Biennial report of the State Board of Fish Commissioners of the State of California

California.

Sacramento : J.D. Young, supt. State printing

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THIRTEENTH BIENNIAL REPORT

OF THE

State Board of Fish Commissioners

OF THE

STATE OF CALIFORNIA

1893-94

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STATE FISH HATCHERY, SISSON, CALIFORNIA.

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THIRTEENTH BIENNIAL REPORT

OF THE

STATE BOARD OF FISH COMMISSIONERS

OF THE

STATE OF CALIFORNIA,

FOR THE

YEARS 1893-1894.

COMMISSIONERS:

JOSEPH D. REDDING, President, San Francisco.
HUGH L. MACNEIL, Los Angeles.
WILLIAM C. MURDOCH, Secretary, San Francisco.



SACRAMENTO:

STATE OFFICE, : : : : : A. J. JOHNSTON, SUPT. STATE PRINTING.

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REPORT.

To H. H. MARKHAM, *Governor of the State of California:*

The State Board of Fish Commissioners present herewith their Thirteenth Biennial Report of operations, covering the period from September 1, 1892, to September 1, 1894. Since the last biennial report rendered by the Commission the personnel of the Board has undergone several changes. Hon. Ramon E. Wilson, appointed by you on March 17, 1891, was compelled by stress of personal business to resign his commission under date of September 22, 1892. The services of Mr. Wilson on the Board were of marked value, and his untimely death, the year following his resignation, was a source of greatest sorrow and regret to all who knew him.

In November, 1892, Hugh L. Macneil, of Los Angeles, was appointed Fish Commissioner to succeed Mr. Wilson.

Joseph Morizio, appointed under date of March 17, 1891, tendered his resignation in December of 1892. William C. Murdoch was appointed his successor on December 22, 1892. Mr. Murdoch was then elected Secretary of the Board and has served in that capacity ever since.

The office of the Commission was removed on September 22, 1892, to No. 33, Chronicle Building, where it has since remained. Since the last report the Commission has held twenty meetings upon the following dates:

1892—September 13th,	1893—February 14th,	1893—September 16th;
September 22d,	March 28th,	December 14th,
October 1st,	May 18th,	1894—February 6th,
October 6th,	July 18th,	April 13th,
November 29th,	July 26th,	June 4th,
December 22d,	August 14th,	July 27th.
1893—February 10th,	September 15th,	

With one or two exceptions each of these meetings has been attended by a full Board. The labors of the Commission have steadily augmented during the two years just past, and it is apparent that the scope and extent of the work defined by law are developing upon broader lines each year. The extent of the Commission's labor we believe has been fully as great as circumstances would allow. The record of what has been done affords ample explanation of why things less important and things impracticable were not done. With the means that we have had at our disposal we are gratified at the results which we are enabled to embody in this report; yet by no means are we convinced that the State is giving the necessary attention to this department of her industries that its importance calls for. We have deemed it wise to give our first and chief attention to the food-fishing industry, as being the most important charge placed in our care. Protection and propagation affect the quantity and the price of fish, by reason of which circumstance our work is made of deep concern to the entire commonwealth. The importance of these industries has justified our endeavors. Among the States of

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the Union, California ranks sixth in fisheries, with products valued at $3,044,731, as against Massachusetts, which takes first rank with products valued at $7,531,194. As showing the comparative inadequacy of our appropriation for all the work of the Commission, it should be borne in mind that California has an area of 158,360 square miles and is the largest State in the Union, except Texas. Massachusetts has an area of 8,315 square miles and appropriates $15,700 per annum. California, with a dozen times the area to protect, appropriates $17,500. With this amount at its disposal the Commission feels that it can protect the food fish of the State. For other purposes, however, the amount is wholly inadequate, as will be seen by reference to the following pages.

It must be remembered that the Commission is allowed to use in each fiscal year but one half of the legislative appropriation. In order, therefore, to cover the ground before us, we have been compelled to husband our resources, at times suspending the men in our employ for a month or two at a time in order to keep within the appropriations and avoid the necessity of presenting deficiency bills to the next Legislature. The Commission is gratified to be able to say that there are no deficiency bills to present.

