VI.—REPORT OF OPERATIONS DURING 1872 AT THE UNITED STATES SALMON-HATCHING ESTABLISHMENT ON THE M'CLOUD RIVER, AND ON THE CALIFORNIA SALMONIDÆ GENERALLY; WITH A LIST OF SPECIMENS COLLECTED.

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A—INTRODUCTORY REMARKS.

1.—THE SALMON-HATCHING ESTABLISHMENT ON THE M'CLOUD RIVER.

SAN FRANCISCO, CALIFORNIA, *December* 9, 1872.

SIR: I beg leave to report as follows:

In pursuance of your instructions received in July last, to proceed without delay to the Pacific coast, and make arrangements for obtaining a supply of salmon eggs, I left Boston on the 1st day of August, for San Francisco, with this object. As I was directed in your subsequent letters to obtain, if possible, the eggs of the Sacramento River salmon, I set myself at work at once to ascertain the time and place of the spawning of these fish, but, singular as it seems, I could find no one in San Francisco who was able to say either where or when the salmon of the Sacramento spawned. Those best informed in regard to fishing matters, advised me to locate at Rio Vista, the chief salmon-fishing ground of the Sacramento. This seemed practicable at first, but, on examination, the water at Eio Vista was found to be wholly unsuitable, and this place was given up. Fortunately, a short time after, I was introduced, through the kindness of Hon. B. B. Redding, a member of the board of California commissioners of fisheries, to Mr. Montague, the chief engineer of the Pacific Railroad, who showed me the Pacific Railroad surveys of the upper waters of the Sacramento, and pointed out a place on the map, near the junction of the McCloud and Pit Rivers, where he assured me he had seen Indians spearing salmon in the fall on their spawning-beds. This point is one hundred and eighty-five miles north of Sacramento City. Following this clew, I proceeded to Red Bluff, the northernmost railway station of the California and Oregon Railroad, situated fifty miles from the McCloud River. From inquiries made here, I became so well convinced that the salmon were then spawning on the McCloud Eiver, that as soon as supplies and men could be got ready I took the California and Oregon stage for Pit River ferry, two miles from the mouth of the McCloud. We arrived here at daylight on the 30th of August. Leaving the stage at this point we followed up the left bank of Pit River on foot, to the mouth of the McCloud, and continued thence up the McCloud River. At a distance of about two miles above the mouth of the river, we came upon several camps of Indians with hundreds of freshly caught salmon drying on the bushes. Salmon could also be seen in the river in such numbers that we counted sixty in one spot, as we stood at the waters' edge. It was evident that this was the place to get the breeding fish, and the next thing was to find water to mature the eggs for shipment. This was not so easy a task as finding the salmon, but we at last discovered a spring stream, flowing a thousand gallons an hour, which I decided to use, this season at least, and on the morning of September 1, 1872, the hatching-works of the first salmon-breeding station of the United States were located on this stream. The location is about three miles up the McCloud River, on its left or western bank. It is one hundred and eighty-five miles from Sacramento City; three hundred and twenty-three miles from San Francisco via Pacific Railroad; four hundred and fifty-three miles from Portland, Oreg.; two hundred and seventy-two miles from Oakland, Oreg.; fifty miles from Red Bluff, Cal.; twenty-two miles from Redding, Cal. The point selected is on the California and Oregon stage-road, which, at the time of our arrival, connected with the railroad at Red Bluff. The railroad has now been continued to Redding, and it is thought that next year it will run within ten miles of the salmon-breeding station. The spawn found in the fish that the Indians were spearing on our arrival indicated that there was no time to spare in getting ready for the hatching-work. We were twenty-five miles from the nearest town or village, fifty miles from a railway station, over fifty miles from an available saw-mill, and in the Sierra Nevada Mountains, where the mule-teams barely made twenty miles a day with supplies; but we went to work, and in fifteen days we had a house built, filtering tanks, hatching apparatus, and flume in perfect running order, and on the 16th of September were catching and corralling the salmon. There were but three of us, and every day for a week the mercury ran from 105° to 112° F. in the shade. But although we worked so expeditiously through the broiling sun of those days, we were too late. The first few hauls of the net showed that the salmon had spawned. In fact, the salmon begin to spawn in the McCloud River some time in August, and are through spawning, or nearly through, by the 12th of September.

We caught plenty of salmon in the seine, but only rarely a female with ova. By hard fishing, and hauling the seine every night and sometimes all night, we succeeded in capturing twenty-six salmon, including both sexes, in spawning condition, by the 28th of September. On the night of the 28th, at midnight, as the returns did not seem to warrant the expense of handling the seine, I stopped fishing. Of the twenty-six breeding salmon caught, twelve were females and yielded about 50,000 eggs. Of this number 20,000 were destroyed by the terrible heat of the last of September; the mercury on some days reaching as high as 112° in the shade. The remaining 30,000 did well, in spite of many dangers from sediment, and from a fungoid growth which seemed to permeate the brook water on hot days, and which rendered constant vigilance necessary; and on the 12th day of October, the most advanced eggs showed the eye-spots. By Friday, October 18, all the

eggs were ready to pack for shipment, but owing to miscarriage of a letter the moss which was to be delivered on the previous Tuesday did not arrive until the evening of the following Tuesday. On the next day, October 23, the eggs were packed and shipped to Sacramento, where I placed them in charge of Wells, Fargo & Co., by whom they were forwarded East on the 25th of October, 1872.

2.—THE LOCATION OF THE SALMON-BREEDING STATION ON THE M'CLOUD RIVER.

The location which has been selected for this station seems to be the best, all things considered, that could be found for obtaining and maturing for shipment the eggs of the Sacramento River salmon. Although I made a careful exploration of the whole course of the Sacramento River, I found no place which seemed to me to possess equal advantages. The mill-brook at Tehama came the nearest to it, but at Tehama the salmon spawn so late as to throw the transportation of the eggs into December, when there is danger of snow-blockades on the Pacific Railroad; the rainy season commences at Tehama while the eggs are maturing, and renders the brook liable to become roiled by the rains; there is a mill on the stream, the operations of which would interfere with the water-supply of the hatching-troughs; and the fact that Indians, Chinese, and whites congregate there in great numbers to kill the salmon, makes the neighborhood anything but favorable for the delicate work of maturing salmon-eggs.

On the other hand, at the McCloud, the spawning period is such as to place the transportation of the eggs at the best time, viz, in October or November; the eggs will be shipped before the rainy season sets in, and if it did rain, it would not disturb the water of the McCloud river which it is proposed to use in future. There is no mill nor anything else on the McCloud River to interfere with the water-supply, and, lastly, this river is wholly free from the rough neighborhoods which are found on the outskirts of a town like Tehama. The Tehama brook has the only advantage of being half a day's travel nearer Sacramento, but I do not think this a sufficient offset to the other advantages of the present location.

3.—CHANGES PROPOSED FOR ANOTHER SEASON.

I would recommend that next year the house and all the hatching apparatus be moved down close to the edge of the high-water mark of the river, where the seine is hauled for catching the parent salmon, and that the water for hatching be taken from the river itself. This can all be done at a very inconsiderable expense, and the whole thing will then be very compact. The fishing-ground, the dwelling-house, the corral for the parent salmon, and the hatching-works will all be close together, and a vast deal of labor and risk arising from these departments being separated, as they

were this year, will thus be saved. Last fall, when the works were put up, I did not know enough about the McCloud River to risk the proposed arrangement of the works, but I am satisfied now that it is both safe and very desirable. By this arrangement other advantages are gained besides compactness and convenience, for water will be obtained in unlimited quantities, of an even temperature, not varying over five degrees in two months. The water is as clear as crystal, and is *never* roiled from any cause whatever so as to deposit dangerous sediment; and lastly, this cold water of the McCloud, with a temperature of 48° to 53° F., will not grow the insidious fungus which continually showed itself in the warm water of the hatching-works of this last season. With these changes nine-tenths of the trouble and dangers of the past season will be avoided, and I see no obstacles in the way of very large success in obtaining salmon-eggs at this station in the future.

4.—WHY MORE SALMON-EGGS WERE NOT OBTAINED IN 1872.

The simple reason why more eggs were not obtained this season was because the salmon had spawned at the head-waters of the Sacramento before it was possible to get ready for the eggs. A subsequent effort might have been made at Tehama, but the lateness of the season, the uncertainty of the results, and the reduced condition of the appropriations, were sufficient to discourage it.

Although so small a return in the actual number of salmon obtained has been derived from the outlay attending this enterprise, the money can hardly be considered as unprofitably spent, for another and very adequate return is to be found in the actual preparations made for future operations and in the information and experience which have been obtained, and which, in the writer's opinion, are worth all they cost as a guide to future labors.

5.—CONDITIONS OF HATCHING SALMON IN CALIFORNIA COMPARED WITH SIMILAR OPERATIONS AT THE EAST.

The conditions of hatching salmon-eggs in California are wholly different from those which present themselves in similar work at the East. At the East you have to guard against cold; in California you have to guard against heat; at the East you can usually find a good spring in a favorable locality; here it is out of the question; at the East a brook will usually answer the purposes of hatching-water in the absence of a spring; in California the brooks, as a rule, are wholly unsuitable for hatching; at the East the eggs are hatching in the winter; in California the salmon run in the summer; and, finally, most of the hatching work is done in California before the Atlantic fish begin to spawn.

6.—CATCHING THE SALMON IN THE M'CLOUD.

I tried three ways of capturing the parent salmon; first, by the Indian trap; second, by a stake-net and pound; third, by a sweep-seine.

The Indian trap consists of a fence of stakes or bushes, built out into the river, at a fall or rapid, in the form of a letter V, having the angle down stream, and a basket-trap at the angle. This method proved perfectly worthless, as of course it must, for catching healthy fish, as this contrivance catches only the exhausted fish that are going down the river, and none of the good fish that are coming up.

The second method of using a stake-net did not work on account of the volume and force of the river-current. I set the stake-net so as to just reverse the form of the Indian trap, that is, so that it formed a letter V with the angle *up stream*, and a trap or pound in the angle. As it happened, it was too late for such a net to be effective, because the salmon were all going down at that time, and none, or at most a very few, were coming up; but even if the salmon had been coming up, this contrivance would not have answered here as a permanency, because the velocity and volume of water in the McCloud are such as would ultimately tear any such net away, in any place where it could otherwise be set to advantage.

The third method, of sweeping with a seine, worked to perfection. In some of the holes, and especially in one large hole near which it is proposed to place the hatching-works next year, any number of parent salmon can be caught in the proper season. The only objection to hauling a seine in these places is, that as the boat taking out the seine turns to come ashore again, it is drawn near the brink of the rapids, over which it would be dangerous to go in the night. This is an objection, however, which skill and nerve can always overcome.

7.—TAKING THE EGGS.

When we fished where the corral or inclosure for the breeding salmon was situated, the salmon were taken carefully from the net as soon as it was hauled ashore, and placed in the corral, and kept there till the last haul was made, just before daylight. The eggs were then taken from the fish and impregnated, so that by the time the last haul was finished, and the net hung up to dry, the eggs were ready to be washed and placed in the hatching-troughs. This was all very simple, but when we hauled the seine at other points, where there was no place to confine the salmon, it was quite different. At these places, as soon as a spawning-fish was hauled to the shore, I took and impregnated the eggs at once, on the beach where we were, and kept the eggs in pails of water during the night, till we had got through seining. It took four men to strip a fish on these occasions; one to hold the head, one to hold the tail of the fish, and a third to take the eggs, while a fourth held a pitch-pine torch for light. On the darkest nights the scene on the river bank was exceedingly wild and picturesque. Behind us was the tall, deep shadow of Persephone Mountain, and before us at our feet ran the gleaming, rapid current of the McCloud, while the camp-tire threw an unsteady light upon the forest, mountain, and river, suddenly cut off by the dense

darkness beyond. The flaming pitch-pine torches, stuck into the sandy beach at intervals of 20 feet, to guide the boatman, the dusky forms of a half-dozen Indians coiled around the fire, or stoically watching the fishing, the net, the fishing-boat, and the struggling fish, added to the effect, and made a picture which, especially when the woods were set on fire to attract the salmon, was one of surpassing interest. It was quite impressive, in the midst of these surroundings, to reflect that we were beyond the white man's boundary, in the home of the Indians, where the bear, the panther, the deer, and the Indian had lived for centuries undisturbed.

The eggs were all taken in a dry pan, according to the new or Russian method of impregnation, and the milt of the male added immediately. Contrary to rule, I took a half a panful at a time instead of one layer, and stirred the eggs up with my hand, as you would stir up a pan of flour. After they were well mixed and had stood a minute or two, I filled up the pan with water, gave them another stirring, and left them from half an hour to an hour, at the end of which time I washed them, and poured them into a pail of water, to be taken to the hatching-troughs. When the eye-spots appeared, three weeks afterward, almost *every* egg was seen to have a fish in it, which proves two things: one is, that the dry method will impregnate almost, if not wholly, a hundred per cent. of the eggs; and the other is, that the old precaution, not to take over one layer of eggs in the pan at a time, is wholly needless. In fact, I believe I could take a ten-quart water-bucket half full of salmon-eggs at a time, without losing any more than by the one-layer method.

I found that the Sacramento River salmon *(i. e.,* the McCloud River salmon) yield their eggs much more readily than the Eastern salmon. It is not half the work to strip the fish, and they are in general more easily handled than the salmon of the Atlantic rivers.

8.—THE EGGS OF THE SACRAMENTO RIVER SALMON.

The eggs of the salmon of the Sacramento are larger and have a more reddish tinge than those of the Atlantic salmon. There are less eggs to the same weight of fish than with the eastern salmon, seven hundred eggs to each pound of the parent fish being a large average. We cannot yet tell how the period of incubation of these eggs compares with those of the Atlantic rivers, as it was impossible, with the varying temperature of the hatching-brook, to get at the exact average temperature of the water. I may say, however, that the eggs first showed the eye-spots in nineteen days, and that they hatched in forty-two days, and the *estimated* average temperature of the water was 58°–60° F.

9.—THE HATCHING-APPARATUS.

