Keeping the Brook Trout in a Home or Classroom Aquarium

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Photos by the author.

The brook trout is an elusive and beautiful fish that conjures images of small alpine streams and soft-trodden fly-fishermen. Brook trout, or "brookies" for short, are pipsqueaks compared to most other species of trout. They are found in the headwaters of mountain streams and spring-fed creeks where the water is cool, clean and well oxygenated. The brook trout is viewed as an environmental indicator of water quality similar to the "canary in the coal mine." If a watershed naturally harbors a self-sustaining brook trout population, then "all is well." Appropriately, the brook trout's scientific name, *Salvelinus fontinalis*, translates as "salmon-like fish of the springs." The markings and colors of the brook trout are breathtaking. Some Native Indian tribes would not kill or eat brook trout because they considered their beauty sacred. The late Luis Marden, renowned writer/photographer for *National Geographic*, described the brook trout as "the most beautiful fish that swims." This is quite a compliment from a man who photographed wildlife worldwide, including many species of fresh- and saltwater tropical fishes.

Ironically, the brook trout's gaudiness serves as camouflage against the multi-hued cobble of the streambed. This is vital since the brook trout's existence in small streams makes it vulnerable to predators. Small streams are also subject to flash flooding and/or drought. Consequently, the brook trout is rather hardy as trout go, enduring dramatic fluctuations in water levels and pH. The virtual sterility of some mountain streams affords little in the way of food for the brook trout. It is often the only fish present in higher altitude waters. As a result, the brook trout is an opportunistic feeder, alert to any aquatic or terrestrial invertebrate careening by, since the next meal may not be any time soon. Under such environmental circumstances, brook trout seldom exceed a length of 10" in the wild, although some large Canadian rivers contain brook trout measured in pounds rather than inches.

This article originally appeared in the May 2001 Freshwater and Marine Aquarium *and is reprinted here with the author's permission.*

History and Classification

The brook trout is native to the northeastern U.S. and eastern Canada. It was the first New World "trout" encountered by colonists, where it was soon recognized as excellent table fare. The brook trout has figured favorably in the development of fly-fishing in this country. The name "brook trout" is attributed to the early colonists, who were largely of English descent. Small streams or creeks were called "brooks." These new fish commonly found in "brooks" had the same general appearance of their beloved brown trout back home—hence the name "brook trout."

Farming, industry and general urban sprawl has since reduced brook trout habitat to a fraction of what it was prior to European settlement in the U.S. True native brook trout strongholds still exist in some northeastern states, especially in the Appalachian Mountains. Hatchery brook trout have been successfully transplanted in Rocky Mountain watersheds and other western U.S. streams.

Taxonomically speaking, the brook trout is actually a char, belonging to the genus *Salvelinus*, which also includes lake trout, bull trout, arctic char and Dolly Varden, among others. Char are distinguished from other salmonids as having light spots on a dark background. Simply compare their markings to rainbow trout (*Oncorhynchus mykiss)*, cutthroat trout (*O. clarki*), and brown trout (*Salmo trutta*), all of which have dark spots on a lighter background. Less apparent to the casual observer, trout have teeth on the shaft of the vomer

Fig. 1.
The beauty of the brook trout is breathtaking.

bone located in the roof of the mouth, whereas in char these teeth are absent.

Setting Up and Maintaining a Brook Trout Aquarium

Despite their beauty and popularity, brook trout have not routinely been kept in home aquaria. They are active fish requiring a large tank with good water movement and aeration. Mechanical, chemical and biological filtration should be in place. A means for keeping the water consistently cool needs to be established. The aquarium should be set up and ready *prior* to acquiring the trout. Trout are not the kind of fish you can leave in a bucket for a day or two while you set up the tank. General instructions and recommendations for the aquarium set-up and husbandry are discussed below.

Keep it Cool!

The primary obstacle to keeping a brook trout in an aquarium, or any trout for that matter, is keeping the water sufficiently cool. Water temperatures between 50-65°F define the "comfort zone" for brook trout. They will be stressed and susceptible to diseases if water temperatures edge into the low 70s. If temperatures approach 80°F, death will come quickly. The water solubility of atmospheric oxygen is inversely proportional to water temperature. In other words, cold water can hold more oxygen. So even if your aquarium water is well aerated, it will not be able to hold enough oxygen to sustain trout if it gets too warm.

