

REPORT
OF THE
COMMISSIONERS OF FISHERIES
OF THE
STATE OF CALIFORNIA
FOR
THE YEARS 1876 AND 1877.

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Ans 2947



To His Excellency,
WILLIAM IRWIN,
Governor of California :

The Commissioners of Fisheries for the State of California, appointed under an Act of the Legislature, entitled "An Act to provide for the restoration and preservation of fish in the waters of this State," approved April second, eighteen hundred and seventy, respectfully submit their Fourth Biennial Report.



REPORT.

SALMON (*SALMO QUINNAT*).

Before the discovery of the gold mines in California, nearly all of the tributaries of the Sacramento and San Joaquin Rivers were the spawning beds of the salmon. Soon after mining commenced the sediment deposited by gold washing covered the gravel bottoms of the streams. The fish found no proper place on which to deposit its eggs, and after three or four years became extinct in those tributaries. The instinct of the fish leads it to return from the ocean to the stream in which it was born for purposes of reproduction. If this place, for any reason, is rendered unfit, it will not seek a new and appropriate place. In eighteen hundred and fifty the salmon resorted in vast numbers to the Feather, Yuba, American, Mokolumne, and Tuolumne Rivers for purposes of spawning, and many places, such as Salmon Falls, on the American, were named from the abundance of these fish. On the Yuba River, as late as eighteen hundred and fifty-three, the miners obtained a large supply of food from this source. At the present time no salmon enter these streams. It would be safe to estimate that one-half the streams in this State to which salmon formerly resorted for spawning, have, for this purpose, been destroyed by mining. As mining is the more important industry, of course, for this evil there is no remedy, other than by artificial means to increase the supply in those tributaries that are still the resort of these fish. The principal spawning grounds remaining, are the McCloud, Klamath, Little Sacramento, and Pit Rivers in the northern part of the State, and the San Joaquin and Merced in the southern. The short streams entering into the ocean from the Coast Range of mountains from Point Conception, in latitude $34^{\circ} 20'$ north to the boundary of Oregon, are also spawning grounds for salmon. The fish of the coast streams deposit their eggs in January and February, during the winter rains, when the streams are full, while the salmon of the tributaries of the Sacramento and San Joaquin spawn in August and September, when the water is at its lowest stage. The salmon of the short coast rivers do not average as large as the Sacramento salmon, but they are probably the same fish with habits modified to suit the streams to which they resort.

The *salmo quinnat* readily adapts itself to a life in fresh water, and reproduces its kind where it has no opportunity to go to the ocean. When the dams were constructed on the small streams that go to make the reservoirs of San Andreas and Pillarcitos—which supply the City of San Francisco with water—as also when the dam was constructed on the San Leandro, to supply the City of Oakland, the young of the salmon that had spawned the year previous to the erec-

tion of these dams, remained in the reservoirs and grew to weigh, frequently, as much as ten pounds; these reproduced until the reservoirs have been stocked. As the supply of fish increased the quantities of food lessened, so that the salmon have gradually decreased in weight until now, after nine years, they do not average more than two pounds. From the fact that, when food was in abundance, they grew to weigh from eight to twelve pounds, and that, as they increased in numbers, they averaged less in size, but still continued to spawn and produce young fish, it would seem that the Sacramento salmon may be successfully introduced into large lakes in the interior of the continent, where, in consequence of dams or other obstructions, they would be prevented from reaching the ocean. The history of this fish in these small reservoirs shows, that all that is requisite for their successful increase is the abundant supply of food, to be found in larger bodies of fresh water. Salmon, fully mature, weighing two pounds, and filled with ripe eggs, were taken, in September, eighteen hundred and seventy-seven, in the waters of San Leandro Reservoir. These fish were hatched in the stream which supplies the reservoir, and by no possibility had ever been to the ocean. The San Leandro is a coast stream, not exceeding fifteen miles in length, and empties into the Bay of San Francisco. It contains water in the winter and spring, at which time, before the reservoir was constructed, the salmon sought its sources for the purpose of spawning. There was never sufficient water in the months of August or September to permit the fish to reach their spawning grounds. After the construction of the reservoir, large numbers of salmon that came in from the ocean in January and February were caught at the foot of the dam and transported alive and placed in the reservoir above. The descendants of these fish thus detained in fresh water and not permitted to go to the ocean, have so far modified the habits of their ancestors that they now spawn in September, instead of in January and February. Inasmuch as these fish spawn in the McCloud, in the headwaters of the Sacramento, and at the sources of the San Joaquin, in the Sierra Nevada, in September, and in the short coast range rivers, in January and February, and as, when changed to other waters, their eggs ripen at a time when the conditions of their new homes are most favorable for reproduction, they show a plastic adaptability, looking to their future distribution, of much practical, as well as scientific, importance.

The statistics hereafter given of the temperature of the water through which the Sacramento and San Joaquin salmon pass to reach their spawning grounds, show that they swim for hundreds of miles through the second hottest valley in the United States, during the hottest portion of the year, where the mean temperature of the air is 92° Fahrenheit, and of the water, 75°. These statistics have been obtained from the record kept by the Central Pacific Railroad Company, and are for the months of August and September of the years eighteen hundred and seventy-five, eighteen hundred and seventy-six, and eighteen hundred and seventy-seven. They are of importance as showing that the Sacramento salmon will enter rivers for spawning purposes, where the water is so warm that the eastern salmon (*salmo salar*), if it were to meet it, would turn back to the ocean. They are also of importance as illustrating the probability that there are many streams on the Atlantic Coast, from the Potomac to the Rio Grande, into which this fish could be successfully introduced.

Mr. Livingston Stone, Deputy United States Fish Commissioner, in charge of the government hatching establishment on the McCloud River, reports officially that, in his opinion, all of the salmon of that river die after depositing their spawn. This is possibly true, but it does not account for the fact, that in the spawning season the McCloud contains grilse and fish evidently of three, four, and five years old, unless we are to imagine that some salmon, after being hatched and going to the ocean, remain there two, three, or more years without returning to the parent stream for purposes of spawning. Beyond doubt the salmon that spawn in the coast streams go back to the ocean, as they are frequently taken in the lagoons at the mouths of these rivers on their return. Somewhere on the tributaries of the Sacramento or San Joaquin, there are salmon that do not die after the act of spawning, for they are frequently taken in the nets of the fishermen in the brackish waters at Collinsville and Rio Vista, on their return from their spawning grounds. If it were the fact that the Sacramento salmon so widely differed from other fish that it spawned but once and then died, it would detract from its value. This subject is one of importance, but at present the facts are so obscure that we have made considerable effort to obtain the opinions and the result of the observations of the men who are practically engaged in the taking of salmon in the Sacramento River.

The following, from the letter of a fisherman who has pursued the business of taking salmon for the San Francisco market during more than fifteen years, gives some facts and his theory, based on his observations. In reply to an inquiry on the subject, he says: "As to the return of the seed salmon to the sea after depositing the spawn, I am inclined to the opinion of Mr. Stone, so far as the greater part of the female fish is concerned. I think very few of these, but many, though not all, of the males return. I should judge that five per cent. of females and twenty per cent. of males might be an approximation. I express this opinion diffidently. It is based on the style of fish caught in the lower part of the river (from Sacramento to Collinsville). After about the twentieth of September, of the fish then dropping down the nets catch but few, for the reason that the net is drifting with the current, and the fish are doing the same thing, and in consequence, as a rule, the two do not come together, and the greater part of the return fish escape. When the run is upward, the net drifts with the current, and the fish swim against it, and the rule is reversed. The percentage named above is not that of return fish caught, but of fish that I estimate may have returned, judging by the very few return fish that are caught. It is a very cloudy subject to all fishermen. I have heard perhaps a thousand discussions on the river, at all times of day and night, at the head of the 'drift,' among men of the largest experience—men right in the teeth of the business—men born to a boat and net, and grown gray and grizzled in their use—upon the point you raise, and the average conclusion always was that nobody quite knew how it was. Of one thing I am convinced, to wit, that return fish need no protection from the drifting gill net. Not one fish in ten could be caught in that way. No such thing as a run of salmon down the river ever occurs. The normal position of salmon is head to the current. Though drifting with the current, his head is toward it. In the light (or darkness) of these facts, you see how difficult it is to say, positively, what proportion of these fish that have delivered seed, return to the ocean. No man can say posi-

