

**XXII.—REPORT OF OPERATIONS AT THE UNITED STATES TROUT  
PONDS ON THE M'CLOUD RIVER, CAL., DURING THE  
SEASON OF 1880.**

By **LIVINGSTON STONE.**

**BAIRD, SHASTA COUNTY, CAL.,**  
*December 31, 1880.*

**Prof. SPENCER F. BAIRD,**  
*United States Commissioner.*

**SIR:** I beg leave to report as follows: My last report closed with the 31st of December, 1879, up to which time no trout eggs had been taken. Very soon, however, after the new year began, the breeders in the ponds commenced to show signs of preparing to deposit their spawn, and on the 12th of January, 1880, the first eggs were taken to the number of 25,000. The spawning season lasted from January 12 to May 2, the eggs being taken at intervals between these dates. Even after the 2d of May a few straggling spawners were manipulated, the very last eggs of the season being taken on the 26th of that month.

There being a fine supply of water at the trout ponds and every facility for hatching, very little difficulty was encountered in maturing the eggs for shipment.

The method adopted of manipulating the breeders was the same as that in common use among trout-raisers, viz., that of pressing the eggs from the fish by hand without the aid of any apparatus. The eggs are taken directly from the fish into a dry pan, and, after being impregnated and washed, are placed in deep wire trays or baskets, like those used at the salmon fishery for hatching salmon, 15,000 being placed in each tray. The eggs of the California trout are so large that the same baskets were used for hatching the trout eggs that are used for hatching California salmon eggs.

The actual shipping of the eggs was a much more difficult matter than taking and maturing them. To get an idea of the difficulties of this part of the work, it should be remembered that the trout ponds are four miles from the stage road, and that the only path to the road is a rude Indian trail, over a very rough and broken country. The mud in some parts of this trail is in winter knee-deep, and the intervening streams, at that season swollen torrents, have to be waded by the horseman or footman, as the case may be, who carries the eggs.

After reaching the stage-road the eggs must be carried to the railroad station, 22 miles, over a road that is almost impassable on account

of the depth of mud. In the course of this ride Pit River must be crossed at a season of the year when it is such a swollen and violent stream that for several days at a time only the Oregon mail is taken over, and that at no little peril to the boatman. After reaching the railroad a journey by rail of 3,500 miles still remains for the eggs before they arrive at their distant destinations.

All these difficulties were successfully overcome last winter by the energy and skill of those who had the work in charge, and in almost every, if not every, instance the transportation of the eggs across the continent was a success.

The total number of eggs distributed from the station was 261,000.

Mr. Green returned to the McCloud River and tributary creeks 68,000 fish left over after all the eggs were distributed. There was a loss of 15 per cent. from want of impregnation and other causes, which makes the total number of eggs taken at the trout ponds in 1880 as follows:

Actual number of eggs distributed.....	261,000
Number of eggs returned to river as young fish.....	68,000
Number left over at end of season.....	2,000
Loss from unimpregnated eggs, &c.....	57,000
	388,000
Total number of eggs taken.....	388,000

The eggs were distributed as follows:

*Distribution of trout eggs, 1880.*

Jan. 30.	To T. B. Ferguson, Baltimore, Md.....	40,000
Feb. 3.	To T. B. Ferguson, Baltimore, Md.....	17,000
Feb. 20.	To T. B. Ferguson, Baltimore, Md.....	20,000
Feb. 28.	To T. B. Ferguson, Baltimore, Md.....	22,000
Mar. 13.	To T. B. Ferguson, Baltimore, Md.....	30,000
Mar. 16.	To T. B. Ferguson, Baltimore, Md.....	22,000
April 2.	To T. B. Ferguson, Baltimore, Md.....	24,000
Mar. 15.	To M. Metcalf, Battle Creek, Mich.....	1,500
Mar. 19.	To R. O. Sweeny, St. Paul, Minn.....	2,500
Mar. 19.	To B. F. Shaw, Anamosa, Iowa.....	3,500
Mar. 19.	To W. Welsher, Wis.....	2,500
Mar. 19.	To S. Webber, New Hampshire.....	2,500
Mar. 19.	To F. N. Clark, Michigan.....	2,500
Mar. 19.	To J. G. Portman, Pokagon, Mich.....	2,500
Mar. 20.	To N. K. Fairbanks, Chicago, Ill.....	2,500
April 8.	To C. S. White, Green Spring River, Baltimore and Ohio Railroad.....	10,000
April 10.	To Seth Weeks, Corry, Penn.....	4,000
April 10.	To ——— Potter.....	4,000
April 17.	To J. G. M. Steedman, Saint Louis, Mo.....	18,000
May 3.	To J. G. M. Steedman, Saint Louis, Mo.....	9,000
May 12.	To J. G. M. Steedman, Saint Louis, Mo.....	12,000
May 22.	To R. Klotz, Shasta County, Cal.....	10,000