Fortunately, a market has emerged in the tropical fish industry in the last few years for aquarium chillers. Several refrigeration companies and vendors now offer a full line of chillers suited to various needs and aquarium sizes. A popular model is the "drop-in" type. This chiller design features a stainless steel or titanium coil at the end of a length of flexible refrigerant tubing. The coil is simply dropped into the tank or sump to chill the water. No plumbing is required. Most aquarium chillers are reliable and quiet running, but they are expensive. Prices range from $500-$1000, depending upon how much water needs to be cooled. The intense lighting

Fig. 2.
Brook trout are very active and need a lot of swimming room. A 14" male is the lone occupant of this 175-gallon aquarium.

used in some tropical fish aquariums heats the water considerably and has prompted the development of these chillers. They are used to cool water temperatures in the 90s down to the 70s or 80s. In the case of trout, the water temperature will need to be dropped from the low 70s (room temperature) to the low 60s or high 50s. In order to do this, the chiller will need to be fitted with a "thermal expansion valve" (TEV). If you are ordering or purchasing a chiller for a trout aquarium or other cold water application, be sure the manufacturer or supplier knows this ahead of time so the TEV will be installed before shipping. The TEV will add $50-$75 to the cost of the chiller.

Those of you that are competent in refrigeration might be able to forego the cost of a commercial chiller by fabricating a homemade chiller from used refrigerator parts. Be careful that no copper parts are submerged in the aquarium water. Another alternative is to set up the aquarium in an unheated basement or cellar. Depending upon where you live, most unheated basements retain air temperatures in the 60s even in the summer. You can further reduce the water temperature by positioning a small fan to blow air across the water surface. This can result in as much as a 5-degree drop in water temperature, but evaporation is accelerated. Those of you who have access to a strong well or spring water might be able to set up a "continuous flow" trout aquarium where you pump in a constant supply of ground water through the tank to keep it cool.

Aquarium Size

Have you ever been to a zoo where they had a 500-pound tiger in a cage about the size of your kitchen? The tiger may have had all its needs met, but it probably wasn't very happy in its cramped quarters. Fortunately, most zoos now have more open areas for their animals, and the natural surroundings of the animal are often closely depicted. When keeping fish such as trout, we should strive to do the same. The brook trout is an active predatory fish, and it needs a lot of room if it is to thrive. I would recommend placing even a single brook trout (6"-8") in an aquarium no smaller than 50 gallons. An aquarium of at least 150 gallons would be needed to house several adults. Also, less fish in a large aquarium translates to increased water quality stability, and decreased tank and filter maintenance.

Filtration

Most of you reading this are probably well versed in aquarium filtration, and understand the nitrogen cycle and the importance of biological filtration and partial water changes. If you are a beginning aquarist, I would advise educating yourself on these topics before attempting to keep challenging fish such as trout. There are many excellent books and journal articles on basic aquarium maintenance and filtration.

The filtration system for an aquarium containing brook trout need not be anything elaborate nor expensive. Any filter or combination of filters that performs mechanical, chemical and biological filtration is fine. Ideally, the total volume of water that is filtered per hour should be at least five times the tank volume. For example, the pump(s) operating the filter(s) in a 150-gallon tank should be moving a collective minimum of 750 gal/hr. Adhering to such ratios will ensure good water circulation and aeration which is critical to keeping healthy trout. A special note on biological filtration in a cold water tank: The nitrifying bacteria will take longer to culture in cold water, so the "break-in" period will be prolonged. Monitor ammonia and nitrite frequently so that "new tank syndrome" doesn't claim your trout. You can utilize zeolite to convert toxic ammonia (NH_3) to the non-toxic ammonium ion (NH_4+) until the tank is cycled. Ammonia and nitrite as low as 1.0 ppm can kill brook trout. Also keep in mind that ammonia toxicity is exponentially proportional to water pH.

One of my favorite filters for a trout aquarium is the "trickle" or "wet/dry" filter. These filters and their associated "bio-balls" or "bio-wheels" allow a large surface area for nitrifying bacteria colonization, coupled with very effective air-water exchange. This greatly enhances the biological filtration and aeration of the water which, once again, is a big plus for trout.

The "algae filters" now becoming available for home aquariums sound promising in some of the advantages they offer over traditional aquarum filters. They might be fine for a trout aquarium, but the proximal, long-term fluorescent lighting involved may cause water temperature increases. If you are using a chiller with your trout aquarium, you may have to go to a higher h.p. model to offset the temperature increase caused by the algae filter.

Whatever filtration system you choose, once biological filtration is established, I would strive to keep nitrate (NO_3+) below 50 ppm for brook trout. This is probably most easily accomplished with partial water changes, preferably, 25% of the aquarium water every two weeks. This also reduces the levels of other toxic compounds (not removed by mechanical or chemical filtration) that can accumulate over time. Be sure that any new water you add to the aquarium is de-chlorinated.

