

SUCCESSFULLY SPAWNING AND RAISING
THE BLACKBANDED SUNFISH (*Enneacanthus chaetodon*)
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On June 20, 1994, I collected two dozen Blackbanded Sunfish in South Central New Jersey, ranging in size from juvenile to adult. I was sure I had several pairs. No pregnant females were caught, so I assumed I missed spawning, which in their native habitat generally begins in May or when the water temperature approaches 70°F. The water conditions at the time of collection were: no measurable hardness, pH of 6.0, and a temperature of 75°F.

I maintained the Blackbanded Sunfish for the summer in a "community"-style 29-gallon aquarium in the house. The tank is equipped with a "Whisper 1" power filter with a home-made water-current-dissipator at the discharge. This system provides adequate filtration with minimal current. In their natural habitat, there was virtually no water current present.

Aeration is provided by a bubble wand attached to the back of the tank. There is about 2" of gravel on the bottom; otherwise, except for a flowerpot turned on its side and a few rocks, the bottom is bare to facilitate cleaning and fry collection (I will cover this later). A light is attached to the back of the aquarium stand above the tank, and a thick growth of Water Sprite grows on the water surface. This arrangement reduces light intensity significantly while still providing enough light for viewing.

The adult Blackbandeds will be wintered outside in my shed and housed in a 20-gallon-high aquarium. Filtration is provided by an adjustable flow "Visi-Jet 100" internal power head attached to a sponge filter and an air-driven sponge filter. Lighting is provided by a fluorescent tube suspended above the tank. Light intensity can be lowered to appropriate levels by adjusting the height of the light above the tank. An inch-and-a-half of gravel is provided along with the aquatic plant *Elodea* (sometimes called *Anacharis*). This plant grows especially well during the winter when the water temperature is below 50°F. A submersible heater set on a timer provides minimal heating. This arrangement prevents freezing or major drops in temperature. The heat is manually controlled and used only when excessively cold. In the summer, this tank is attached to a chiller and maintained at an optimal temperature of 70°F for spawning and raising of fry during the hot summer months. Filtration is provided by a sponge filter attached to the chiller intake line and by a power head attached to a sponge filter. The shed is also equipped with a thermostatically controlled exhaust fan to prevent heat buildups.

Initially, I tried to acclimate the Blackbanded Sunfish to my tapwater, which is hard and has a pH of about 6.8. They started off well, but within two weeks their health started to decline. Their appetites decreased, and the most noticeable change was the loss of most of their color. Since it was clear that they would not thrive on my terms, I went to work turning their tank water into a close duplicate of their natural habitat.

My efforts began on July 8. The first problem was how to soften the water with the least effort. I decided to use a rechargeable ion-exchange softening pillow, which is placed in the filter box. Using a five-gallon container and an extra power filter, I softened the water to levels that could not be measured by my test kit. I also added "Blackwater Extract" to the softened water. The softening process takes about one-and-a-half to two hours per five gallons. Prepared water is stored in five-gallon bottled-water containers with lids. When I had prepared enough water, I changed the tank water and looked for any changes. Within only 48 hours, the fishes' natural color returned and they became active and hungry again. Softening the water appears to be a very important factor for maintenance of healthy fish.

The next problem was how to acidify the water. During the softening process, I added "pH Down" till I reached a pH of 6.0 to 6.2. The fish were slowly acclimated to this new water. I then sampled the tank-water pH and found it to be 6.8 instead of 6.0. I had neglected to consider that my tapwater has a high buffering capacity; the pH will rebound to higher levels unless the buffering capacity of the water is exhausted. The next time, I adjusted the pH to 6.0. I waited several hours and checked the pH again. It had rebounded as it had in the tank. I adjusted the pH again and let it sit overnight. This time the pH remained the same.

As an aid to the acidification and conditioning process, I also filter the water through peat prior to storage or use. The completed water is tea-colored, as it is in their native habitat. It takes a day to make five gallons, but the results make it worth the trouble.

In the summer, the sunfish in the house are fed moderately every other day, and in the winter, when they are in the shed, 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 in the summer include: freshly hatched brine shrimp; frozen and freeze-dried bloodworms; frozen glassworms; small live crickets; small, live, cut-up garden worms; live daphnia; frozen shrimp; live mosquito larva; live cyclops; live blackworms; and other small insect I can catch. The winter diet for these fish will be the same as that in the summer except for some of the live foods that cannot be cultured indoors, caught, or bought.

As with my experiences with breeding Green Sunfish, (AC, Spring '94), the fish endured an average summer temperature (in the house and shed) of about 80°F, and will experience average winter temperatures of about 40°F in the shed. Thirty-three-percent water changes are made weekly, in spring, summer, and fall. Twenty-five-percent water changes are made about monthly in winter (when water temperatures are consistently below 55°F). Don't be lax with water changes. These fish may be small but they have big appetites and produce large amounts of waste.

By early August, all was going well. On August 8, I noticed that two of the Blackbanded Sunfish appeared to be fanning eggs and were chasing the other fish away from their designated territory. No nests were formally constructed; they simply chose natural depressions already existing in the gravel. I immediately began to consider the possibility that they were spawning, but I wanted to be sure. The next night, I noticed several fish approach the guarded territories slowly and deliberately. Some were immediately chased away and some were not. It appears that rival males and unripe females are chased away immediately while ripe females are allowed to approach. To all approaching fish, the guarding fish--the male--reacts by extending his fins and then seems to look the approaching fish over. If the male does not chase away that fish, the odds are very good that it is a ripe female.