As soon as the eggs were all shipped we turned our attention to making improvements about the place. A stable was needed, for it is impracticable here to get along without horses, and the winters are too

severe in these mountains to make it safe for horses unprovided with shelter. Many additions of various sorts were also needed in and about the dwelling-house, as everything was done last year almost exclusively with a view to make the trout-egg season a successful one, regardless of personal inconveniences. Accordingly we proceeded to build a commodious stable and a woodshed, and to make additions inside of the dwelling-house in the way of closets, &c. This, with the fishing for parent trout to add to our stock, took till about the 1st of September, when Mr. Redcliff and Mr. Loren Green came to the salmon fishery to help take salmon eggs.

The trout did not bite as well this year in June and July as they did in the same months of last year, possibly because we had taken out about 1,500 from this locality in the river and put them into the ponds.

We had some talk about building a wagon road from the salmon fishery to the trout ponds this summer, but it proved to be too expensive an undertaking, and was given up; but as a substitute I sent for a Bell telephone with wire enough to connect the trout-breeding station with the salmon fishery on the California and Oregon stage road, which now enables us at the trout ponds to hold direct communication with the outside world.

As not much is yet generally known about the natural history of the California trout (*Salmo iridea*), I will venture to present the following rather fragmentary notes, most of which have been furnished me by Myron Green, concerning the eggs, the fish, and the manner of catching them. The eggs of the McCloud River trout (*Salmo iridea*) are about one-fifth of an inch in diameter, twenty-five averaged-sized eggs, one layer deep, just covering an area of a square inch. There is quite a wide variation in the color of eggs, some being of a light straw color and others of a deep salmon red. A two-pound trout gives about 800 eggs.

At 54° Fahrenheit the eggs hatch in twenty-six days, and the eye spots show in twelve days. Seth Green's formula, in regard to the hatching period of the New England brook trout (*Salmo fontinalis*), is that these eggs hatch in fifty days at 50° F., and require six days less for every degree's increase in the warmth of the water. According to this formula the *fontinalis* eggs, in water at 54°, would hatch in twenty-six days, which happens to be precisely the time required by the eggs of the McCloud River trout (*Salmo iridea*) to hatch.

The empty eggs of the *iridea* do not turn white as soon as the empty salmon eggs do, consequently one is more likely, in packing and shipping, to get empty eggs mixed with the impregnated ones than in packing salmon eggs. The empty or unfertilized eggs can, however, usually be made to turn white by running a somewhat violent stream of water through the hatching troughs after the eye spots are plainly apparent in the rest. This will turn the empty eggs white while it will not injure the eggs which have fish in them.

The California trout eggs seem to be peculiar in one respect, namely, that they will stand a great deal of sediment in the water without appearing to suffer from it.

Mr. Green, and Mr. Woodbury who hatched trout eggs for the California fish commission, both say that the eggs can be completely covered with sediment for three days and come out all right. These eggs possess another peculiarity, viz, the embryo, previous to the development of the choroid pigment (eye spots), can be seen quite clearly through the shell, and the form of the fish is distinctly apparent for four or five days before the eye spots show, which usually happens about the eleventh day in water at 54° F.

