

Sex Outside the City

This fall from Boalsburg to Milesburg more than 5,000 couples will reproduce outdoors and no one will notice. Why? Because it will all take place underwater in the solitude of Spring Creek.

Fall is the time when our native brook trout and the introduced brown trout carry out their annual ritual of reproduction. Brook trout will spawn in the small headwaters of Spring Creek, while brown trout will deposit millions of eggs over more than 20 miles of the main stem.

It seems incredible that so much sexual activity will occur and so few people will witness this remarkable process. During this vital life stage, mature male and female trout will barely touch each other— it is Mother Nature's answer to safe sex.

For brown trout, the spawning season runs from the middle of October to early December with peak activity in mid November.

Female brown trout with ripe eggs begin the process by seeking a one-foot-square portion of streambed with coarse sand and gravel, with depth ranging from 6 to 24 inches, and with a moderate current velocity, that is evident by some turbulence at the water surface. The female tests the adequacy of a site by turning on her side and rapidly flexing her tail, which propels her upstream for 6 to 12 inches. If the gravel is not tightly bound by fine silt, the female's digging action will dislodge some gravel and create a shallow depression.

As you might imagine, all of this activity by female trout will not go unnoticed by the males. In fact, even before the female begins digging, she will have attracted one or more males by secreting fluids that contain sex hormones. These compounds are known as pheromones, which males can smell. It is the trout's version of Chanel No. 5, and it really works.

If the female is able to dislodge some sand and gravel during her first exploratory dig, she will continue digging until she either encounters an immovable rock, which will cause her to seek a new site, or she is able to excavate a pit about 4 inches deep. This process can take from several hours with rests in between bouts of digging. This excavated nest is called a redd.

While the female goes about her work, there is much frantic activity by a group of males hoping to mate with her. It is not uncommon to observe in the vicinity of digging female, six or more male brown trout ranging in length from 5 to 18 inches. The largest male in the group will assert his dominance by chasing and occasionally nipping the smaller males. The dominant male maintains a position alongside the female and keeps the other males downstream.

Vigorous bouts between males will result as downstream males try to come alongside the female and the dominant male chases after the intruder. If the chase lasts for more than a few seconds another subdominant male will move up near the female. When the dominant male returns, another chase ensues. Competition for spawning females is intense.

Oftentimes there will be one or more juvenile male brown trout in the vicinity of the redd. These males, 4 to 5 inches long, were hatched in March or April; hence, they are only 7 to 8 months old, but they are precocious – that is, they have ripe testes. Rather than try to jostle with the larger males, these “sneaky petes”, lie in waiting, perhaps under the cover of large rocks.

When the female has excavated a sufficiently deep pit, she will lower herself into it so that her anal fin just touches the gravel. This is the signal the dominant male has been waiting for. He swims quickly alongside the female. She will almost arch her back and open her mouth to its maximum gape as she releases some eggs. At the same time the male will assume a similar pose and release a milky cloud of sperm - the piscine version of an orgasm.

Meanwhile, the smaller satellite males, who have been stalking this female, with no sense of decorum, will race to the vacant side of the female and they too will release their contribution of sperm. Not to be outdone by the big guys, the sneaky petes who have been patiently waiting under cover, will dart right under the larger spawning fish and contribute their little squirts of sperm while being enveloped in a shower of eggs and sperm. No one said spawning was neat.

A 12-inch female brown trout produces about 600 eggs that are about three-sixteenths of an inch in diameter. She may not release all of her eggs the first time she spawns. Her eggs are slightly heavier than water and will sink to the bottom of the pit.

The males probably spew out hundreds of thousands of microscopic sperm cells that are propelled by a hair-like tail. The tiny sperm cells swim blindly around, bumping into each other and into the eggs. If, by chance, a sperm cell makes contact at the single pore in the egg's outer membrane, the sperm cell will be able to penetrate. The sperm cell then makes contact with the nucleus of the egg and sperm's nucleus fuses with the egg's nucleus – successful fertilization.

Soon after the sperm penetrates the egg, the entrance pore closes so that no other sperm can enter the egg. Nearly all of the eggs laid will come in contact with at least one sperm. The percentage of eggs that is successfully fertilized is typically more than 90%, and given all of the male inputs, this high rate of fertilization should not be surprising.

Immediately after depositing her eggs, the female moves upstream about a foot and begins digging. The dislodged sand and gravel are sprayed downstream

and bury the exposed fertilized eggs. After the female has buried her eggs, she often rests and remains close to her buried eggs. Then she will move to the pit she created while burying her eggs, and may deepen the pit. She then deposits a second batch of eggs, and the males, of course, once again go through their antics and shower the eggs with sperm.

Again, the female will move upstream slightly and dig to bury her second batch of eggs. A 12-inch female, may only require two spawnings to deposit all of her eggs, while larger females may have to repeat the process three or four times.

Once a female has deposited all of her eggs and successfully buried them, she leaves the nest and moves to deeper water with cover. The spawning sites are readily visible to predators like great blue herons and mink. And, spawning fish are particularly vulnerable to these predators as the fish go about their reproductive ritual.

Unlike many other animals, trout do not provide any parental care to their eggs. Once the eggs are buried in the streambed, their development and ultimate hatching are dependent upon conditions in the stream. Under ideal stream conditions, trout eggs hatch in about 100 days. Once hatched, they are called alevins – tiny fish with a large yellowish yolk sac bulging from their bellies. The yolk provides the fish with the energy it needs to develop into a normal fry, the final stage.

The alevin stage lasts 14 to 20 days. When the fish have completely absorbed their yolk sac, they begin to wriggle up through gravel and emerge from their nest. Depending on when the eggs were laid, water temperature throughout the winter, and other factors like dissolved oxygen, brown trout emergence can occur from late February to early April.

Once fry emerge from the gravel, they move to the shoreline and seek cover with little or no current velocity. The fish are tiny and vulnerable. They immediately begin feeding on tiny invertebrates. If they are lucky enough to avoid being eaten by larger fish or birds, they may survive until fall, and perhaps take part in the spawning ritual that produced them one year earlier.

Successful reproduction in Spring Creek and many other trout streams in central Pennsylvania is essential for producing the fine sport fisheries that we enjoy in this region.

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