Our hatching-apparatus was all that could be wished. It consisted of twenty-four troughs of sugar-pine, 1G feet long, 12 inches wide, and 4½ inches deep, the inside surface of which was converted to a coal by

charring. These troughs furnished almost 400 square feet of hatching space. There were three sets or tiers of troughs, one set below the other, with eight troughs arranged parallel to each other in each tier. There was a fall of three inches from one tier to another. The troughs were covered.

The filtering arrangement was quite perfect. It consisted of what the miners call a sand-box, which is merely an empty box to catch the heaviest of the sediment, and of two filtering-tanks proper. The water, after leaving the sand-box, passed through ten filters of sand and gravel and eight common filters of flannel.

All this provision for cleansing the water did *not*, however, prevent a fine fungoid growth from coming down with the water on to the eggs, which, when it was first discovered, had got such a start that its results must have been very disastrous had it not been for the ingenuity of my first assistant, Mr. John G. Woodbury, of San Francisco. Mr. Woodbury, on having his attention called to the condition of the eggs, suggested the very bold course of washing off the fungus with sand and water. The plan adopted was to put a few hundred eggs in a pail partly full of water, and having a handful of fine river-sand at the bottom. Upon holding this pail of eggs and sand under a stream of water, the whirling sand was brought into contact with the whirling eggs so constantly and rapidly, and yet so gently, that in a *few* minutes the fungus was entirely cleansed from the eggs, while the eggs were not injured in the least.

It would be a long and tedious job to go through this operation with many hundred thousand eggs, but with the few thousands which we had then laid down this ingenious contrivance answered its purpose admirably. It is proper to say that this plan was not tried till the spinal column of the fish had appeared; otherwise, even the *gentle contact* of the sand and water would probably have injured the less-matured embryo.

10.—PACKING AND SHIPPING THE EGGS.

The only moss that I could find or hear of was nearly seventy miles to the north, at the sources of the Sacramento, and the best of this moss grew just where one of the tributaries of the Sacramento bursts from the earth, at the base of Shasta Butte. This was the moss which I used for packing, and it was admirable. I packed the eggs in two common wooden boxes, holding about a cubic foot each. A soft but dense layer of moss, just as it grows, was first placed at the bottom of the box. A layer of eggs was then spread over the moss carpet, then a thin layer of moss, and so on, alternating to the top, as is the usual manner of packing ova, except that half way up the box a thin wooden rack or partition was put in to break the pressure of the upper layers. These two boxes being filled, and the covers being fastened on with screws, to avoid the concussion of driving nails, a dozen or twenty holes were bored in them to admit the air, and they were packed in an open wooden crate large enough to admit a layer of hay and straw four inches through on all sides. This open space was filled with hay to weaken the force of concussions and to equalize the temperature inside. The cover of the crate was then put on, and I took them twenty-two miles down the stage-road to Redding, and thence one hundred and seventy miles by rail to Sacramento City, where, after unpacking the boxes and moistening the moss very thoroughly with cold water, I repacked the boxes in the crate, and shipped them East, in care of Wells, Fargo & Co., by way of the Pacific Railroad.

I packed two tin boxes of eggs, also, and inclosed them in pails of sawdust, with the expectation of hanging up the pails in the car, and so avoid in some degree the jolting of the trains; but on examining the car, and considering the number of changes of car between here and the Atlantic, I concluded that it was more dangerous to hang them up than to have them rest on the floor of the car. Accordingly, all the packages of eggs were carried like any other merchandise, on the floor of the express-car.

Permit me to add that, during the fall, I traveled the whole length of the Sacramento River, from its sources around Mount Shasta to its outlet at the bay of San Francisco, and also ascended the McCloud River as far as it is accessible, which is about twenty miles, and collected quite a complete series of specimens of the *Salmonidæ* of the Sacramento and McCloud Rivers, a catalogue of which I transmit herewith. The specimens and accompanying drawings have been forwarded to you, at the Smithsonian Institution.

B—THE SALMONIDÆ OF THE SACRAMENTO RIVER.

11.—THE SACRAMENTO RIVER.

In order to make what follows more clear, permit me to describe briefly the course of the Sacramento River.

The Sacramento River proper has its sources in Mount Shasta, and in the Siskiyou Mountains to the west of Mount Shasta, about four hundred miles by the river channel from its outlet into the ocean at San Francisco. A few miles below Mount Shasta, on Shasta Butte, as it is called in California, the smaller sources form a clear, rocky, and swift-running stream, about a hundred or a hundred and fifty feet across, and so deep that it can just be waded with high rubber boots at its shallowest parts. Its temperature is here very low, and probably does not average over 50° F. the year round. From this point, for nearly eighty miles, it falls at the rate of thirty-seven feet to the mile, running nearly due south, and retains its character of a clear and cold stream all the way. Down to this point it is known as the "Little Sacramento," and receives the waters of many small streams, but no large ones till it reaches its junction with Pitt River. At this stage of its course it has swollen to three times its original volume, and with the addition of the contents of Pitt River makes a stream six times the bulk

which it possessed just below Mount Shasta. It is still a clear river; but soon after passing this point it becomes roily, and continues to grow more and more so to its mouth. Above the mouth of Pit River it flows through a deep canon, with high hills or mountains on both banks; but a short distance below the mouth of Pit River it enters a more level country, and from thence to the bay of San Francisco it moves slowly, widening every league, through a level country with broad sweeps of prairie on either side, now famous all over the world as the wonderfully productive region of the Sacramento Valley.

About a hundred and fifty miles below the mouth of Pit River it receives the muddy waters of the Feather River, and twenty miles farther down, at Sacramento City, the still muddier waters of the American Fork. From here to San Francisco the Sacramento River is navigable for large vessels and steamers; but receives no other extensive tributaries except the San Joaquin, which empties into it at Rio Vista, forty miles below Sacramento.

It will be seen by the above description that the Sacramento River has but four large tributaries, the San Joaquin, the American Fork, the Feather River, and Pit Eiver. With the Sau Joaquin we have nothing to do in this report, as it may be regarded as almost an independent river, and has not come within the scope of the present investigation. I will only say in regard to this river that it is much warmer than the Sacramento, but is frequented somewhat by salmon, especially in the fall, which are killed in considerable quantities on some of its tributaries.

The American Fork was formerly a prolific salmon river, but the mining operations on its banks have rendered it so muddy that the salmon have abandoned it altogether, and none ascend it now. Precisely the same thing is to be said of Feather River. The salmon come up in some numbers to spawn in the smaller streams between the American and Pit Rivers, but the returns from these spawning-grounds are probably small. The salmon come up Pit River iu great numbers iu the spring, but I am informed that they all leave Pit River for the colder waters of the McCloud River in the latter part of June or the first part of July. It is probable that they ascend the upper waters of the Pit River also to a limited extent at this time, but I could obtain no positive information on this point. Above the mouth of Pit River the salmon ascend the Sacramento, now called the Little Sacramento, iu great numbers, and make the clear waters of this stream the principal spawning-ground of the salmon of the Great Sacramento River, with one exception. This exception is the McCloud River.

12.—THE M'CLOUD RIVER.

This river, which is the great spawning rendezvous of the Sacramento salmon, deserves special notice both on this account, and because it is on this river that the United States salmon-breeding station has been located. The McCloud River heads iu Mount Shasta and in the southern

slopes of the mountains, stretching away from Shasta Butte easterly and southeasterly toward the sources of Pit River. Its principal source is an immense spring, which bursts out from the southeastern flank of Mount Shasta, and at once forms a river from its own supply. This spring is fed by the melting snows of Shasta, and accounts for the unusual coldness and clearness of the McCloud River. The McCloud receives, near its source, a tributary about fifteen miles in length, coming from the northeast, but there are no other considerable streams emptying into it below, and it is said to have this peculiarity, that it is almost as large near its source as it is at its mouth. Through all its course it flows rapidly through a deep rocky canon of the wildest scenery. The rocks and mountains rise up abruptly from its banks, in many places to the height of several thousand feet, and for ten or twenty miles near the middle of the river's course are iuaccessible. On this account the river has never been surveyed throughout its whole course, and the river channel, as laid down on the maps, is wholly conjectural, for a considerable extent.

The McCloud River, near its mouth, where the salmon-breeding works are placed, averages about 60 yards in width, although in places it flows through gulches not over 30 feet wide, and in other places spreads out to a width of nearly a hundred yards. The temperature of the water is here, in September, 48°–49° at sunrise, and 53°–54° at sunset. It is singularly uniform in its temperature, and does not vary two degrees from these figures throughout October and November. The bed of the river is here rocky, gravelly and sandy, as it is throughout its whole course. The water is as clear as crystal and always rapid. The river begins to rise in December, and swells to a maximum height of 15 feet above the midsummer level. It is another peculiarity of this river, (and it can hardly be said of any other river in California,) that it has been abandoned to the Indians. The miner's pick and shovel have upturned the banks of other rivers, or the, farms of white men have stretched along their waters, but, for some reason or other, the civilized races have very singularly left the McCloud River to its aboriginal inhabitants. The consequence is, that the McCloud Eiver presents an instance of what is becoming extremely rare, at least in the more accessible portions of the country, namely, a region which is just as it was before the white man found it, and a race of aborigines, whose simple habits have not been corrupted by the aggressive influence of communication with the whites.

13.—THE M'CLOUD RIVER INDIANS.

The Indians themselves are a good-featured, hardy, but indolent race. I found them always pleasant, genial, and sociable, though, like other Indians, very sensitive when their pride was wounded. They at first adopted the plan of ordering all white men out of their country, and were the last of the California Indians to yield to the encroachments of civilization. Even now they are not slow to say to the white stranger, "These

are my lands," and "These are my salmon;" but the stern consequence of conflict with the whites have taught them to abstain from any violent vindication of their rights. They will still always revenge a wrong inflicted on them by their own people, and deem it a duty to avenge murder of one of their kindred, but I think they are a well-disposed race by nature, and have no malice naturally in their hearts toward any one and will not injure any one who does not first injure them. Every c... told me, before my arrival and during my stay on the McCloud, that the Indians would steal everything that they could lay their hands on. I am glad that this opportunity is afforded me of bearing testimony to the contrary, which I wish to do very emphatically. I would trust the McCloud Indians with anything. We used to leave our things every day around the house, and even down on the river-bank, for weeks together where the Indians could have stolen them with perfect safety, and when they would not have remained ten minutes *in a white man's settlement* and yet I do not know of a single instance of theft of the smallest thing on their part, during all our stay of two months among them. On the contrary, in one instance, an Indian traveled six miles one hot day to return me a watch-guard, which he found in the pocket of a garment which I sold him, and which he might have kept with perfect impunity. And on another occasion, on the arrival of some gold coin, when I had reason to expect an attack from *white men, I* gave the gold to one of my Indians, and told him that I depended on him to protect that and me till morning. I slept soundly; and the next morning the faithful Indian handed me the gold just as I gave it to him. I wish on these accounts to be very emphatic iu saying that the charges against these Indians of being a race of thieves, are untrue and unjust.

With all their good traits, however, murder did not seem to have lost its obnoxious character that it has among more enlightened people. Almost every McCloud Indian we met had killed one or more men, white or red, in the course of his life, but it was usually because they were goaded to it by ungovernable jealousy or revenge. It was not *from* motives of gain or causeless malice.

The McCloud Indians live and sleep in the open air in the summer. In the rainy season they build wigwams or huts of drift-wood and logs, which they inhabit pretty comfortably through the winter. In the summer and fall they live mainly on the salmon and trout which they spear. In the winter they live on the salmon which they catch and dry in the fall, and on acorns, which they gather in great quantities in the woods. They hunt with bows and arrows, with which they occasionally kill a bear, though a few of the more enterprising have rifles. *They* trap a very little, but the salmon of the river are so abundant that they are not obliged to resort to hunting and trapping at all, and do not much of either.

I have made this long digression about the McCloud River Indians partly because their presence here is so singularly connected with the

abundance of the salmon in the Sacramento River. Had white men come here, and required the salmon for food, this main artery of the supply system of the river would have been stopped; or had white men come and engaged in mining, as they have done on the Yuba and on the ... ther and American Rivers, the spawning-beds would have been covered with mud and ruined, as in those rivers, and in less than three years ... salmon supply of the Sacramento would have shown a vast decrease. The presence of the Indians, therefore, as far as it implies the absence of the whites, is the great protection of the supply of the Sacramento salmon.

14.—THE CLIMATE OP THE M'CLOUD RIVER.

The rains come on a little earlier here among the mountains than lower down in the valleys, and continue a little later in the spring. It is wet, therefore, from November to May, and dry from May to November. The winters are mild, a very little snow falling occasionally with the rains. The summer and fall days are extremely hot, but the nights are cool, and in the fall are very cold compared with the days. In consequence of this the variations of temperature in the fall during the twenty-four hours are extreme. For many days together in September the mercury ranged from 55° Fabr. at sunrise to 105° in the shade at 11 a. m., making a variation of 50° in five hours. On some days the variation was 60°, and on one occasion nearly 70° in the same length of time. I have seen ice formed in our fislting'-boatat night within ninety-six hours of a noon temperature of 110°. The hot days continue till November, and often extend into November. There were many successive days in October when it was over 100° in the shade. The hot hours of the day were ... from 13 a. m. till 4 p. m. From 8 a. m. to 11 a. m. the rise of temperature was very rapid, and from 4 p. m. to 7 p. m. the fall was really rapid.

I have been speaking of the climate of the McCloud at our salmon station, near its mouth. As you ascend the McCloud the weather grows colder, the rains last longer, and at its headwaters, in winter, there are deep snows.

15—THE SACRAMENTO SALMON IN GENERAL.

The ... cramento salmon in its prime is a large, handsome, silvery fish, averaging about 20 pounds in weight, as they are caught at Rio Vista, the main fishing ground of the river. * These salmon have a darker color and deeper bodies, and are less delicate in form, and slightly coarser in appearance than the Atlantic salmon. They are also heavier and coarser, less silvery, and probably less vigorous than the eastern salmon. It is so difficult to determine whether they differ from the eastern salmon in quality, as food, that it is quite safe to say that if they are not the same

* Salmon weighing from 40 to 50 pounds are not uncommon; and once in a great while one is caught exceeding 50 pounds in weight.

fully equal to their eastern kindred, as a table luxury, they are so ne
it, that the difference, if any, is not an important one. Their flesh i
their prime is firm, sweet, rich, and juicy, and is certainly good enoug
to make them a desirable fish in any river in the world. (See question
p. 195.) As a game-fish they are active and powerful fighters, and are only
conquered after a hard struggle. They are caught with a hook and line
in salt and brackish waters, and also iu the fresh waters of the upper
tributaries. Salmon roe is the best bait in fresh water; but they will
also take the artificial fly. Last July hundreds of salmon, averaging
15 pounds apiece, were caught iu the Little Sacramento with a hook and
line, near Frye's Hotel, at Upper Soda Springs, in Siskiyou County, Ca
ifornia. It is not an uncommon but a common thing to catch salmo
here with bait, which settles the question beyond dispute as to the
ramento salmon biting at a hook in fresh water.