tively that the mass do not return. That some return is beyond doubt of a reasonable nature. If they all perish, it is certain that many survive long enough to reach the fishing grounds lying in the bays nearest the ocean. But I fail to see why the value of the California salmon is affected by the fact (if it is a fact), that the fish never spawn but once. I have a theory of the salmon of this river. It may not be scientific, but it is mine, and I can give reasons for it. It is this: the female salmon seldom or never spawns but once. The exceptions to the rule, if any, are few, and the second product of these exceptions is found in a salmon differing slightly from the mass of fish found in the river. A goodly, though not the larger part of the male salmon that have assisted in reproduction, return to the ocean and 'live long and grow broad,' and return to the river many times. On their return these fish constitute that class far above the average size. They reach thirty, forty, fifty, and even a greater number of pounds in weight, while the average weight for which our meshes are sized is from sixteen to twenty pounds. The female spawn is not ripe for delivery, nor the male fish sufficiently mature for milting, until they have made repeated trips between the ocean and the river. The yearly broods return periodically and in regular cycles; the youngest fishes arrive earliest in the season, which begins about the first of November, and do not penetrate far the first time. In the order of their birth, the other broods arrive and return to the sea, until in August and September, the great seed run, consisting of mature fish, always on time, always urgent in their movements and purposes, passes up to the headwaters. Salmon of different ages are always coming in and going out to the sea. The older the fish the longer his stay in fresh water. The younger the fish (after he once leaves for the ocean), the more of flirting about the bays and brackish water near the mouths of the river, with short excursions up the river. The foregoing is the outline of a theory, though it is derived from, and apparently justified by, known truths in the history of the Sacramento salmon during the last twenty years. I believe it to be correct; that is to say, that in any year representations of the brood of any other year not yet extinct, enter the river, and that not one-fifth of the fish that enter the river in any given year go to the headwaters that year, but that more than four-fifths return to the ocean, and, consequently, that of all the fish that come in to the river each year, but about one-fifth go to the headwaters for purposes of reproduction."

The habits of the Sacramento salmon, while on their spawning grounds in the McCloud River, have been closely observed by Deputy United States Fish Commissioner Livingston Stone, and the result of his investigations has been published by Congress in the Report of the United States Fish Commissioner Spencer F. Baird. But little is known of their habits while in the ocean. They probably feed on shoals not many miles from the shore. They are occasionally taken in the nets of fishermen in the ocean not far from the Golden Gate. Many grilse, and a few mature fish, make their appearance in the bay of San Francisco in December and remain several weeks feeding upon smelts and other small fish. During this period thousands are taken with hook and bait on lines from the Oakland pier and other wharves. Many more are also taken in the nets of fishermen. After leaving the salt water of the bay they go to the brackish waters where the currents of the Sacramento and San Joaquin meet the

tide from the ocean. After entering the fresh water of the river they cease to feed. No food has ever been found in all the tens of thousands caught in the Sacramento. As it is of importance to obtain a knowledge of the habits of the salmon while it remains at the mouths of the rivers, playing back and forth between brackish and fresh water, before it makes its long and perilous journey to the head of the stream, we select from our correspondence extracts from a letter from Mr. Samuel N. Norton, of Rio Vista. Mr. Norton is a practical fisherman of many years experience, and the record of his close observation is of much value. He says: "I will give you a synopsis of one year's trip with the salmon, showing the general habits of the fish in all years while remaining in or passing through that part of the Sacramento River lying between its mouths and the point where the Feather River empties into it. For this purpose the Georgiana Slough, the Three-mile Slough around the head of Sherman Island, the San Joaquin River between these sloughs and the bay, and the Montezuma Slough leading into the northern arm of Suisun Bay from the Sacramento River, are considered as mouths of the river with like functions and processes as the main trunk of the river. Indeed, some of the best fishing ground, at certain seasons, is found in the Montezuma, Three-Mile and San Joaquin. To commence with an anachronism, the spring run begins in the fall! In November and December a very few small (as fishermen use the word—say twelve or fourteen pounds each) bright salmon appear in the river, and if no rains occur, or only slight rains, an increase in their numbers is noticed, yet they are always very scarce in those months. There are never enough to half supply the local demand of the San Francisco and other home markets. At first, in November, we pick up occasionally on their return, the last dregs of the old seed run which occurred during August and September. These are usually male fish, very dark, ill-conditioned, lank-jawed, disconsolate looking fellows, who through misfortune, incompetency or other cause,—to me not more than presumable,—seemed to have failed in their mission up the river, or to have fallen into disgrace. The last of these soon disappear. The bright ones are the *avant couriers* of the great spring run, which thus, as I said, begins in the fall. With the first heavy rains the fish that have penetrated the river recede, or as we say, back down before the thick muddy stream, retreat to tide-water in the bays and remain there reconnoitering and waiting a steady river current. Now is the time for good fishing in the bay and just in the mouths of the river. The fish are not very plentiful, but none being caught within the river proper, there is a great demand and great price against a small area of fishing ground, where all that had before penetrated the river are now concentrated. When the river becomes steady, that is, neither rising nor falling, the fish start up again, no matter how high the water may be, and by the varying moods of the river in sudden rise or fall, is the spring run mainly governed. Sudden rise or fall alike will check them. Thus it often happens that for many weeks the fish will be taken in numbers at Benicia and Collinsville, in smaller numbers at Rio Vista, and none at all farther up. Again, there have been seasons when a steady run commenced in the early part of January, and by an almost uniform rate of increase reached its culmination in May. But this is exceptional. The spring run may be stated as commencing

ing in November and ending in July, and having its greatest strength in May. Under the most favorable conditions the months of November and December might be classed 'very scarce;' January and February, 'scarce;' March, 'not scarce;' April, 'plenty;' May, 'very plenty;' June, 'not scarce;' July, 'scarce.' Under unfavorable conditions, November, December, January, and February would have almost none at all; March, 'scarce;' April, 'not scarce;' May, 'plenty;' June, 'scarce;' July, 'almost none at all.' In defining the terms here adopted, let them be applied to the product of the labor of two men with their boat and net per day: 'Almost none at all' would mean two fish per week; 'very scarce,' two fish per day; 'scarce,' six fish per day; 'not scarce,' eighteen per day; 'plenty,' thirty-six per day; 'very plenty,' seventy-two per day. There are times in the height of the run, when a greater number than is here named might be caught with ease, but these are exceptional. In the great run three years ago, three hundred salmon per day might be caught with ease; but in no other year, since the Anglo-American occupation, has there been such a run. It must not be understood that salmon can be caught at all times by fishing for them, even in the most limited numbers above stated. There are times when one could not be caught in a month, if life were at stake upon it. I only intend to give a fair idea of the average business. You will readily deduce from it that there are not more than two months, during the spring run, when fish can be caught in excess of the demand for home consumption. After the subsidence of the spring run in July they are often found in great numbers near the confluence of the Feather River with the Sacramento. They have a taste for variety, it would seem, and the marked difference between the cool, muddy water of the former and the warmer, limpid and clear stream of the latter, affords them great satisfaction. During the first half of August the mature seed fish start for the spawning grounds. All along the line, from the ocean to the most advanced posts along the river, the word (if fishes have words—if not, then wag) is onward and upward. They are on business, and on time; they do not shy much, nor stop for trifles; they rush at a drifting gill net determined to do or die, and of course generally die, if the net is sound. The run of August and September I have before described. As for the few belated fellows that are about in October, they might as well be caught as not—and so, my year is out."

