2.—A PRELIMINARY REPORT UPON SALMON INVESTIGATIONS IN IDAHO IN 1894.

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In this report are presented the results of certain investigations, carried on under instructions of the Commissioner of Fish and Fisheries, concerning the abundance, distribution, and spawning habits of the species of salmon which have spawning-grounds in the waters of the State of Idaho.

The alarming decrease in the salmon catch of the Columbia River within recent years, the importance of preventing the continuance of this decrease, and the desire and hope that the salmon industry may be rebuilt to its former importance, render imperative a most careful study of the natural history of the salmon and a more accurate knowledge of the location of their spawning-beds, their time of spawning, and the temperature and other physical conditions under which their spawning takes place.

These investigations were really begun in 1893, when the present writer, assisted by Dr. Charles H. Gilbert and Dr. Oliver P. Jenkins, both of Stanford University, made an examination of the obstructions in Snake River and in the Pend d'Oreille River, the report of which has been published.* During the spring and summer of 1894 they were continued on the Columbia and lower Snake River by Dr. Gilbert, whose report is now in preparation.

I left Washington September 1, 1894, and, being joined at Terre Haute, Ind., by Dr. J. T. Scovell, proceeded to Shoshone Falls, Idaho, where the work was begun. Our attention was directed chiefly to three localities: (1) The streams and lakes at the headwaters of the Salmon River; (2) the streams and lakes at the headwaters of Payette River; (3) that portion of Snake River lying between the Great Shoshone Falls and Huntington, Oreg.

In the following pages is given a somewhat detailed account of the physical features of the waters of each of these regions, and then follows what we have been able to learn regarding the three important species of Salmonidæ which ascend to the waters of Idaho for spawning purposes. These species are: (1) The chinook salmon (*Oncorhynchus tschawytscha*); (2) the blueback salmon or the redfish of Idaho (*Oncorhynchus nerka*); (3) the steelhead or salmon trout (*Salmo gairdneri*).

Although less than five weeks' time was given to this work, it is believed that new and very important facts were discovered regarding these three valuable food-fishes, and only the lateness of our arrival upon the spawning-grounds prevented our

*Report of the Commissioner of Fish and Fisheries on Investigations in the Columbia River Basin in regard to the Salmon Fisheries; issued as Senate Mis. Doc. No. 200, Fifty-third Congress, second session, 1894. This report contains "A report upon investigations in the Columbia River Basin, with descriptions of four new species of fishes, by Charles H. Gilbert and Barton W. Evermann."

making still further important observations. In addition to the definite information gained, the investigations are of great value in that they show us just what problems connected with these fishes can be studied with advantage in these waters and indicate when and how these problems may be best investigated.

The investigations show undoubtedly that very important spawning-grounds of the chinook salmon, redfish, and steelhead are found in Idaho, and that it is upon these grounds that we must depend in large measure for the natural increase necessary to the continuance of the salmon industry of Columbia River. The actual extent of these spawning-beds, the actual time of spawning in different streams, and several other questions of importance, can be learned only through a series of observations covering the entire breeding season of each species. For the redfish and the chinook salmon which ascend to the headwaters of Salmon, Payette, and Weiser rivers, this time apparently lies between July 1 and October 30; for the steelhead, observations should cover the time from April 1 to early summer, at least.

While making these inquiries and investigations in Idaho we were the recipients of many favors and courtesies from various citizens of that State. To all who rendered us assistance in any way I desire to express our appreciation of the kindness shown us. We are under especial obligations to Mr. Liberty Millet and Mr. Joseph McMeekin, of Upper Salmon Falls, who not only showed us every kindness during our week's stay with them but who were kind enough to keep an accurate record of their seining operations after we left. This record involved a large amount of work, in that it includes the weight, length, sex, and condition of every salmon which they caught, items of information of very great value to us in our investigations. To Mr. George H. Day, of Upper Salmon Falls, and Messrs. George W. Bell, Robert E. Conner, and Charles Harvey, of Lower Salmon Falls, we are under obligations for numerous favors shown us. Mr. William O'Brien, of Ontario, Oregon, not only furnished valuable information regarding his own fishery at Weiser, but he very kindly obtained for me as complete data as possible concerning the salmon and salmon-trout catch of all other fishermen between Huntington and Glenn Ferry.

I desire to mention also Messrs. Frank C. Parks, of Sawtooth; J. L. Fuller, of Bliss; Calvin White and William C. Jennings, of Salmon Meadows, and Thomas C. McCall, of Payette Lake, whose numerous kindnesses enabled us to accomplish much more than would otherwise have been possible.

SALMON RIVER BASIN.

The Salmon River is the largest and most important tributary of Snake River, in Idaho. It has its sources in Alturas and Custer counties, on the eastern slope of the Sawtooth Mountains, and, after a very crooked course for several hundred miles, it finally empties into Snake River near the northeast corner of Oregon in about latitude 46°. This river is said to be one of the most important salmon streams in the Columbia Basin. I know nothing about this stream, however, except at its headwaters in the vicinity of Alturas Lake, where we made observations September 11 to 14, inclusive.

Alturas Lake.—This small lake lies on the east side of the Sawtooth Mountains, about 45 miles northwest from Ketchum, the nearest railroad station. The elevation of the lake above sea level is about 7,335 feet, or 200 feet lower than the mining camp of Sawtooth, which is given as 7,536 feet by the United States Geological Survey. The lake is about a mile in average width, 3 miles in greatest length, and is estimated to be about 200 feet in greatest depth. The inlet is at the upper end and is called

Lake Creek. It is formed of two smaller streams, one coming down from Old Baldy Mountain on the right, the other from the Manly Creek summit of the Sawtooth Mountains. Lake Creek is about 8 miles long. Near its mouth it is about 30 feet wide. The upper portion of the stream is a rapid mountain creek with many falls and cascades, but the last 3 miles are through a relatively level meadow or wooded plain. The shores are usually covered with a dense growth of low bushes, chiefly willows. The bed of the stream is of fine white sand in the quiet reaches and of coarse granite gravel in the swifter portions. There are numerous gravel bars where the water is a foot or less in depth, and many quiet pools with a depth of several feet. The water is extremely clear and very cold, its temperature September 12 being 45° F., or less. There appears to be no vegetation of any kind growing in the water.

The outlet of Alturas Lake is a stream some 40 feet in width. About a quarter of a mile below Alturas Lake this stream flows through another very small lake and then, flowing 6 miles northward, joins Salmon River just below Stenton's ranch. From the left it receives two small tributary creeks, the outlets of Pettit and Twin lakes. These are two small lakes situated at the base of the mountains only a few miles below Alturas Lake.

Salmon River.—The main division of this river rises on the divide between Sawtooth and Ketchum, the divide which forms the watershed between the waters of Salmon River on the north and those of Wood River on the south. That portion of Salmon River above the mouth of Alturas Creek is about 12 to 15 miles long, but it carries less water than Alturas Creek does. Its course is through a narrow valley, free of trees in the main and meadow-like in character. Along its shores is usually a heavy growth of small bushes.

At the junction of Alturas Creek and Salmon River the former is perhaps 50 feet in average width and 3 feet in average depth, while the latter is somewhat smaller. The water in each is very clear and cold, the temperature September 13 being 47° F., at noon.

Above the mouth of Alturas Creek Salmon River receives a number of small tributary streams, the principal ones from the left being Beaver, Smiley, and Washington creeks, while those from the right are Pole, Lost, and Warm Spring creeks. Below the mouth of Alturas Creek, on the right, are two rather larger creeks, known as Champion and Fourth of July creeks, while from the opposite side, and about midway between these, Salmon River receives Roaring Creek. Still farther down are Big Redfish Lake and Stanley Lake, each of which pours its waters into the river through a short outlet. These lakes were not visited by us. Redfish Lake is said to be a long but narrow lake into which redfish come in large numbers. Stanley Lake is smaller, but a lake of considerable importance.

PAYETTE RIVER BASIN.

The Payette River is one of the important streams of Idaho. The main river rises on the southwest slopes of the Sawtooth Mountains in latitude about 44° 10′, and immediately west of the headwaters of Salmon River, the Redfish Lakes lying at the foot of the range on the east side. After flowing westward about 90 miles it is joined by a stream from the north known on the maps as North Fork of Payette River. It is this fork with which we are at present chiefly concerned. At the head of this fork are important spawning-grounds of the chinook salmon, the redfish, and the steelhead. The Payette Lakes are situated here.

Payette Lakes.—The group of small lakes known as the Payette Lakes is situated at the head of the North Fork of Payette River in the northern end of Boise County, Idaho, about 125 miles north of Boise. There are three or four of the Payette Lakes, but the only one in which the redfish certainly occur is Big Payette Lake, which is at the head of the North Fork proper. This lake is quite irregular in form. Its greatest length is about 6½ miles and its greatest width about 2 miles. Toward the upper or northern end there is a very narrow arm, about 2½ miles long, extending southeastward from the east side. The lake is surrounded by granite mountains, and its shores are for the most part precipitous and rocky. The water is clear and cold, the surface temperature at noon September 27 being 50°. In places where the bottom was of white sand we could easily see to a depth of 20 to 30 feet. Some soundings have been made, and the greatest depth found was 140 feet, though the depth is currently believed to be much greater.

About 9 miles above Big Payette Lake is Upper Payette Lake, the outlet of which is the inlet to the larger lake. We examined the last 5 miles of this stream September 27, and found it to average about 60 feet wide and 2 feet deep on the shallows, while in the numerous pools and quiet reaches depths from 5 to 20 feet are found. The water is exceedingly clear, and the bottom of coarse sand can be distinctly seen even in the deepest portions. The water is also very cold, the surface temperature from 10 a. m. to 3 p. m. September 27 being 45°.

The valley of this stream is apparently from 1 to 2 miles wide and is covered with a heavy evergreen forest, chiefly of Murray pine and Douglas fir. The immediate banks of the stream are covered in most places with a dense chaparral of willows, birch, cottonwood, and other low bushes. The stream is very tortuous in its course, and in many places is clogged by large amounts of logs and other drift material. The bottom in most places is of coarse white sand or fine white gravel. There are numerous shallows where the current is very swift, and usually below each is a deep, quiet pool.

North Fork Payette River.—The outlet of the Payette Lakes is North Fork of Payette River, which, flowing southward through Long Valley about 100 miles, joins the main river north of Boise; then, after flowing eastward for about 50 miles, it joins Snake River near the town of Payette. I examined this river through the first 4 miles of its course immediately below Big Payette Lake. The river here will average over 60 feet in width and 2 feet in depth. The current on the riffles was about 1 foot per second.

The water was, of course, very clear and cold. The temperature taken at four places September 26 when the air was 57° was 55°, 54.5°, 53°, and 53°, respectively. The bottom is of coarse sand in the deeper places, gravel where the current is swifter, and still coarser gravel and larger rocks where the current is swiftest. The banks are usually low and of gravel and sand. Murray pine is the principal tree in the valley, and there is a good deal of underbrush or chaparral.

About 20 miles below Big Payette Lake the North Fork is joined by two streams of nearly equal size, from the left or east, known as Lake Fork and Gold Fork. At the head of Lake Fork is Little Payette Lake, a small lake only a mile or so east of Big Payette Lake and separated from it by a low rocky mountain. Redfish are not known to enter this lake.

Gold Fork is a somewhat larger and colder stream coming down from the mountains farther east.

SNAKE RIVER.

During former investigations in the Columbia River Basin, particularly those of 1893, considerable information was gathered regarding the physical characters of Snake River, and something was learned about the salmon and other fishes occurring in that stream. This information has already been published.* In that report are given descriptions of the various falls in the Snake River, and a consideration of each as a barrier to the distribution of fishes in that river. The investigations upon which that report was based showed that salmon can not possibly ascend Snake River farther than the foot of Shoshone Falls; and it was also believed that certain falls below Shoshone Falls (Auger Falls, Upper Salmon Falls, and Lower Salmon Falls) interfere seriously with the ascent of salmon.

During my trip to Idaho in September and October, 1894, I made still further investigations along that portion of Snake River between Twin Falls and Weiser, Idaho, a distance of more than 200 miles. It was desired to determine more accurately: (1) The character of Auger Falls, Upper Salmon Falls, and Lower Salmon Falls, and the part each plays as a barrier to the free movement of fishes; (2) the abundance of salmon in that part of Snake River.

It was desirable not only to learn as much as possible regarding their abundance, but to locate their spawning-beds, determine their spawning time and habits, determine the location and importance of the salmon fisheries of the Snake River, and to make investigations with reference to locating a salmon-hatchery at some point on Snake River.