The Sacramento salmon, like all other salmon, fall off in size, weigh
quality, and beauty from the time they enter fresh water. A week
two before they spawn they become very black, then smooth and slim,
their scales being absorbed into the skin. Soon after this they becom
foul, diseased, and very much emaciated, and in the McCloud River,
least, they die a short time after spawning.

16.—GENERAL MOVEMENTS OP THE SACRAMENTO SALMON IN T LOWER PARTS OF THE RIVER.*

The prime salmon first make their appearance in the tide-water of t
Sacramento, the early part of November. They are then very scar
only three or four a day being at first caught at the great fishe
They are at this time 18 cents a pound at wholesale, and 25 cent
pound at retail. They increase gradually in numbers, through Nov
ber and December, and the retail price falls to 20 cents. By the mid
of January they are somewhat more abundant in the bay, but few c
tinue to be caught up the river. They remain scarce, or, rather,
abundant—more all the time being caught in the bay than up the riv
until the 1st of March, when they begin to pour up the river in
quantities. This flood of salmon lasts through March, April, and M
making these months the harvest months of the river fishermen.
because the salmon are plentiful and because they are in good condit
The run culminates the last of April, or first of May. They are t
the most abundant.. They fall off from this time gradually in numb
and condition through May, and become comparatively scarce in
and July, and the. first part ot August. Before the end of Aug

* It should bo understood that the account given hero and elsewhere in this re
the salmon of the main Sacramento river applies only to tho salmon *above tide-wa*

† Eleven thousand three hundred and ninety-four salmon were sent down ti
to San Francisco last March (1873) by one line of river-boats. It is estimated th
thousand more were salted on the river. This makes a yield of sixteen thousan
hundred and ninety-four fish, or about three hundred thousand pounds, in the mo
March, making no allowance for other sources of outlet, which were considerable

new run commences, and, to quote the fishermen's words, "the river is full of them." The quality of this fish is very poor compared with the winter and spring runs, which circumstance, connected with their great abundance, makes them a drug iu the market at this time. They can now be bought at 3 cents a pound, and even for less, as tons of them are thrown back into the river for want of purchasers. This abundance continues through September, the quality of the fish remaining very poor. In October the numbers fall off again and continue to lessen, till the new winter run begins again in November.

The following table, according to months, shows the condition of the Sacramento River, in regard to the salmon, at Sacramento:

Month.	Numbers.	Quality.
nuary	Increasing but not abundant	Prime.
bruary	Increasing, but not abundant	Prime.
arch	Very abundant	Prime.
ail-	Very abundant	Nearly prime.
ay	Falling off, but still abundant	Nearly prime.
ne	Somewhat scarce	Inferior.
ly	Somewhat scarce	Inferior.
gust	Very abundant indeed	Very poor.
ptember	Abundant	Very poor.
ctober	Falling off. New run begins	Very poor.
OBER	Very scarce	Very fine.
cember*	Scarce	Very fine.

—GENERAL MOVEMENTS, ETC., OF THE SACRAMENTO SALMON IN THE M'CLOUD RIVER.

It will be seen by the previous notes that there are salmon in the Lower cramento every month iu the year. It is not so in the upper tributa- s of the river, as for instance, in the Little Sacramento, or in the Me- nd. The salmon have stated times for arriving in the upper tribu- es[and for remaining in them, and at other periods of the year there no salmon in these streams.

he) salmon arrive in the mouth of the McCloud in March, but are ce iu that month. In April and May they become plentiful but are large, the average weight not exceeding ten or twelve pounds. They ain plentiful through June and July, during the latter part of which ths they receive an accession from Pit River, the lower part of which r now becomes nearly deserted by the salmon. In August, there is rge run of salmon up the McCloud, composed of larger fish. The on are now, in August, the largest and most abundant of any time he year in the McCloud. They begin to spawn in tbe lower portions e McCloud during the last half of August. By tho middle of Sep- ber the salmon begin here to die, aud from this till the end of the h they die very rapidly, and there are thousands of dead salmon ng down the stream and being washed up to the banks. The bears

n December, January, and February, the salmon are more abundant in the lower of the river than further up.

now come down to the river in great numbers to eat the salmon, and th Indians stop spearing and go bear-hunting. About this time—the latte half of September—a new run of salmon makes its appearance in th McCloud, called the "fall run." They were not by any means plentifu this year, (1872,) but kept the river from being actually deserted by sal mon for a month or more. During October there are no salmon in th McCloud, except the few new-comers of the "fall run," and by the 1s of November all the salmon are gone from the river except one or tw individual stragglers here and there. By this time the Indians have all their salmon dried and packed away for winter. Some of the Indians have moved back into the woods, while those that remain on the river have built little wigwams of drift wood, to protect them from the winter rains, and have gone into winter quarters. From November till March there are no salmon in the McCloud River.

All I could learn about the young salmon in the river was that in May the young fry, about two inches long, are very abundant. Soon after this they wholly disappear, and their destination is unknown. During my stay on the McCloud through August, September, and October, I saw no small fish which I recognized as young salmon, nor could I learn from any source where the young salmon were. Their whereabouts at this season still remains a mystery.

18.—CONDITION OF THE SALMON DURING THEIR STAY IN THE M'CLOUD RIVER.

In March, when the salmon first arrive in tbe McCloud, they are in fine condition. They are now bright aud silvery, with shining scales. They are fat aud excellent for the table, but not large. The spawn in the females is very small. Their flesh is of a deep-red color. The males and females are almost indistinguishable at this time. This state of things remains till August, except that the salmon gradually deteriorate in quality, and the eggs increase in size. The first marked change in the fish takes place a little before the middle of August. The salmon then become very black. The males grow deep and thin, and the dog-teeth begin to show themselves, aud to increase rapidly in size. The females are now big with spawn, aud the sexes are easily distinguishable. From this time they rapidly deteriorate. Their flesh shades off to a light, dirty pink. They become foul and diseased, aud very much emaciated. Their scales are wholly absorbed into the skin, which is of a dark olive hue, or black. Blotches of fungus appear on their heads aud bodies, and in various places are long, white patches where the skin is partly worn off. Their fins and tails become badly mutilated, and in a short time they die exhausted. By the 1st of October most of the fish that were in the river in August are dead. The height of the spawning-season in 1872 was about the 8th of September. The salmon had begun to spawn when I arrived on the McCloud, the 30th of August. By the middle of September nearly all the salmon had spawned, except the "fall run."

Table showing the movements, condition, etc., of the Sacramento salmon in the McCloud river in each month of the year:

Months.	Numbers.	Quality.	Remarks.
January	None		Trout now spawning.
February	None		River very high.
March	Very few	Prime	Do.
April	Abundant	Prime	Trout have scarlet bands.
May	Abundant	Falling off slightly	Young salmon fry abundant.
June	Abundant	Falling off slightly	First appearance of salmon at head-waters of Little Sacramento.
July	Abundant	Considerably deteriorated.	Begin to spawn at head-waters.
August	Very abundant	Large fish, but black and poor.	Begin to spawn on lower McCloud.
September	Very abundant but dying rapidly.	Foul, emaciated, and mutilated.	Gone from head-waters.
October	All dead except fall run.	Fall run, considered not bad.	Trout will not bite on McCloud.
November	None but one or two stragglers.		First rains.
December	None		Trout ascend small streams in great numbers.

Table showing the condition of the ova of the salmon at the head-waters of the Little Sacramento, (Mount Shasta;) at the Lower McCloud; at Tehama; at Rio Vista and Sacramento City, and at Eel River, Humboldt County, California.

Months.	CONDITION OF OVA AT—				
	Mount Shasta.	McCloud.	Tehama.	Sacramento City and Rio Vista.	Eel River.
January	No salmon	No salmon	No salmon	Very small	Ripe
February	No salmon	No salmon	No salmon	Very small	
March	No salmon	Small	No salmon	Very small.	
April	No salmon	Small		Larger	
May	No salmon	Larger		Larger	
June	Quite large	Larger		Larger	
July	Ripe	Well developed.		Quite advanced.	
August	Ripe	Ripe		Very large	
September	Spawning season over.	Ripe		Very large	
October	Spawning season over.	Spawning finished. Salmon dead.	Ripe	Very large	
November	Spawning season over.	Spawning finished. Salmon dead.	Ripe	Very small.	
December	Spawning season over.	Spawning finished. Salmon dead.	Spawning season over.	Very small	Ripe

19.—ANSWERS TO QUERIES CONCERNING THE SACRAMENTO SALMON, GIVEN IN THE ORDER OF PROFESSOR BAIRD'S PRINTED LIST OF QUESTIONS ENTITLED "QUESTIONS RELATIVE TO THE FOOD FISHES OF THE UNITED STATES.

(The capital letters indicate the topics; the figures refer to the questions.)

A.—NAME.

Question 1. What is the name by which this fish is known in your neighborhood? If possible, make an outline sketch for better identification.

Answer. The salmon of the Sacramento River which are caught at or below Sacramento City are known by the name of the Sacramento salmon. The salmon which are caught above Sacramento City take the name of the stream or the locality at which they are caught, as, for instance, the salmon caught in the mill-brook near Tehama are called Tehama salmon. So with the McCloud salmon and Pit River salmon, although all these fish are the proper Sacramento salmon. The grilse is very often called the *salmon-trout,* which confusion of names is likely at first to mislead a new-comer. In every instance which came under my observation on the tributaries of the Sacramento I found that *salmon-trout* invariably meant only a salmon grilse, with the single exception of the *wye-dar-deekit.* (See No. 27 and No. 68 of the catalogue of specimens.)

The spawning male salmon of the tributaries is called the *dog-salmon* or *dog-toothed salmon,* and is supposed by the uninformed to be a different fish from the Sacramento salmon, though it is the same in a different stage.

The Indian names for the McCloud salmon in their different stages are as follows:

Salmon	Nóo-oolh.	Late "Fall salmon"	Eée-par-tóppem.
Male salmon	Charrk.	McCloud salmon	Winni-mãme nóo-oolh.
Female salmon	Kó-raisch.	Young salmon fry	Kóo-ootét nbo-oulh.
Grilse	Kó-riùlch.	Salmon eggs	Poo-oop.
Black salmon	Choo-lóo-loo noo-oulh.	Salmon skin	Nóo-oolh irritcha.
White (emaciated) salmon	Aée-teppem.	Dead salmon	Min-nal noo-oolh.

(For outline sketch of salmon see drawings accompanying the Smithsonian specimens.)

B.—DISTRIBUTION.

Question 2. Is it found throughout the year, or only during a certain time, and for what time?

Answer. Salmon are found in the Sacramento River, at and below Sacramento City, at all times of the year. They are found in the McCloud River from March to November. (See tables, pp. 181 and 183.)

Question 3. If resident, is it more abundant at certain times of the year; and at what times?

Answer. Salmon are most abundant in the Lower Sacramento in March, April, May and August. In the McCloud, they are most abundant in August.

C.—ABUNDANCE.

Question 4. How abundant is it, compared with other fish?

Answer. Salmon in the Sacramento are much more abundant than any other fish.

Question 5. Has the abundance of the fish diminished or increased within the last ten years, or is it about the same?

Answer. The fishermen say that the salmon in the river are as plentiful as ever they were, (although I see that the California fish commissioners report differently,) and that if anything they have been more abundant the last three years. The year 1866 was an exceptional year. The salmon were then very scarce, the river being almost destitute of them. The fishermen attributed it to the unusually muddy water of the river, caused by the mining that year. Some thought that there was a falling off in 1864 and 1865, but they are not all agreed on this point. In 1867, the salmon were as abundant as ever in the Sacramento River, and have remained so since.

It should be stated here that the salmon which used to abound in the Feather and American Rivers have been wholly driven out by the mining, without, however, appearing to affect the abundance of the salmon in the main river.

Question 6. If diminished or increased, what is the supposed cause?

Answer. See question 5.

Question 7. What is the amount, or extent, of the change in abundance?

Answer. See question 5.

D.—SIZE.

Question 8. What is the greatest size to which it attains, (both length and weight,) and what the average?

Answer. The greatest size to which the Sacramento salmon attain is from 50 to GO pounds. Mr. S. R. Jones, of Sacramento City, has seen fish caught at that point that weighed 51 pounds. He says he has heard of one, at San Francisco, weighing 60 pounds. Salmon weighing between 40 and 50 pounds are not uncommon. The average weight seems to be about 20 pounds for spring-salmon, and 23 pounds for summer-salmon. The longest salmon that I saw, measured 38 inches. This length probably seldom exceeded much. I should judge the average length of the salmon to be about 30 or 32 inches.

Question 9. State the rate of growth, per annum, if known; and the rate at one, two, three, or more years.

Answer. The rate of growth per annum is not known. The grils in the McCloud River, which were supposed to be eighteen months old measured from 18 to 24 inches in length. The theory is that salmon are full-grown at the age of about three years. It is also known that the young salmon in tbe McCloud, in May, are 2 or 3 inches long, from which the following conjectural table may be formed:

	Length.
Young fry, a few months old	2 or 3 inches
Grilse, eighteen months old	18 to 24 inches
Salmon, about three years old, (average)	30 inches

Question 10. Do the sexes differ in respect to shape, size, rate of growth, etc.?