The statement is sometimes made that the Eastern States demand a larger appropriation for pisciculture, owing to the fact that the population is so much greater. The converse of this proposition is true. The laws have to be enforced independent of the population, and the fewer number of people living on a stream the greater its need for protection. Public sentiment in thickly settled communities has always been an efficient aid in the enforcement and maintenance of laws for the protection of fish and game.

The time of our deputies has been chiefly taken up with the hatching and protection of fish, to which special work the Legislature devoted its appropriations.

In the line of game and fish protection, we have, while patroling the large market centers of the State, caused the arrest of dealers detected offering game or fish for sale out of season. Effective steps have been taken to secure the enforcement of the cold storage and other acts of the last Legislature, and, when necessary, test cases have been made in the Courts. All complaints received by the Board have been investigated by deputies, and in proper cases the offenders have been watched, arrested, and prosecuted.

There can be no question but what the Legislature should take additional action to secure the enforcement of the game laws. To this end we cheerfully commend to you and the Legislature the work of the late convention, which, in response to a call from you, met and decided among other things to recommend the appointment of a game warden for each county.

The Commissioners take pleasure in stating that during the past two years they have propagated and planted in the public streams of the State more than twice the number of fish accredited to any former Commission within the same period of time. This result has been rendered possible by the increased appropriations and the efficiency of our deputies. Dams and fish-ways in all parts of the State have been inspected and kept in order. The Truckee River and other streams have been cleared of shavings, sawdust, and other deleterious substances. Several new species of trout have been introduced, and a favorable start has

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been made in the propagation of Mongolian pheasants. The records of the Commission embodied in this report will show that all moneys intrusted to the Board have been judiciously and economically expended. It has been sought to make this report show in detail the work of the Commission in all of its departments. Many valuable facts and statistics have been gathered and grouped under appropriate heads, to which your attention is directed.

COMPARATIVE APPROPRIATIONS.

California has for many years claimed the attention of the world on account of her vast area of water, her extent of land formation, and her variety of climatic conditions. We venture to say, however, that but few appreciate the fact that these conditions combine to marvelously adapt the waters of the State as a habitat for fish of all kinds. Almost every known species of fish should, in some portion of the State, find waters suited to its needs. California has within its borders nearly all the conditions which are necessary to the welfare of fish and game. There is but one State which exceeds us in area; nine that have more salt-water area (gulfs, bays, sounds, etc.), and four that have more fresh-water area (lakes, rivers, etc.); but six States have more miles of developed coast-lines (or mainland in the direction of the ocean), and but one State—Florida—has more miles in general or straight coast-line.

With these natural conditions so favorable we should seek to take the position which is properly ours and develop the fishing industry until in that respect we rank first in the commercial world. We must also, as a people, give this subject of pisciculture the attention it merits and which it has attained in most of the States, as will be seen by reference to the funds placed at the disposal of the various Fisheries Commissions. All of the older States, and many new ones, have well organized Fish Commissions, which are caring for the industry. For several years, State after State has come to appreciate the necessity for activity in this direction, with the result that Legislatures are constantly setting aside more generous appropriations.

With the exception of Virginia, all of the States which outrank California in value of fish products also outrank her in appropriations per square mile of land and water area. It will be noticed that many States whose products have less value, or, comparatively speaking, no value at all, take higher rank in that particular. Unfortunately for us, perhaps, we are so situated that we do not get the benefit of the work of other States in the matter of fish propagation, as do many of the States on the Eastern coast. This is particularly true of Connecticut, New York, and New Jersey, and of New Jersey, Delaware, and Pennsylvania, where the work of shad propagation in one State is of great benefit to the adjacent States. Therefore, in making a comparison with the North Atlantic States it would not be unfair to group those States together. Comparisons made upon this basis would be of such a nature as to make us feel ashamed of the insignificant amount we spend upon our fisheries.

In area, the States of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Delaware exceed California by only 2,600 square miles, yet those States spend $146,000 per annum in the propagation and preservation of fish and game. Besides this large amount, which they themselves expend,

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they derive great benefit from the extensive operations of the U. S. Commission of Fish and Fisheries in the propagation of shad, cod, lobster, etc. Thus it will be seen that in many respects a comparison of individual Eastern Coast States with California results in a higher rank in appropriations for this State than the actual figures justify.

Rhode Island and Delaware are fortunate in being so situated that they derive a benefit from the work of other States, and have, no doubt, come to the conclusion that it is not necessary for them to make appropriations, even in proportion to their size.