Twin Falls and Shoshone Falls.—Both of these falls were visited by us. At Twin Falls there is a vertical descent in a single plunge of about 180 feet, while at the Great Shoshone Falls, 4 miles farther down the river, the descent is 210 feet. Each of these is, of course, an absolute barrier to the ascent of fish. As already stated in the report referred to, the construction of fishways at either of these falls seems entirely impracticable.

Auger Falls.—About 10 miles below Shoshone Falls are Auger Falls. These are a long series of rapids and short falls, occupying 250 to 300 yards of the length of the river, as we have already described. It does not seem possible that many salmon would be able to sustain the long and continuous effort necessary to pass up through these turbulent rapids, though individual fish may occasionally succeed in doing so. One man with whom we talked at Shoshone Falls tells of a fisherman who claims to have seen some salmon at the foot of Shoshone Falls.

I visited Auger Falls September 9 and spent several hours examining that part of the river. Although it was at a time when we might expect to find fish there, we did not see a single salmon attempting the rapids or in the quieter water below. Immediately below these rapids a small stream known as Rock Creek flows into Snake River from the south or left bank, and it is claimed that salmon entered this stream formerly.

Mr. I. B. Perrine, of Blue Lakes, situated about 4 miles above Auger Falls, says he has killed salmon in this creek and that they used to run into it in considerable numbers.

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*A Report upon Investigations in the Columbia River Basin, with descriptions of Four New Species of Fishes, by Charles H. Gilbert and Barton W. Evermann, in Report of the Commissioner of Fish and Fisheries on Investigations in the Columbia River Basin in regard to the Salmon Fisheries.

Upper Salmon Falls.—These falls are situated about 25 miles below Auger Falls, and have been sufficiently described in the report of the investigation of 1893. Salmon pass over these falls in considerable numbers. A fishery has been maintained more or less regularly each year near Lewis's Ferry, about 4 miles above these falls. During last October, Mr. E. E. Sherman operated a seine at this place and caught about 300 salmon. He regarded this as very poor fishing, and finally abandoned this ground and went to Glenn Ferry, where he hoped for better success.

From Upper Salmon Falls down for more than a mile the river is, for the most part, full of short rapids and irregularities; about 2 miles below the falls is a considerable rapid at the head of a large island owned by Mr. Liberty Millet. At the head of this island, in the main stream, which flows to the left of the island, is the largest and most important salmon spawning-ground of which we know in Snake River. The spawning-bed is at the foot of the rapids and is on gravel bottom where the water is from 1 to 5 feet deep. From this island down for about 5 miles the river is comparatively quiet; there are a few very swift places, but nothing that would interfere with salmon until Lower Salmon Falls are reached.

Lower Salmon Falls.—These falls are very similar to the Upper Salmon Falls and are situated about 6 miles below them. Through most of their width these falls are 20 to 30 feet in vertical descent, but at about a third of their width from the right bank are two places where the lava ledge has become worn or broken down so as to materially decrease the vertical portion. At the top of each of these chutes the water takes a vertical drop of about 10 feet, and then descends 20 or 30 feet more in a boiling, seething rapid before reaching comparatively quiet water.

Toward the left bank of the river the ledge is broken up into benches resulting in irregular series of shorter falls, up which salmon are able to go, only, however, with more or less difficulty. The facilities for observing the salmon ascending the left portion of the falls were not good, as it was impossible to reach any point from which one might watch any portion where the salmon attempted the ascent. But by taking a boat below the falls on the right bank one can cross to some exposed portions of the ledge at the right side of the first of the chutes already mentioned, and from this point the entire length of the chute can be watched.

I first visited these falls September 16, and, crossing over to the ledge, spent some time watching the salmon jumping. We saw some thirty or thirty-five attempts made by salmon to ascend the falls, but all failed; these attempts likely represent only a few different fish, as each fish probably made more than one attempt. During the time we watched I never saw more than two fish in the air at the same time. The fish kept to the water until within 10 to 20 feet of the foot of the vertical portion. Our first sight of the fish would be when he shot out of the water like an arrow speeding toward the top of the falls; for 10, 15, and often 20 feet he sustains himself in the air, and then drops into the turbulent water at the foot of the falls, or strikes the column of falling water at some point below the lip of the ledge; occasionally he strikes near the top where the water is scarcely vertical, and then, with every muscle strung to its utmost tension, the body quivering in every inch of its length, he fights the descending torrent, retaining his position perhaps for several moments; but the contest is an unequal one and the salmon is finally carried down and into the pool below, perhaps to renew the fight after a period of rest. Often the leaping salmon would strike in the seething water at the foot of the fall and there he would sustain himself at the

top of the water for a longer time. Just under where we stood was a nook where the water was less turbulent, and there we could occasionally see salmon apparently resting before making another attempt.

We visited these falls at other times, on October 1, 2, and 7, and saw a few salmon jumping each time, but never saw one succeed. In years past this is said to have been a favorite place for the Indians to spear or gaff the salmon. A few salmon are still taken in that way by people living in the vicinity. The second chute can not be reached without considerable danger, nor can it be seen very well from any accessible point; it appears, however, to offer less difficulty than the first, and a good many salmon probably pass up the stream at that point. The large majority of salmon that make these falls, however, probably go up at some of the places nearer the left shore. Yet even these offer such serious obstruction that it is quite certain that many salmon which would otherwise reach the spawning-beds above are prevented from doing so by Lower Salmon Falls. There do not appear to be any suitable spawning-places below these falls in a distance of several miles. The river in this part of its course is usually quite deep and the bottom is said to be very rocky or else muddy. A little blasting at these falls would make it very much easier for the salmon to ascend. The expense would not exceed $100 to $300 and I believe it would result in a considerable increase in the salmon supply of Snake River.

Snake River below Lower Salmon Falls.—Immediately below Lower Salmon Falls, Snake River is quite deep and filled with large detached masses of lava. Even where the water is shallow these irregular, jagged lava rocks are so abundant as to render the use of the seine impossible.

Farther down, near the mouth of the Malade or Big Wood River and on to below Bliss, there are some gravel bars, but we could not learn that they have ever been used as spawning-beds. In the vicinity of King Hill, some 18 or 20 miles below Bliss, or 25 miles below the Lower Falls, are said to be some spawning-beds. King Hill was formerly resorted to by the Indians during the salmon run, and a few are said to visit there each year yet.

Five or six miles below King Hill is Glenn Ferry, in the vicinity of which some fishing is carried on. The railroad leaves the Snake River just below Glenn Ferry and does not return to it until below the mouth of the Boise River, more than 125 miles below Glenn Ferry. Very little is known concerning this portion of the river, and we do not know of any salmon fishing below Glenn Ferry until we reach the mouth of the Boise and Owyhee rivers. Beginning at that place there are fisheries scattered all along for about 60 to 75 miles, or from the mouth of the Boise to Huntington, and perhaps farther.

The time at our disposal did not permit us to visit all the fishermen in this part of the river, but we were able to get some figures regarding the number of salmon and steelhead which they caught during the past fishing season. These figures will be found farther on in this report. Several men whom we interviewed gave valuable information regarding the salmon and other fishes of Snake River.

In the following pages are brought together under each species all the important facts learned regarding it (1) at the headwaters of Salmon River, (2) at the headwaters of Payette River, and (3) in the Snake River.

THE CHINOOK OR QUINNAT SALMON.

Headwaters of Salmon River.—The headwaters of Salmon River have long been known as containing important spawning-grounds of the chinook salmon. All persons familiar with the region with whom we talked spoke of the salmon as spawning there in great numbers. Ten and fifteen years ago they were very abundant, but all agree that the number spawning there now are as nothing compared with former years.

Mr. F. C. Parks, postmaster at Sawtooth, has observed the fish of that region for several years, and he gives the following concerning the occurrence of chinook salmon in the headwaters of Salmon River:

The salmon (called dog salmon here) appear above the mouth of Alturas Creek about July 25. They are then in excellent condition, and people spear and shoot them for food. There is no regular shipping of fish from here; the fish are taken chiefly by miners and ranchers, and by tourists and campers, who often ship some home. They begin spawning about August 10 and keep it up until about September 1. On September 1, 1894, a Mr. Benson shot four near the mouth of Alturas Creek. About August 20 or 25, Mr. B. Carlo, of Sawtooth, shot and speared fourteen large salmon in Alturas Creek, half a mile above its mouth. [The writer saw the heads of most of these lying on the bank at Stenton's ranch, where the fish had been dressed.] These fish were ripe when taken. The best spawning-beds are in the last 1½ miles of Alturas Creek. There are other large spawning-beds in Salmon River immediately below the mouth of Alturas Creek and at various places on down the river, at least as far as the outlet of Redfish Lake. I have seen them as far up Salmon River as the mouth of Pole Creek, several miles above the mouth of Alturas Creek. Fully three times as many go up Alturas Creek as go up Salmon River above the mouth of Alturas Creek. I caught two in Pole Creek last August, and saw four dead ones there.

The salmon that come here will average about 15 pounds in weight. The largest I ever saw weighed 40 pounds, and the smallest about 8 pounds. The males are of a very dark lead-color, with some dirty red on the sides; the females are more silvery. When the spawning time arrives the male digs out a hole in the gravel with his nose; he sometimes turns on his side and may scoop out the gravel some with the hump on his back; he also seems to use his fins for this purpose. The female comes along and, passing over the hole scooped out by the male, lays her eggs, and the male comes and plunges around some, probably pouring out the milt at the same time. They always stand in the current with the head up stream. I think they all die after spawning; I do not believe any ever return to the sea; have seen many dead ones every year. I never knew one to take a hook, nor did I ever find any food in their stomachs. They spawn on the riffles in shallow water.

There were more salmon this year than for the past five or six years. More than six years ago they were much more abundant.

Thomas B. Mulky, of Stanley Basin, made the following statement:

The salmon come in July and their spawning is finished in September. Yesterday (September 12) I saw as many as 100 live "dog salmon" in Salmon River between Basin Creek and Valley Creek. Saw a good many dead ones, also. They spawn all along in that part of the river. I think all the salmon which spawn here die after spawning, none ever returning to the sea.

Mr. B. S. Brown, of Bliss, Idaho, gives the following information:

The dog salmon come into Upper Salmon River about August 1 and spawn very soon after. The largest spawning-bed that I know is in the river at the mouth of Roaring Creek. They go up Alturas Lake Creek about a mile above Stenton's ranch and up Salmon River to just above White's ranch. The height of their spawning here is between August 10 and 15. I think they all die after spawning. The largest I ever saw weighed 50 pounds; the smallest I have seen were about 18 inches long.

On September 13 I examined very carefully at least 2 miles of Salmon River next below the mouth of Alturas Creek; I also examined more than a mile of the river above the mouth of Alturas Creek and a mile or more of the lower portion of Alturas Creek. We walked along the shores or banks and counted all the salmon we saw. Only one live salmon was seen; it was covered with sores and would certainly die soon. Along the banks or in the water we counted 72 dead salmon; of these, 31 were

males, 36 females, and 5 too rotten to determine the sex. Five females which we examined measured 28, 32, 37, 39, and 44 inches, respectively, in total length. One male measured 53 inches long. All of these fish were much decayed, and we noticed that, as a rule, the males were more decayed than the females. The indications are that the spawning in this part of Salmon River is completed, and most of the salmon dead or gone early in September. The presence of salmon in the river in Stanley Basin as late as September 12, as noted by Mr. Mulky, probably indicates that the spawning takes place later there than it does farther up the river where the waters are colder.

Headwaters of Payette River.—This is also an important spawning region for the chinook salmon, as may be seen from the interviews given below. Mr. W. C. Jennings, who lives at the Meadows, about 10 miles from Big Payette Lake, says:

I have been familiar with Big Payette Lake and the surrounding country for twenty-five years. The salmon (the males of which we always call "dog salmon") come up Payette River into Long Valley about July 4; saw some on that day a few years ago in Gold Fork, about 15 or 20 miles above its mouth. They are most abundant about August 15 to September 15, when they are spawning. They spawn earlier in Gold Fork and a little later in North Fork and Lake Fork, the time for the last two being September 1 to 20. Gold Fork is a colder stream than either of the others, and I am confident the salmon run into it earlier and spawn there earlier because it is colder. I think that 75 per cent of all the salmon that come up Payette River spawn in Gold Fork. These three forks are nearly of the same size, and their mouths are very close together.

