
EXPERIENCE IN ABATING DISEASE AMONG BROOK TROUT



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Paper presented before the Fourth International Fishery Congress
held at Washington, U. S. A., September 22 to 26, 1908

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Mr. PRESIDENT: I shall ask your kind indulgence at the beginning of this paper to give you a brief history of my own fish-cultural operations, as this is essential to the subject.

I established the Spring Brook Trout Hatchery in 1895 without having had any practical experience. The site on which operations were commenced was a basin of about $4\frac{1}{4}$ acres surrounded by high hills. The water supply originates at the north end of the basin at the foot of the hills, where is a number of what are called in this part of the country (Michigan) spring holes. The land was covered with tamarack, elm, ash, etc. These were all cut off and a dam 209 feet long was built across the site, flooding about three-fourths of an acre. Eight ponds were excavated by hand labor, as the soil was muck, and ditches were dug to carry the water from springs that were uncovered. I took about 20,000 eggs in the fall of 1895 from wild fish and hatched a good percentage; also bought 25,000 fry in the spring of 1896.

It soon appeared that conditions were not right for extensive fish-cultural operations, as I had started too near the head of the supply and the water became too warm and stagnant. Some of the ponds contained a number of bottom springs which supported a limited number of fish. By 1897 the reservoir had grown up to a dense mass of moss, which, although it was raked out by the boat load, could not be suppressed.

In February, 1899, there were three weeks of intensely cold weather, which heaved all the raceways and put the ponds out of commission. Early in the spring the remainder of the farm was purchased and a large reservoir constructed at the head of the valley. Here was a water supply of 453 gallons a minute. The reservoir was 277 feet long, had an average width of 58 feet, and an average depth of $3\frac{1}{2}$ feet, and was full of small bottom springs.

In 1900 the pond built in 1895 went out during a severe storm. Meanwhile fry of 1899 had grown to good size and 1,500,000 eggs were taken that fall. Losses during the spawning season were normal.

Early in the spring of 1901 an epidemic broke out among these fish. We could pick up from 40 to 50 dead fish early in the morning, and by evening there would be just as many more. Most of them showed no marks of any kind; a few were fungused. The ponds were thoroughly cleaned and the fish shifted, but there was no abatement of the disease.

About the middle of June the fish were netted and given their liberty in the reservoir and the mortality ceased at once, only seven fish being lost. Here there was plenty of natural food and the fish were not supplied with artificial food. In the early fall they were netted and trapped for breeding purposes and placed in a clean pond, but they commenced to die in large numbers before they had ripened their spawn. It was apparent that they had the boil or ulcer disease, as they were covered with purplish blotches and boils.

The hatch of 1900-1901 proved almost a total loss, caused by water pollutions. Early in 1902 I started to build a new system of ponds down the valley. All the brook trout on hand were disposed of. Two hundred and fifty thousand eggs were purchased from eastern sources that season, a number of flowing wells were installed, and it looked as if the troubles were over. But the sequel proved there were worse. Heretofore the fish had not been attacked by disease until 18 to 24 months old, but now the trouble commenced in the fall following their hatching and continued all winter, culminating in the spring with losses of from 90 to 95 per cent. None of these young fish showed any symptoms of boil disease, but most of them had fungus on the gills and head. Not knowing exactly what the trouble was, I continued to hatch fry from eggs taken from wild fish, but the result always proved the same.

I became thoroughly convinced early in 1904 that brook trout could not be reared on an intensive scale under existing conditions, and so reported to persons interested with me, but after these continual losses they were discouraged and would not take any steps to better conditions.

In 1903, 1904, 1905, and 1906 I lost on an average 50,000 to 75,000 yearlings each season, and as no changes were made in methods matters went from bad to worse. In the spring of 1906 there were left only some 40,000 brook trout fry, and as I was unable through severe illness to give the work personal supervision these shrank by September 1 to 10,000. I then determined not to waste any more time and labor on brook trout until the existing conditions could be altered.

I neglected to state that I had taken on rainbow trout in 1898, and had become by 1906 very successful with these fish.

The reservoir built in 1899 had become more or less filled with liquid muck and decaying vegetation. Tons of algae were taken off each year in the early spring and the water could be seen to work and boil. This would continue

until about June 1, when all the trees had leaved and water cress had grown to good size, then losses in fry would cease until fall.

In the fall of 1906 I secured complete possession of the plant and at once cut out this reservoir, laying dry the ponds it fed, disposed of all brook trout fingerlings on hand and contracted all eggs taken excepting 18,000 eyed eggs from wild stock.

In the spring of 1907 I ordered made a galvanized iron raceway 277 feet long, 18 inches wide, and 5 inches deep. This was put in place about June 10, and fry were placed in the pond about June 15. The water entering the raceway comes some 700 feet across the marsh, through a solid bed of water cress, and is very cold.

The loss in brook trout fry before they left the hatchery had been very slight, and the still smaller losses outdoors were agreeably surprising. In fact, from June 15 to September 15 the total loss was 152 fry. This pond was drawn once a week and thoroughly cleaned. The fish were fed sheep's liver, always absolutely fresh, and the pond was literally alive with water fleas and pond snails. About this time we became so busy with other work that this pond was not cleaned for about four weeks and the result was a loss of 110 fish, which had become fungused, confirming my theories that unsanitary conditions had been the cause of all this waste of fish and time.

These fish were moved and sorted into two ponds farther down and estimated, by counting a series, at 14,000 in number. A finer lot of fry it would be hard to find. They were of a good size and color. I looked forward eagerly to spring, as I was not satisfied that this would be a permanent success. They were again moved and reassorted into larger ponds about April 22, 1908. As a matter of course there is some loss in these fish—kingfishers, herons, snakes, etc., destroying some, and a few dying of disease.

In addition to the above I have about 450 two, three, and four year old fish. The losses in these have been about two fish per month since spawning, last fall. I have kept all of the hatch of brook trout, this season some 75,000. I am thoroughly convinced that they can be reared successfully. In order to accomplish this desirable result the water must be pure and cold, the ponds kept absolutely clean, and the food perfectly fresh and sweet.

I believe that if conditions permit of changing the application of the water supply these results can be obtained at other stations that have had this trouble, provided the water is suitable to start with. At stations which derive their water supply from brooks or ponds that heat and dry up in summer and freeze hard in winter, it will be obvious that the case is hopeless.

In conclusion, I will state that I will be pleased to give personally any further information that may be desired.