At the time our last report was made, Mr. Charles Crocker had requested us to cause to be hatched, at his expense, and placed in streams that do not reach the ocean, a half million of Sacramento salmon. One half of these we determined to put in Kern River, which empties into Buena Vista and Tulare Lakes, and the other half in the Truckee River, which empties into Pyramid Lake, in the State of Nevada. The quarter of a million of eggs sent to Kern River, where their hatching was to be completed, unfortunately were lost. At the point on the river selected for hatching, the water contains too much alkali, it is supposed, and all the eggs died within twenty-four hours from the time they were placed in the hatching troughs. The other quarter of a million sent to the Truckee, were successfully hatched out and turned into that stream. They will go to Pyramid Lake the present season. They should return during the summer of 1878, and we are confident they will be taken in the Truckee weighing five or six pounds. Pyramid Lake is a body of water forty miles long and averaging ten miles in width, and has no

outlet. It contains an abundance of food. This experiment will demonstrate how large the Sacramento salmon will grow, with plenty of food, when confined entirely to fresh water.

Since the organization of the Commission, we have caused to be hatched and placed in the streams of this State eight million three hundred and fifty thousand young salmon. These include one million paid for in eighteen hundred and seventy-five, and presented by ex-Governor Leland Stanford. As the salmon is our most important food fish, we deemed it of the greatest importance to keep up the supply. The numbers of fishermen are yearly increasing, as are also the numbers of persons who are consuming the fish. As railroad facilities are increased, and reach new points, the market becomes extended. The sea lions and seals at the outlet of the bay, being preserved and protected by law, are also increasing. They now number thousands, and as each requires from ten to thirty pounds of fish daily, it was a serious question whether we could keep up the supply by the addition of two and a half million artificially hatched each year. Since our last report, a salmon "cannery" has been established on the Sacramento, at Collinsville, and another opposite the City of Sacramento. This Collinsville canning establishment reports as having canned this year eight thousand five hundred and forty-two cases, of four dozen cans in a case, equivalent to thirty-four thousand one hundred and sixty-eight fish, weighing five hundred and forty-six thousand six hundred and eighty-eight pounds.

Under the enlightened superintendence of Professor Spencer F. Baird, United States Fish Commissioner, the Sacramento salmon is being widely distributed to streams throughout the United States. The government establishment on the McCloud River annually hatches from six to ten million eggs. These are distributed to all States having appropriate waters, whose Legislatures have appointed Fish Commissioners. From this source the State of California has received, as a donation, a half million fish each year since eighteen hundred and seventy-four. In addition, we have expended a large part of our appropriation annually, in payment for the hatching of one or two million young fish, which, through the kindness of Professor Baird, have been furnished at the actual cost of hatching. The introduction of more than eight million young salmon into the headwaters of the Sacramento, since the organization of the Commission, in addition to the natural increase, has had the effect to keep up the supply, and reduce the local market price of these fish. It is reported that the "cannery" at Collinsville has purchased all the salmon it could consume during the past season at from twenty-five to forty cents each.

Over-fishing, the absence of any close season, and no effort at artificial increase, has at last had an effect on the salmon of the Columbia River, in Oregon, and complaint is made that this river, once thought inexhaustible, has begun to fail in its accustomed supply. This decrease has been so marked during the season that the "canners" have been compelled to pay from thirty to fifty cents each for salmon. In the absence of legislation, the canning companies on this river have subscribed twenty thousand dollars, which have been placed under the control of Mr. Livingston Stone, Deputy United States Fish Commissioner, to be expended in artificial hatching, and restocking that stream. Fortunately, intelligent legislation in California made provision for continuing the supply of fish in the Sacra-

mento before there was any marked decrease by over-fishing. It is not disputed that the salmon were more numerous in the Sacramento before their spawning grounds on the American, Yuba, Feather, and other rivers had been destroyed by mining. After the fish were destroyed in these tributaries, the supply of the State had to come from the other tributaries of the Sacramento and San Joaquin, on which there was no mining, and these latter streams furnished the normal supply. Before these became exhausted, the natural increase was supplemented by artificial hatching.

In this connection a fact, of much practical as well as scientific importance, may be stated as showing the advantages in numbers to be obtained by artificial hatching in comparison with the increase by natural methods. In eighteen hundred and seventy-six, Mr. Myron Green, foreman for Mr. Livingston Stone, United States Deputy Fish Commissioner, at the McCloud River, having observed in the river a favorite gravel bed where many salmon were depositing their eggs, carefully dug up the gravel and several thousand eggs. He separated the eggs from the gravel and placed the former, after counting them, in the hatching boxes. After twenty-four hours he found large numbers of these eggs turning white, showing that the milt had failed to come in contact with the eggs. After throwing out all the eggs found not to be fecund, there were left eight per cent. of the whole number gathered, which were found to be fertile. When the eggs and milt are artificially brought in contact out of the water, it would be carelessness or inexperience that would prevent ninety-five per cent. of the eggs from being fertilized.

The following tables will show the numbers and weight of salmon transported on the railroads and steamboats from the Sacramento and San Joaquin Rivers to the Cities of San Francisco and Stockton, from points on the river below the Cities of Sacramento and Stockton, from November first, eighteen hundred and seventy-five, to August first, eighteen hundred and seventy-six, and from November first, eighteen hundred and seventy-six, to August first, eighteen hundred and seventy-seven. They do not include the catch of the fisheries at Tehama or near the mouth of the Feather River, nor do they include the fish taken on the upper waters of the Sacramento and San Joaquin, nor the salmon brought to market by fishermen in their own boats; therefore, to the totals should be added at least twenty-five per cent. to show an approximation of the actual catch :

STATEMENT

Of salmon transported from the following stations on the Sacramento and San Joaquin Rivers to San Francisco and Sacramento, from November 1st, 1875, to August 1st, 1876.

FROM THE FOLLOWING STATIONS TO SAN FRANCISCO:

Collinsville, New York of Pacific, Rio Vista, Emmaton, Jersey Landing, Antioch, Benicia, Clarksburgh, Courtland, Martinez, Kentucky, Bradford, Sacramento, Vallejo, and Webbs.

127,843 loose salmon, weighing	3,196,075 lbs.
2,433 boxes of salmon, weighing	486,030 lbs.
3,118 sacks and baskets of salmon, weighing	311,800 lbs.
158 barrels of cured salmon, weighing	31,600 lbs.
512 barrels and boxes of smoked and dried salmon, weighing	102,644 lbs.
Total	4,128,149 lbs.

FROM THE FOLLOWING STATIONS TO SACRAMENTO:

Courtland, Benicia, Rio Vista, Collinsville, Emmaton, and Clarksburgh.

1,116 loose salmon, weighing	29,150 lbs.
106 baskets and sacks of salmon, weighing	10,600 lbs.
53 barrels of salmon, weighing	12,850 lbs.
414 boxes of salmon, weighing	57,440 lbs.

FROM ANTIOCH TO STOCKTON.

70 loose salmon, weighing	1,750 lbs.
46 boxes of salmon, weighing	9,200 lbs.

Total weight of salmon

4,249,139 lbs.

NUMBER OF STURGEON.

5,466 loose sturgeon	274,375 lbs.
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STATEMENT

Of salmon transported from the following stations on the Sacramento and San Joaquin Rivers to San Francisco and Sacramento, from November 1st, 1876, to August 1st, 1877.

FROM THE FOLLOWING STATIONS TO SAN FRANCISCO:

Collinsville, New York of Pacific, Rio Vista, Emmaton, Jersey Landing, Antioch, Benicia, Clarksburgh, Courtland, Martinez, Kentucky, Bradford, Sacramento, Vallejo, and Webbs.

143,998 loose salmon, weighing	3,599,950 lbs.
1,903 boxes of salmon, weighing	384,300 lbs.
3,454 sacks and baskets of salmon, weighing	345,400 lbs.
128 barrels of cured salmon, weighing	25,600 lbs.
653 barrels and boxes of smoked and dried salmon, weighing	132,788 lbs.
8,542 boxes canned salmon, weighing	546,688 lbs.
Total	5,034,726 lbs.