Answer. During the fresh runs of the winter and spring, the sexes differ very slightly, if any, in shape or general appearance. The male may possibly be a little more curved in the jaws, and a little less plump along the sides of the abdomen, but these, differences arc but slightly defined. The difference is also very slight through the summer, but in the fall the distinctions of the sexes are very marked. The now full developed ova of the female gives her sex a peculiarly rounded and plump appearance, and the shape and expression of her head does not change much. On the other hand the male grows very deep and thin. His head flattens, his upper jaw curves like a hook over tbe lower, his eyes assume a peculiarly sunken and malicious expression. Large powerful white teeth, like dog's teeth, appear on both jaws, and the whole creature acquires an ugly and ferocious appearance. As to the comparative rate of growth of the two sexes, although I have not noticed that the males are larger than the females in winter and spring, I have always observed that they are considerably larger in the spawning season. Allowing the average age of both sexes to be the same, it would consequently appear that the rate of growth of the males is greater than that of the females.

E.—Migrations and movements.

Question 11. By what route do these fish come in to the shore; and what the subsequent movements?

Answer. All the fishermen agree that most of the Sacramento salmon come down the coast from the North. On arriving at the mouth of the river they spend some time in the bay of Sau Francisco. Two weeks after their arrival in the bay, they make their appearance at the head of tide-water. At this point they seem to wait some time, the fishermen being of the opinion that they play about here for a period, and actually go up a little ways into fresh water and return to tide-water again. It is more than four months after their appearance in the bay of San Francisco before they enter the colder tributaries of the river, as, for instance, the McCloud and Little Sacramento, one hundred and seven miles north of the head of tide-water. They do not reach the sources

of the Sacramento for two or three months after entering the mouth of the McCloud and Little Sacramento. There are, therefore, seven months between the first appearance of the salmon at the mouth of the Sacramento and their arrival at its sources four hundred miles above. They leave the sources of the river by August, tbe colder tributaries by September, the Sacramento proper by November or December, during which latter months the new winter run is beginning to come up.

Question 12. By what route do they leave the coast?

Answer. Not known.

Question 13. Where do they spend the winter season?

Answer. Mostly in the ocean. There are a limited number in the winter in the bay of San Francisco and tide-waters of the Sacramento.

Question 14. When are the fish first seen or known to come neat the shore, and when does the main body arrive; are the first the largest; are there more schools or runs than one c'oming in, and at what intervals?

Answer. The salmon first appear inshore in November, (the winter run.) The main body arrives at the head of tide-water in March and April, (the spring run.) There is another large run up the river in August, (the summer run.) The first are the smallest; the last run, in August, are the largest. There are three annual runs of salmon in the main Sacramento; the spring run, beginning in March; the summer run, beginning in August, and the winter run, beginning in November. The intervals between the runs are as follows: From winter run to spring run, no interval; from spring run to summer run—May to August—two months, the beginning of the spring run joining on to the end of the winter run. From summer run to winter run—September to November—one month.

Question 15. When do the fish leave shore, and is this done by degrees, in a body?

Answer. Not known.

Question 16. Is the appearance of the fish on the coast regular and certain, or do they ever fail for one or more seasons at a time, and then return in greater or less abundance? If so, to what cause is this assigned?

Answer. The appearance of the salmon at the month and at different points of the river is quite regular, a variation in the runs of two weeks, depending on the rains, (early and copious rains bringing early runs,) being the greatest irregularity. Their appearance is also very certain, the year 1866 being the only year since California was settled when the salmon did not run up the river as usual. This year they were very scarce. The fishermen, in their wish to represent it strongly, say, "there were no salmon in the river in '66." They attribute the extraordinary dearth of salmon that year to the muddy water, occasioned by the mining. The rains affect the running of the salmon to a limited degree, in two ways—the earlier the rains come, tbe earlier the salmon ascend the river, and the greater the rain-fall, the longer the run of fish.

Question .17. How do the runs differ from each other in number and size?

Answer. The winter run is small, and consists of comparatively small fish. The spring run is larger, aud contains larger fish. The summer run is the largest of all, and is composed of the largest fish.

Question 18. Which sex comes in first; and how far advanced is the spawn in the female on first arriving?

Answer. It is not known which sex comes first. The spawn is exceedingly small when the first salmon come in from the ocean in November. It is larger in the spring run, and still larger in the summer run.

Question 19. Will either sex, or both, take the hook on first arriving; and if so, is there any period of the stay of the fish when they refuse Hi

Answer. The salmon of both sexes take the hook in salt and brackish water and at the fresh and cold sources of the tributaries, but at no intermediate place that is now known.

Question 20. If they refuse the hook at first, how soon do they begin to take it after arriving?

Answer. See 19.

Question 21. Do the schools of fish swim high or low; and is their arrival known otherwise than by their capture; that is, do they make ripple on the water: do they attract birds, &c. i

Answer. In winter the salmon swim low; in summer they are in all depths of the water. The water is so muddy in the Sacramento that they are only discovered by their capture. In the cold tributaries forming their spawning-grounds they are seen by thousands in the water and jumping out of the water, and swimming with the dorsal fin cutting the surface.

Question 22. What is the relation of their movements to the ebb and flow of the tide ?

Answer. The salmon are generally moving against the tide. The fishermen watch the tide, and fish *with* it, so as to encounter the salmon swimming toward the net.*

Question 23. Does spawn ever run out of these fish taken with hook *l*

Answer. The spawn sometimes runs from the salmon taken with hook at the head-waters of the Little Sacramento.

Question 24. Answer same question in regard to fish taken in nets pounds; is the spawn ever seen in any quantity floating about inside nets?

Answer. The spawn never flows from the salmon caught in nets, except when they are taken on their spawning-beds.

Question 25. Are these fish anadromous; that is, do they run up fr the sea into fresh water for any, and for what, purpose?

*The water of the main Sacramento is so muddy that the fish cannot see the net close upon them ; consequently the fishing in this river can be done in the day-ti while in all other clear rivers the nets must be drawn at night.

Answer. Yes. They run up into fresh water to spawn.

Question 26. If anadromous, when are they first seen off the coast when do they enter the mouths of the rivers, and what is the rate of progression up stream?

Answer. See question 11, p. 186.

Question 27. If anadromous, what is the length of their stay in fresh water, and when do they return to the sea?

Answer. See question 11, p. 186.

Question 28. Do the different sexes or ages vary in this respect?

Answer. Not known.

Question 29. Do these fish come on to the breeding-grounds before they are mature; or do you find the oue or two year old fish with the oldest?

Answer. Male grilse, small and large, are found on the breeding-grounds, with the mature fish, but I have never seen a female grilse on the spawning-grounds or anywhere else.

Question 30. What are the favorite localities of these fish; say whether in still water or currents; shallow or deep water; on the sand; in grass; a" out rocks, &c.?

Answer, As a rule, I think the salmon keep in holes, and in deep and sheltered places. When they are spawning, or getting ready to spawn, they leave the holes and stay on the rapids.

Question 3.1. What depth of water is preferred by these fish?

Answer. They prefer generally the deepest water they can find in the rivers, except when spawning, and then they are seldom found in more than four or five feet of water, and are satisfied with less than will cover their dorsal fins.

Question 32. What tho favorite temperature aud general character of water?

Answer. In spawning they seek a temperature below 55° F., and do not avoid a temperature as low as 45°. The temperature of the lower McCloud was 48° at sunrise and 53° at sunset, during the spawning-season. The mercury falls two or three degrees below these figures on the spawning-grounds of the sources of the Little Sacramento. The water in the McCloud and Little Sacramento is very clear, swift, and cold. The water of the main Sacramento is always muddy.

F.—RELATIONSHIPS.

Question 33. Do these fish go in schools after they have done spawning; or throughout the year; or are they scattered and solitary?

Answer. The salmon always go in schools. Whenever they are found solitary and scattered it is because there are too few to make a school.

Question 34. Have they any special friends or enemies?

Answer. The seals and sea-lions are very destructive to the salmon in the salt water. Cuts and scars are often seen on the salmon, where they have been bitten by seals. They eat the bodies and leave the

heads. Eleven salmon-heads were once caught at Wood's Island, fr
which the bodies had been eaten by seals. Fishers and otters, and fi
hawks, also destroy them in fresh water, but not enough to affect th
numbers much. They have no friends that I am aware of, except fish-
turists and fish-commissioners.

Question 35. To what extent do they prey on other fish; and on wh
species?

Answer. Their food is similar to that of the Atlantic coast salm
while they are in the salt water; but they eat nothing in fresh wa

Question 36. To what extent do they suffer from the attacks of oth
fish, or other animals?

Answer. See question 34, p. 189.

G.—Food.

Question 37. What is the nature of their food?

Answer. See question 35.

Question 38. Are there any special peculiarities in the manner of i
ing of these fish?

Answer. They eat nothing in fresh water, but probably eat voraciou
in the ocean, their growth in salt water being so extremely rapid.

Question 39. What amount of food do they consume?

Answer. See question 38.

H.—Reproduction.

Question 40. Is there any marked change in the shape or colo
either sex during the breeding-season; or any peculiar developmen
or on any portion of the body, as the mouth, fins, scales, &c.?

Answer. At the spawning-season the changes, especially in the m
salmon, are very marked. Both sexes lose their bright and silvery c
Their scales become absorbed into the skin, which grows very slimy
perfectly smooth, like that of a catfish or horn-pout. Their color cha
into a dirty black, and then into a dark, unclean olive color. Blot
of fungus, and large patches of white, caused by abrasion of the
appear all over them. Their fins and tail become mutilated. T
bodies grow foul and emaciated. (The head of the male changes i
scribed under question 32.) Their eyes get more or less injured;
often become blind; swarms of parasites gather in their gills, and st
their fins. Their bodies reach the extreme point of attenuation, an
soon as the spawning is accomplished, they die.

Question 41. Are there any special or unusual habits during
spawning-season?

Answer. They lose their shyness at the spawning-time, so that
will not avoid a person standing a few feet from them, at the m
edge. I attributed this to their state of great exhaustion.

Question 42. Is spawning interfered with by lines or nets, or o
wise?

Answer. Not at all on the McCloud and "Little Sacramento." At
ama the salmon are *all* destroyed by fishermen, or nearly all.

Question 43. At what age does the male begin to breed; and at what
lithe female?

Answer. Probably the male begins to breed eighteen months after
ching. The female probably does not breed till one year later.
5 question 29, p. 189.)

Question 44. For how many years can these fish spawn?

Answer. No one knows. It is certain, however, that the salmon of the
Cloud and Little Sacramento do not spawn but once in *those rivers,*
they all die after spawning. If they ever spawned before, it must be
ewhere else, and they can never spawn again. There were fish in
McCloud this fall, 1872, that seemed to be several years old. They
like the rest, and it is a puzzling question where they spent the two
ree previous years. Other puzzling questions are called out as, for
ance, Why did they not come into the McCloud last year? If they
elsewhere last year, why did they not go to the same place this
If all the salmon die after the first spawning, how is the stock of
re fish kept up? &c., &c. These questions must remain unan-
ed for the present. The fact alone remains that ninety-nine one-
dredths, if not all of the salmon in the upper tributaries of the Sacra-
to River, appear to die immediately after their first spawning in
e streams, unless the few stragglers of the "fall run" be an excep-

uestion 45. Does the act of spawning exert an injurious effect?

nswer. Whatever the effect of the spawning may be, it is certain
the spawning fish die as soon as it is over.

uestion 46. Where do these fish spawn, and when?

nswer. The Sacramento salmon spawn as follows: At the sources of
iver, in July; in the Little Sacramento and in the McCloud rivers,
ugust; at the mouth of the McCloud, in September; in smaller
taries of the main river at and below Tehama, in October and
mber.

estion 47. Can you give any account of the process; whether males
emales go in pairs, or one female and two males; whether the sexes
uted indiscriminately? &c.

swer. The fish pair off and spawn very much according to the com-
lescriptions of the spawning of other salmon. The males are very
ssive at this season, and are always attacking other fish near them.

estion 48. Is the water ever whitened or colored by the milt of the

swer. Not. Never to a noticeable extent.

estion 49. What temperature of water is most favorable for hatch-

swer. 45° F. to 50° F.

estion 50. At what depth of water are the eggs laid, if on, or near
ottom?

Answer. The eggs are laid on the bottom, usually in from 1 foot to feet of water.

Question 51. What is the size and color of the spawn?

Answer. The spawn are very large, being not far from a quarter an inch in diameter. Their color is a deep salmon-red.

Question 52. What is the estimated number for each fish; and how ascertained ?

Answer. In the McCloud the number of eggs averaged about 700 f each pound of the parent fish; a 10-pound fish giving 7,000 eggs. Th was ascertained by weighing the fish and counting the eggs.

Question 53. Answer the question for one season, and for the lifetim

Answer. See question 52.

Question 54. Do the eggs, when spawned, sink to the bottom, and b come attached to stones, grass, &c., or do they float in the water un hatched *

Answer. See question 55.

Question 55. Do the fish heap up or construct any kind of nest, wheth of sand, gravel, grass, or otherwise; aud, if so, is the mouth, the snou or the tail used for the purpose, or what; and, if so, how is the mater transported; or do they make any excavation in the sand or gravel?

Answer. The parent salmon dig a nest in the gravelly and stony b of the river, with their tails and heads, and, having laid their eggs, th cover them over with stones and gravel in the same way. The McClo salmon did not pile up the gravel and stones over their nests as mu as the eastern salmon, but left them more level.

Question 56. Do they watch over their nest, if made, either singly in pairs ?

Answer. They do not watch over their nests.

Question 57. When are the eggs hatched, and in what period of t after being laid ?

Answer. The salmon-eggs in the McCloud probably hatch in Octo and November, or about sixty days after being deposited.

Question 58. What percentage of eggs laid is usually hatched ?

Answer. No one knows.

Question 59. What percentage of young attains to maturity ?

Answer. No one knows.

Question 60. What is the rate of growth ?

Answer. See question 9, p. 185.

Question 61. Do the parents, either or both, watch over the y after they are hatched ?

Answer. The parents are dead long before the young are hatche

Question 62. Do they carry them in the mouth, or otherwise?

Answer. See question 01.

Question 63. What enemies interfere with, or destroy, the spaw the young fish ? Do the parent fish devour them ?

Answer. Water insects, water fowl, trout, suckers, white-fish *possibly* the water ouzel. See question 61.

Question 64. Are the young of this fish found in abundance, and in what localities?

Answer. The young fish are found in great abundance in the neighborhood of tho spawning-ground in May, and probably before. After the month of May they suddenly and mysteriously disappear.