I have seen salmon up Gold Fork 10 to 12 miles, and as much as 15 miles up Lake Fork; have seen them in North Fork occasionally at the outlet of Big Payette Lake. These salmon will average 10 pounds or more. There are a good many small ones, weighing 4 to 8 pounds, but these are all males. They spawn on the riffles in Payette River, North Fork, Lake Fork, and Gold Fork, the principal spawning-grounds being in Gold Fork. They very rarely enter Big Payette Lake. I once killed one above the lake and heard of another.

I think all the salmon which come up here die after spawning; have seen thousands dead along the river. I think they come up from the sea, of course. I do not know when the young go down to the sea. A half-breed once told me that in Spokane River the young salmon go down stream in the mush ice in the spring. He says the Indians and French would catch them by the thousands in the mush ice. They would average 1½ inches long and were very good when fried. I do not know whether there is any truth in this or not. The salmon were much more abundant formerly than now.

Mr. Thomas McCall and his son, Dawson McCall, state:

We have lived at the lower end of Big Payette Lake several years; have not paid much attention to the salmon, but know that they come up the river within a mile or so of the lake; have an interest in a seine with which one haul was made about August 1, but only two salmon were caught. The other owners did a good deal of fishing in August and got a good many fish. At one haul they got thirty fish. The two gotten August 1 were females and weighed about 8 pounds each. One shot a few days ago was a male weighing about 8 pounds.

We think we saw one in the lake at the outlet, but it may have been a redfish. This is the only fish seen in the lake which we thought was a salmon. The Indians come in here in the early fall and camp along the river. They get a good many salmon which they cure for winter use.

My examination of Payette River (or North Fork, as the outlet of Big Payette Lake is called) did not result in the discovery of a single live chinook salmon. About 2½ miles below the lake we found one dead female, 28 inches long. A number of deserted wickiups along the stream showed that the Indians had been there recently.

Most of the people of whom we inquired stated that the salmon came somewhat earlier and in larger numbers than usual this year. Evidently the spawning season in this stream occurred much earlier this year than the last of September; not only were no live fish seen, but nearly all the dead ones had disappeared, either by decay or by having been eaten by coyotes or other animals.

Snake River.—The spawning-grounds of chinook salmon in Snake River between Huntington and Auger Falls have been, and perhaps still are, the most important in Idaho. Certain it is that more salmon fishing for commercial purposes is done here than in any of the other streams of the State. Owing to the interesting fact, not hitherto noted by anyone writing upon the salmon, that the spawning takes place in Snake River from six weeks to two months later than in the headwaters of Salmon and Payette rivers, we were able to learn more regarding it from personal observation in Snake River than elsewhere.

Mr. William O'Brien, of Weiser, Idaho, says:

I have been fishing for about sixteen years, off and on, principally for salmon trout, salmon, and sturgeon; also pay some attention to chubs, whitefish, and suckers.

I call these fish chinook salmon. They appear in this part of the river about the middle of August, but, as my fishery is on the Oregon side, I am prohibited by the law of that State from fishing until the 15th of September. We get our best salmon fishing between then and the 15th of October; they are most abundant, however, in latter part of August and early September. Up to the present time (September 21) have caught about 175 salmon. They will average 12 to 25 pounds, or about 15 pounds dressed. Have taken about 25 or 30 young ones this year; never saw any of these small ones until four or five years ago. All that I noticed were males. Some chinooks probably come up during the high water in July. They begin to get ripe about October 1 to 15; then they are not so good. I know of one large spawning-bed at Washoe near Ontario. This bed is of gravel in water 1 to 1½ feet deep. Have seen the old males turn on side and flip the tail as if scooping out the gravel. I think all the salmon that spawn here die after spawning. Have seen weak and dead ones floating down about last of October and early November, and some drifted up on shore. Have caught spent fish, but they were no account, so we threw them away. This, of course, would be late in the season.

While at Mr. O'Brien's fishery, September 21 and 22, the following additional information was gained: The fishery is 4 miles below Weiser and on the Oregon side of the river. Fishing began this year on September 18. The seine is 12 to 14 feet deep, about 350 feet long, and 2¼-inch bar. To operate it requires three men, a horse, and a boat, and the seine is hauled over the same ground each time. Starting at the upper end of the seining-ground, the man in the boat rows straight out from the shore as far as he can, the seine beginning to pay itself out when the boat is 150 to 200 feet from the shore; when he has gone as far out as he can, he rows downstream as fast as possible, the shore end being pulled downstream by the horse at the same time. When the boat is about two-thirds of the distance down to the landing-place it is pulled in toward the shore, and the oarsman, assisted by the third man, takes hold of the rope at the lower end of the seine and pulls it in to the shore, while the other man and the horse manage the other end.

When the area inclosed by the seine became small the fish would begin to dart from one end to the other; seldom would one get away, but most of them would soon become entangled in the seine. Then one of the men would hold a gunny sack into which another man would push the fish, and then they would be carried down to the live-boxes, where they are kept until ready to dress or sell. The place where the seine is hauled out is a long, broad gravel bar between which and the shore is a long, narrow, shallow strip of water. Mr. O'Brien has dammed this both at the lower and upper ends, thus making a pond into which he can put his fish and keep them alive indefinitely. He says he has had as many as 600 or 700 fish in this pond at one time.

He sells his fish (1) to farmers who come to his fishery for them, (2) to men who peddle them over the country, (3) some few to the hotels and others in Weiser, and (4) in the latter part of the season he ships a good many by express to various points, such

as Pocatello, Butte, etc. He lets the farmers have the fish at 25 cents a fish. For those which he ships or sells to the hotels he gets about 4 cents a pound. A few years ago he got 8 to 10 cents a pound. The fish he was getting while we were there were in excellent condition; the flesh was firm and of a good color, the nose of the males was not yet much hooked, the teeth not enlarged, and the body not covered with sores. The females examined were full of roe, but not yet ripe.

Mr. William Kinney fishes some on the Idaho side, about 3 miles below Mr. O'Brien's, but he was not doing any fishing at the time of our visit.

Through the kindness of Mr. O'Brien I have been furnished the figures given in the following table. These figures cover not only the catch of Mr. O'Brien for the season of 1894, but that of seven other fishermen operating between Huntington and the mouth of the Boise River.

Approximate number of chinook salmon and steelheads caught in Snake River between Huntington and Weiser in September and October, 1894.

Name of fisherman.	Location of fishery.	No. of chinook salmon caught.	No. of steelheeds caught.
Cole & Hopper	10 miles above Huntington	400	200
William Kinney & Co.	7 miles below Weiser	250	650
William O'Brien	4 miles below Weiser	*385	*1,516
Purcell & Co.	4 miles above Weiser	600	200
Pickler & Co.	5 miles above Weiser	400	400
Erricson & Co	8 miles above Weiser	200	100
Milton Hopper	10 miles above Weiser	500	300
Mr. Duncan	12 miles above Weiser	200	500
Hall & Reamy	Opposite Ontario	50	100
C. McDowell	At mouth of Boise River	(†)	(†)

*Of the 385 chinook salmon caught by Mr. O'Brien, 250 were males and 135 females; of the 1,516 steelheads, 834 were males and 682 females. Mr. O'Brien estimates that the male chinooks caught by him averaged 38 inches long and 25 pounds in weight; the females 34 inches long and 16 pounds in weight; the male steelheads 30 inches long and 12 pounds in weight, and the females 28 inches long and 12 pounds in weight. Not over 5 or 6 of the female chinooks were ripe.

† No figures obtained.

William Betz and Henry Oleson, of Glenn Ferry, Idaho, state:

We have fished more or less for three years, mostly for sturgeon, but catch some salmon. The salmon appear here about September 15 and are thickest about September 30. We see most dead ones during first half of November. We think most of them die, but some may get back to the sea. The first ones which come up we call "silver salmon," or, when the meat is very red, "salmon belly." Those which come later have hooked noses and are "dog salmon." They spawn on gravel beds in this part of the river, but we never noticed their spawning habits particularly.

Mr. Robert E. Conner, of Lower Salmon Falls, says:

I have lived here near these falls since 1882. For the first four or five years after my coming salmon were abundant; have seen the chute full of salmon; there must have been a thousand in sight at one time. But there has been a great decrease in the last four or five years. They used to come earlier than they do now, as early as August 1, I think. During the last few years I have not noticed them until September. Think they spawn upon all the riffles above the falls; have noticed them in shallow water along the shore. The Indians that come here say the salmon prefer the sandy beds, and that the coarse gravel which the miners have run into the river has caused the salmon to seek other spawning-beds. "Camas Jim" is sure this is the case.

No one has ever carried on salmon fishing here to any extent, but this used to be a famous Indian fishing-ground; they don't come here much now. The run usually begins about September 1 of late years and continues about a month. The salmon that I see here will average 15 to 20 pounds. Used to see many dead ones, but not many now; the coyotes pick them up. I think all the salmon that come here die. I never see any salmon except during the fall, and never saw any little ones.

Mr. E. E. Sherman, who lives 3 miles below Upper Salmon Falls, says:

The first salmon to run in the fall are what we call "silver salmon." They come about September 10 and continue until about October 15; occasionally catch them later, with "dog salmon." Last year I caught perhaps a ton at Mr. Millet's fishery. They would average about 8 pounds; the largest weigh about 15 pounds, and the smallest about 3 pounds. They spawn on the bars in the river, where the dog salmon spawn a little later. I never saw a dead silver salmon. Can tell them from the dog salmon by the difference in color, shape of head, shorter nose, and smaller teeth. I never see them at any time except early in the fall.

The "dog salmon" arrive about September 30, and are most abundant about October 10, but continue until the last of October. They are ripe when they first come. The smallest weigh about 5 pounds, the largest probably 60 pounds, or 49 pounds dressed; they average about 15 pounds. Last year I caught about 6 tons, which I sold at 3 cents a pound to people who would come to the fishery for the fish, then peddle them out, chiefly at Oakley, Goose Creek, Raft River, etc., getting 6 to 8 cents a pound.

The dog salmon spawn on coarse gravel bars. There is a good-sized spawning-ground at Millet's Island, and a large one about 8 miles above Millet's at Lewis's Ferry. They get sore late in the fall, especially the males. Have seen a good many dead dog salmon, and have seen them fighting a good deal.

It is scarcely necessary to state that the names "dog salmon," "silver salmon," "silversides," "salmon belly," "chinook salmon," and "quinnat salmon," as used in Idaho, all refer to the single species *Oncorhynchus tschawytscha*. The individuals which arrive earliest in the season are in the best condition and are known as silver salmon, silversides, or salmon bellies, while the distorted, disfigured, and dying individuals seen late in the season are generally known as dog salmon. "Chinook" and "quinnat" are not often heard among the Snake River fishermen.

Since my return home from Idaho Mr. Sherman has kindly sent me the following information regarding his fishing during the season of 1894:

From October 1 to October 15 I fished about 2½ miles above Upper Salmon Falls. I did not keep any record of my catch, but it amounted to about 3,200 pounds. The fish were not numerous, but were about as thick when I quit as at any time. About one-third of those caught were females and about half were ripe. They would average about 10 pounds each. Our seining-ground here was on a spawning-bed, and there are still other spawning-beds above the upper falls. Thinking I might do better I went to Glenn Ferry, and from October 20 to 26, inclusive, I fished at a point about 2 miles below the ferry. I caught about 5 tons of salmon, but they were in bad condition and I saved only about 1 ton. The run at that place was said to have been about October 10. The fish that I got were all spent fish and about a third of them were females.

Charles Harvey, Duret, Idaho, gives the following:

I am mining just below Lower Salmon Falls; have been here only one year. Caught a few salmon for my own use last year. Dog salmon came up last year about the last of September. Two weeks ago (about September 2) there were a great many salmon here at the falls. Most of the fish which get over the falls do so near the left shore and the left one of the two middle chutes. On Monday, September 17, caught a 20-pound female "silver salmon" with a grab hook at the chute. It was in excellent condition; the eggs were not yet ripe and the flesh was firm and of fine flavor.

Mr. George W. Bell, also living at Duret, says:

I have lived here near Lower Salmon Falls since 1889; have paid some attention to the salmon. Think they formerly came up earlier than they do now—as early as last of July. They used to be more abundant than now. Indians used to get a good many. There is only one run, lasting about a month. Camas Jim, an Indian who fishes a good deal, says there are not many fish this year.

Mr. Liberty Millet, Salmon Falls, Idaho, gave us the following information:

Have lived here on this island below Upper Salmon Falls for ten years, and have fished for eight years. Salmon were formerly much more abundant than now. They usually appear about September 1, but I have caught some in August. The early ones we call "silversides." The ones we call "chinooks" do not come until later, say about September 15 to October 1, and continue until the last of October.