FROM THE FOLLOWING STATIONS TO SACRAMENTO:

Courtland, Benicia, Rio Vista, Collinsville, Emmaton, and Clarksburgh.

1,511 loose salmon, weighing	37,775 lbs.
208 baskets of salmon, weighing	20,800 lbs.
414 boxes of salmon, weighing	74,350 lbs.
47 barrels of salmon, weighing	11,950 lbs.

FROM ANTIOCH TO STOCKTON.

106 loose salmon, weighing	2,650 lbs.
63 boxes of salmon, weighing	12,600 lbs.

Total weight of salmon

5,194,851 lbs.

NUMBER OF STURGEON.

5,913 loose sturgeon, weighing	295,650 lbs.
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In our last report, after adding twenty-five per cent. to the statements of the catch which we obtained, we showed the total weight as transported from the same places, from November first, eighteen hundred and seventy-four, to August, first, eighteen hundred and seventy-five, to be five million ninety-eight thousand seven hundred and eighty-one pounds. Adding the same percentage to the totals in the above tables, and they show the catch from November first, eighteen hundred and seventy-five to August first, eighteen hundred and seventy-six, to be five million three hundred and eleven thousand four hundred and twenty-three pounds, and from November first, eighteen hundred and seventy-six, to August first, eighteen hundred and seventy-seven, six million four hundred and ninety-three thousand five hundred and sixty-three pounds.

This shows a gain of more than a million of pounds in the legal catch over any year since the organization of the Commission, and may be ascribed to the fact that our waters are now beginning to feel the beneficial effects of the millions of salmon hatched artificially and turned into the headwaters. We have no means of ascertaining the weight of fish taken out of season, but estimate that between August first and November first of this year, not less than two million pounds were taken in defiance of law.

CLOSE SEASON FOR SALMON.

We are informed that a determined effort will be made to induce the Legislature to alter the time of the close season, so that fishing for salmon may be permitted in August and September, and that the close season may be changed from these months to July. With this object in view, it is reported that the proprietors of the present "canneries" and capitalists, who have in contemplation the construction of other "canneries," have been obtaining the evidence of fishermen, to present to the Legislature, to show that July is the proper month when fishing should not be permitted.

As we have shown, in July the spring run of fish has about ceased and the fall run but commencing. It is one of the months when fish are most scarce. To permit unlimited fishing during all the months in the year except July would have the effect of exhausting our rivers of salmon within ten years. It is a simple proposition that if some of the ripe fish are not permitted to reach their spawning grounds, they cannot reproduce naturally, neither can the United States nor the State obtain eggs from which to restock the river by artificial hatching. One of the fishermen who was approached with the object of obtaining his testimony in favor of a change to July, wrote to the Commissioners September thirtieth, as follows: "The close season should never, on any possible pretense or persuasion, be pressed outside the months of August and September to give opportunity for fishing in those months. Right there is the life of the matter. The regularity, the multitudes and urgency of the seed run, the consequent ease and certainty of the catch, the fine weather for work, all present a weighty temptation to both catcher and canner." The object of a close season is, that some of the fish may be permitted to reach the headwaters to spawn. If they are not allowed to do so the race will soon be extinct. Cupidity and desire for immediate profit should not be permitted to influence legislation with the ulti-

mate result of the extinction of the last fish. The interest of the public is that the fish be continued in the river. A change in the law that will omit August and September from the close season cannot but result in material and permanent injury.

TEMPERATURE OF AIR AND WATER.

The following statistics will be found of much importance. They exhibit the temperature of the water and air at two stations, each on the Sacramento and San Joaquin Rivers, taken for three years during the months the great army of salmon are passing up to their spawning grounds. They will show conclusively that the Sacramento salmon lives for weeks, if not months, in water much warmer than any other fish of the same family. They also show the strong probability that these fish may be successfully introduced into rivers in still lower latitudes than those of which they are native—without doubt into the waters that flow into the Gulf of Mexico, and with many prospects of success into the rivers of Europe emptying into the Mediterranean :

TEMPERATURE.

Lower Railroad Crossing, San Joaquin River, latitude 37° 50' N., longitude 121° 22' W.

	AUGUST.						SEPTEMBER.								
	1875.		1876.		1877.		1875.		1876.		1877.				
	Air	Water at Surface	Air	Water at Surface	Air	Water at Surface	Air	Water at Surface	Air	Water at Surface	Air	Water at Surface			
Maximum	98°	82°	97°	79°	95°	81°	78°	94°	78°	93°	75°	78°	102°	78°	78°
Minimum	73	72	75	74	78	71	72	73	70	73	69	71	70	71	71
Mean	88.16	78.67	86.16	76.93	89.58	77.87	74.08	85.63	74.43	83.43	72.06	73.80	87	73.80	73.80
				Water at Bottom		Water at Bottom		Water at Bottom		Water at Bottom		Water at Bottom		Water at Bottom	
				78°		81°		78°		78°		78°		78°	
				74		71		72		73		71		71	
				76.09		77.87		74.43		74.08		74.43		73.80	

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TEMPERATURE.

Upper Railroad Crossing, San Joaquin River, latitude 36° 52' N., longitude 119° 54' W.

	AUGUST.						SEPTEMBER.								
	1875.		1876.		1877.		1875.		1876.		1877.				
	Air	Water at Surface	Air	Water at Surface	Air	Water at Surface	Air	Water at Surface	Air	Water at Surface	Air	Water at Surface			
Maximum	107°	84°	111°	77°	112°	76°	104°	82°	83°	108°	77°	78°	105°	77°	77°
Minimum	82	74	81	73	90	72	82	74	73	80	73	75	76	74	74
Mean	100.61	80.67	101.09	74.96	99.64	74.80	95.53	78.83	77.83	94.00	76.76	76.63	92.96	76.63	75.63
				Water at Bottom		Water at Bottom		Water at Bottom		Water at Bottom		Water at Bottom		Water at Bottom	
				79.67		75.80		77.83		77.83		77.83		77.83	
				79.67		75.80		77.83		77.83		77.83		77.83	
				79.67		75.80		77.83		77.83		77.83		77.83	

ILLEGAL FISHING.

There is a prevalent opinion throughout the State, that it is the especial duty of the Fish Commissioners to act as local police in each neighborhood and prevent violations of the law in relation to fishing during the close season. Much time is consumed in answering questions on this subject, and informing correspondents by letter that it is the duty of every citizen to see that the law is obeyed. We believe the law which prohibits the catching or having in possession salmon from August first to November first has been more extensively violated during the present year than ever before. It is true the fish are not sold openly in the city markets, but we are informed that the fishermen have erected salting establishments and smoke-houses in various by-places on the sloughs between the Sacramento and San Joaquin, where the work of salting and smoking has been prosecuted more extensively than in any previous year. We learned that the canning establishment of Messrs. Emerson Corville & Co., at Collinsville, only made a pretense of ceasing work on the first of August, and that they secretly persisted in violating the law. We caused them to be arrested and fined, upon which they quit work and promised hereafter to obey the law. The canning establishment near Sacramento was also reported as at work during the close season. The proprietors have been indicted by the Grand Jury of Sacramento, and will be fined, if found guilty, during the next term of Court. It is well known that salmon, during the spawning season, are unfit for food. The fish canned, salted, or smoked at this period, if consumed or sold, will have the effect of giving the Sacramento salmon a bad reputation in the market. For this reason the "canners" on the Columbia River cease work on the first of August in their own interest, and without any requirement of law. It is useless for the State to hatch fish and turn them into the river if there is no time in the year when they are permitted to reach their spawning grounds for purposes of reproduction. It would seem that when the State expends money in filling the river with valuable fish for the benefit of the public, and especially for the benefit of fishermen, that there should be sufficient intelligence and public spirit among local officers and the fishermen themselves to see the law obeyed and give the fish an opportunity to keep up the supply. If the Commissioners are to expend the appropriation in prosecuting violations of the law there will be no money to pay for the hatching of additional fish. Many of the fishermen acknowledge the justice and ultimate benefit of an observance of the law, and obey it, but very properly complain that their work ceases, while those who violate it reap a greater benefit.