The male then starts nudging her belly area with his mouth and body while swimming in a circular path, with fins fully extended, around the female at a 45° angle. The female stays mostly upright in a normal swimming position during this process. The male was devoid of color, but the females' color was intense. After a few moments of this behavior, they stop swimming, the female quivers, and eggs are released and simultaneously fertilized. The male then chases the female away. Even during the height of the spawning process, sex determination is extremely hard. Granted, there are color differences during spawning, but immediately afterward the colors of the male and female return to normal and the sexes can no longer be distinguished. During spawning, when I briefly knew who was who, the female, when viewed from above, appeared broader than the male across the top of her body. This is by no means very accurate, but it does serve as a guide in approximating the sexes, especially when spawning is near.

This spawning process continued till the next day. The eggs are amber-colored and extremely small (no larger than 1/32") and adhesive. Close examination of the nesting areas showed eggs covering the nearby rocks. The rocks were removed and placed into the rearing tank. I anxiously waited for the eggs to hatch. No chemicals were added for egg protection. Clean, well filtered, well aerated water is sufficient. Based on my reference books, the eggs of this type of sunfish hatch

in 3-5 days depending on temperature. My Blackbanded Sunfish eggs hatched in two days on August 11, 1994 at a water temperature of 76°F and a pH of 6.2. The wigglers were entirely clear and no visible markings could be seen. Within 24 hours, eye spots became apparent, and the wigglers started to take the form of fish 24 hours after that. Twenty-five-percent water changes are made every week and so far all is well. With regard to how long it takes for the wigglers to become free-swimming, my references estimate a few days to about one week, depending on water temperature. By August 15, four days after hatching, all wigglers were free-swimming. I offered a very small quantity of brine shrimp, but none were taken. I tried infusoria for the next two days. Three days after all were free-swimming, brine shrimp were again offered and accepted. Further experience has shown that infusoria is not necessary. One to two days after the fish are free-swimming, they will accept newly hatched brine shrimp. Feedings began twice a day, once in the morning and once in the evening. During feedings, aeration and filtration should be turned down to a minimum. This prevents the shrimp from being sucked into the filtration system and aids the somewhat uncoordinated fry in catching their food. The young fry cannot successfully capture the moving shrimp in moving water. In 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. For variety, the fry are also given freshly hatched mosquito larva, live cyclops, and microworms.

I estimate I have about 100 to 150 Blackbanded Sunfish fry. The Blackbanded Sunfish continued to spawn every week through the first week of September, stopped for the remainder of September, and spawned twice in the first week of October. The last few spawnings occurred in the flowerpot. In one case, they spawned in the root mass of the floating Water Sprite when the flowerpot was occupied by a male guarding eggs. He was not about to let any others spawn anywhere on the bottom of the tank. It appears that the Blackbanded Sunfish are adaptable and not particular about where spawning takes place.

In all Blackbanded Sunfish spawnings I removed as many of the eggs and/or wigglers as possible to ensure that none would be eaten, but on one occasion I decided to let the male guard the eggs and fry to see what would happen. He did as good a job as devoted cichlid parents. He continuously fanned the eggs and chased away any fish that came close to his area. Any wigglers that strayed too far were picked up in his mouth and spat back into the nest. Once the fry were free-swimming, fry and parents went their separate ways.

Once the fish are transferred to their winter quarters spawning will quickly stop as the water temperature drops. This will be a welcome relief because all my available tank space is devoted to the rearing of the Blackbanded Sunfish fry at various stages of development. This spawning behavior is contrary to the literature which states that "The Blackbanded Sunfish has a non-protracted spawning season and low lifetime reproductive potential." (1)

The spawns have been small to moderate, averaging about 15 to 75 eggs, and have hatched in two to three days. When I notice a spawn area, I cover it with sheer material supported by a plastic frame (6" long x 5" wide x 4" deep) to prevent the eggs from being eaten. The males can still see through it, continue to guard the eggs, and in one case spawned again on top of the egg guard. The wigglers adhere to the inner walls of the material and the entire egg guard with wigglers is carefully removed and placed in the rearing tank. So far this is the best method I have devised to collect fry from the Blackbanded Sunfish Community tank.

After several months, a few of the fry were between 1/4" and 1/2", with most nearer 1/4". The fry were still dependent on brine shrimp, live cyclops, and microworms, and attempts were made to wean these fish off the live foods as soon as they are large enough. I was successful in doing this with the Green Sunfish and hoped to succeed with these fish. As they aged, the young sunfish naturally began to show physical attributes of adults. They developed a horizontal black spot on the caudal peduncle and a vertical dark band through the caudal fin. They also began to develop black vertical stripes and the two-tone black and salmon colors on their first dorsal spines (the first three dorsal spines are black and the fourth is salmon-colored) and front edge of their ventral fins. Their overall background body color is gold-silver.

When I bred Green Sunfish, cannibalism of the smaller fry by the larger fry began at about this time. So far, the larger Blackbanded fry have not attacked the smaller, as occurred with the Green Sunfish. My feeling is that their mouths are too small to cause any damage at this age, let alone swallow their smaller tankmates. The Green Sunfish were much more aggressive and equipped with large mouths capable of easily swallowing their smaller tankmates.

This group of fish will be overwintered as naturally as possible in my shed as described earlier. I look forward to spring, when I hope to experience additional spawnings of the Blackbanded Sunfish.

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3. Quinn, John R. 1990. Our Native Fishes. The Aquarium Hobbyist's Guide to Observing, Collecting and Keeping Them. Countryman Press. 242 pp.
4. Raasch, Maynard S. & Altemus, Vaughn L. 1991. Delaware's Freshwater and Brackish Water Fishes. A Popular Account. Claude E. Phillips Herbarium. Delaware State College. Dover, DE. and Society of Natural History of Delaware. 166 pp.

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