Question 65. On what do they appear to feed?

Answer. They probably feed on Crustacea, water-insects, and smaller fish.

I.—ARTIFICIAL CULTURE.

Question 66. Have any steps been taken to increase the abundance of fish by artificial breeding ?

Answer. No steps have been taken to increase the Sacramento salmon in the Sacramento river by artificial breeding. The United States has a salmon-breeding station on the McCloud river, one of the tributaries the Sacramento, but the object of this station is to obtain salmon for the Atlantic rivers, and not to replenish the Sacramento. Several thousand impregnated salmon eggs were successfully sent to the Atlantic coast from this place this fall, 1872, and have been hatched successfully. The destination of these young salmon is the Susquehanna river.

K.—PROTECTION.

Question 67. Are these fish protected by law, or otherwise ?

Answer. The Sacramento salmon are protected by a law imposing penalties on the use of weirs, pounds, or other fixed engines of capture, giant powder, and small-meshed nets. The Rio Vista and Sacramento fishermen wish for a law prohibiting salmon-fishing with nets, from the 1st of June till the beginning of the winter run in November. This seems to be a very judicious way of regulating the fishing, whenever it is thought best to regulate it by law. During the time mentioned, from June to November, the salmon are very poor, the fishermen make poor averages at fishing, and tons of spoiled salmon are thrown back into the river for the want of a market.

The supply of the Sacramento salmon has a singular natural protection arising from the fact that the McCloud river, containing the great spawning-grounds of these fish, is held entirely by Indians. As long as this state of things remains, the natural supply of the salmon stock of the Sacramento may be considered as guaranteed. That this protection is of no slight importance may be inferred from the fact that the advance of the white man, on the American and Feather rivers, two forks of the Sacramento, has been followed by the *total destruction* of the spawningbeds of these once prolific salmon-streams, and the spoiling of the water, so that not a single salmon ever enters these rivers now where they used to swarm by millions in the days of the aboriginal inhabitants. I earnestly hope that the policy which has been pursued

the Modoc Indians, against whom a war of extermination is n
on just north of the McCloud river, will never be adopted
McCloud River tribe. It would be an inhuman outrage to dri
and inoffensive race from their river, and I believe that
policy to use with them is to let them be where they are, and if ne
sary, *to protect them from the encroachments of the white men.*

L.—DISEASES.

Question 68. Has any epidemic, or other disease, ever been n
among them, such as to cause their sickness or death in greater
number?

Answer. No particular epidemic or disease has been observed,
of, among the Sacramento salmon. The breeding-s
are aware tributaries all die after spawning, but this is to
to their great emaciation and exhaustion, consequent upon
so long away from salt water, and not to disease, properly so

Question 69. When have these epidemics taken place, and to
causes have they been assigned?

Answer. See Question 68.

M.—PARASITES.

Question 70. Are crabs, worms, lampreys, or other living an
found attached to the outside, or on the gills of these fis

Answer. A worm-like parasite attacks the salmon in
gathers in vast multitudes in their gills toward the close of the
ing-season. They also fasten on their fins to some extent. I
noticed other parasites on the salmon.

N.—CAPTURE.

Question 71. How is this fish caught; if with a hook,
different kinds of bait used, and which are preferred?

Answer. The Sacramento salmon is caught with nets,
and with the hook. In the smaller tributaries of the main
as at Tehama, they are killed with shovels, pitch-forks, clubs,
available weapon. In the upper tributaries, as the McCloud,
them in traps, arranged to capture the fish going down
catch not those ascending the river. At the
exhausted, but Shasta, they are caught by legitimate angling
near Mount Salmon roe is almost exclusively used for bait. Some have
with the artificial fly.

Question 72. If in nets, in what kind
Answer. The salmon-fishing at the great fisheries in the m
is done wholly with drift-nets. These are gill-nets, which, when
across the river, are drawn or drifted up or down *with* the
salmon are caught, of course, by the gills in the meshes of the

Question 73. At what season and for what period is it taken in nets,
when with the line?

Answer. The salmon are always caught in the main river with nets,
the year round. They are taken with the hook at the sources of the
er, chiefly in July.

Question 74. What would be the average daily catch, of one person,
h the hook, and what the total for the season?

Answer. The average daily catch, at the head-waters of the Sacra-
nto, near Upper Soda Springs, with the hook and line, is about a
en salmon, weighing, on the average, 15 pounds apiece,

Question 75. Answer the same question for one seine or pound, of
ciftedlength.

Answer. Mr. William Hamilton, of the Schwartz fishing-grounds—a
specimen of the smaller fishing-grounds of the main river—caught
almon a day during the regular fishing-season, from March 1 to June
ith a common drift-net.

estion 76. Is the time of catching with nets or pounds different
that with lines?

nswer. Nets are used all the year round. Hook and line are used
resh water only, in July.

estion 77. Is it caught more on one time of tide than on another?
nswer, I believe the fishermen draw their nets chiefly at the turn
e tide.

O.—ECONOMICAL VALUE AND APPLICATION.

stion 78. What disposition is made of the fish "caught, whether
on the spot or sent elsewhere; and if so, where?

swer. All the salmon that are caught in the main river, including
y, are sold *fresh* in the San Francisco, Sacramento City, and
home markets, if possible. This includes, probably, about all that
freight in the winter and three-fourths of those caught in the spring.
that do not find a sale as fresh-salmon, are to some extent salted
and the rest are thrown back into the river.*
Indians on the upper tributaries dry their salmon and store them
their winter food. It is unnecessary to say what the anglers do
heirs.

stion 79. What is its excellence as food, fresh or salted?
wer. The Sacramento fresh salmon, when prime, is a fish of great
nce as food. The flesh is firm, juicy, rich, and delicious. After
pains to form a careful and correct opinion on the subject, I am
to say that it is in any degree inferior, when in its best condi-
o the Atlantic salmon, in its best condition. I think the common
is the other way, and I account for it as follows: The Atlantic

* On the 26th day of August, I saw 600 pounds of spoiled salmon at one fish-market
Sacramento City, which were about to be thrown into the river.

salmon are only sent to market in June, July, and August, when th
are in their very best condition. The *average*, therefore, is of a very hi
quality. On the contrary, the Sacramento salmon are in the mar
every month in the year, whether prime or not, and are the cheapest a
most common when they are the poorest, in consequence of which t
average Sacramento salmon of the markets the year round is a ve
ordinary fish. Now, people generally, unless their attention is specia
called to the subject, when forming their opinion of the comparati
merits of the two kinds of salmon, involuntarily compare the *avera*
Sacramento salmon with the *average* Penobscot salmon, and are co
pelled to decide in favor of the latter. I think this is the reason w
the Sacramento salmon is held to be an inferior fish. I was myse
before my arrival here, much prejudiced in favor of the Atlantic fi
and the Sacramento salmon, which I ate in August, confirmed
prejudice; but now, having eaten and carefully judged of the quality
the winter run or prime salmon of the Sacramento River, I resign
prejudice against these salmon, and state with confidence that I do
consider them in any respect inferior in quality to their Atla
kindred.

The same remarks apply in general to the salted salmon of the S
ramento.

Question 80. How long does it retain its excellence as a fresh fish

Answer. These salmon do not differ from other salmon in respect
the length of time that they will remain fresh and sweet. They
be kept fresh two weeks, and even more, on ice, especially when pri

Question 81. To what extent is it eaten ?

Answer. The Sacramento salmon are universally eaten, and the <ext
of their consumption is very great.* One line of steamboats brou
400,000 pounds of Sacramento salmon into San Francisco in March, 18

Question 82. Is it salted down, and to what extent ?

Answer. It is estimated that 25,000 salmon were salted down on
Sacramento River last spring, (1872,) and 9,000 last fall. This, hoyre
includes all that were salted, both from the catch above tide-water
below it.

Question 83. Is it used, and to what extent, as manure, for oil, <o
other purposes, and what ?

Answer. It is not used to any extent as manure, for oil, or other
poses than for food.

Question 84. What were the highest and lowest prices of the fish
pound, during the past season, wholesale and retail, and what the aver
and how do these compare with former prices ?

Answer. The highest price during the last year for Sacramento sa
was 25 cents per pound, wholesale, and 18 cents, retail. The lowest
wholesale and retail, ran from 5 cents to nothing. The average

* See note at bottom of page 1!)7.

rough the year has been about 10 cents. These are gold figures. The
ee has not varied much the last few years.

Question 85. Are these fish exported; and if so, to what extent f

Answer. The Sacramento salmon are not exported at all, or only in a
exceptional instances, the home demand being sufficient to exhaust
em.

Question 86. Where is the principal market of these fish ?

Answer. The principal market for them is the City of San Francisco.

20.—OTHER SALMONIDÆ OF THE SACRAMENTO RIVER.

The other *Salomonidæ* of the Sacramento (main) River are confined to
variety, which some call a salmon, but which the fishermen think is
ountain-trout, which has dropped down the river farther than usual.
is described in my catalogue of Smithsonian specimens under Nos. 12
13. It is quite rare iu the Lower Sacramento.

The common mountain-trout is found in abundance in all the cold
utaries of the main river, and probably other varieties which have
been reported.

21.—OTHER SALMONIDÆ OF THE M'CLOUD RIVER.

Besides the salmon, there are, in the McCloud, three other varieties
Salmonidæ: 1, the common mountain-trout; 2, the *wye-dar-deeket;*
3, tho "silver-trout." A full series of specimens of the first variety
been collected and sent to the Smithsonian Institution. (See cata-
ue of specimens.) This fish is delicious eating, when prime, and is
abundant in the river, and ascends the small tributaries of the river
ast quantities, to spawn, in the winter.

The second variety is very rare in the Lower McCloud, but abundant
to head-waters, and being a very handsome and delicious fish, is the
orite fish for fifty miles around. (See No. 27 and No. 68 of Catalogue
Smithsonian Specimens.)

The third variety I only heard of as being at the sources of the
Cloud. It was described to me as a round, plump, silvery trout, and
rare.

fell here add that the other fish of the Sacramento (main) River are
white-perch, Sacramento pike or white-fish, (a cyprinoid,) sturgeon,
, hard-heads, split-tails, (herrings,) suckers, mud-fish. Of these the
ite-fish, sucker, and mud-fish are found in the McCloud River. (See
alogue of Specimens.)

22.—LIST OF INDIAN WORDS OF THE M'CLOUD DIALECT.

lthough it does not properly come within the scope of this report, I
the liberty to append a few words of the dialect of the McCloud

am informed by the fish-dealers in San Francisco that 10,000 fresh salmon a week
flit into that city from tho Sau Joaquin and the Sacramento Rivers in August,
salmon are the cheapest and most abundant.

Indians, for the sake of preserving something of a language which wi
soon become extinct. Without expecting to save them, I picked up the
words casually from the Indians lastfall, (1872,) while getting the salmo
eggs, and, meager as the list is, I believe it is the only collection of wor
of the McCloud Indians that has been made:

LIST OF WORDS.

Indian	Wintoon.
White man	Yi-patoo.
No	fillo.
Yes	Ho.
Yes, (emphatic)	Urmâno.
Very	Bóo-ya.
A great many	Bóo-ya.
Large	Bo-hā-ma.
Small	Koo-oo-tett.
Cold	Teém-ma
Warm	Peé-lár-ma.
Live	Móoruch-béer.
Dead	Min-nâl.
I, me, mine, my	Nett.
You, your, him, her, his, hers	(Non ego) mutt.
North	Wy-ee.
East	Pôu-ey.
South	Norrh.
West	Num.
Day	Sannie.
Morning	Horn-heema.
Evening	N6-monnie.
Night	Ken-wahnie.
Dark	Chéepy.
Sleep	Kéen-na.
Sleepy	Keen-ka.
Breakfast	Himmár-bar.
Dinner	Sannie-bar.
Supper	Kenwannie-bar.
To-morrow	Hímmar.
Yesterday	Lender.
Head	Pîll-yoak.
Eye	Toohio.
Mouth	Oó-ool.
Face	Toom.
Hair	Tom-moi.
One	Két-tett.
Two	Parr-la,
Three	Pahn-oulh.
Four	Clów-ett.
Five	Sánsigh.
Six	Set-panoulh.
Seven	Ló-lochett.
Eight	Sét-clow-ett.
Nine	Kétett-éllcss.
Ten	Tickalouss.
Fish	Déek-et.
Salmon	Noo-oohl.
Trout	Syee-oolott.
Salmon-trout	Wye-dar-dceket.
Salmon-eggs	Poo-oop.
Sacramento white fish.	Chóo-sûs.
Male salmon	Cliarrk.
Female salmon	Kō-raisch.
Black salmon	Choo-lóo-loo nóo-o
White, (emaciated) salmon.	Aée-teppem.
Late-fall-salmon	Eéc-par-teppett.
McCloud salmon	Winny-māme h oolh.
Grilse	Kóo-rilsh.
Salmon-fry	Kóo-ootett noo-oo
Dorsal-fin	Khō-rōhl.
Adipose-fin	Toohw-keeh.
Pectoral	All-āle-i-kóbol.
Anal	Kén-tee-kóbol.
Caudal	Pwár-tolh.
Gills	Khar-nee.
Man	Wintoon.
Woman	Mō-hālee.
Boy	Wéetah.
Girl	Pochtílah.
Infant	Pickaninny.
Wife	Poích-ta.
Sweetheart	Poich-ta.
Hand	Semm.
Foot	Semm.
Arm	Khée-dett.
Horse	Horse.
Cow	Cow.
Bear	Checlkh.
Grizzly bear	Wée-mar.
Hog	Hor-róichta.
Deer	Nopp.
Beaver	Só-chett.
Otter	Māme-tóolich
Mink	Bíes-syooss.
Coon	Ca-rāillett.
Fisher, (cat)	Yúpokos.
Water-dog, (lizard)	Hée-sollett.
Water-ouzel	Soñr-sínny.
Gun	Kō-lool.
ow	KO-lool.
rrow	Nott.
shoot	Yoopcha.
ll shoot, (future)	Yoopcha.
ve shot, (past)	Yoopcha.
ear	Kay-ell.
spear	Dídt-ley.
spear a salmon	Noo-oolh didt-ley.
hoot a deer	Nopp yóop-cha.
catch	Perri-mahn.
patch a trout	Syee-oolott perri-raahn.
use	Boss.
ver	Même.
ater	Même.
it	Welche.
an	Welche meme, or bohāma meme.
amento River	Bohaima meme.
	Pohrr.
ad	Chów-tráss.
ur	Chów-tráss.
ns	Klích-ly.
od	Chûsse.
	Mee.
acco	Lo-ole.
te	Kelly-kelly.
ns, growing	Peurmalh.
ket	Jackloss.
king-glass	Ken-wiúnas.
	Winnem-coddie.
	L6o-hay.
ain, (verb)	Lóo-hay.
	Pomm.
ury	Pomm.
ars	Lóo-lich.
skin, tanned	Táy-ruch.
-eye, (nut)	You-nott.
y	Péss-sûs.
tain	Bo-haima pil-yokh.
	Charrua.
	Wor-óhter.
	Chálla.
	Chip-kálla.
clean)	Illa.
	Bóo-koolah.
	Winn-neh.
ne	Widder.
	Harra.
gone	Harra.
	Harra.
	Bóoha.
	Bóoha.
, (rest day)	Sannie booha.
	Ketett sannie booha.
To bring	Wérrell.
To pay	Doo-ya.
To give	Doo-ya.
To stand	Hick-f-yah.
To give	Kóot-eh.
To want	Squéea.
To eat	Bar.
To be hungry	Bar-squeea.
To drink	Boolah.
Intoxicated	Whisky-Boolah.
To drink spirits	Whisky-bar.
To strike	Kóopah.
To chop	Kóopah.
To steal	Khí-yah.
To remain	Pomadilly.
To reside	Pomadilly.
To sit down to rest	Kéltnah.
To buy	Poolah.
To work	Kléet-ich.
to be tired	Klee-tich-et.
To sew	Hooray.
To skin	Irritïcha.
To skin a deer	Nopp irritcha.
To be afraid	Khée-lup.
To like	Hī-hīna.
To love	Hī-hina.
To kiss	Ell-chópcha.
To swim	Méme-tulich.
To row (a boat)	Méme-tulich.
To understand	Tipna.
To know	Tipna.
To know	(Spanish) sáp-beh.
To talk	Teen.
All	Komm.
Same	Pée-yanny.
Other side	Poo-yelty.
Opposite bank of river.	Poo-yelty māme.
This side	Num-ílty.
Chief	Wee-ee.
Stars	K16o-yook.
Straight	Kéllar.
Bye and bye	Pôp-ham.
Black	Choo-loo-loo.
White	Kī-yah.
To have	Bemen.
How	Hen-nSnie.
How many	Híssart.
When	Héssan.
How long	Héssan.
Where	H6cky.
Here	Éh-weh.
What	Pày-ee.
Say, (tell me)	Hád-die.
I don't know	O-oo.