The following extracts from a letter received by the Commissioners from a fisherman who has followed the business of catching salmon on the Sacramento and San Joaquin for the San Francisco market during twenty years, will illustrate that, at least, the more intelligent and thoughtful of these men acknowledge the necessity of an observance of the law. His letter also gives facts of importance as to the habits of the Sacramento salmon. Writing from Rio Vista, August 17th, 1877, he says: "I understand the 'cannery' has shut down, but the greed for salmon is so great, I would not trust them without watching. As to the fishermen, they will be salting them all along the banks of the Sacramento and Lower San Joaquin (as far up as

the mouth of the Mokelumne) unless especial means are taken to prevent it. The Three-mile Slough, leading from one river to the other, around the head of Sherman Island, is also fine fishing ground, and more retired from public observation than any other. Many of the fishermen started off with their tanks, etc., the very day the 'can-nery' was reported to have stopped. Many of them are energetic, restless men, and the idea of doing something sly or contrary to law gives zest to their labor. Right here where I write a few boards have been thrown up shed-fashion by a party I need not now name. You may well believe salted salmon will be under it if some stranger does not prevent it. You may rest assured that the people who reside here will not be known as the initial instruments in punishing anyone for the violation of the salmon laws, although there are many who feel it ought to be respected. No doubt, public feeling and practice will occupy about the same status at Collinsville and wherever salmon fishing is a business. As I wrote to you the other day, now (August) is the time to protect the salmon. In review of long experience and observation I opine that of all the salmon passing in the months of August, September and October, more than ninety per cent. pass between August tenth and October first. The seed run is always on time, not being like the spring run, accelerated or retarded by the differing moods of the river, caused by the winter and spring rains. If during the last named period (August tenth to October first) the law were rigidly enforced, you would find seed enough for home use and a good part of all creation beside. Indeed, I think that one month out of the thickest of them, say August twentieth to September twentieth, would be quite sufficient, and therein I differ with you in opinion, no doubt. But you have not, perhaps, observed in person, as I have, the multitudes and urgency of the run at that time; and this is almost uniform—it has not varied in time ten days in twenty years. Now, during the period of four or six weeks, the State, in view of the magnitude of the producing interest involved, ought surely to provide beyond peradventure for the enforcement of the law. The statute names the taking or possession of salmon a crime, but in the public mind this crime is only an illegal act. You cannot force sentiment by act of the Legislature. The absence of sentiment excuses the citizens' apathy, and between ignorance and cupidity the salmon will suffer unless special agents of the State do for the public what the public have not yet quite learned they ought to do for themselves. Strangers are the best agents for this business. Citizens living in a fishing neighborhood do not feel like subjecting themselves to the enmity and revenge of a rough class by complaint. And, again, in this salting business, the criminal acts are beyond observation, except by express intention, as the fish are caught chiefly in the night, and the salteries are usually situated away from public highways and thoroughfares."

We have expended a part of the appropriation in prosecuting offenders against the law, but the field is so large and the profit so great, that but little good has been accomplished. The more fish hatched and placed in the river, the more numerous the fishermen, and the greater, apparently, the desire to make a profit from a violation of the law. As has been stated, unless the fish are allowed, in their season, to reach their spawning grounds, the rivers will be exhausted. Until the fishermen realize that the object of the law in creating a close season is the perpetuation and increase of the num-

ers of fish, the law will continue to be violated. We see no remedy at present except, hereafter, to devote a larger portion of the appropriation in preventing illegal fishing, and in prosecuting offenders against the law. This will require the use of a part of the appropriation which should be devoted to increasing the number of fish placed in the river. If it is expected that the Commission shall employ special means to enforce an observance of the law, and also employ attorneys to prosecute offenders, it is necessary that the appropriation should be increased. It is not now sufficient for these purposes, and also for the hatching of any large quantity of salmon with which to keep pace with increased fishing and the increasing numbers of sea lions. We have consulted with many of the fishermen, and they admit that the law creating a close season should be obeyed, provided all be made to obey it. It is but proper to say, however, that they, at the same time, urge that the close season for salmon (August first to November first) is too long a period. In correspondence with one of these men, who has made a business of fishing for salmon on the Sacramento and San Joaquin for many years past, as to the necessity for an observance of the law, he says: "I do not wish to be known as urging the enforcement of the law, or as a special informer against any party who has violated it. My reasons for this reservation affect alike my own peace and safety and that of many persons whom, I know, have no worse intention than to earn a living and obey the law, provided that others, less honest, are prevented from violating it with impunity. Your idea of a patrol boat, or boats, with officers, is the correct one, and I firmly believe that if, by this or other means, the prohibition were strictly maintained from Benicia upward, wherever there are practical fishing grounds, during the period of one month at the right time, that the perpetuation of salmon in our rivers would be abundantly secured. Between the tenth of August and first of October more than ninety per cent. of the seed run passes, and has not failed to pass, during twenty years of my observation. If the whole of the seed run is not wanted for seed, they ought not to be so used, for the fish is just as good food then as at any other time, only the wastage is something more, the spawn being larger. On the Columbia River I understand that the fall run is almost or quite worthless. Not so on the Sacramento. Well, we may be proud of our river; it is the paradise of the salmon, and they seem determined to resist the devils—who also seem determined to drive them out—better than could be expected; but they will need help in the future. The nets for taking them are being multiplied and improved. The fishing grounds are better known than formerly. Such obstructions as snags in the river bottom are less common—many of them having been broken off or taken up by the nets and put out of the way, or covered by sediment, so that a wider and longer sweep may be taken by the drifting net. Altogether, the salmon is sure to be exterminated, fight he ever so persistently, unless we help him. Surely the State can afford to guard him effectually one month in the year. The cupidity of the fish speculator, who only cares for the greatest number of cases he can pack and ship, should not be allowed to influence the statement of that time. Let it be somewhere between the tenth of August and the first of October. By the way, it seems to me that at the extreme upper waters, on the spawning grounds, the fish should be protected during their entire stay, excepting as needed solely for the purpose

of artificial hatching. But of this you are a better judge than I can be."

While not agreeing with this intelligent fisherman as to the propriety of shortening the close season, we fully concur as to the absolute necessity of a patrol to prevent unlawful fishing while the salmon are passing up to their spawning grounds. We also concur in his suggestion that the salmon should be protected on their breeding beds. The most important spawning ground left in this State is the McCloud River, in Shasta County. Its banks are mainly composed of lava and limestone, and, so far as known, they contain no mines. By some inadvertence or intentional manipulation, this county was exempted from the law creating a close season for salmon, and the fish are persistently taken in this county for market, while in the act of reproduction on their spawning beds. We respectfully urge that Shasta County be reincorporated in the law, and that no salmon be allowed to be taken there during the close season, except for purposes of artificial propagation.

The Chinese and others continue to use nets of a mesh much finer than is allowed by law, and the young of all kinds of salt water fish that spawn in the bays and estuaries, are persistently caught, dried, and shipped to China. The records of the Custom House show that there were shipped to China, from San Francisco, during the year ending July first, eighteen hundred and seventy-seven, dried fish and dried shell fish valued at two hundred and ninety-three thousand nine hundred and seventy-one dollars.