Legal Issues

Now that your aquarium is set up and waiting for trout, it's time to grab your rod and a bucket and head for the mountains. But before you do, make sure it is legal. The brook trout is a game fish, and with that may come some restrictions. Most states allow possession of live game fish as long as you have a valid fishing license and you caught the fish on rod and reel. Check local laws for the size and number of fish that you are allowed to keep. Be sure you do not take any fish from restricted waters such as catch and release streams or where populations are protected. If wildlife officials question your intent in keeping live trout, explain that you are interested in them for aquarium study. Assure authorities that you are not trying to raise trout for commercial purposes, and that you will not release fish back into public waters after they have been in an aquarium. Once officials view you as sincere and responsible, they are usually happy to oblige you, and may even offer assistance.

Catching the Trout

At this point, I am not going to insult you by telling you how to catch a trout. I will offer advice on making "the catch" easier on the trout. Whether you catch it with a fly rod or a cane pole, this may well be the most stressful point in the trout's life, and could easily result in its death if you are not careful. Once you have hooked the trout, do not play it excessively—it can die of exhaustion. Get it to the net or bucket quickly, and remove the hook as swiftly and least traumatically as possible. Needle-nose or hemostat pliers can be helpful in doing this. If the trout is deeply hooked in the gills or has swallowed the hook, just cut the line and release it. The hook will eventually rust away and the trout may survive. Chances are it will not survive in your aquarium. I would strongly suggest using barbless hooks or at least crimping down the barbs—this makes everything easier for the trout and you. Before handling the trout, get your hands wet. This will minimize removal of the slime coating that protects it from infection and disease. For the same reason, do not allow the trout to flop around on the ground. Get it in a container of water as soon as the hook is out. You can even keep the hooked trout in the landing net still submerged in the stream

Fig. 3.
A male brook trout (top) nudges a female, coaxing her to "cut" a spawning bed. This pair spawned three weeks later.

and remove the hook while keeping the trout in the water. I have done this if I anticipated difficulty in removing the hook.

Hatchery Trout vs. Wild or Native Trout

If you would like to forego the whole "experience" but you still want to keep trout in an aquarium, you can usually acquire them directly from a hatchery without too much of a problem. There are hundreds of state and private trout hatcheries across this country, and many of them raise brook trout. Ask hatchery officials if it is permissible to buy a couple of trout for aquarium study. They might just give them to you free, especially if you just want fingerlings. Again, assure all that are involved that you will not release any trout. You should not need a fishing license to purchase or keep hatchery fish, but keep your receipt(s) as proof of the origin of your trout.

Getting a trout from a hatchery for your aquarium may not be as rewarding as catching one, but there are some advantages to the hatchery trout. Obviously, hatchery trout do not endure the trauma of being caught on hook and line, or the stress of being torn away from their natural environment. Hatchery trout are accustomed to the presence of humans and handling. They are more tolerant of each other, which is good if you want to keep several trout in one aquarium. They will readily accept commercial fish food, since that is what they were raised on.

Some hatchery trout are bred from shallow gene pools, which can result in congenital anomalies, deformities and susceptibility to diseases. Try to take home trout that are alert and active, and visually check their fins, eyes, jaws, gill covers and overall appearance.

Whether you get a trout from a hatchery or catch one in a stream, it is probably still a hatchery trout, or originated from hatchery stock at some point down the bloodline. When hatchery trout survive in the wild to reproduce, the progeny are considered "wild." This does not necessitate that the trout were originally native to that water. For example, self-propagating populations of brook trout in the Rocky Mountains are wild, but not native. Streams that exclusively contain native trout populations of any species are precious and few, and in general, should be left alone. It is not my intent that this article prompt anyone to plunder protected and fragile native trout populations just to adorn home aquarium. Again, check with authorities before removing any trout.

Transportation

When it is time to transport the trout from the stream or hatchery back to your car or truck, any container with a cover that will hold a couple of gallons of water should be fine. I just use a 5-gallon bucket and snug fitting lid. If it will take you less than an hour to get home, just keep the trout in the bucket until it is time to transfer it to the aquarium. For longer drives, transfer the trout into a larger container or cooler (15-20 gallons). Be sure the water in the larger container is cool and well oxygenated. Ideally, the water temperature and pH of the transport container should be close to what it was in the stream, or better yet, fill the transport container with stream water. If necessary, stop at a gas station and buy some ice to add to the water to keep it cool. You may want to add aquarium water conditioner to the transport water. This reduces stress on the fish and helps it maintain a protective slime coating. The water conditioner also removes chlorine that may be present in bagged ice. If you are transporting trout for many hours or days, you can aerate the water with aquarium airline tubing and a small battery-operated aerator. These aerators are commonly used to keep baitfish alive and are available in sport fishing stores.