The first, i. e., the "silversides," are not ripe. The males will average 15 to 20 pounds, the females about 10 pounds. The "chinooks" will average, leaving out the small males, about 15 pounds. The largest will weigh 40 pounds. The smallest ones are always little males weighing about 3 pounds, and they are nearly all ripe. Do not think I ever saw a female weighing under 8 pounds.

The height of the spawning season is about the middle of October. They spawn on rather coarse gravel with some sand in it, in 1 to 12 feet of water. The principal spawning-ground here is at the head of the island. The area covered is about 1,000 feet up and down the river and about 600 feet in width. On the other side of the bar is another small spawning-bed. When the spawning time arrives the salmon throw the gravel about a good deal; they throw it up into ridges crosswise with the stream, like windrows of hay. The tops of the ridges are sometimes so near the surface of the water that a boat drags in passing over them, while between the ridges the water may be 4 or 5 feet deep. Both the male and the female probably work the gravel about; they appear to turn more or less on their sides and work the gravel up with their fins. I think they cover the eggs pretty deep, for the small trout, whitefish, chubs, and other small fish that eat salmon spawn are there in great numbers. Small trout which we often catch in our seine are so gorged with salmon eggs that the eggs fall out of their mouths in great numbers when we hold them by the tail. The children bait their hooks with salmon spawn and catch great numbers of what we call young trout [they are not trout, but the Columbia River chub, *Mylocheilus caurinus*], which bite very quickly, and when they take them off the hook they find their stomachs full of salmon eggs.

I do not know when the eggs hatch. Have seen myriads of very little fish, 1 to 1½ inches long, in the shallow water in the spring, but I do not know whether they are salmon fry or not. I think the young salmon must start down stream soon after hatching. I never noticed any, or many, of these little fry after high water in May and June.

I do my fishing from about October 1 to October 25. Last year (1893) I leased my fishery to Mr. E. E. Sherman. In 1892 my season's catch amounted to between 7 and 8 tons, dressed. This included a few salmon trout. Most of the early catch are males, but later there are a good many females. We sometimes fish for a week or ten days without getting a single female.

My seine is 300 feet long, 10 feet deep in the wings, and 14 feet deep in the center; the mesh is 4 inches, or 2-inch bar. I haul the seine in 10 to 15 feet of water and right over the spawning-ground. Have caught as many as 200 at a single haul. I sell my fish principally here on the ground to farmers and others who come for them. They get them for their own use or to peddle over the country, chiefly down in the Raft River and Goose Creek country. I get 3 cents a pound, dressed.

A good many salmon die late in the fall, but I do not think all die. Have sometimes seen old males with scars healed up. I have always thought these were fish which had spawned at least once before, but it may be the wounds were received in some other way.

Dr. Scovell and I spent the week from October 1 to 7, inclusive, at Mr. Millet's, which afforded us good opportunities for observing the salmon at that place. Although the fish had not yet come in numbers sufficient to justify operating the seine, Mr. Millet and his brother-in-law, Mr. Joseph P. McMeekin, at our request, made several hauls each day during our stay. This enabled us to see the method upon which their fishery is conducted, as well as to note the abundance and condition of the salmon.

As already stated, Mr. Millet lives upon a large island in Snake River, below Upper Salmon Falls. Immediately above the island is a considerable rapid. Only a small portion of the river flows to the right of the island. The width of that portion flowing to the left of the island is 428 feet, measured at the lower end of Mr. Millet's hauling ground. At this place there is a gravel bar or island, 44 feet wide, separated from the main island by a shallow channel 59 feet wide. This leaves only 325 feet as the distance across the main channel between the small gravel bar and the left bank of the river. The depth in this portion of the river was found to be 14 to 20 feet near the left bank and less and less toward the gravel bar. The bottom temperature at 9 a.m. October 6 was 52°.

The seining is carried on about as follows: From a point about 300 yards above the gravel bar, and as near the rapids as the current will permit, the boat is rowed rapidly across the stream until most of the seine is paid out. Then, at a distance of

about 300 to 350 feet from the shore, the boat is headed downstream, while the man at the other end of the seine walks down the shore rapidly enough to keep approximately even with the boat, being careful at the same time not to let out so much rope as to allow the seine to get so far from the shore as to permit any salmon to run around at his end of the seine. At the upper end of the gravel bar the narrow channel separating it from the main island is quite shallow, permitting him to wade across to the bar. By the time he has reached the upper end of the bar the boat is at the lower end, both ends of the seine are now brought up to the land, and pulling in begins. This requires only a few minutes. The salmon caught are thrown out upon the bar and knocked on the head so as to keep them from floundering back into the water, the seine is loaded into the boat, and everything is ready for another haul.

The upper ground hauled over comprises a considerable portion of the principal spawning-bed. The depth of water there is 3 to 10 feet, while lower down the depth is as much as 15 feet. In the upper part the bottom is of coarse gravel, while below it is of finer gravel, with some sand.

In the following table are given important data regarding the catch of salmon at this place during the fishing season of 1894:

Table showing catch of chinook salmon at Liberty Millet's Fishery on Snake River, at Upper Salmon Falls, Idaho, September 29 to November 1, 1894.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Sept. 29	*a* 1	.....	.....	.....	.....	.....	
Oct. 1	*b* 6	.....	.....	.....	.....	.....	
Oct. 2	1	34	.....	Nearly ripe	.....	.....	
.....		32	.....	Not ripe	.....	.....	
.....	2	23	.....	Ripe	38	20	Not ripe.
.....		29	.....	....do	.....	.....	
.....		23	.....	....do	.....	.....	
.....	*c* 3	.....	.....	.....	.....	.....	
.....	4	44	30½	Nearly ripe	.....	.....	
.....		35	14¾	Not ripe	.....	.....	
.....		30	10¾	....do	.....	.....	
.....		31	11¾	Ripe	.....	.....	
.....		31	11	....do	.....	.....	
.....	5	32	11¾	Not ripe	.....	.....	
.....		25 }	12¼	{Ripe	.....	.....	
.....		29 }		{Not ripe	.....	.....	
.....		37	19	....do	.....	.....	
.....		43	30¼	....do	.....	.....	
.....	6	28	8½	....do	.....	.....	
.....		31	11¼	Ripe	.....	.....	
.....	7	21	4	Not ripe	.....	.....	
Oct. 3	1	40	20¼	....do	.....	.....	
	2	21	4	Nearly ripe	.....	.....	
	3	21	4	....do	.....	.....	
	4	21	4	Ripe	.....	.....	
Oct. 4	1	21	3¼	Nearly ripe	.....	.....	
.....		30	8	....do	.....	.....	
	2	22	3½	....do	.....	.....	
	3	43	29	Not ripe	.....	.....	
.....		32	11¾	Ripe	.....	.....	
.....		33½	11¾	....do	.....	.....	
.....		32	11	Not ripe	.....	.....	
.....		30	9¼	Ripe	.....	.....	
.....	4	41	27¾	Not ripe	.....	.....	
.....		30	9	Nearly ripe	.....	.....	
.....		27	7	Partly ripe	.....	.....	
Oct. 5 A. M.	1	28	9½	Not ripe	.....	.....	
	....	32	12⅝	Ripe	.....	.....	
	....	23	5	....do	.....	.....	
	....	30	9½	....do	.....	.....	
	....	32½	13¼	....do	.....	.....	
	c 2	.....	.....	.....	.....	.....	
	3	31½	10½	Ripe	32½	14¾	Ripe.
	4	40	23½	Not ripe	.....	.....	

a One nearly ripe female caught but not measured nor weighed.
b These were not weighed; four of them measured 30, 30½, 21, and 19 inches, respectively.
c Caught nothing.

Table showing catch of chinook salmon at Millet's Fishery—Continued.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Oct. 5 P. M.	5	30	10½	Not ripe			
	....	35	17½	....do			
	....	28	9¾	....do			
	....	20½	4	Ripe			
	6	21½	4	Nearly ripe			
	....	20	6½	Ripe			
	....	26	6¾	Not ripe			
	....	28	7¼	Ripe			
	....	31	13¼	Nearly ripe			
Oct. 6 P. M.	1	32½	14	Ripe			
	...	30	9½	....do			
	....	30½	10	Not ripe			
	....	22	4	Ripe			
	....	22	3½	....do			
	....	20½	3¾	....do			
	2	29½	10	Nearly ripe			
	....	28	9	....do			
	2	28½	9	Nearly ripe			
	....	30	12½	Ripe			
	....	23	4½	Scarcely ripe			
	....	21	4	....do			
Oct. 10 *a*	*b* 1	39	.....	Ripe	20	.....	Spent.
	.....	33	.....	....do	20	.....	Do.
	.....	30	.....	....do			
	.....	27½	.....	....do			
	c 2	33½	.....	....do	21	.....	Ripe.
	.....	22	.....	....do			
	.....	21	.....	....do			
	d 3	39½	.....	....do	29	.....	Not ripe.
	.....	30	.....	....do			
	.....	43	.....	....do			
	.....	42½	.....	....do			
	.....	41	.....	....do			
	.....	43	.....	....do			
	.....	33	.....	....do			
	.....	34	.....	....do			
	.....	32	.....	....do			
	.....	31	.....	....do			
	e 4	31½	.....	....do	29	.....	Spent.
	.....	.....	.....	.....	26	.....	Ripe.
	f 5	22	.....	Ripe	20	.....	Do.
	.....	26	.....	....do			
Oct. 11	1	21	3	....do			
	.....	24	6	....do			
	.....	23	3½	....do			
	.....	32	13	....do			
	.....	22	3½	....do			
	.....	31	11	....do	34	12	Spent.
	2	31	11	....do			
	.....	20	3½	....do			
	.....	21	4	....do			
	3	23	6½	....do			
	.....	27	14	....do			
	.....	22	5½	....do			
	.....	33	14½	....do			
	.....	33	16	....do			
	.....	38	22	....do			
	4	33	14	....do	32	12	Spent.
	.....	28	10½	....do	29	10	Ripe.
	.....	29	13	....do			
	.....	26	10	....do			
	.....	22	3	....do			
	.....	25	3½	....do			
	.....	21	2½	....do			
	.....	19	2	....do			
	5	39	26	....do			
	.....	37	24½	....do			
	.....	32	22	....do			
	.....	21	4	....do			
	.....	30	7	....do			
Oct. 12	1	31	10	....do	36	15	Ripe.
	.....	21	4	....do	35	13	Do.
	.....	23	4½	....do			
	.....	28	10½	....do			
	.....	23	4	....do			
	.....	40	24	....do			

a No fishing done from October 7 until October 10.
b Total catch, 6; total weight, 73¼ pounds.
c Total catch, 4; total weight, 87 pounds.
d Total catch, 11; total weight, 197⅛ pounds.
e Total catch, 3; total weight, 23½ pounds.
f Total catch, 3; total weight, 48¼ pounds.