We have caused several arrests to be made for violations of this law, but it is impossible for the Commissioners to act as local police on all parts of the bay and rivers, and we see no remedy except in increasing the penalties for violations of the law, involving even, if necessary, the destruction of the nets, when used out of season. Unless in some way the wise provisions of the statute are compelled to be observed, we can see no reason why our present abundance of fish will not decrease, as they have decreased in other States, in consequence of the disregard of wise enactments made for their preservation and increase. Ordinarily salmon should reach their spawning grounds on the McCloud and Little Sacramento by the twentieth of August. As will be seen by the statistics heretofore stated, the catch was never so great as during the past fishing season. At the commencement of the close season, August first, the river was filled with fish, yet they were not permitted to reach their spawning places. Mr. Myron Green, the deputy in charge of the United States fish hatching establishment on the McCloud, reported, September fifteenth, that there were ten salmon in the McCloud in eighteen hundred and seventy-six to one in eighteen hundred and seventy-seven. Up to that time but five million eggs had been taken, while nearly ten million had been taken in a corresponding period in eighteen hundred and seventy-six. The fish were in the Lower Sacramento more numerous than ever before, but they were caught, canned, salted, and smoked, in defiance of the law. It is estimated that the "canneries" took fifty thousand after the first of August, and that there were salted and smoked on the banks of the sloughs and other by-places, at least one hundred thousand more. If this is to continue, the Government hatching works will have to be removed to the Columbia, and we will be compelled to import eggs from some

other State, even to keep up a partial supply of salmon in the Sacramento River.

In addition to making the penalties more severe for violations of the law, we would recommend that the law be so amended that it shall be made a misdemeanor to fish for salmon with nets or traps between sunset on Saturday and sunrise on Monday of each week. This would give the salmon the freedom of the river one day in the week, do no injury to the fishermen, and go far towards continuing the supply in our rivers.

SHAD (*ALOSA PRÆSTABILIS*).

Shad, in their season, are becoming quite numerous in the Sacramento River. The experiment of their importation to this coast has resulted satisfactorily. The river is of proper temperature, and furnishes an abundance of food for the young fish before they go to the ocean. There can be no doubt that the first shad brought from the Hudson River in eighteen hundred and seventy-one have been to the ocean, returned and spawned. No shad were placed in the river during the years eighteen hundred and seventy-four and eighteen hundred and seventy-five, yet shad two years old were quite numerous this year, and they must have been the product of the first importation. It may be safely asserted that we now have shad born in the Sacramento. As it is illegal to take this fish prior to December of this year, probably there has been no systematic fishing for them, yet numbers have been accidentally caught in traps and nets; probably not less than one thousand were thus taken during the winter and spring of eighteen hundred and seventy-seven. They return from the ocean at an earlier season of the year than in the northern Atlantic States, in this respect corresponding to the periods when they return to the rivers of South Carolina and Georgia. The first reported this year were taken in Sonoma Creek, January sixth; the latest, two at Sacramento, June twentieth. These latter were full grown fish, a male and female, on their return to the ocean after having visited their spawning grounds. There were placed in the Sacramento River, at Tehama, in eighteen hundred and seventy-one, fifteen thousand young shad; in eighteen hundred and seventy-three, thirty-five thousand; in eighteen hundred and seventy-six one hundred and twenty thousand, and in eighteen hundred and seventy-seven one hundred and fifteen thousand—in all, up to the present time, two hundred and eighty-five thousand. All of these were donations from the United States Government, but in some cases we have paid all, and in others a part of the cost of transportation. We hoped during the past summer to import at least three hundred thousand, and had all the arrangements made for this purpose, but failed in consequence of the "railroad strikes," which unfortunately took place at the time the young shad were ready for shipment. We are frequently urged to make larger importations of shad, and fill the rivers immediately. This is impossible with the appropriation at our disposal. The eggs of the shad, after being taken, are hatched in from twenty-four to forty-eight hours, while floating in the water, and the young almost immediately require food. From the Hudson to California in seven days, is the greatest distance and longest time that young shad have yet been transported. With the utmost care and attention it is doubtful if they could be kept alive

another day. We can, therefore, only receive in one shipment the eggs of the fish that can be caught in one night's fishing. This rarely exceeds one hundred thousand. As the cost of the passages of the necessary attendants from the Atlantic and their return, with express charges, etc., equals twelve hundred dollars, we have not felt authorized to make more than one importation a year. We believe, however, that by eighteen hundred and seventy-eight shad will be sufficiently numerous in the Sacramento to warrant the attempt at taking ripe fish for the purpose of artificial hatching in our own waters. Should we be successful, we can save the expense and risk of importation, and all our appropriate rivers can, in a few years, be filled with this valuable fish. Having this in view, we would respectfully ask that you recommend the passage of a law restricting the catching of shad at all other times except between January first and April first, of each year. This, if faithfully observed, would give a part of the fish an opportunity to reach their spawning places.

It is well known that salmon, after going to the ocean, invariably return to the river of their birth for purposes of reproduction, and this was supposed to be the instinct of the shad, yet we have information of a shad having been taken at Wilmington, and others in Russian River and in the Columbia, points on the coast separated by more than four hundred miles. It may be possible that as these fish become more numerous they will return in schools to the Sacramento, the young following their elders who have once made the journey. Should they continue to enter different rivers on their return from the ocean they will soon stock all on the coast that are appropriate to them.

WHITEFISH (COREGONAS ALBA).

In January last we received from the United States Fish Commissioner a donation of three hundred thousand eggs of the whitefish. These were successfully hatched under the superintendence of Mr. J. G. Woodbury, at the State hatching house at Berkeley, and the young fish were distributed as follows: Seventy-five thousand in Donner Lake; fifty thousand in Sereno and other lakes near the Summit, in Placer County; and one hundred and seventy-five thousand in Lake Tahoe. Including twenty-five thousand placed in Clear Lake in eighteen hundred and seventy-three, and twenty-five thousand in Tulare Lake in eighteen hundred and seventy-five, there have been planted in the waters of this State three hundred and fifty thousand of these valuable food fish. We believe they have lived in Clear Lake, also in Tulare. It was reported in a Lake County paper, that a whitefish was taken in Clear Lake April tenth, eighteen hundred and seventy-six, which measured a foot in length. We have no positive information that they have found a congenial home in Tulare Lake, but have heard reports that a few have been seen. As these fish can only be taken with a net, and as these are rarely used on these lakes, their waters will have an opportunity to become fully stocked before they are extensively fished. There can hardly be any doubt but they will succeed in Tahoe and other lakes near the summit of the Sierra—the climate, water, and food being not dissimilar to those of Lakes Michigan, Huron, and Superior, in which they are indigenous. These fish live upon small crustacea,

found on the rocky and gravel bottoms of lakes. They grow to weigh an average of one and a half pounds, and constitute the most important food fish of the people living near the great lakes. Professor Baird, in his report to Congress, says: "Few fishes of North America will better repay efforts for their multiplication." We are promised a further supply of eggs during the present winter, and shall continue receiving eggs, and hatching and distributing these fish to all the mountain lakes that are accessible during the winter months.

CATFISH (*PIMELODUS CATTUS*).

The seventy-four Schuykill catfish imported in eighteen hundred and seventy-four, and placed in lakes near Sacramento, increased to a vast extent. They already furnish an important addition to the fish food supply of the City of Sacramento and vicinity. From the increase we have distributed eight thousand four hundred to appropriate waters, in the Counties of Napa, Monterey, Los Angeles, Fresno, Tulare, Santa Cruz, Shasta, Solano, Alameda, San Diego, Yolo, Santa Barbara, and Siskiyou. These, should they thrive and increase as they have in Sacramento, will furnish an abundance of valuable food in the warm waters of the lakes and sloughs of the interior, and replace the bony and worthless chubs and suckers that now inhabit these places. It may be proper to call attention to the fact that these fish have become so numerous in the lakes near Sacramento that they can now be obtained in any quantity for stocking other appropriate waters in any part of the State.

CARP.

In exchange for California trout eggs sent to the Department of Agriculture of Japan, we received, in May last, eighty-eight Japanese carp. These were all young fish. We have had them placed in the aquarium, at Woodward's Garden, where they are regularly fed and cared for. When they shall have arrived at maturity they will be placed in some appropriate lake or slough in the interior, and their increase will be used to stock the warm waters of our valleys. Mr. Sekizawa Akeiko, of the Agricultural Department of Japan, in writing to us of these fish, says: "They grow very fast. In three years they may be a foot and a half in length. We consider them one of the best fish in fresh water."