I don't care	Héster.
Deer-skin	Nopp-nickol.
Deer-stew	Nopp-clummiss.
North star	Wye-dar-werris.
Sick, (at the stomach)	Técklich-kóolah.
Thread	Thee-put.
McCloud River	Wínnie-máme.
My land	Net Pomm.
When you come	Hessan mut widder.
Atlantic Ocean, (far east salt water.)	Kéll-ale-poo-ay welkh mame.
Come again.	Way-ai-worr-ry.
Good bye, (the idea of going, simply.)	Harrá-dar.
Let us go; come on	Harrú-dar.
Moon	Sass.
One month; next month.	Ketett sass.
Thank you—(simply "good.")	Chúlla.
Bring a salmon to my house.	Mut widder net noo-oolh.
Good Indian	Chúlla wintoon.
Bad white man	Chípkalla yí-patoo
Do you want to see my gun?	Mut winner net kolool.
Coming	Well-árbo.
Come in and sit down.	Éll-ponah kéltnah
San Francisco, New York, or any distant place, (far-off land.)	Kóll-ale pomm.

Spanish words used by McCloud River Indians.

These words are spelt as the Indians pronounce them.

Much	Móocha.
Small	Chikéeta.
To know	Sáh-beh.
Man	Moochúcha.
Cluster of Indian lodges.	Ranchery.
Money	Pês-sous.

C—CATALOGUE OF NATURAL HISTORY SPECIMENS, COLLECTED ON THE PACIFIC SLOPE, IN 1872, BY LIVINGSTON STONE, FOR THE UNITED STATES FISH COMMISSION.

No. 1. Skin and head of fish, caught in Green River, near Green River Station, (Pacific Railroad,) August 6, 1872. Weight about three-quarters of a pound. Common name, "Buffalo-fish," "White-fish," "Green River Sucker." (See note.) (See drawing.)

No. 1. Green River, at this station, has an elevation of 6,140 feet. The surrounding country has a very barren and desolate appearance, as if nothing could live there. Fortunately for the few inhabitants of the place, this fish, together with suckers, abound in the waters of Green River, and are here caught in considerable quantities with a small sweep-seine.

No. 2. Common California brook-trout; San Pedro brook, twenty miles south of San Francisco. Yearling. August 17, 1872. These fish spawned in the San Pedro brook in March and April. Abundant. (See note.) Contributed by California Acclimatizing Society.

No. 2. The California Acclimatizing Society has its headquarters at San Francisco and its ponds at Sau Pedro Point, in San Mateo County, twenty miles south of San Francisco. Its officers for 1872-73 are: Dr. W. A. Newell, 632 Mission street, president; John Williamson, 632 Mission street, secretary. This society has successfully introduced from the East the black bass (*Grystes fasciatus*) and the brook trout, (*Salmo fontinalis.*) They have also succeeded in hatching and raising artificially a large n

Lake Tahoe trout and California brook-trout, (*Salmo iridea.*) The society has received several orders recently from Australia and New Zealand for a largo number of its eggs of the California *Salmonidæ.*

No. 3. Same as No. 2.

No. 4. Lake Tahoe trout. Common name, (Tahoe) "shore-trout." Yearling. August 16, 1872. Very abundant at Lake Tahoe. This one was hatched artificially at the ponds of the California Acclimatizing Society in April or May, 1871. Contributed by California Acclimatizing Society.

No. 5. Same as No. 4.

No. 6. Six specimens of young fry, hatched in April, from parents taken from San Andrea's reservoir, and reared at California Acclimatizing Society ponds. August 17, 1872. Contributed by California Acclimatizing Society.

No. 7. Six specimens of California brook-trout. San Pedro brook. Young fry, August 17, 1872. (See drawing.) (See note.)

No. 8. Skin and head. Common name, San Andrea's lower reservoir trout. Weight, 8 pounds. Length, 26 inches. Girth, (just in front of dorsal,) 17 inches. Peculiar to the lower reservoir of the San Andrea's ("Spring Valley") water-works. (See note.) The fattest and heaviest trout of its length that lever saw. Easily landed, and died very quickly. There were about 500 separated and fully-developed eggs of last spring's brood lying loosely in the abdomen. The natural spawn of the next season were quite small—perhaps the size of pin-heads. This fish is rare, and is the only *large* trout caught in the lake. Silvery. No colored spots. Caught with *chub* bait. August 20, 1872.

No. 8. This was a fine specimen of its kind, and one of the largest ever taken. The "reservoir" in which it was caught is an artificial body of water, several miles long, formed by building a dam across the San Andrea's brook, and used to supply the city of San Francisco with water. The appearance of this fish in the reservoir was a surprise, as no fish of that size had over been known about there before. It is thought by some to be a salmon, accidentally shut in from the sea by the dam, and by others to be a trout, which favorable circumstances bring to this unusual size. The reservoir absolutely swarms with *chubs,* about six or eight inches long, which form the food of these large fishes. It is a singular fact that the upper reservoir, a short distance above on the same stream, contains only the common trout of the usual size.

No. 9. Silver trout. San Andrea's lower reservoir. Rather rare. Very much resembles salmon smolt. Never caught large. Beautiful form.

No. 10. Viscera of No. 8.

No. 11. Two specimens. Utah mountain-trout. Young fry. Salt Lake City trout-ponds. Hatched artificially. Parents taken in Bear River. Abundant in Bear River and Bear Lake, aud other cold mountain waters in Utah. Hatched in April, May. Period of incubation, very short. August 9, 1872. (See note.) Contributed by A. P. Rockwell, superintendent fisheries Salt Lake City.

No. 11. Tho Salt Lake City trout-ponds are fed by springs and spring streams, which contain the *clearest* and *purest* water that I have ever seen. Indeed, in these respects the water is very extraordinary. It will run for six months without depositing sediment or growing fungus. Water-cress and other water-plants grow in this water with a rankness and luxuriance that is wonderful. Although the water must contain alkali it is vastly superior to any water that I have ever seen on the Atlantic or Pacific slope for breeding and rearing trout.

There is a fine lot of the native Utah trout at this establishment, which is confined at present to the hatching and rearing of the native varieties, viz, Utah mountain trout and Utah Lake trout. The place is carried by the city government, and is in charge of the Mormon superintendent of fisheries, Mr. A. P. Rockwood.

No. 12. Sacramento River trout. Sacramento River at Sacramento City. Rare. Female. August 26, 1872. (See drawing.) This variety sometimes attains a large size, being occasionally as large as the small salmon. They are called salmon by some. Mr. S. R. Jones, of the Sacramento fish-market, and a good authority, thinks that they are mountain-trout which have accidentally dropped down the river to this point. They are caught here chiefly in the fall, and when the winter rains come on they disappear again.

No. 13. Sacramento River trout. Male, August 26, 1872. See No. 12. (See drawing.)

No. 14. Pharyngeal teeth of "Sacramento pike." August 20, 1872.

No. 15. Viscera of No. 12.

No. 16. Viscera of No. 13.

No. 17. Salmon grilse. September 3, 1872. McCloud River. Very deep and thin. Head, tail, back, aud fins black. Very black all over when dry, except on belly.

Dimensions.

	Inches.
From snout to fork in tail	
From snout to end of tail	
Girth	
Head	

Abundant. Scales absorbed into skin, and skin very slimy. Flesh poor but eatable. Many parasites in gills. (See drawing.) (See note.) It

No. 17. The word "girth" iu tho catalogue, when used without explanation, means the measurement taken just in front of the dorsal fin.

No. 18. Viscera of No. 17. Testes, or milt glands, were not saved but they were very large and full, with milt flowing copiously from the

No. 19. Salmon grilse. Male. Body deep and thin. McCloud River, California, September 5, 1872. Very black and slimy. Gills filled with parasites. Looked foul. Greenish yellow sores iu flesh, under the fins. Weight, 4 pounds. (See drawing.)

Dimensions.

	Inches.
Length, snout to tip of tail	24
Length of head	4
Girt	11
Girth of head	10
Girth of tail, (at smallest part)	4

Weight, 4 pounds.

No. 20. Viscera of No. 19. Milt well developed and prime.

No. 21. Trout. Indian name, *syóolott.* McCloud River. Female. September 7, 1872. Small head and beautiful form. Capital eating. Quite common.

Dimensions.

	Inches.
Length, from snout to tip of tail	15¼
Length of head	1½
Girth	8½
Girth of head	5½
Girth of tail	3

Spawn considerably developed. There were nearly one-half pint of salmon eggs in this trout's stomach when caught. This was the best fish for eating that we found while on the McCloud. (See drawing.)

No. 22! Trout, *syóolott*, McCloud River, September 7, 1872. In poor condition compared with No. 21; but in better condition than No. 23. Stomach one-quarter full of salmon-eggs, which is the bait used by the Indians for catching them. Eggs less developed than those of No. 21. Like the whole *a* lank-looking fish, with comparatively large head, but all bad eating. This one, I believe, was speared by the Indians. (See drawing.)

No. 23. Trout. (Indian) *syóolott.* Said by the Indians to be the common mountain-trout, like the previous specimens. McCloud River, September 7, 1872. Thin, emaciated, and in very bad condition. Very large head, compared with body. Dorsal fin mutilated. Flesh looked unhealthy. Eggs very small and diseased. Organs of exit ulcerated and swollen. NOTE. — Fish (trout) similarly diseased are occasionally found at artificial trout-breeding ponds. The Indians said that Nos. 21, 22, and 23 were the same fish, though found in such different condition. (See drawing.)

No. 24. Viscera to No. 21.

No. 25. Viscera to No. 22.

No. 26. Viscera to No. 23.

No. 27. Common name, salmon trout; Indian name, *wye-dar-déekit.* McCloud River, September 7, 1872. Also called at Soda Springs the "Varden" trout. (See No. 68.)

Dimensions.

	Inches.
Length, snout to tip of tail	17¼
Girth	9

Meat firm and hard, but rather dry; tasted very much like No. 8. The handsomest trout, and, on the whole, having the most perfect form of all the trout we saw on the McCloud. Also, the only fish that had colored spots. This one was profusely spotted over most of the body with reddish golden spots. (See drawing.) Possibly the *Salmo spectabilis*, Pacific Railroad Reports, vol. xii, p. 342-3. (See note.) Only a medium table-fish, at this season. Rare.

No. 27. This trout is rare in the lower waters of tho McCloud, but common at its head-waters. Fishermen say that this trout is caught nowhere else in California. It is considered a great luxury at Soda Springs, on tho Little Sacramento, from which place parties often travel the fifteen-mile trail to the Upper McCloud to catch it. Mr. I. F. Frye, of Soda Springs, once caught a mountain-trout of two pounds on his hook, and as he was just in the act of pulling it out of the water, it was seized by a monstrous *wye-dar-dēekit*, which Mr. Frye says could not have weighed less than 20 pounds. The latter fish was lost, but tho mountain-trout showed the marks of his teeth on both sides.

No. 28. Viscera to No. 27.

No. 29. Male salmon. McCloud river, California, September 23, 1872. A clean, healthy, nice-looking fish, but not silvery. This fish belongs to a class which are just beginning to come up the river, in limited numbers, called the fall run. Their flesh is quite palatable and good, and there is considerable fat on them still. Their scales have usually been absorbed, and the surface of the skin is smooth and slimy. These are the only salmon now coming up the river. All the others are floating down the river, dead or dying. The milt of this fish was well developed and flowing. Girth, 15 inches. (See drawing.)

