch. No chemicals were added for egg protection. Clean, well filtered and aerated water is sufficient. According to my reference books, sunfish eggs hatch in 3-5 days at 80°F, quicker at cooler temperatures. On November 19, the eggs finally hatched. It only took three days at a water temperature of 65°F and a pH of 7.0. There were no apparent problems with bacterial or fungal infestations of the eggs, as evidenced by

the large number of eggs that hatched. With a little care and the heat tape turned way up, I was able to maintain the tank within 2° of 65°F to ensure proper incubation of the eggs and development of the wigglers into fry. The wigglers were entirely clear immediately after hatching; no markings were visible. Within 24 hours (November 20), eye spots became apparent, and the wigglers started to take the form of fish 24 hours after that (November 21). Fifteen- to twenty-five-percent water changes were made every day and all went smoothly.

With regard to how long it takes for the wigglers to become free-swimming, my references estimate about one week. On November 25, I noticed a few fry making their first attempts at swimming on their own. I offered a very small quantity of brine shrimp, but none were accepted. No further offerings were made until the 27th. This was the eighth day since hatching and dozens were free-swimming. I again offered a very small quantity of brine shrimp, and for the first time the fry began feeding. By the ninth day, all were free-swimming, and brine shrimp feedings began twice a day, once in the morning and once in the evening. The feedings require that the aeration and filtration be turned down to a minimum. This prevents the shrimp from being sucked into the filtration system; further, because the fry are somewhat uncoordinated, they cannot successfully capture the moving shrimp in moving water. With still water, it takes them several attempts before they can capture the shrimp. This will quickly pass as the fish grow and become proficient swimmers. It is easy to determine which fry are feeding. Since their bodies are still transparent, consumed shrimp give the fry orange bellies.

By January, the majority of the fry had grown to 1 1/4" or larger. The remaining fry numbered about one to two hundred. The fry unable to swim properly and/or feed consistently quickly died. At first several fry were dying daily, but by January, virtually none were dying on a regular basis. I figured that I lost about 100 fry to what I will call natural selection. At any rate, their survival is by far better than it would be in their natural habitat. Due to limited space, there was cannibalism of the smaller fry by the larger fry; I am unable to provide the tanks necessary to separate out the larger fry as needed. The fry were still mostly dependent on brine shrimp, but I expected to wean them off the shrimp as soon as they were large enough and could be persuaded to accept other foods. Even after two months, most of the fry still did not resemble their parents; i.e., their pelvic fins were not yet visible (dorsal and anal fins were faintly visible) and their bodies were still substantially transparent.

I consider them juveniles when their body shape and coloration resembles adult sunfish. I expected this to occur in one to two months.

This experience has been very rewarding and helpful in understanding the life cycle of the Green Sunfish as well as sunfish in general. I look forward to spring when I hope to experience another spawning of the Green Sunfish.

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