Professor Baird, United States Fish Commissioner, imported from the headwaters of the Danube a number of the king carp. These are now breeding in ponds at Druid Hill, near Baltimore. The increase will be ready for distribution during the coming summer. We are promised a large consignment. The king carp is considered the most valuable and delicately flavored food fish of the carp family. These and the Japanese carp, when they can be distributed to all the sloughs, reservoirs, and lakes of the interior, will furnish a valuable increase of fish food. They will be a very excellent substitute for the worthless and unpalatable fish of the warm waters of the great valleys in the interior of the State.

AWA (CHANOS CYPRINELLA) AND MULLET.

In exchange for some salmon and trout eggs, sent to the Hawaiian Islands, we received, in July last, nearly one hundred fish called "awa." These we placed in a small stream at Bridgeport, in Solano County, where they could have free access to brackish and salt water. They are said to be the most valuable food fish of the Hawaiian Islands, of fine flavor, and thrive in fresh, brackish, and salt water. Where they have access to salt water, they grow to weigh an average of five pounds. We have reason to believe they will find congenial homes, and grow and multiply in the waters of this State. In December, we are promised a consignment of the Hawaiian Islands mullet, said to be a superior food fish, which also lives equally well in fresh or salt water.

TROUT.

In January, eighteen hundred and seventy-seven, we purchased one hundred and thirty-three thousand Eastern trout eggs (*salmo fontinalis*), which were received in good condition, and hatched at the State hatching house, at Berkeley. We also purchased forty-five thousand eggs of the McCloud River trout (*salmo irridea*), which were hatched at the same place. The former we caused to be distributed in proper streams in Siskiyou, Contra Costa, Alameda, Placer, Nevada, Santa Cruz, San Mateo, Monterey, Los Angeles, San Diego, Yuba, and Santa Clara Counties. The latter in streams in Tulare, Placer, Sonoma, Mendocino, Santa Clara, and Monterey Counties. The McCloud River trout is a valuable fish, of fine flavor, and, often reaching four pounds in weight. It grows more rapidly than any other trout with which we are acquainted. No more valuable variety of trout could be distributed. So many of our streams have been depleted of trout by mining, sawdust, and illegal fishing, that more should be done towards restocking them. But the salmon has so much commercial value, and gives employment to so many people, that we have felt it to be necessary to devote the greater part of the appropriation to keeping up the supply of this fish.

BLACK BASS, EELS, AND LOBSTERS, ETC.

The black bass placed in Napa and Alameda Creeks have increased; many have been caught, and by June, eighteen hundred and seventy-eight, the young can be planted in other appropriate streams. It is said that a few eels have been caught, but they have not become numerous. We hear reports of a few lobsters having been taken in the Bay of San Francisco, near Redwood, but none have as yet been brought to us for identification. It is also reported that tautog have been seen in the market of San Francisco. A majority of the varieties of fish imported from the Atlantic States have become acclimated, and are increasing in our waters. If any portion of the appropriation can be spared from the hatching of salmon, we will make another attempt at the importation of a car load of lobsters and eels. Sufficient experience has now been had to insure success in bringing lobsters alive across the continent. Could they be successfully introduced in quantities into the waters of the Pacific Coast they would be a valuable acquisition to our food supply.

HATCHING-HOUSE.

We find the State hatching-house, at Berkeley, to be too small for the quantities of fish required to be hatched. In addition, the supply of water is uncertain and unreliable. During the last spring the State nearly suffered a serious loss of young fish in consequence of the failure of water. We are under obligations to Mr. Chabot, of the San Leandro Water Works, for facilities afforded us in this emergency, and to our Foreman, Mr. J. G. Woodbury, for his ready resources and untiring energy in saving the young fish then in the hatching troughs. Should the Legislature make the necessary appropriation, we deem it advisable to procure a proper location with an abundant supply of water on which to erect a larger State hatching-house.

LEGISLATIVE COMMITTEES.

We would urge that the fishery interests of this State are so important, and are increasing so rapidly, that at each session, the Legislature will be importuned to make changes in the laws which regulate this industry. It appears to be, therefore, necessary that each House should now have a standing committee on fisheries. Such committees could take testimony which would be valuable, and they could then prepare intelligent and enlightened legislation, which would have the effect of continuing and increasing the supply of food fish in our waters. Other coast States have found this to be not only necessary but profitable.

RECEIPTS AND EXPENDITURES.

The following is an account of the receipts and expenditures since the last report:

RECEIPTS.

August 4, 1875—By cash on hand last report.....	\$1,295 42
February 9, 1877—By cash appropriation for fiscal year	5,000 00
January 6, 1877—By cash returned, express on salmon eggs for New Zealand....	11 50
February 7, 1877—By cash returned, express on salmon eggs for New Zealand....	13 00
May 31, 1877—By cash returned, Sportman's Club.....	2 25
July 10, 1877—By cash appropriation for fiscal year.....	5,000 00
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	\$11,322 17

EXPENDITURES.

October 7, 1875—To expenses, 250,000 salmon eggs to Kern River....	\$51 00
October 7, 1875—To telegram to Bakersfield	1 00
October 10, 1875—To Myron Green, balance expenses to Kern River..	69 51
December 10, 1875—To W. Bassett, expense transporting catfish	10 00
January 11, 1876—To W. F. Hubbard, labor salmon hatching on Truckee	150 00
January 11, 1876—To telegram to L. Stone.....	1 12
February 8, 1876—To A. Preece, copying report for State Printer....	50 00
February 8, 1876—To discount on sale of silver.....	6 25
February 8, 1876—To L. Stone, on account purchase of trout eggs....	111 25
February 8, 1876—To W. F. Hubbard, balance in full hatching salmon eggs.....	279 25
February 8, 1876—To expressage on salmon trays to Redding.....	3 00
February 8, 1876—To L. Stone, balance in full on trout eggs.....	87 52
March 17, 1876—To J. G. Woodbury, transporting trout to Lake and Napa Counties.....	82 35
March 22, 1876—To express and telegram	1 15
March 29, 1876—To expenses incurred by J. D. Farwell.....	53 36
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Carried forward	\$956 76
	\$11,322 17