No. 30. Large, full-grown male salmon. September 25, 1872, McCloud River, California. Weight, 20 pounds; girth, 21 inches; girth at anus, 16 inches; length, 38 inches. (Consult *Salmo canis*, W. Pacific Railroad Report, vol. xii, p. 341.) (See drawing.) (See note.)

No. 30. This fish was *one of the largest, if not the largest,* which we saw on the McCloud. He was thin and worn, but would have weighed nearly 40 pounds when in good condition.

No. 31. Viscera to No. 30.

No. 32. Male salmon. McCloud River, September 25, 1872. Girth in front of dorsal, 10 inches; at anus, 13 inches. No drawing was taken of this fish.

No. 33. Viscera to No. 32.

There is no No. 34.

No. 35. Grilse. The skin was accidentally scraped somewhat with a knife. September 25, 1872, McCloud River, California.

No. 36. Grilse. McCloud River, September 25, 1872.

No. 36. Head of male salmon. McCloud River, September 25, 1872.

No. 37. Head of male salmon. McCloud River, September 25, 1872.

No. 38. Head of male salmon. McCloud River, September, 25, 1872. Probably an old fish.

No. 39. Head of female salmon. September 25, 1872.

No. 40. Trout. The common mountain-trout of California. Indian name *syoolott* McCloud River, September 27, 1872. This is a beautiful specimen of the species.

No. 41. Mountain-trout. McCloud River, September 26, 1872. (See note.)

No. 41. Tho common mountain-trout is easily caught at most seasons of the year, with almost any seasonable bait, and also, and quite as successfully, with the artificial fly. The Indians also spear them. It is, however, hard to catch them on tho Lower McCloud after tho 1st of October. (Soc report on salmon-breeding.)

No. 42. Same as 41.

No. 43. Female salmon. McCloud River, September 28, 1872. This fish had spawned; was foul, emaciated, and with tail almost worn off. A fair specimen of the fish which are now floating down the river, dead or exhausted. Weight 10 pounds. (See drawing.)

No. 44. Female salmon. McCloud River, September 27, 1872. Weight, pounds. This fish had not spawned when caught. The drawing was aken after spawning the fish. She had 4,500 eggs. (See note.) (See rawing.)

No. 44. The less number of ova in tho McCloud salmon, compared with the eastern almon, was very noticeable. I never found over 700 eggs to tho pound in the McCloud almon. On the other hand, the eggs were larger than those of the Atlantic salmon.

No. 45. Male grilse. McCloud River, September 27, 1872. Foul, but fair specimen. Abundant, though not so much so as the full-grown almon. (Sec note.)

No. 45. I did not find a single female grilse among the great numbers of grilse which examined and saw on the McCloud; nor have I ever seen a female grilse elsewhere, though I have seen persons who said they had seen them.

No. 46. Young trout. Indian name *kóo-ootét syo-lott*="small trout." cCloud River, September 29, 1872.

No. 47. Yellow sucker. McCloud River, September 29, 1872. Abundant. (See note.)

No! 47. The other fish of the McCloud River besides tho (1) salmon are the (2) common mountain-trout, (3) *wye-dar-dēekct,* (see No. 48,) (4) white-fish, (cyprinoid?) (5) common sucker, (6) yellow sucker, (see No. 72,) (7) mud-fish, (8) silver-trout? Headwaters of McCloud.

hese above are all the fish that are found in the McCloud River in September, October, and November.

No. 48. Common name on the McCloud, "white-fish;" common name on the Sacramento, "Sacramento pike." McCloud River, September 29, 1872. Abundant,

No. 49. Viscera to No. 48.

No. 50. Same as No. 48. These fish are caught with salmon roe, and are very abundant at this season. (See drawing.) They grow here to an average weight of one or two pounds; but in the warmer waters of the Lower Sacramento, say at Sacramento City, they attain a very large size. Their flesh is sweet and good, but soft and bony.

No. 51. Viscera to No. 50.

No. 52. Female salmon. Indian names, *mohalie no-oolh* = she or woman-salmon, and *kōraisch* McCloud River, September 30. Weight, 18 pounds. Girth, 18¾ inches. This is a "fall run" fish, and is larger than the average of the "fall run," but not larger than the average of the summer-salmon.

No. 53. Red-headed woodpecker. McCloud River, California, October 8, 1872. Contributed by Hon. B. E. Redding.

No. 54. Snake. Head-waters of Sacramento, October 10, 1872. Contributed by B. B. Redding.

No. 55. Trout. Indian name, *syóo-lott.* Sometimes called the red-banded trout. Little Sacramento River at Upper Soda Springs, October 10, 1872. This trout has an almost scarlet band, extending the whole length of the body, and about as wide as one-fourth the depth of the fish. The band overlies the lateral line, and is about evenly divided by it. The Indians say that it is the common mountain-trout, and that the scarlet band is found on some, but not on others. (See note.)

No. 55. The scarlet-banded trout appears to be tho same as tho common mountain trout, the scarlet baud being an accidental feature, dependent upon seasons and localities. For instance, on tho coast it is rarely seen in its full brightness; in the Lower McCloud, the trout have it iu June, aud it continues to grow more vivid and deeper colored till the middle of August, when it leaves them altogether, and does not show itself at all in September and October. Again, at the head-waters of the Sacramento the golden band is on tho trout all the year round, and it is probably the same with the trout at the head-waters of the McCloud. The bright scarlet band is so rare on the coast that the trout fishermen call if a different variety, and esteem it an unusual prize. (See No. 64, catalogue.)

No. 56. Red-banded trout. Head-waters of Sacramento, near Mount Shasta. Temperature of water, 46° F. The trout caught in these cold waters are very fine. October 10, 1872.

No. 57. Red-banded trout. Head-waters Sacramento, near Mount Shasta, October 10, 1872.

No. 58. Same as No. 57.

No. 59. Red-banded trout. Little Sacramento. Upper Soda Springs, October 10, 1872.

No. CO. Same as No. 59.

No. 61. Same as No. 59.

No. 62. Same as No. 59.

No. 63. Same as No. 59.

Among these specimens of red-banded trout, is one skin and head not designated, of which there is a drawing.

No. 64. Red-banded trout. Little Sacramento, at Frye's Upper Soda Springs, October 9, 1872. Abundant. Caught all the months in the year. All the trout at this part of the Sacramento have the red band at all seasons of the year. These trout are caught with artificial fly, and the ordinary trout-fishing bait; salmon roe being found the most effective of the natural bait. Mr. Sisson says that the flesh of these fish is sometimes white and sometimes red. Mr. Frye says that this is the same trout that he has caught all the way up and down the California coast.

No. 65. Red-banded trout. October 9, 1872. Little Sacramento River, near the hotel kept by Mr. Isaac F. Frye, at Upper Soda Springs.

No. 66. Same as No. 65.

No. 67. Same as No. 65.

No. 68. Common name, salmon-trout. McCloud. Indian name, *nye-dar-déek-it,* which means the fish from the North, this variety being caught only iu the head or northern waters of the McCloud. The local name at Soda Springs is the "Dolly Varden" trout. Head-waters of the McCloud River, September 1, 1872. This specimen is salted, and is the same as No. 27, but in the lower waters of the McCloud, where No. 27 was caught, it is rare and exceptional, while at the head-waters of the river it is common. (See note.) The spawn in this fish were large and almost ripe. These fish are thought to sometimes attain a size of 20 pounds. One was caught which weighed 5 pounds; another which weighed 11 pounds. They are considered very fine eating at Soda Springs. The salted one which I ate was certainly very fine. (See No. 27.)

No. 68. I was told that at the head-waters of the McCloud, there is a beautiful silvery trout beside the "Dolly Varden," called tho "silver-trout." (See note to No. 47.)

No. 69. There is no number 69.

No. 70. Trout, October 10, 1872. Head-waters of the Sacramento.

No. 71. Water-ouzel. October 10, 1872. Indian name *sours-sinny.* Head-waters Sacramento, October 10, 1872. At a distance the water-ouzels seemed to be almost the color of the rocks on which they stand and look for food. They have a peculiar note like a child's rattle, but at times sing beautifully.

No. 72. Mud-fish. McCloud River, October 31, 1872.

No. 73. Small mud-fish. McCloud River, October 31, 1872.

No. 74. Young trout, McCloud River, October 31, 1872.

No. 75. Same as No. 74.

No. 76. Trout. Wentworth's brook. This brook empties into the

McCloud on its east side, about thirteen miles above its mouth. There are a ranch and cabin here, occupied by the only white resident of the McCloud River, Mr. Frank Wentworth. November 1, 1872.

No. 77. Same as No. 76.

No. 78. There is no No. 78.

No. 79. Salmon. Female. Mill-brook, near Tehama, on the Sacramento River, November, 7, 1872. Abundant. This is a small stream where the salmon rush up to spawn in great numbers, in October and November. They also come up this brook in April, May, and June. They resemble in many particulars, in outward appearance, the "fall run" of the McCloud River. This point is fourteen miles below the head of navigation of the Sacramento River, which is here quite deep and broad. The water of the main river is roily here. (See note.) (See drawing.) Girth, 20 inches. Weight 16½ pounds.

No. 79. At Tehama, in the fall, the salmon are speared and trapped in great numbers and many are sent to the San Francisco and Sacramento markets, salmon from other sources being very scarce at this time. These spawning-fish, however, are seldom offered for sale in the first-class markets, and are not eaten by the initiated. They are in demand, however, at the more common restaurants and eating-saloons.

No. 80. Salmon. Male. Mill-brook, near Tehama, on the Sacramento River. Abundant. November 7, 1872. These fish wore in their prime for spawning the last week in October. At this date many had spawned but many, also, of this run, had spawn and milt in them. Weight, 5 pounds; girth, 13¾ inches. (See drawing.)

No. 81. Same as No. 80. Male, weight 13 pounds; girth 18½ inches. (See drawing.)

No. 82. Salmon. Female. Mill-brook, near Tehama. Weight, 10½ pounds; girth, 16½ inches. November 7, 1872. (See drawing.)

No. 83. Salmon grilse. Male. Mill-brook, near Tehama, November 7, 1872. Weight, 4½ pounds; girth, 12⅜ inches. (See note.) (See drawing.)

No. 84. Salmon. Female. Mill-brook near Tehama, on Sacramento River, November 7, 1872. Weight, 10¾ pounds; girth, 16 inches. The fish had perfect or nearly perfect scales, and a somewhat silvery appearance. The eye will be seen in this specimen to be larger than that of the other specimens. Salmon with unabsorbed scales are very rare at this season, and at this distance from the sea. I did not find one on the McCloud from September 1 to November 1 that had scales like those on this specimen. (See drawing.)

No. 85. Tom-cods. San Francisco Bay, November 16, 1872.

No. 86. Common name on Pacific coast, is smelts. San Francisco Bay, November 16, 1872.

No. 87. Shrimps. San Francisco Bay, November 16, 1872. (These creatures lived longer in the alcohol than anything I have seen except lizards.)

No. 88. Octopus. Common name among the fishermen is squid. I suppose this is the *pieuvre* of Hugo's "*Les Travailleurs de la Mer*," or *poulps*. Farallone Islands, November 15, 1872. Occasionally caught on this coast. The fishermen speak of it with dread, and evidently consider it very formidable. This specimen was not considered a very large one; yet it must have been much larger than the one Hugo describes, as this one has over 1,200 suckers to 400 of his specimen. Adams speaks of one caught near the Meia-cashimah Islands as a very large one, because it could cover an area of 12 feet in circumference. The arms of this one were about 4½ feet long, and could cover an area at least 28 feet in circumference. The Italian fishermen consider them good to eat, and very good, too. The ink-bag was quite full, and had, I should say, over a half a pint of fluid in it.

No. 89. Trout. McCloud River, November 2, 1872.

No. 90. Rock-perch. Near Goat Island, San Francisco Bay, November 18, 1872.

No. 91. Porgee. Near Goat Island, San Francisco Bay, November 18, 1872.

No. 92. Salt-water trout. San Francisco Bay, November 18, 1872.

No. 93. Rock-perch. Sau Francisco Bay, November 18, 1872.

No. 94. Rock-perch. San Francisco Bay, November 18, 1872.

No. 95. Salt-water trout. Sau Francisco Bay, November 19, 1872.

No. 96. Salt-water trout. Sau Francisco Bay, November 19, 1872.

No. 97. Spider. Near Mount Shasta, October 10, 1872.

No. 98, No. 99. There are no Nos. 98 and 99.

No. 100. Three specimens. White-fish, Russian River, Mendocino County, California, September, 1872. Contributed by J. Williamson.

No. 101. Herring. Five specimens. San Francisco Bay, November 22, 1872. Males very full of milt.

No. 102. Rock-fish, rock-cod. Three specimens. San Francisco Bay, November 22, 1872.

No. 103. Rock-fish, rock-cod. Yellow. San Francisco Bay, November 22, 1872.

No. 104. Water-dog. Tributary of McCloud River, California, October 21, 1872.

No. 105. Salmon head. A fresh-run fish. Caught at Rio Vista, Sacramento River, November 21, 1872. Female. Rare at this season. Prime condition. Fat, silvery, and fine eating. Eggs very small. A true Sacramento River salmon. (See drawing.) The Sacramento salmon command in this month the highest price in the market—25 cents, retail; wholesale, 18 cents—being more rare this month than at any time. There is another salmon (see No. 106) which is sold in the Sau Francisco market at this time, much inferior, and not commanding so high a price.

No. 106. Salmon head. November 21, 1872. Male. Point Arena, Mendocino County, California. The fish referred to under the last number. It resembled in *form* the "fall run" of the McCloud scales, in their best condition. It was, however, bright and silvery, with

scales very much as in a prime fish. The scales were smaller than thos
of the Sacramento salmon, and brushed off easily, as with a smolt. Bot
jaws had large teetb, but, as will be observed in the specimen, they ar
smaller than in the McCloud River males and are fitted loosely and flex
bly into the jaw, as if set loosely in a piece of rubber lining. The teet
are, also, unlike the McCloud River fall run male, dark and dirty-loo
ing. The teeth seemed to be in a transition state, and raised the que
tion whether they were *coming* or *going*. A female of the same variet
being found the next day with nearly ripe eggs, the inference seeme
to be that the teeth of the fish must be *coming*. The milt of this fis
was copious and prime. The eye, it will be observed, is larger than tha
of the Sacramento salmon. It also has a less forked tail. The fishe
men say that it will not compare in table qualities with the true Sacr
mento salmon at this season. There were less fin-rays in the dorsa
pectoral, and anal fins than in the respective fins of Sacramento salmo
(See drawing.) There were grilse of this variety caught at the sa
place, in the San Francisco market to-day, bright silvery, and of ver
graceful form. These commanded a high price, (See drawing of N
128.)