The California trout (*Salmo iridea*), which is the same fish as Suckley's *Salmo Masoni*, is described by him under the latter name as follows:

**SALMO MASONI, Suckley.**

Sp. ch.—Body subfusiform; head well developed, forming the fifth of the total length. Maxillary slightly bent, extending to a vertical line drawn inwardly to the posterior line of the orbit. Jaws equal. Anterior margin of dorsal fin a little nearer the extremity of the snout than the insertion of the caudal fin. Back brownish gray; upper surface of head blackish gray; sides silvery gray; fins ash gray; dorsal and caudal spotted; upper regions of head and body studded with irregular black spots or specks; tail emarginate.

I will merely add to this description that the McCloud River trout have a broad red stripe on their sides extending on each side of the lateral line from the mouth to the caudal fin. In the spawning season their silvery-gray color assumes a much darker hue, and the broad stripe turns to a deeper red. During the spawning season the trout get white and flabby and very poor, though they quickly recover when they begin to feed again. The *iridea* in the McCloud River, probably owing to more abundant feed and better water, grow to a larger size than in most other waters. The males in our ponds averaged last January about three pounds in weight and the females two pounds. There were several individual fish that weighed five pounds and six pounds, and even more.

Mr. Green describes them as being good feeders, hardy and well able to hold their own among other voracious fish, while at the same time they are not as destructive to smaller fish of their own kind as many other varieties of trout, notably the *fontinalis*, the common speckled brook trout of the Northern Atlantic States. Large and small fish can consequently be kept together in the same pond with comparative safety. Their favorite food is salmon eggs. After that come the caddis worms, with which the McCloud River abounds. These trout also feed on the dead salmon in the bottom of the river. Mr. Green says he has never found any smaller trout in the stomachs of the McCloud River variety. In other streams, however, when feed on the bottom is less abundant,

they may possibly devour their own kind to some extent. The artificial food which we give our trout in the ponds consists, chiefly, in the summer, of boiled salmon. They eat this voraciously, but they like fresh meat better. When salmon are not to be had we give them venison, and occasionally kill a steer for them in the winter. The trout that are in the ponds at the present writing will eat a whole deer at two feeds. We also give them dried salmon and the dead salmon eggs picked out of the salmon-hatching troughs, which we dry for this purpose. Of course it is impossible to purchase any food for them from the markets in this remote region.

As the number of trout in our pond increases it is obvious that more food will be required for them, and the question of furnishing food to the parent trout promises, at no distant day, to be quite a serious one. We probably have now in our ponds upwards of two tons of live trout. They will certainly eat five times their weight, or ten tons in a year. We can easily manage this amount of food, but what shall we do when we have ten tons of fish and they require annually fifty tons of food? Fortunately the salmon which they subsist on during the summer costs nothing, but an allowance of several hundred dollars a year will probably have to be made to supply the trout with food in the winter, when the trout ponds at this station are being carried on on the scale which is now contemplated.

Mr. Green thinks that the males have milt when they are two years old, but that the females do not spawn till they are three years old. He says he never saw a spawning female of less than one and a half pounds weight. In this respect they must be very different from eastern brook trout (*Salmo fontinalis*), as the writer has taken eggs from an eastern trout that weighed only an ounce and a half. Mr. Green is of the opinion that the McCloud River trout do not cross with the salmon unless in rare instances, and if they do at all that the progeny are barren.

#### FISHING FOR TROUT.

One of the most essential tasks when we began to operate here with trout was of course to catch breeders for the ponds. The fishing has been entirely under the management of Mr. Myron Green, who has shown great sagacity in discovering the ways of the fish and in using his knowledge in capturing them.

Mr. Green's method has been almost entirely to use set lines. These horizontal lines are 150 to 175 feet long when the nature of the water will permit the use of so long a line. The eddies and the comparatively quiet pools of the river are used to fish in. The short vertical lines attached to the long horizontal line are 5 feet apart and are themselves 2 feet long.