Table showing catch of chinook salmon at Millet's Fishery—Continued.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Oct. 12	2	28	8	Ripe	30	14	Ripe.
.....		32	12	do			
.....		36	14	do			
.....		18	2½	do			
.....		26	6	do			
.....	3	32	14	do			
.....		28	10	do			
.....		34	15	do			
.....		26	10	do			
.....		26	9	do			
.....		27	10	do			
Oct. 13	1	40	25	do	37	16	Spent.
.....		28	8½	do			
.....		32	12½	do			
.....		34	12	do	30	10	Ripe.
.....		28	8½	do	30	12	Do.
.....		23	8	do	31	9½	Do.
.....		20	3	do			
.....		21	3½	do			
.....	2	20	5	do			
.....		31	13	do			
.....		20	4½	do			
.....		40	29	do			
.....		21	7	do			
.....		23	10	do			
.....		40	26½	do			
.....		38	25	do			
.....		20	4	do			
.....		21	10	do			
.....	3	34	18	do			
.....		29	16	do			
.....		42	24	do			
.....		25	6	do			
.....		19	3	do			
.....		22	3½	do			
.....		29	13½	do	37	18	Ripe.
.....		30	12½	do	36	15	Do.
Oct. 14	1	32	10½	do	22	7	Do.
.....		30	11	do	21	12	Not ripe.
.....		31	13	do			
.....		28	9	do			
.....		24	6	do			
.....	2	39	26	do	35	18	Ripe.
.....		30	14	do	28	13	Do.
.....		28	12	do			
.....		30	13	do			
.....		31	14	do			
.....	3	42	31	do			
.....		37	24	do			
.....		20	4½	do			
.....	4	42	29	do	38	21	Ripe.
.....		30	10	do	32	17	Do.
.....		41	25	do			
.....		34	15	do			
.....		40	28½	do			
.....		29	9	do			
.....		20	5	do			
.....		29	9½	do			
.....	5	30	12½	do			
.....		30	12	do			
.....		19	2½	do			
.....		40	25	do			
.....		42	32	do			
.....		38	21	do			
.....		34	12	do			
.....		20	3	do			
.....		22	3½	do			
.....		20	3	do			
.....	6	39	23	do			
.....		32	21	do			
.....		41	31	do			
.....		39	23	do			
.....		38	24	do			
.....		32	22	do			
.....		34	23½	do			
.....		30	12	do			
.....		29	8½	do			
.....		29	9	do			
.....		28	10	do			
.....		22	7	do			
.....		20	6½	do			
.....		20	5	do			

Table showing catch of chinook salmon at Millet's Fishery—Continued.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Oct. 14	7	36	13	Ripe			
.....		31	10	....do			
.....		38	15	....do			
.....		28	10	....do			
Oct. 15	1	38	20	....do	36	16	Ripe.
.....		30	11	....do			
.....		23	8	....do			
	2	34	17	No record			
.....		30	15	....do			
.....		24	10	....do			
.....		27	10	....do			
.....		20	5	....do			
.....		34	15	....do			
.....		20	4	Ripe	34	13	Ripe.
.....		20	5	....do			
.....		18	3	....do			
.....		15	2⅛	....do			
	3	40	25	....do	30	12	Ripe.
.....		30	12	....do			
.....		32	14	....do			
.....		36	19	....do			
.....		37	20	....do			
	3	24	8	....do			
.....		28	10	....do			
	4	33	13½	....do	32	17	Not ripe.
.....		30	12	....do	32	12	Spent.
.....		42	35	....do			
.....		32	14	....do			
.....		30	13	....do			
.....		18	3½	....do			
Oct. 16	1	30	11	....do	36	14	Ripe.
.....		41	25	....do	26	7	Spent.
.....		43	29	....do			
.....		26	9½	....do	36	15	Ripe.
.....		28	10	....do	32	7	Spent.
.....		31	12	....do			
.....		27	9½	....do			
.....		32	14	....do			
.....		30	14	....do			
.....		26	10½	....do			
.....		22	7	....do			
.....		22	7½	....do			
.....		39	23½	....do			
.....		40	26	....do			
	2	42	34	....do	33	15	Ripe.
.....		30	12½	....do	35	16	Do.
.....		32	15	....do	35	14	Do.
.....		32	15½	....do	34	17	Do.
.....		41	32½	....do	36	13	Spent.
.....		34	18	....do	33	14	Ripe.
.....		32	15	....do	30	8	Spent.
.....		21	7½	....do			
.....		42	27	....do			
.....		32	14	....do			
.....		33	16	....do			
.....		32	14½	....do			
.....		30	11	....do			
.....		41	27	....do			
.....		36	10	....do			
.....		41	26½	....do			
	3	31	13	....do	30	10	Spent.
.....		21	7½	....do	33	17	Not ripe.
.....		26	9½	....do	30	11	Spent.
.....		24	6½	....do			
.....		26	10	....do			
Oct. 17	1	30	11½	....do			
.....		39	23	....do			
.....		43	26½	....do			
.....		39	23	....do			
.....		30	12	....do			
.....		28	10½	....do			
.....		30	12	....do			
.....		28	11	....do			
.....		32	15	....do			
.....		31	14	....do			
.....		32	14½	....do			
	2	44	30	....do	38	28	Not ripe.
.....		42	29	....do	32	14	Spent.
.....		43	29	....do	31	10	Do.

Table showing catch of chinook salmon at Millet's Fishery—Continued.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Oct. 17	2	40	26½	Ripe			
.....		29	10¾	....do			
.....		30	12	....do			
.....		29	9½	....do			
.....		22	6	....do			
.....		30	10	....do			
.....		24	5	....do			
.....		21	5	....do			
.....		22	6½	....do			
	3	38	25	....do	36	20	Not ripe.
.....		45	32	....do	35	16	Ripe.
.....		36	20	....do			
.....		24	8½	....do			
.....		26	9	....do			
.....		22	4¾	....do			
Oct. 18	1	42	28	....do	38	15¾	Ripe.
.....		31	12	....do	30	10	Spent.
.....		34	16	....do	39	17	Ripe.
.....		20	4	....do	31	15	Do.
.....		20	4½	....do	29	9½	Spent.
.....		41	25	....do	38	17½	Ripe.
.....		27	9½	....do	38	17	Not ripe.
.....		40	26	....do	40	19	Do.
.....		28	10¾	....do			
.....		26	10	....do			
.....		26	8¾	....do			
.....		30	12	....do			
.....		30	12	....do			
.....		28	19	....do			
.....		38	20½	....do			
.....		27	9	....do			
.....		42	28	....do			
.....		40	26½	....do			
.....		40	24	....do			
.....		38	25	....do			
.....		38	25	....do			
.....		36	20	....do			
.....		34	18¾	....do			
.....		37	19	....do			
.....		28	10	....do			
.....		29	9½	....do			
.....		26	7	....do			
.....		18	3	....do			
Oct. 19	1	30	11	....do	36	18	Spent.
.....		31	12½	....do	34	15½	Ripe.
.....		30	12	....do	30	11	Do.
.....		38	19½	....do			
.....		30	14	....do			
.....		42	28	....do			
.....		40	26	....do			
.....		40	24½	....do			
	2	32	15¾	....do	36	13	Spent.
.....		40	33	....do	34	14	Do.
.....		24	4½	....do	38	14	Do.
.....		20	4	....do	39	17	Do.
.....		40	32½	....do	34	17	Not ripe.
.....		31	8¾	....do	30	10	Ripe.
.....		24	6	....do	36	23	Do.
.....		41	24½	....do	32	14	Do.
.....		24	8	....do	34	16	Do.
.....		40	26	....do			
.....		31	12	....do			
.....		30	11½	....do			
.....		31	12	....do			
.....		30	11¾	....do			
.....		31	14	....do			
.....		22	7	....do			
.....		38	10	....do			
.....		36	20	....do			
.....		30	11	....do			
.....		36	18½	....do			
.....		28	10	....do			
.....		28	9¾	....do			
.....		40	29	....do			
.....		39	24	....do			
.....		27	10½	....do			
.....		32	15	....do			
.....		34	16	....do			
.....		26	8½	....do			
.....		28	9	....do			
.....		42	27	....do			
.....		36	20½	....do			

Table showing catch of chinook salmon at Millet's Fishery—Continued.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Oct. 19	2	38	24	Ripe			
		40	26	do			
		28	10	do			
		25	7	do			
		25	6½	do			
		30	15	do			
		44	28	do			
		20	3	do			
		25	7	do			
		33	20	do			
		31	16	do			
		28	9½	do			
		24	6½	do			
		28	10½	do			
		29	10¾	do			
		35	22	do			
		20	4	do			
Oct. 20	1	40	20½	do	28	11	Ripe.
		35	16½	do	38	18	Spent.
		37	16	do	35	16½	Ripe.
		26	10	do	29	11½	Do.
		25	8	do	30	11	Spent.
		27	10	do	35	15	Ripe.
		28	11¾	do			
		22	5	do			
		25	7	do			
		42	25	do			
		38	23	do			
		27	20	do			
		27	20	do			
		41	24	do			
		26	9½	Spent			
		42	25	Ripe			
		26	7½	Spent			
		39	17	Ripe			
		41	26	do			
		40	24½	do			
		20	3½	do			
		21	4½	do			
		34	14	do			
		26	6	do			
		25	8	do			
		28	11	do			
		22	7	do			
		30	12¾	do			
		40	25	do			
		20	3	do			
	2	43	26	do	36	18	Ripe.
		40	23	do	34	16	Spent.
		44	30	do	34	17	Ripe.
		29	12	do	30	10¾	Do.
		33	10¾	do	38	20	Do.
		30	9	do	40	23	Do.
		20	4	do	33	15	Spent.
		28	9½	do	30	11	Do.
		42	24	do			
		43	29	do			
		28	9½	do			
		34	16	do			
		40	29	do			
		40	28	do			
		28	10	do			
		30	14	do			
		20	3	do			
		20	3	do			
		26	9	do			
		41	23½	do			
		30	15	do			
		22	6	do			
		28	8½	do			
		40	22	do			
		40	24	do			
		40	22	do			
		36	18½	do			
		22	5	do			
		31	14	do			
		25	9	do			
		26	9	do			
		44	30	do			
		25	10	do			
		32	11½	do			
		20	3	do			

Table showing catch of chinook salmon at Millet's Fishery—Continued.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Oct. 20	2	31	11	Ripe			
	.....	36	20	....do			
Oct. 22	.....	40	24	....do	35	16	Ripe.
	.....	30	12½	....do	36	17	Spent.
	.....	28	10	....do	40	24	Ripe.
	.....	26	9	....do	32	13½	Spent.
	.....	46	39	....do	36	17	Do.
	.....	44	26	....do	35	14	Do.
	.....	41	25	....do	35	15½	Do.
	.....	43	27	....do			
	.....	30	11¾	....do			
	.....	25	8	....do			
	.....	42	27	....do			
	.....	38	19	....do			
	.....	40	29	....do			
	.....	25	7	....do			
	.....	40	23½	....do			
	.....	26	9¾	....do			
	.....	40	23	....do			
	.....	40	23	....do			
	.....	26	8	....do			
	.....	26	9	....do			
	.....	25	7	....do			
	.....	25	7½	....do			
	.....	30	12	....do			
	.....	24	6¾	....do			
	.....	30	11½	....do			
	.....	29	10¾	....do			
	.....	25	9½	....do			
	.....	24	7	....do			
	.....	30	10	....do			
	.....	25	8	....do			
	.....	30	10½	....do			
	.....	36	18	....do			
	.....	29	12	....do			
	.....	26	8	....do			
	.....	41	22¾	....do			
	.....	25	9	....do			
	.....	26	9	....do			
	1	26	10	....do			
	.....	42	26	....do			
	.....	25	9	....do			
	.....	41	25	....do			
	.....	36	19	....do			
	.....	22	6	....do			
	.....	24	4	....do			
	.....	41	22½	....do			
	.....	32	12½	....do			
	.....	28	10	....do			
	.....	24	8½	....do			
	.....	33	14	....do			
	.....	25	10	....do			
	.....	40	20¾	....do			
	.....	44	27¾	....do			
	.....	41	23½	....do			
	2	30	12	....do			
	.....	37	18½	....do			
	.....	43	27	....do			
	.....	26	9	....do			
	.....	24	8	....do			
	.....	21	5	....do			
	.....	23	7	....do			
	.....	22	7	....do			
	.....	22	7½	....do			
Oct. 23	1	41	23¾	....do	37	22	Ripe.
	.....	43	26	....do	29	10	Spent.
	.....	33	13	....do	33	16	Do.
	.....	37	18½	....do	26	9	Do.
	.....	40	20	....do	40	20	Ripe.
	.....	20	4	....do			
	.....	24	8	....do			
	.....	41	24	....do			
	.....	42	22	....do			
	.....	26	18	....do			
	.....	26	10	....do			
	.....	41	24	....do			
	.....	26	10½	....do			
	.....	33	16	....do			
	.....	41	25	....do			
	.....	27	18	....do			
	.....	40	22	....do	32	14	Spent.
	.....	24	8	....do	28	10	Do.
	.....	34	16¾	....do	30	14	Do.