Acclimating the Trout to the Aquarium

As recommended earlier, your aquarium should be set up and ready when you bring the trout home. Water circulation, filtration and cooling should be up and running. To reduce stress to the trout, the water temperature and pH should be similar to the water the trout was in. Be sure the aquarium water is de-chlorinated.

Once the trout is in the aquarium, get the cover on. Brook trout are strong, acrobatic fish. They will jump out of any open spot in the aquarium cover that is large enough for them to fit through. If the trout was caught in the wild, it may take a few days for it to adjust to the aquarium and the presence of people. Avoid bright lights and excessive commotion around the tank until the trout appears less stressed and is feeding.

Feeding

If you are keeping hatchery brook trout, they will eagerly feed on most commercial fish foods. For adult brook trout, I use the large dry pellets or sticks that are sold for large, carnivorous, tropical aquarium fish. If you have trout fry or fingerlings, you can feed them fine grain, high protein aquarium fish food or "starter" trout chow. Frozen foods such as brine shrimp or bloodworms are good supplements for fry or fingerling trout. Most brands of aquarium fish food are high quality, high protein and nutritionally complete. They tend to have a lower fat content than "trout chow" used in hatcheries. Several aquarium fish food companies offer tropical fish foods formulated with natural color enhancers such as paprika, beta-carotene, and shellfish. If your brook trout has that washed out, drab coloring sometimes seen in hatchery trout, its color can usually be restored with a consistent diet of this "color enhancing" food. Feel free to supplement a brook trout's diet with live foods such as insects and earthworms. It is fun to feed your trout live minnows, crayfish or "feeder" goldfish, but you risk introducing disease when you do so. Keep a special lookout for "ick" if you feed your trout live fish.

If you are acclimating a wild caught brook trout to an aquarium, it will probably show no interest in commercial fish food unless it was raised in a hatchery and recently released into the stream where you caught it. True native or wild trout will initially need to be fed live foods. I have found small, live earthworms to be the perfect "break-in" food. Sooner or later even the most finicky trout finds them irresistible. Earthworms are very nutritious, they are naturally disease free, and they are abundant—whether you collect them or buy them. Once your wild caught trout starts feeding, it will be more willing to take various foods including commercial foods if you are persistent and patient.

Breeding

Brook trout spawn in the fall. You can induce spawning activity by decreasing the photoperiod, and water temperature in the aquarium into the low 50s or high 40s. Place only one male and one female in a large aquarium (100 gallons or more) with clean gravel across the bottom about 2" deep. If the aquarium water is clean and you have a good flow across the gravel bottom, then the trout will probably attempt to spawn. The male will swim alongside the female, nudging her and quivering. The female will use her tail to vigorously sweep out or "cut" a spawning bed. When she is done, the bed appears as a bowl-like depression in the gravel. The female's belly will slowly get plump with eggs. When the time is right, she will expel the eggs into the bed. The male will simultaneously release milt to fertilize the eggs. The female will then cover the eggs with gravel (now called a redd). The time between the male initially nudging the female to the

Fig. 4.
This Appalachian stream is at an elevation of 3500 feet and harbors native brook trout.

deposit and fertilization of the eggs is usually 4-6 weeks. The adults should be removed from the tank to keep it cleaner, and also so they do not eat the fry. Once the eggs are buried, another 6-8 weeks will pass before the fry emerge from the redd (depending on water temperature). You can start feeding the fry "starter trout chow." This is a high-protein, finely ground feed formulated for trout fry.

If you do not care about the natural spawning process, and you do not want to dedicate a large tank to the incubation of eggs, you can simply "strip" the male and female of their eggs and milt into a mixing bowl, as hatcheries do. You can then transfer the fertilized eggs to a small aquarium or incubator until the eggs hatch. You will observe the "sac-fry" stage, which is not seen under the gravel. If you want higher hatch rates and fry survival numbers, you should adhere to this latter practice. I would advise reading more on the specifics of trout aquaculture if you are serious about breeding and raising trout to adulthood.

Conclusion

The brook trout's small size, stunning beauty, availability and hardiness make it the ideal trout for an aquarium. A large aquarium in your living room that houses such an enchanting fish is enough to make the TV obsolete. In the classroom, a brook trout aquarium can teach students "hands on" about biology, water chemistry, and conservation. The time, effort and money involved in setting up a brook trout aquarium may be more than to what you're accustomed, but it is worth it to be able to keep and learn about this classic North American native.

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