Brought forward	\$956 76	\$11,322 17
July 8, 1876—To drayage and freight on air pump for shad	38 80	
July 27, 1876—To telegram to Holyoke, Mass., on shad	13 60	
August 8, 1876—To labor and ice for shad at Sacramento	4 75	
August 10, 1876—To Wells, Fargo & Co., expressage on shad from Holyoke, Mass.	146 60	
August 12, 1876—To fare and expenses of Clark and Bean with shad ..	421 44	
August 12, 1876—To return fare of Clark and Bean to Washington ..	228 60	
October 18, 1876—To prosecutions under salmon law, freight, telegram, etc.	46 75	
December 12, 1876—To David Griffin, labor and care trout	50 00	
January 4, 1877—To telegrams December 12th, 22d, and January 4th ..	7 65	
January 4, 1877—To express on whitefish eggs from Michigan	23 00	
January 4, 1877—To wire cloth and repairs to hatching house	45 35	
January 4, 1877—To express on trout eggs from New Hampshire	39 67	
January 9, 1877—To wire cloth, fares of Woodbury, and telegrams to New Hampshire ..	27 32	
January 10, 1877—To telegram to Michigan, etc., wire cloth	4 85	
January 15, 1877—To Woodbury, one month's salary, hatching	150 00	
January 17, 1877—To express on whitefish eggs from Michigan, drayage and telegram ..	27 64	
January 23, 1877—To Ellis, one month's labor, \$60, express on trout eggs from New Hampshire, etc.	105 50	
January 24, 1877—To Livingston Stone, on account of transportation of lobsters	142 50	
January 27, 1877—To Expense of transporting whitefish to Donner Lake	30 00	
February 5, 1877—To carpenter work on hatching house, freight, etc., ..	53 55	
February 9, 1877—To Livingston Stone, hatching 1,500,000 salmon ..	1,500 00	
February 19, 1877—To express on trout eggs, New Hampshire, and telegram	27 05	
February 12, 1877—To express on land-locked salmon eggs, Maine, and telegrams	16 15	
February 14, 1877—To transporting whitefish to Tahoe, Capital Savings Bank advanced ..	98 11	
February 28, 1877—To freight, cans, transporting trout, and telegram ..	7 65	
February 28, 1877—To Woodbury, salary, \$150; Ellis, labor, \$60; and transporting fish, etc.	258 70	
March 5, 1877—To Stone and Hooper, 133,400 trout eggs, New Hampshire ..	481 71	
March 5, 1877—To transporting trout to South Yuba and American, etc.	22 32	
March 19, 1877—To Woodbury, salary one month	150 00	
March 26, 1877—To transporting trout and whitefish, etc.	47 20	
March 26, 1877—To iron pipe for hatching house, express, and telegrams	101 72	
March 28, 1877—To Seth Green, balance due, \$50 50; Ellis, one month's labor, \$60	110 50	
March 28, 1877—To express, etc., on cans and fish	6 04	
March 28, 1877—To ice used in transporting fish	32 95	
April 13, 1877—To Ellis, six days' labor, \$12; express and telegrams, \$8 90	20 90	
April 15, 1877—To Woodbury, salary \$150, and freight on eggs and fish, \$23 75	173 50	
April 23, 1877—To fish to Russian River, cartage, etc.	14 70	
April 27, 1877—To expense of trout to North Fork of American River ..	10 75	
May 1, 1877—To fourteen days' labor to Dunn, and freight on distributing fish	82 15	
May 28, 1877—To express charges and labor	33 10	
May 30, 1877—Importation of carp from Japan	30 00	
May 31, 1877—To Woodbury, two weeks' services and telegram	75 80	
June 23, 1877—To expenses, fares, and labor on shad, Sacramento and Tehama	96 00	
July 10, 1877—To discount on silver	27 50	
July 12, 1877—To Clark and assistants, shad at Tehama, ice and telegram	79 55	
July 17, 1877—To Whittier, catching and distributing catfish	41 25	
July 20, 1877—To Green, 45,000 McCloud trout eggs, etc.	182 00	
July 27, 1877—To expenses, importation and distribution of fish, Honolulu	25 50	
Carried forward	\$9,317 13	\$11,322 17

Brought forward.....	\$ 9,317 13	\$11,322 17
July 31, 1877—To purchase twenty cans for transporting fish.....	100 00	
August 14, 1877—To catching and distributing 1,000 catfish.....	83 00	
August 16, 1877—To H. D. Dunn, prosecution violations of salmon law.....	100 00	
August 31, 1877—To N. Lovely, two weeks' labor.....	25 65	
September 8, 1877—To N. Lovely and assistant, one week.....	28 00	
September 9, 1877—To Henry Pitzer, catching and distributing 7,000 catfish.....	50 00	
September 21, 1877—To Lovely and Bradley, ten days work at Collinsville.....	43 00	
October 3, 1877—To Young, gathering statistics.....	40 00	
October 3, 1877—To fares and expenses of witnesses, People vs. Corville.....	54 38	
October 6, 1877—To Flynn, twenty days, witness, People vs. Corville, and express.....	52 50	
October 6, 1877—To Cowdery & Preston, People vs. Labella, Garibaldi & Corville.....	242 75	
October 11, 1877—To Kimber and Whittier, catfish for Siskiyou, and ice.....	55 63	
October 19, 1877—To fees of Sheriff of San Joaquin, serving notices.....	2 60	
October 19, 1877—To Purser Australia, care of fish.....	2 50	
October 29, 1877—To United States, on account hatching salmon.....	500 00	
November 2, 1877—To freight, fish cans, and cartage.....	1 25	
November 8, 1877—To J. D. Farwell, bill transporting trout, Alameda.....	10 65	
November 16, 1877—To H. C. Marks, copying report.....	50 00	
November 16, 1877—Amount on hand to balance.....	3,563 13	
	<hr/>	<hr/>
	\$11,322 17	\$11,322 17

This balance of three thousand five hundred and sixty-three dollars and thirteen cents will be consumed in payments to become due for the salmon now hatching on McCloud River, and in the expense to be incurred in the hatching of white fish eggs, and other fish eggs promised to be donated by the United States during the present winter.

All of which is respectfully submitted.

B. B. REDDING,
S. R. THROCKMORTON,
J. D. FARWELL,
Commissioners of Fisheries.

SAN FRANCISCO, CAL., November 10, 1877.

COMMISSIONERS OF FISHERIES.

UNITED STATES.	
Spencer F. Baird.....	Washington, D. C.
ARKANSAS.	
N. H. Fish.....	Pine Bluffs.
J. R. Steelman.....	Little Rock.
N. B. Pearce.....	Fayetteville.
CALIFORNIA.	
S. R. Throckmorton.....	San Francisco.
B. B. Redding.....	San Francisco.
J. D. Farwell.....	San Francisco.
CONNECTICUT.	
William M. Hudson.....	Hartford.
Robert G. Pike.....	Middletown.
James A. Bill.....	Lyme.
GEORGIA.	
Thomas P. James.....	(Duties embracing the work of the fish interest assigned to Commissioner of Agriculture.)
IOWA.	
Samuel B. Evans.....	Ottumwa.
B. F. Shaw.....	Anamora.
Charles A. Haynes.....	Waterloo.
KENTUCKY.	
Pack Thomas.....	Louisville.
MAINE.	
E. M. Stillwell.....	Bangor.
Henry O. Stanfield.....	Dixfield.
MARYLAND.	
T. B. Ferguson.....	Baltimore.
T. W. Downes.....	Denton.
MASSACHUSETTS.	
Theodore Lyman.....	Brookline.
Asa French.....	South Braintree.
E. A. Brackett.....	Winchester.
MICHIGAN.	
George Clark.....	Ecorse.
A. J. Kellogg.....	Allegan.
E. R. Miller.....	Richland.
MINNESOTA.	
R. O. Sweeney.....	St. Paul.
Robert Owsley.....	
William Golcher.....	
NEW HAMPSHIRE.	
Colonel Samuel Webber.....	Manchester.
Albina H. Powers.....	Grantham.
Luther H. Hayes.....	Milton.
NEW YORK.	
Horatio Seymour.....	Utica.
Robert R. Roosevelt.....	New York City.
Edward M. Smiths.....	Rochester.

NEW JERSEY.

B. P. Howell Woodbury.
 J. R. Shortwell Rahway.
 G. A. Anderson Trenton.
 George Ricardo Hackensack.

OHIO.

John C. Fisher Coshocton.
 John H. Klipput Columbus.
 Robert Cummings Toledo.

PENNSYLVANIA.

J. H. Reeder Easton.
 B. L. Hewett Hollidaysburg.
 James Duffy Marietta.

RHODE ISLAND.

Newton Dexter Providence.
 Alfred A. Reed, Jr. Providence.
 John H. Barden Scituate.

UTAH TERRITORY.

A. P. Rockwood Salt Lake City.
 (Superintendent of Fisheries, Zion's Co-operative Society.)

VERMONT.

M. C. Edmunds Weston.
 M. Goldsmith Rutland.

VIRGINIA.

A. Moseley Richmond.
 W. B. Robertson Lynchburg.
 M. G. Ellyzer Blacksburg.

WISCONSIN.

William Welch Madison.
 A. Palmer Besobel.
 P. R. Hoy Racine.

DOMINION OF CANADA.

W. F. Whitcher Ottawa.
 W. H. Vining St. John's, N. B.
 (Inspector of Fisheries for New Brunswick and Nova Scotia.)