Table showing catch of chinook salmon at Millet's Fishery—Continued.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Oct. 23	1	22	4¾	Ripe	28	12½	Ripe.
.....		20	3	....do	39	23	Do.
.....		21	7	....do	30	12	Spent.
.....		20	3½	....do	38	16	Ripe.
.....		40	25	....do	37	15½	Do.
.....		23	4¾	....do	32	12½	Do.
.....		26	9½	....do	.....	.....	
.....		42	25	....do	.....	.....	
.....		18	3	....do	.....	.....	
.....		19	5	....do	.....	.....	
.....		40	26	....do	.....	.....	
.....		45	32	....do	.....	.....	
.....		41	26	....do	.....	.....	
.....		25	8½	....do	.....	.....	
.....		43	27	....do	.....	.....	
.....		40	24½	....do	.....	.....	
.....		24	8	....do	.....	.....	
.....		25	8½	....do	.....	.....	
.....		22	7	....do	.....	.....	
.....		40	23	....do	.....	.....	
.....		25	6	....do	.....	.....	
.....		34	18	....do	.....	.....	
.....		26	8½	....do	.....	.....	
.....		26	9	....do	.....	.....	
.....		32	14½	....do	.....	.....	
.....		39	22	....do	.....	.....	
.....		35	23	....do	.....	.....	
.....		31	12½	....do	.....	.....	
.....		25	8¼	....do	.....	.....	
.....		24	7	....do	.....	.....	
.....		30	12	....do	.....	.....	
.....		32	14	....do	.....	.....	
.....		38	20	....do	.....	.....	
.....		38	18¾	....do	.....	.....	
.....		25	7	....do	.....	.....	
.....		34	7	....do	.....	.....	
.....	2	26	8½	....do	29	10½	Spent.
.....		25	10	....do	28	9	Do.
.....		32	15	....do	37	14	Do.
.....		20	6	....do	38	18	Ripe.
.....		33	16	....do	29	10½	Do.
.....		30	10	....do	28	9	Spent.
.....		44	30	....do	30	18½	Ripe.
.....	3	36	19½	....do	34	18	Do.
.....		29	9	....do	26	10	Do.
.....		29	9	....do	35	18	Do.
.....		37	21	....do	33	16	Do.
.....		18	3	....do	36	15	Spent.
.....		15	2½	....do	30	12	Do.
.....		19	3½	....do	37	15½	Do.
.....		20	5	....do	30	12¾	Do.
.....		22	6½	....do	40	23	Ripe.
.....		40	23	....do	35	18½	Do.
.....		29	10	....do	32	15	Spent.
.....		30	11	....do	.....	.....	
.....	4	32	14	No record	.....	.....	
.....		31	14½	....do	.....	.....	
.....		41	23½	....do	.....	.....	
.....		36	24	....do	.....	.....	
.....		26	20	....do	.....	.....	
.....		26	20½	....do	.....	.....	
.....		24	7½	Ripe	34	18	Ripe.
.....		41	25½	....do	26	10½	Do.
.....		44	30	....do	35	22	Do.
.....		33	19	....do	33	17	Do.
.....		33	17	....do	38	23	Do.
.....		18	2½	....do	34	16½	Do.
.....		42	27	....do	.....	.....	
.....		44	28½	....do	.....	.....	
.....		26	10¾	....do	.....	.....	
.....		42	28	....do	.....	.....	
.....		25	8¾	....do	.....	.....	
.....		40	26	....do	.....	.....	
.....		26	9	....do	.....	.....	
Oct. 24	1	39	23	....do	31	12	Ripe
.....		22	7½	....do	.....	.....	
.....		24	8	....do	.....	.....	
.....		21	6¾	....do	.....	.....	
.....		30	12	....do	.....	.....	
.....		30	12½	....do	.....	.....	
.....		20	7	....do	.....	.....	

Table showing catch of chinook salmon at Millet's Fishery—Continued.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Oct. 24	1	38	23	Ripe			
.....		28	10	....do			
.....		24	6½	....do			
.....		26	10	....do			
.....		25	8	....do			
.....		24	6	....do			
.....		22	7	....do			
Oct. 25	1	18	3	....do	25	7	Ripe.
.....		37	20	....do	36	14	Spent.
.....		26	9	....do	30	11½	Do.
.....		31	13½	....do	39	18	Ripe.
.....		46	34	....do	39	19	Do.
.....		30	13	....do			
.....		19	4½	....do			
.....		17	3	....do			
.....		32	14	....do			
.....		31	14	....do			
.....		42	29	....do			
.....		26	9	....do			
.....		42	26	....do			
.....		18	3	....do	38	19	Spent.
.....		23	8	....do	34	12½	Do.
.....		19	4½	....do	39	19	Ripe.
.....		34	18	....do	40	22½	Do.
.....		34	17¾	....do	35	17	Do.
.....		28	10	....do	35	17¾	Do.
.....		27	10	....do			
.....		29	10	....do			
.....		30	11¾	....do			
.....		40	26	....do			
.....		43	27	....do			
.....		35	17	....do			
.....		36	18½	....do			
Oct. 26	1	38	22	No record			
.....		40	26	....do			
.....		26	10	....do			
.....		27	12	....do			
.....		25	8	....do			
.....		25	9	....do			
.....		22	7	....do			
.....		24	8	....do			
.....		37	20	Ripe	30	12	Ripe.
.....		31	10½	....do	30	11½	Do.
.....		26	7¾	....do	32	14	Do.
.....		28	8	....do	32	15	
.....		18	3	....do	30	12½	
.....	2	33	14	....do	38	18	Spent.
.....		29	9¾	....do	34	16	Ripe.
.....		30	12	No record			
.....		18	3	....do			
.....		26	10	....do			
.....		27	7½	....do			
.....		27	8¾	....do			
.....		34	18	....do			
.....		27	8	....do			
.....		32	12	....do			
.....		32	13¾	....do			
.....		28	8½	....do			
.....		26	7¾	....do			
.....		24	6	....do			
.....		27	8	....do			
.....		24	8	....do			
.....		40	23	....do	33	15	Spent.
.....		32	15	....do	34	21	Ripe.
.....		33	16½	....do	32	14¾	Do.
.....		35	17	....do			
.....		30	11	....do			
.....		32	19	....do			
.....		44	27	....do			
.....		24	5	....do			
.....		24	5	....do			
.....		32	14	....do			
.....		24	5½	....do			
.....		25	6½	....do			
Oct. 27	1	28	11	Ripe	30	12	Spent.
.....		26	8	....do	32	13	Do.
.....		38	24	....do	37	23	Ripe.
.....		25	7½	....do	30	12	Do.
.....		30	14	....do			
.....		36	22½	....do			
.....		40	26	....do			
.....		39	22	....do			

Table showing catch of chinook salmon at Millet's Fishery—Continued.

Date.	Haul No.	Males.			Females.		
		Length.	Weight.	Condition.	Length.	Weight.	Condition.
1894.		*Inches.*	*Pounds.*		*Inches.*	*Pounds.*	
Oct. 27	1	28	10½	Ripe	36	19	Ripe.
.....	.....	26	8	....do	32	14	Spent.
.....	.....	25	7	....do	28	9	Do.
.....	.....	31	15½	....do	30	12½	Do.
.....	.....	30	16	....do	34	16	Do.
.....	.....	42	31½	....do	.....	.....	
.....	.....	42	30	....do	.....	.....	
.....	.....	25	7½	....do	.....	.....	
.....	.....	26	7	....do	.....	.....	
.....	.....	24	6	....do	.....	.....	
.....	.....	26	8	....do	.....	.....	
.....	.....	31	16	....do	.....	.....	
.....	.....	28	10	....do	.....	.....	
.....	.....	36	22	....do	.....	.....	
.....	.....	24	6½	....do	.....	.....	
.....	.....	20	4	....do	.....	.....	
.....	.....	25	9	....do	.....	.....	
.....	.....	40	26	....do	.....	.....	
.....	.....	19	2	....do	.....	.....	
.....	.....	39	24	....do	.....	.....	
.....	.....	26	8½	....do	.....	.....	
.....	.....	25	10	....do	.....	.....	
.....	.....	25	8	....do	.....	.....	
.....	.....	24	6	....do	.....	.....	
.....	.....	38	22	....do	.....	.....	
.....	.....	36	21	....do	.....	.....	
.....	.....	38	20	....do	.....	.....	
.....	.....	28	12½	....do	.....	.....	
Oct. 31	.....	42	26	....do	36	15	Spent.
.....	.....	44	29¾	No record	30	10½	Do.
.....	.....	41	26	....do	33	13	Do.
.....	.....	44	28	....do	36	14	Do.
.....	.....	40	26	....do	36	18	Ripe.
.....	.....	24	3½	....do	28	9	Spent.
.....	.....	18	2	....do	32	12	Do.
.....	.....	28	7¾	....do	34	14	Do.
Nov. 1	.....	45	30	Ripe	.....	.....	
.....	.....	38	23	....do	.....	.....	
.....	.....	34	18½	....do	.....	.....	
.....	.....	38	22	....do	.....	.....	

Summary of catch of chinook salmon at Upper Salmon Falls, Snake River, from September 29 to November 1, 1894, inclusive.

Date.	Males.	Females.	Date.	Males.	Females.
Sept. 29	.....	1	Oct. 17	29	5
Oct. 1	6	.....	Oct. 18	28	8
Oct. 2	18	1	Oct. 19	56	12
Oct. 3	4	.....	Oct. 20	67	14
Oct. 4	11	.....	Oct. 22	62	7
Oct. 5	16	1	Oct. 23	93	38
Oct. 6	12	.....	Oct. 24	14	1
Oct. 10	20	7	Oct. 25	26	11
Oct. 11	28	3	Oct. 26	41	10
Oct. 12	17	3	Oct. 27	36	9
Oct. 13	26	6	Oct. 31	8	8
Oct. 14	49	6	Nov. 1	4	.....
Oct. 15	26	5			
Oct. 16	35	14	Total	732	170

Summary of catch of chinook salmon in Snake River between Huntington and Auger Falls, September to November, 1894.

Fishermen.	Place.	Males.	Females.	Total.
Cole & Hopper	10 miles above Huntington			400
William Kinney & Co	7 miles below Weiser			250
William O'Brien	4 miles below Weiser	250	135	385
Purcell & Co	4 miles above Weiser			600
Pickler & Co	5 miles above Weiser			400
Erricson & Co	8 miles above Weiser			200
Milton Hopper	10 miles above Weiser			500
William Duncan	12 miles above Weiser			200
Hall & Reamy	Opposite Ontario			50
Liberty Millet	Near Upper Salmon Falls	732	170	902
E. E. Sherman	do			320
Grand total				4,207

Headwaters of Weiser River.—In order to reach the Payette Lakes we traveled by wagon from Weiser, a distance of about 120 miles, chiefly through the valley of Weiser River and its upper tributaries. This afforded us some opportunity to learn of the occurrence of salmon in that region.

The Little Weiser River flows through Indian Valley, 50 miles north of Weiser, and we were informed that a few "dog salmon" are seen in that stream each fall. They come there to spawn in September. The stage-driver says he saw three or four at the ford above Indian Valley post-office about September 19. People in the vicinity spear them to some extent.

Just above Council Valley we examined Weiser River for about a mile of its course (September 25), but saw no fish. Persons living in the neighborhood told us that they caught four salmon about September 2, and saw a good many others. Those caught weighed 9 pounds or less each and were not ripe. They are said to be more common this year than usual; none were seen last year. One man says there were ten times as many this year as in any recent year, but there are scarcely any now compared with ten years ago. They go 5 to 8 miles above Council Valley to spawn. Most of the men with whom we talked think that late in September is the spawning time, but our observation indicated that it is somewhat earlier.

Mr. Oscar Ferguson, of Council Valley, says:

> The fish here now are all regular salmon, though some call the earlier ones "salmon trout" and the late ones "dog salmon." The regular salmon trout come in the spring. The salmon are spawning now; saw them 2 miles above the stage station at Seavey's ten days ago; saw twenty-five or thirty and killed three fine ones, each 2 to 3 feet long. Found a recently dead female a few days ago above Seavey's. She was full of eggs and had not begun spawning.

The stage-driver says he saw three or four salmon at the ford of Weiser River below Price Meadow about September 15.

It seems probable that a good many salmon still spawn in this river. The upper portion of Weiser River and its tributaries appear to have excellent water and all suitable conditions for salmon spawning-grounds.

THE REDFISH OR BLUEBACK SALMON.

Headwaters of Salmon River.—The redfish or blueback salmon (*Oncorhynchus nerka*) is the most important of all the salmon of Alaska, where it is known as the red salmon. In the Lower Columbia, where it is known as the blueback salmon, it is exceeded in importance only by the chinook salmon, the catch of bluebacks in the Columbia River in 1892 amounting to 873,106 fish, or 4,365,530 pounds. That this species spawns in large numbers in the Columbia basin is certain, but we know very little regarding its spawning habits or the location of its spawning-grounds. Dr. Bean has studied it in Alaska, but not until now has any naturalist studied it at any of its spawning-grounds in the Columbia basin.

So far as is yet known, the lake region at the headwaters of Salmon River contains some of the most important spawning-grounds of this species. I observed it at Alturas and Pettit lakes, and it is known to occur in Redfish Lake, Stanley Lake, and perhaps in one or two other small lakes of this group. They are also known from the headwaters of Payette River (Big Payette Lake), from Wallowa Lake in Oregon, and from Okanagan Lake in Washington.