We use No. 1 and No. 1½ Sproat's hooks in the spring and summer and No. 2 and No. 3 in the fall. The reason for using a larger hook in the spring and summer is that the salmon, which are so abundant in

the river and which occasionally, indeed very often, get hold of the hooks, would break a smaller size. In the fall the salmon are all gone and smaller hooks can be used. We file off the beard of the hook to some extent to make it easier to extract the hook from the fish's mouth without killing it. Sometimes when the hook cannot readily be drawn out the usual way, Mr. Green saves the fish by cutting the line and drawing the hook out the other way. Sometimes in clear pools (and the McCloud is a very clear river usually), the trout will take alarm at the line and will not bite, though they can be seen in considerable numbers about the hooks. When this happens, Mr. Green hides the lines under the sand on the bottom of the river and leaves only the hooks and bait visible. Then the trout will bite. When the trout are suspicious of the bait they disturb it with their tails and examine it before biting at it. Mr. Green is quite sure that these trout are all in the habit of stirring up the bottom of the river with their tails when they are foraging for food. They also have this peculiarity, so different from the eastern trout (*Salmo fontinalis*), viz, that they swim partly on one side when in search of food, with one eye inclined downward so that they see what is on the bottom.

When a new place has been selected for setting a line we usually "salt the ground" pretty well with bait—that is, scatter salmon eggs over it for three or four days before we begin to fish the place. This attracts the trout to the spot and gets them familiar with it. The only bait we ever use is salmon eggs. This is by far the most "killing" bait, to use a sportsman's term, which is rather inapplicable here, as we do all we can to avoid killing the trout. No other bait for trout begins to compare with salmon eggs in effectiveness in this river. It is used altogether here when it can be obtained, not only by us in capturing breeders, but by all the sportsmen who come here to fish. As fish culturists, however, we should feel some compunction about destroying so many salmon eggs did we not recall the many millions of them which we annually hatch for the benefit of this river.

When the dried eggs are used for bait Mr. Green puts two on each hook. This is in the fall when the small hooks are used. At this season and with these hooks we do not lose over one trout in twenty from injuries in catching them. In summer, when large hooks are used, we kill about one in eight in getting the hook out. As soon as the fish are caught they are taken as rapidly as possible to the nearest corral. These corrals, of which we have a good many along the river, are temporary ponds made merely to hold the trout until we are ready to bring them to the regular trout ponds, and are used to save making a journey to the trout ponds every time a fish is caught at a long distance off. When the fishing is over, for the night or day, as the case may be, the trout which have been placed in the temporary corrals are collected together and taken to the trout ponds, where they are deposited.

We use for carrying the live trout the common five-gallon rectangular

tin cans which turpentine, alcohol, and other liquids come in. We save all these cans for this purpose and rig them with a bail and a lid, and find them very convenient and safe to carry the trout in, as well as economical.

We have had one set of lines, twenty in number, extending at intervals over nearly four miles of the river, which makes it quite important to have a system of convenient temporary corrals to confine the fish in when they are first caught. We fish somewhat with a rod, but not to any great extent.

The trout fishing lasts from the middle of May till the last of November, June and July being the best months for fishing. Indeed the trout bite very well till the salmon begin to spawn in August, when, till the salmon-spawning season is over, the trout fishing is very poor. In the very hot weather the trout feed mostly at night.

During the spawning season the wild trout in the river sometimes run up the tributary creeks in great numbers when they are swollen by the rains. Taking advantage of this peculiarity of theirs we have taken them in traps placed in the creeks, but the more experience we have of this method of getting breeders and eggs the less we like it, and shall probably not rely much upon it in future.

Owing to the powerful current in the river, which indeed is a succession of cascades and rapids, great inconvenience has been experienced in using the heavy wooden boats which we have at present. I therefore sent for one of Osgood's patent-folding canvass boats this summer for tending the lines with. This boat is extremely light and can be easily carried by the rapids and falls in ascending and descending the river, and saves a vast deal of time and severe labor. With this boat we were enabled to extend our fishing this fall more than ten miles above the trout ponds.

The fishing this fall was conducted with so much success that we were enabled to nearly double the number of breeders in the ponds, and next year (1881) we hope to take half a million eggs.

In concluding, I will say that we now have at the United States trout-breeding station, on the McCloud River, a large and commodious dwelling-house and stable, a hatching-house, with a hatching capacity of several million trout eggs, four large and very substantial ponds, and over two thousand breeding trout, averaging three pounds in weight.