No. 107, Young cod-fishes. November 24, 1872. San Francisco Ba

No. 108. Spawn of Point Arena salmon, showing stage of d
velopment. (See No. 106.) I learned from parties living at Eel Riv
north of Point Arena, that the salmon of that river come up
spawn in December and January, and if the rains are early, that the *m*
mon spawn in those months in Eel River. It is possible that No. *a*
was on his way to Eel Eiver to spawn, as was also the female, havi
the eggs (No. 108), It is obvious from the advanced stage of the m
and eggs of these fish, that they were on their way to their spawni
grounds. If it is true that the Eel River salmon deposit their eggs
December and January, we have then seven months of the year n
known to be salmon-spawning months, namely, July, August, Sept
ber, October, November, December, and January.

No. 10.9. Pelican. *(Pelecanus fuscus.) Sun* Pedro brook. Novem
22, 1872. Contributed by J. Williamson.

No. 110. Dried salmon. This is a fair specimen of the dried salm
which the McCloud River Indians live on chiefly through the wi
Most of the salmon used for drying are taken in August and Septem
when they are spawning or felling down the river exhausted, a
spawning. "They are then easily captured by spearing, or by tr
The spears are very long, and carefully made. The traps are ma
baskets of bushes, placed at a fall or rapid, and winged on each side
a fence of stakes or bushes running at a slight angle *up* the riref
that the exhausted fish *coming down* the river, finally find their way
the basket and are there trapped. Tho McCloud Indians do not t
trap the fish coming *up the river,* but only those *going down,* which is
the contrary of the principle of the white man's trap aud nets. The

ians, very singularly, *prefer* the exhausted and dying salmon for dry-
ng to the fresh and prime ones. As soon as a salmon is speared or
ken from the trap it is opened—the spawn always being saved as a
xury—and split and hung on a bush or fence made for the purpose, in
) open air. In the dry air of California, the drying process is suffi-
ent to preserve them without salt. The Indians *never* use salt in pre-
ving their salmon, and will not eat salt meat of any description.
hen the salmon are sufficiently dried, they are tied together in bun-
es, and packed away around the sides of the lodges. These specimens
er) presented by one of the McCloud chiefs, and, repulsive as they seem,
ey represent the main support of the Indians during the winter, and
e highly valued by them.

ro. 111. A deer-skin, tanned and dressed by the McCloud Indians.
e" for making moccasins, and sometimes for clothes. Some of the
er-skins dressed by the McClouds are very white and soft. October,
2.

o. 112. Deer-skin blanket. Prepared and sewed by the McCloud In-
ns. This is the common blanket of these Indians, October, 1872.

o 113. Heavy buck-skin blanket. Tanned by the McCloud Indians.
ge and heavy skins like this are used alone, as blankets. This one
early as large as the two sewed together of the last specimen.

o. 114. Seeds, stalk, and leaf of plant used and highly valued by
Sacramento River Indians, for making thread and nets. It will be
rred that it has a good fiber. Near Mount Shasta, October 10,
2.

ro. 115. White-perch. San Francisco Bay, December 2, 1872.

o. 116. Nuts of the "Digger" pine. Highly valued by the Indians
ood. October, 1872.

o. 117. Soap-root, McCloud River, November, 3872. Used by In-
s for making brushes.

, 118. Stones of which arrow-heads are made by the McCloud In-
s. McCloud Eiver, October, 1872.

. *110.* Acorns and leaves of mountain live-oak. These acorns, togeth-
ith the acorns of other oaks, form the next important staple of food
IB dried salmon, among the McCloud Indians. The squaws gather
in great quantities, and make a kind of paste or soup of them, in
. form they are eaten, almost exclusively. McCloud River, Octo-
, 3872. Contributed by B. B. Redding.

. 120. Parasite on pine-tree. McCloud River, October 31, 1872. Con-
ted by J. G. Woodbury.

. 121. Skate. San Francisco Bay, December 2, 1872.

. 132. Skate. Bay of San Francisco, December 2, 1872.

. 123. Young smelts. (*Atherinopsis californiensis*) Bay of San Fran-
December 3, 1872. These are universally sold in California for smelts,
e people generally suppose that they are smelts. Three specimens.

No. 124. Flounders. Three specimens. Bay of San Francisco, December 4, 1872.

No. 125. Soles. Three specimens. Bay of San Francisco, December 4, 1872.

No. 126. *Drawing.* A fine specimen of a Sacramento River salmon in prime condition. This was a fresh-run fish, bright, plump, and silvery. Spawn very small. Caught at Rio Vista. Weight, 14 pounds. November 11, 1872. Winter run. These fish have just begun to ascend the Sacramento, this one being among the first that were caught this season, of the "winter run." Only a very few are taken as early as this; they are consequently rare in the markets and command a high price (for California,) viz, 25 cents a pound, retail, and 18 cents a pound, wholesale. This isthe beginning of a run of prime fish which does not slacken nor much depreciate iu quality, till June. (See Report on Sacramento Salmon.)

No. 127. *Drawing.* Male salmon. McCloud River, October, 1872. Foul, emaciated, and tail partly worn off. Compare with last drawing, No. 126.

No. 128. *Drawing* of grilse frequently seen in San Francisco market in November. This fish is taken at Point Arena, (a point on the coast of California, in Mendocino County,) and is sent to the San Francisco market when the Sacramento salmon are scarce. It is a beautiful fish in form and general appearance, and commands a high price. They are all about the size of this specimen. They are bright and silvery. The scales are small aud brush off very easily, as in salmon smolt. November 20, 1872.

No. 129. *Drawing.* Sacramento salmon, in prime condition. Female. Rio Vista, November 11, 1872. Weight, 18 pounds. "Winter run." Compare No. 126.

No. 130. Snake. Menlo Park station, Southern Pacific Railroad, San Mateo County. October, 1872. Contributed by Mr. Williamson.

No. 131. Salmon eggs. Dried by Indians for food. Esteemed a luxury. Presented by Indian chief. McCloud River, California, October, 1872.

No. 132. Arrows without points. Six specimens. McCloud Indians, McCloud River, California, October, 1872.

No. 133. Arrows, with stone points. McCloud Indians, McCloud River, California. Six specimens. October, 1872.

No. 134. Arrows, with steel points. Two specimens. Sacramento River Indians, (Upper Sacramento,) October, 1872.

No. 135. Arrows, with glass points. McCloud Indians, McCloud River, California, October, 1872. Six specimens.

No. 136. Arrows. Pitt River Indians. Pitt River, California, October, 1872.

No. 137. Indian bow, made by Con-choo-loo-la, chief of McCloud Indians, McCloud River, California. The bow is made of yew, and is

ered on the back with salmon skin, which is prepared by a secret which the Indians will not disclose. The salmon skin imparts a wonderful elasticity to the bow, which will bend back, when it is unstrung, several years after it is made. Con-choo-loo-la is probably the last of the great chiefs of the McCloud Indians.

No. 138. Sprig of yew, from the wood of which the Indians make their bows. October 12, 1872. Upper Sacramento River.

No. 139. Salmon-eggs. McCloud River, California, September, 1873.

No. 140. Salmon-eggs, showing eye-spots. McCloud River, California, October, 1872.

No. 141. Young salmon, just hatched and hatching. McCloud River, California, October, 1872.

No. 142. *Shapaulle,* (Indian name.) Clear Lake, Lake County, California, February 5, 1873. Four specimens.

No. 143. Trout. Clear Lake, Lake County, California, February 5, 1873. Twenty-one specimens.

No. 144. *Chy?* (Indian name.) Clear Lake, Lake County, California, February 7, 1873.

No. 145. Male trout. Supposed to be two years old. Milt flowing. Cold Creek, Clear Lake, Lake County, California, February 8, 1873.

No. 146. Perch. Soda Bay, Clear Lake, California, January 25, 1873.

No. 147.————? Clear Lake, California, February 8, 1873.

No. 148. *Shy,* (Indian name.) Clear Lake, California, February 10, 1873.

No. 149. Indian cake, made of the nuts of the *pepper-tree.* Used for food by the Clear Lake Indians. February 10, 1873.

No. 150. Spawn of mountain-trout, showing its stage of development in this variety. Cold Creek, Clear Lake, California, February 10, 1873.

No. 151 Salmon-trout. Kelsey Creek, Clear Lake, California. Girth, just in front of dorsal fin, 9 inches. Milt ripe. Formerly abundant, now becoming scarce.

Color.—Dark gray on back, shading off to lighter gray and pink, toward the lateral line. Gill-covers bright vermilion-red. Baud of same color, about ¾ inch wide from gills to tail; brightest and broadest near the middle. Grayish-pink below red band. Abdomen white underneath, with blotches of grayish-pink. The fishermen say that this is the only variety of trout caught in or about the lake, besides the common rnountain-trout. The body of the fish was deep and thin; and very thickly dotted above the lateral line and on the caudal, dorsal, and adipose fins with black spots. There were a very few black spots below the lateral line, chiefly near the head and tail. The pectoral, ventral, and anal fins were of a dark-gray color, and without spots.

No. 152. Sucker. Male. Clear Lake, California. Milt ripe. February 11, 1873. *Mem.*—Suckers and trout in this locality spawn at the same

time, while in New England they spawn at exactly opposite seasons of the year; the suckers in May and the trout in October.

No. 153. Skin of mud-hen. Clear Lake, California, February 13, 1873. Very abundant and very tame.

No. 154. Skin of white heron. Clear Lake, California, February 2, 1873. Not abundant.

No. 155. Water-lizard. February 10, 1873. Kelsey Creek, Lake County, California.

No. 156. Spawn of salmon-trout. Kelsey Creek, near Clear Lake, California, February 11, 1873.

No. 157. Pyloric appendages and milt-glands of No. 158.

No. 158. *Muraena.* (Italian name.) Farallone Indians, December 14, 1872. Spawn nearly ripe, and about the size of trout-spawn.

No. 159. Lake-trout or salmon-trout. Burtnett's mills, Kelsey Creek, Lake County, California, March, 1873. Contributed by J. G. Woodbury.

No. 160. *Shy* or *chy.* (Indian name.) Five specimens, (tag says six.) Cold Creek, Lake County, California, March 8, 1873. Contributed by J. G. Woodbury.

No. 161. *Nic-coosh*, or *mŭkh-ush.* Cold Creek, Lake County, California, March 8, 1873. By J. G. Woodbury.

Numbers 161 to 167 omitted.

No. 167. *Shapaulle.* Burtnett's mills, Kelsey Creek, Lake County, California, March 9, 1873. By J. G. Woodbury.

Nos. 168 to 208 omitted here; resumed further on.

No. 208. Trout. Independence Lake, on Sierra Nevadas, California, February 24, 1873.

No. 209. Same as No. 208.

Nos. 210 to 216. Chubs. Sacramento River, near mouth of San Joaquin, February 25, 1873.

Nos. 217 to 231. Perch. Sacramento River, Rio Vista, February 25, 1873.

Nos. 232 to 236. Hardheads. Sacramento River, near mouth of San Joaquin, February 25, 1873.

Nos. 237 to 243. Sacramento pike. Sacramento River, Rio Vista, February 25, 1873.

Nos. 244 to 250. Viviparous perch. Local name "sun-fish." Sacramento River, Rio Vista, February 26, 1873.

Nos. 251 to 262. Split-tails. Sacramento River, near Courtland, February 26, 1873.

Nos. 263, 264. Suckers. Sacramento River, Rio Vista, February 26, 1873.

Nos. 265 to 270. Herrings. Sacramento River, Rio Vista, February 26, 1873.

Nos. 271 to 273. Sturgeons. Sacramento River, Rio Vista, February 26, 1873. Saw one, February 27, at Rio Vista that weighed 200 pounds and was 9 feet long. Was told of one caught here that weighed 600 pounds.

No. 274. Herring. Sacramento River, Rio Vista, February 26, 1873.

No. 275. Lobster, (local name.) Sacramento river, Rio Vista, California, February 26, 1873.

No. 168. Small fish. Cold Creek, Lake County, California, February, 1873.

No. 169. Small fish. Cold Creek, Lake County, California, February, 1873.

No. 170. Two specimens from Chinese fish-market at San Francisco, February, 1873.

No. 171. Heads of male salmon; two specimens. Point Arena, California, December 1872.

No. 172. Yellow rock-fish. Bay of San Francisco, November 22, 1872.

No. 173. Small *Muraena.* (See No. 158.) Farallone Islands, March 12, 1873.

No. 174. Red-headed woodpecker. McCloud River, California, November 1873.

No. 175. Blue-jay. McCloud River, November, 1873.

No. 176. Salmon-spawn, showing stage of development. Rio Vista, February 26, 1873.

No. 177. Salmon-spawn. Sacramento River, near Rio Vista, March 10, 1873.

No. 178. One bottle containing seven small fish, from Clear Lake, Lake County, California, February, 1873.

No. 179. Salmon-spawn. Near Rio Vista, December, 1873.

No. 180. Salmon-spawn. Near Rio Vista, January 25, 1873.

No. 181. Spawn of lake-trout. Clear Lake, February, 1873.

No. 182. Young trout. Spawned and bred artificially from parents caught in the San Andreas reservoir, hear Sau Francisco. (See No. 8 of first catalogue.) Three specimens.

No. 183. Small water-dogs. McCloud River, California, November, 1872. The bottle also contains two 1000-legged worms, and an unknown insect.

No. 184. Supposed to be the "steamboat-bug." Sereno Lake, Sierra Nevada Mountains, California, altitude 7,000 feet, November 9, 1872. This insect was found swimming in the water, under ice an inch thick or more. It seemed, says Mr. Redding, to gather water within its body by some process, and to propel itself along by ejecting it again from behind. It was observed some time in order that the pumping process of the insect might be well ascertained. Contributed by Hon. B. B. Redding.

No. 185. Twig of pepper-tree. See No. 149, Clear Lake, Lake County, California, February, 1873.