Redfish at Alturas Lake.—Mr. F. C. Parks gives the following information:

The redfish appear at Alturas Lake usually about August 1, and reach the inlet of the lake about August 5, when some are nearly ready to spawn; others are tight and the flesh firm and without sores. They are then more wild and active than later. There are two distinct sizes, those of one size weighing 3 or 4 pounds, while those of the other size are very much smaller, weighing less than half a pound each. The small and large ones nearly always school separately. Have seen no big ones for three years until this year. Four years and more ago the large ones were common. About 1881 a prospector took 2,600 pounds fresh from Alturas Lake to Atlanta and Rocky Bar, where he sold them to the miners. Formerly many were salted and barreled. At one time there was talk of starting a cannery here or at Redfish Lake, but the passage of a law prohibiting traps stopped the matter.

Most of the fish seem to be males. We get them when they first come in, with grab hooks and spears. They spawn only in the inlet; do not believe they ever spawn in the lake. The small ones run up the inlet at least 3 miles, where the water is so shallow that their backs stick out. The large ones spawn in the lower part of the inlet. The spawning habits of the large and small ones are essentially the same. They spawn upon the gravel bars in shallow water. While on the spawning-beds the males fight a good deal; they bite each other upon the back and hold on for quite a while.

The spawning begins early in August and is usually over by the first of September. Finding them still spawning to-day (September 12) was a great surprise to me. When we started out this morning I did not believe we would find any redfish.

I think they come up from the sea each year; have never seen any in the lake in the winter and do not believe any stay there. I have never seen them in or about the lake except from about the last of July to late in September. I think they practically all die after spawning; a few may get back to the sea. The little ones I have always regarded as the same as the big ones, size being the only difference. I never found any food in their stomach, and never knew them to take a hook.

The ones we got to-day (September 12) will average in size with those of former years, both the large ones and the small ones. Have seen some weighing probably 6 pounds. Mr. Ferris, an old fisherman here, says he has caught them weighing 6 pounds.

There is not much variation in their time of arrival. They seem to have come a little later and in greater numbers this year than for several years; the large ones especially were more abundant this year than usual. The greater abundance this year may be due to the unusually high water of last spring, which may affect fish in two ways: (1) By reaching farther out to sea; (2) by enabling fish to get over falls, which prove a barrier in lower water.

Mr. B. S. Brown, of Bliss, Idaho, says:

I was at Alturas Lake about August 15, 1893, and saw 400 or 500 small redfish, but no large ones. They were in the inlet about 2 miles above the lake and were spawning. Have seen these little redfish fight just like dogfish (chinook salmon). The little redfish I have never seen in any of the lakes up there except Alturas Lake. Have seen the large ones in Big Redfish Lake, Stanley Lake, and Pettit Lake. Saw them spawning in Big Redfish Lake about August 18, 1893, and about August 15, in 1887, 1888, and 1889. I was there in each of those years and salted quite a lot of them. Have seen them in Salmon River about 3 miles below Stenton's ranch, and never saw any in Salmon River above the mouth of Alturas Creek. I am sure they come up Salmon River and I believe they all die after spawning. The large ones will average 3 to 4 pounds. There appear to be more males than females.

On September 12 we visited Alturas Lake and examined the inlet for about 3 miles in the lower part of its course. We started at the lake and followed all the windings of the stream, and then returned to the lake, keeping in sight of the creek all the way. By thus examining every foot of the stream we probably saw every redfish in that part of its course. In this distance I counted 114 small redfish and 14 large ones. Twelve of the large ones were on a shallow gravel bar near the mouth of the stream, and the other 2 were about a mile farther up, and on the same riffle with 29 small ones. Other bunches of small ones of 23, 13, 9, 6, and fewer, were seen. These were all on the riffles in shallow water and engaged in spawning. They were invariably in the current with head up stream. We noticed that they scooped up the gravel into piles or ridges, using the nose, pectoral fins, tail, and sometimes the back. These piles of gravel were not large, however, and could not be noticed at a very great distance. Frequently we noticed the fish in pairs, a male and a female, the female being usually a little in advance of the male. We supposed that they were spawning when in such position.

Sometimes there was considerable fighting among the males. They would catch each other by the pectoral fin or by the nose, and hang on quite tenaciously, meantime slowly floating down stream. Then they would release their hold and return to the shallow water, perhaps to renew the fight in a few moments. Immediately below each riffle, sometimes above, was a deep hole into which the fish would go when disturbed. By retiring into the bushes where they could not see us, we usually had to wait only a few minutes when they would again return to the riffle. After having been disturbed once, however, they became more timid and more easily frightened.

I have spoken of "small redfish" and "large redfish." The small redfish is what has been known as Kennerly's salmon (*Oncorhynchus kennerlyi*), and it has by some been regarded as a species distinct from the large redfish (*Oncorhynchus nerka*), while others have regarded it as a landlocked variety of the large redfish. The structural differences upon which the separation has been made do not appear upon an examination of a large number of specimens of each size. At present I am inclined to regard them as being specifically identical, though a fuller knowledge of the migrations of each may justify their specific separation.

In the water, both males and females of the large fish were quite red, the males but little more intense than the females. The small males are of a dirty red on the back, and much brighter red on middle of side; on the back are about thirty small, round black spots, not greatly unlike those on the cut-throat trout. The under parts were a dirty white; dorsal and anal fins, pale or dirty red; other fins smoky. The females were darker and less red; the spots were plainer, and the general resemblance to the cut-throat or black-speckled trout was more marked. By the use of a small seine we caught 29 small ones and 6 large ones.

The sex, weight, and condition of each are given in the following table:

Sex, weight, and condition of redfish caught in the inlet to Alturas Lake, Idaho, September 12, 1894.

Sex.	Weight.	Condition.	Sex.	Weight.	Condition.
	Lbs. oz.			*Lbs. oz.*	
Male	9	Scarcely ripe.	Male	7	Ripe.
Do	7⅛	Ripe.	Do	6½	Do.
Female	7	Do.	Do	5	Partly spent.
Male	8	Do.	Do	6	Do.
Female	7		Do	5	Spent.
Do	5½	Partly spent.	Do	5½	Partly Spent.
Do	5⅛	Do.	Do	5	Spent.
Male	7⅛	Ripe.	Do	5½	Do.
Do	6⅛	Do.	Female	7	Ripe.
Do	6⅛	Do.	Male	Not weighed.	Do.
Do	5⅛	Partly spent.			
Do	6½	Ripe.			
Do	6½	Do.			
Do	8	Do.	Male	3 10½	Ripe.
Female	6⅛	Do.	Do	3 2⅛	Partly spent.
Do	5⅛	Partly spent.	Do	3 5⅛	Do.
Do	4½	Spent.	Do	3 7⅛	Do.
Male	5½	Partly spent.	Female	3 10½	Ripe.
Do	8	Ripe.	Do	2 5	Spent.

Average weight of 28 small redfish, 6⅛ ounces. Average weight of 6 large redfish, 3 pounds 4¼ ounces.

Of the 29 small redfish, only 4 (2 males and 2 females) were without sores or mutilations. The fraying out of the fins seems to begin first with the caudal, then on the front of the dorsal and anal, and later upon front of ventrals, and to some extent upon the front of pectorals. Besides the fraying out of fins, there are sores sometimes upon the body in different places. Whether these mutilations are due to the wear and tear incident to the long journey from the sea (if they really come up from the sea), to the wearing incident to spawning, to their fighting, or to general physiological collapse, is not certainly known. I am inclined to think it is chiefly due to the wear and tear of the journey up from the sea, but am not at all certain that this is the correct explanation.

Besides the 128 redfish which we saw in the stream, we counted 6 dead ones along the creek. We examined the inlet of Pettit Lake, also, but we saw no live fish; on the bank we found one large fish which had been partly devoured by some animal. And this suggests a reasonable explanation of the scarcity of dead fish. If all or nearly all the redfish die soon after spawning, as is generally believed, and as seems probable, more dead fish ought to be seen. But the dead fish are eaten by various animals, as we have observed, and many of them are no doubt eaten or carried away soon after dying.

Headwaters of Payette River.—At the head of the North Fork of Payette River are the small lakes already described. In the inlet of Big Payette Lake, the principal one of the group, important spawning grounds have existed and the evidence given below shows that considerable numbers of redfish still come there.

Concerning the fish of the Payette Lakes, Mr. W. C. Jennings gives the following:

Have lived near Payette Lakes 25 years. Heard of the redfish in these lakes even before I came here. For many years I put up a good many for use. Two fisheries were run here for seven or eight years, between 1870 and 1880, by Hughes & Bodily and Louis Fouchet. They put up great quantities of redfish. Hughes & Bodily put up about 75,000 fish one year. They quit fishing in 1876; no one fished in 1877, but in 1878 Fouchet came back and fished one or two years. Fish were not abundant enough to make it pay, so he quit, and there has been no commercial fishing here for over ten years.

Formerly the redfish were very abundant; the water was literally full of them; there were millions of them. Very few during recent years. They appear about August 10th to 15th each year, and continue to be seen up to the last of October, or until snow comes; have seen them in great numbers late in October. They appear a week or two before they are ready to spawn. They come from the lake

into the inlet and lie in the deep holes until ready to spawn. The height of the spawning season is throughout September. Then they come upon the gravel beds in the shallow water. Their spawning habits are very much the same as those of the dog (chinook) salmon—usually see a male and a female together. The males fight a good deal; bite each other, especially on the back. Have seen them fighting very often. Both male and female scoop out the gravel with their tails.

The principal spawning-beds were in the inlet 2 to 3 miles above the lake; they go up 5 or 6 miles, however. When they were so abundant many used to spawn around the edges of the lake on sandy places where there are springs which make the water colder. This spawning in the lake took place at same time as that in the inlet. I never knew but few to go up as far as the Upper Lake, which is 9 miles above the Big Payette Lake; they rarely go farther than 5 or 6 miles up. I never saw any in the outlet of the lake. Have never seen them in any of the lakes about here except Big Payette Lake. Some say they have seen them in Little Lake, which is about three-fourths of a mile east of Big Payette Lake, but I never saw any there, though I have noticed a few in the outlet (Lake Fork) of that lake.

I do not believe the redfish come up from the sea or return to the sea, but believe they remain right here in this lake and its inlet during the entire year. I have seen them in the lake at all times of the year. They are not red except in the fall; at all other times they look like trout, but the shape of the head is different. They will not bite a hook during the spawning season, but at any other time they take the hook readily; can catch them with hook baited with meat of any kind.

I wish to repeat that I am confident the redfish do not return to the sea. They belong in the lake. The thing that bothers me is this: If they come up from the sea, why is it that, on their way up, a million will come up the North Fork while few or none go up Lake Fork into Little Lake, and not one goes up Gold Fork? All three of these streams come together less than half a mile apart and they are all of about the same size and general character. Gold Fork is probably some colder than either of the others, but, aside from this, the streams are essentially alike. It may be that these redfish do come up from the sea and that, when they come to these three forks, every one of the thousands knows which of the three roads to take in order to reach the spawning-beds in and above Big Payette Lake, *but I don't believe it.*

There are both large and small redfish here; the large ones run 4 to 5 pounds undressed, or about 2½ pounds dressed. In putting them up we always counted 40 fish to the 100 pounds. The males are heavier than the females.

There used to be millions of them here. So thick were they that often, in riding a horse across at the ford, I have been compelled to get off and drive them away before my horse would go across. Thousands of dead ones would be seen along the shores and in the deep holes.

Mr. N. B. Robertson, of Weiser, Idaho, says:

I came down from Big Payette Lake last Friday (September 14); was at the head of the lake on Thursday (13th instant), and looked for redfish, but saw none; examined about a mile of the inlet. People up there say they have seen none this year, and few if any for five years. The last time I saw any there was in 1888—in September—when there were a good many, some of which I caught. One man put up 800 pounds, and Jennings, Folsom & White had about 600 pounds. This must have been about September 10. The fish were ripe at that time. The large ones averaged about 2½ pounds dressed. Have seen small ones 6 to 8 inches, which were said to be redfish, but they were not ripe and not much red. They were called young redfish at the lake, and probably were such.

I think the redfish stay in the lake and run up into the inlet to spawn. But they are never seen in the lake except right at spawning time, and then only at the bar at the mouth of the inlet. They spawn in shallow water where there is not much current, and where the bottom is sandy or of gravel. They used to begin spawning about the last of July.

Louis Fouchet used to come in about the first of July to get ready for fishing. Fifteen or twenty years ago he would salt down 30,000 to 40,000 pounds every year, and ship them out to the mining camps. William C. Jennings, of Salmon Meadows, knows more about the redfish of Payette Lake than anyone else.

Mr. John W. Smith, of Council Valley, Idaho, has observed the redfish at Payette Lake. He says:

I saw redfish in the inlet to Big Payette Lake some time early in September. They were 4 or 5 miles above the lake; there were 20 or 30 in one place and several in other places. All of these were large ones. Also saw a good many small ones, usually schooling by themselves; in one bunch of

small ones I saw one large fish. Have not seen many during the last few years; saw none in 1890, 1891, or 1892. They may have been there in 1893, but I did not notice any; other parties said there were none last year. During the spawning they fight a good deal.

I have heard it claimed that a few years ago the redfish spawned at the head of Crazy Woman Island, in Payette River, 2 miles above Emmettsville, or about 20 to 25 miles above Payette. This was a year when the water was so low that the fish were unable to reach the lake. They go up the inlet of Payette Lake 5 or 6 miles. I never saw nor heard of redfish in any of the Payette lakes except Big Payette Lake. They have been reported from Weiser River, about 75 miles above Weiser, but I do not know if they were really redfish.

They are reported more abundant than usual at Payette Lake this year. I have seen them coming up into the lake in great numbers, and they were then all *blue*, there being very little red upon them. I am sure they come into the lake from below. They are rarely seen upon the spawning-beds until in September. I think they all die after spawning.

At Council Valley, Idaho, we saw Mr. Alexander Kessler, who had recently returned from a trip to Payette Lake. He gave us the following important information:

At the end of the first week in September of this year I visited the inlet to Big Payette Lake, and while there spent two days catching redfish. This was on September 8 and 9, and we got about 175 fish. At least half of them were of the small form, less than a foot in length. Most of them were females [this is probably a mistake. E.] and nearly all were spawning or ready to spawn; some were about spent. We caught them with grab hooks in the inlet about 3 miles above the lake. They were very abundant; we saw one bunch in which there seemed to be as many as a thousand. We must have seen 2,000 to 3,000 altogether. We noticed that most of them lay in deep water during the day and came upon the riffles to spawn chiefly at night. We camped by the stream and at night could hear them splashing about in the shallow water. The small ones were not much red outside, but their meat was redder than that of the large ones. Most of the small ones and some of the large ones were blue like trout. This is the only year I ever paid any attention to these fish.

My own observations on the redfish of Big Payette Lake were made September 26 and 27, 1894. On September 27 I took a sailboat and Dr. Scovell a rowboat at the lower end of the lake and crossed the lake to the head, making such observations en route as we could to determine the presence of fish. Dr. Scovell followed up the east (left) shore, examining the shoal water as he went. We saw no redfish in the lake, though trout were very abundant. At the mouth of the inlet is a considerable bar, over which we had to drag our boats. After getting into the inlet we were able to ascend it about 2 miles, when a drift of logs prevented further progress with the boats. Leaving the boats at this place and carrying our seining outfit with us we followed on up the stream about 3 miles farther. The thick chaparral along the stream made it very difficult to get down to the water at many places. We put in the entire day, however, and succeeded in examining nearly every rod of the last 5 miles of the stream.

About 4 miles above the mouth of the inlet we found six large redfish spawning on a gravel bar in shallow water just below a deep hole filled with logs and brush. When disturbed the fish would run up into this deep hole and remain concealed some time before returning to the riffle. The temperature of the water on the riffle at 2 p. m. was 45°, and the depth about 18 inches. We watched these fish quite a while and saw them fighting some. Whenever two males came near each other, one would swim rapidly up to the other and catch him by one of the fins, usually the pectoral, or by the back. He would keep his hold quite a little while, the two meanwhile slowly drifting down with the current. At least two of the six were males, and two or three of them were covered with sores. After repeated attempts we caught one of the six, which proved to be a spent female 1 foot 8 inches long, and weighing 2 pounds 2

ounces. This fish was very thin and weak, and its fins were very much worn. Every time we attempted to get any of the others they would run under the brush in the deep pool above. These six are the only live redfish we saw in this stream.

As we were crossing the bar at the mouth of the inlet we saw a large fish which may have been a redfish, but we did not see it plainly enough to enable us to be certain as to the species. At various places along the stream we saw dead redfish in various stages of decay. We counted at least fifteen small ones and four or five large ones. Fragments here and there indicated that the dead fish were being eaten by animals of some kind, probably fishers, wolverines, wolves, etc., which occur here. One female redfish, 11 inches long, was found full of eggs; whether she got killed in some way we could not determine. All the small ones we examined were females.

There may have been a few other live fish lying in the deep holes under the drift, but there could not have been many. The clearness of the water and the care with which we examined the stream precluded the possibility of many escaping detection. Evidently the spawning season of the redfish in this stream was practically over at this time, and nearly all the fish had gone or had died and disappeared.

THE SALMON TROUT OR STEELHEAD SALMON.

One of the most interesting and important results of our work in Idaho was the discovery of the fact that large numbers of steelheads spawn in the streams of that State, and that the catch of steelheads in the Snake River is almost as important as that of the chinook salmon. During our stay at Weiser and Upper Salmon Falls we saw a number of steelheads caught. An examination of these specimens shows them to be *Salmo gairdneri*. We saw no specimens in Salmon, Weiser, and Payette rivers, but the evidence that this species breeds in all these streams is quite trustworthy. The name by which this fish is usually known in these Idaho localities is "salmon trout," although "steelhead" is occasionally heard along Snake River.

Headwaters of Salmon River.—Mr. F. C. Parks, Sawtooth, Idaho, says:

The salmon trout come to the Alturas Lake region about May 5, and are seen up to about June 10. Some spawn in Salmon River and Alturas Lake outlet, while others go up into the inlets where they probably spawn on the same gravel bars used later by the redfish. Their spawning habits are about the same as those of the redfish. Their noses get hooked and some sores appear later. Have seen some dead ones, but do not think many die. They are of various sizes, not in *two* sizes as the redfish are. The largest I have seen would weigh about 14 pounds, the smallest about 2 pounds, while the average weight is probably nearly 8 pounds. They are becoming less abundant each year. The small ones are very scarce.

We catch them with spears and grab hooks. They will sometimes take a hook baited with their own spawn tied up in mosquito bar. About one-third of those we get are females. Their eggs are about the size of those of the redfish.

Color: Along middle of side as red as the redfish; back, steel-color; the female has less red and is more silvery.

We saw no salmon trout here at the time of our visit, unless the fry which we found in little pools along Salmon River were salmon trout. The little pools and ditches in the vicinity of Stenton's ranch and elsewhere contained large numbers of young trout. We caught 50 or more of these fry which measure 1½ to 2¼ inches in length. We have no means of telling certainly whether they are young *Salmo gairdneri* or *Salmo mykiss*, but are inclined to believe them the former.

Mr. B. S. Brown, Bliss, Idaho, says:

The salmon trout arrive April 1 or earlier. They spawn in April, going up into the outlets of the lakes and sometimes using the same spawning-beds which the dog salmon use in the fall. They stay here at least until May 15. The largest I ever saw weighed perhaps 12 pounds, the smallest 4 or 5 pounds. I never saw many dead ones; they probably all go back to the sea.

Headwaters of Payette River.—Mr. W. C. Jennings states:

The salmon trout come up Payette River about April when the water is high. Never saw any above the lake. They will bite a hook occasionally. They will weigh from 5 to 30 pounds; have heard of them weighing as much as 40 pounds, but they probably do not average more than 10 pounds. I think they come up from the sea and that they do not die, but return to the sea or at least go down stream when the water gets low.

Snake River.—Mr. William O'Brien, Weiser, Idaho, says:

I first noticed these fish here about 18 years ago, but they are now more abundant than the chinook salmon. They come up early in September and remain in Snake River until about April 10, when they run up into the smaller streams to spawn. Do not think they spawn in Snake River. I think they spawn from April 15 to about May 10. Never caught any ripe salmon trout in the river. Six years ago my catch of salmon trout was about 18,000 pounds, or about 2,250 fish, the average weight being about 8 pounds. Since then they have decreased, so that last year I got only about 8,000 pounds, or 1,000 fish. But there are more fisheries now than there were a few years ago, so that the decrease in salmon trout is more apparent than real. We get them in the river from September 1 to December 1, and again in April. I expect to try for them about the first of next February, and believe I shall find some.

The catch of Mr. O'Brien and of the other fishermen interviewed will be found in the tables of this report.

According to Mr. R. E. Conner:

The salmon trout appear at Lower Salmon Falls as early as February, March, and April. Never saw any except in those three months. The fish which we call "steelheads" are the first salmon that come up in September.

Mr. E. E. Sherman says:

The salmon trout come chiefly in April; not so many in the fall. They are pretty common in the spring, but hard to catch. I never got any in the spring, but others sometimes get them with spears or grab hooks. They are said to run up Salmon and Cedar creeks, above Upper Salmon Falls.

Mr. Charles Harvey caught a 15-pound male "steelhead" at Lower Salmon Falls about the last of August, 1894. He thinks they spawn in the spring.

Mr. Liberty Millet says:

I catch salmon trout at same time with the chinook salmon, but they are not very common. They seem to be here all year. People catch them with hook and line sometimes. They weigh as much as 15 pounds, and probably spawn in the spring. I think they eat the salmon spawn in the fall. During the entire fishing season of 1894 caught only 10 salmon trout.*

CONCLUSIONS.

From the investigations detailed in this report it appears:

(1) That the chinook salmon, the redfish, and the salmon trout all occur in considerable numbers in the headwaters of Salmon and Payette rivers.

(2) That the chinook salmon and the salmon trout still ascend Weiser River in limited numbers, and that the chinook salmon and salmon trout are found in large numbers in Snake River, which they ascend as far as Auger Falls.

*Two which were caught October 5, and which I saw, were both females, 27 and 28 inches long, and weighing 6¾ and 7½ pounds, respectively. They were unripe. The 8 others were caught later. They were all unripe females, and weighed about 8 pounds each.

(3) While the number of fish of these three species now ascending the streams is very few compared with former years, important spawning-beds of the chinook salmon and salmon trout are still found in all these streams, and of the redfish in the inlets to Alturas, Redfish, Pettit, Stanley, and Big Payette lakes.

Many questions concerning these species, however, are still unsettled, and it is important that the investigations be continued. What has already been done is valuable chiefly for the reason that we now understand more clearly the nature of the problems that require solution and are better able to pursue the investigations in such ways as will lead to definite and practical results.

Among the problems which require further investigation may be mentioned the following:

(1) The migrations of the blueback salmon or redfish should be definitely made out. We should be able to settle the question whether the large redfish or the little redfish, or both, come up from the sea; and its spawning habits should be more carefully studied. Observations should begin in July at the outlet and inlet of one or more of the lakes in which they are found, and should continue until in October. Observations should be made on each of the lakes at the head of Salmon River, at the head of Payette River, and on Wallowa Lake, in Oregon. In addition to these localities, investigations should be made to determine the location of other spawning-beds in Washington and elsewhere in the Columbia Basin. This would include Lake Washington and the lakes on the Upper Columbia and the Okanagan rivers. The spawning-beds at present known do not account for the immense annual catch of blueback salmon in the lower Columbia; there must be other important spawning-grounds of this species in the Columbia Basin.

(2) The chinook salmon and the steelhead should be studied through at least one entire spawning season at their spawning-beds in Idaho, and the relation of temperature of water to time of spawning should be made out.

As to the artificial hatching of redfish, I have no doubt it could be carried on very successfully and profitably either at Big Payette Lake or Alturas Lake. The number of spawning redfish that could be obtained at either of these places would supply eggs sufficient for considerable fish-cultural operations; and the number of chinook salmon eggs that could be gotten in the same waters would still further increase the value of these places as desirable hatchery-sites. The distance from railroads is the only difficulty. A temporary station, however, could be established and conducted profitably at either of these places.

For the hatchery of chinook salmon the vicinity of Upper or Lower Salmon Falls offers many advantages. Near Lower Salmon Falls an abundant gravity supply of water can be obtained from the river or from creeks and springs, as may be desired. At the Upper Falls, or at Millet Island, an abundance of what I suppose would be excellent water can be obtained by gravity from the river or from springs, or both. The distance from Bliss, the nearest railroad station, would be 5 to 10 miles over a fairly good road.

The supply of salmon eggs that could be obtained here would be sufficient to guarantee a fair output for the station. Additional supplies of eggs could be obtained at Weiser and other points between Huntington and Glenn Ferry. At O'Brien's fishery, near Weiser, the salmon could be held in a pond until ripe.