Maine has 125,320 square miles less territory than California, and appropriates $16,500 per year. Her Commissioners advise that they find their $16,500 (to which must be added some $2,000 derived from fines), "inadequate for efficient service and the demands of the best interests of this department of the State's business. We hope to double our appropriation at the next Legislature."

New Hampshire was authorized to erect new hatcheries and will expend about $10,000 this year, although the State has but 9,305 square miles, or 149,055 square miles less than California.

Massachusetts, ranking first in the value of her products, realizes what the fishery industry has done for her, and what benefits are to be derived from keeping her waters well stocked and cared for. That State shows its appreciation by appropriating $15,700 per annum.

Connecticut appropriates $9,000 for the propagation and preservation of fish; and also gives the counties power to appoint and pay game wardens.

New York appropriates the splendid sum of $66,050. Of this amount $44,000 is for the maintenance of the several hatcheries, enabling the State to operate on a magnificent scale, and to keep her waters well stocked. The balance is used for the salary and disbursements of twenty fish and game protectors. Can it be said that New York does not receive large returns for the amounts expended for these purposes?

We might continue with mention of various Coast States and the recital of figures showing the prominence attached to the subject of fish culture and fish and game preservation in nearly all of them.

As has already been said, few, if any, of these States have conditions more favorable for fish culture than can be found in California.

The following tables show a comparison of appropriations and the rank of the various States:

Amount Appropriated by the Various States.

States.	Amount Appropriated.			
	Per Square Mile of Total Area.	Per Square Mile of Coast Waters and Coast-line.	Per Square Mile of Fresh Water.	Per Square Mile of Total Water Area.
California	**.13**	**12.57**	**11.34**	**6.00**
Pennsylvania	.50	----------	97.82	97.82
New York	1.34	66.45	55.04	31.54
Connecticut	1.80	50.85	75.00	30.30
Maryland	5.73	27.39	20.00	22.91
Massachusetts	1.89	17.74	104.67	15.17
New Hampshire	.43	205.13	13.33	12.52
New Jersey	1.54	9.76	77.42	8.66
Maine	.50	8.22	6.35	3.58
Delaware	.24	1.13	8.33	.99
Virginia	.07	1.18	5.50	.97

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Rank of the Various States.

States.	Value of Products.	Amount Appropriated.			
		Per Square Mile of Total Area.	Per Square Mile of Coast Waters and Coast-line.	Per Square Mile of Fresh Water.	Per Square Mile of Total Water Area.
California	6	17	7	17	17
Pennsylvania	18	8		2	1
New York	3	5	2	5	3
Connecticut	9	3	3	4	4
Maryland	2	1	4	8	5
Massachusetts	1	2	5	1	10
New Hampshire	26	10	1	13	12
New Jersey	5	4	8	3	15
Maine	8	8	9	20	22
Delaware	21	13	12	18	27
Virginia	4	20	11	22	28

In making a comparison with the States bordering on the Great Lakes, it will be noticed that the amount of fresh-water area does not exceed that of California in any State except Minnesota, and yet these States are looking after their interests so well that in 1892 the waters of five out of eight of them exceeded our fresh waters in productiveness. The people of these States appreciate the value of their fisheries, and are taking care of them to such an extent that in 1892 they had increased the value nearly a million dollars over 1880. Those States which show their attitude by the amount of money expended, are the ones which have made the largest increase in value of products.

Michigan, with 58,000 square miles in area—100,000 less than California—expends $27,483 for the propagation of fish alone. She also has a salaried game warden, who appoints ten paid deputies to assist him in the protection of fish and game. Besides these deputies, each county appoints three more. In 1891, the counties paid these men over $5,000 for their services. It may well be asked, has Michigan more cause to look after her fish and game than California?

Wisconsin is as fully alive to the necessities of the case as Michigan; that her people appreciate the need of liberality in the matter, is evidenced by a quotation from a letter in which the Commissioners of Fisheries of that State say:

"We have an annual appropriation of $12,000; then, if we want funds for any extra work or for permanent improvements, we ask for them. During the session of 1890, we asked for $5,000 for a new building, and there were only seven votes against it. During the last session, we asked for $5,000 for a fish car, and the vote was unanimous. Eighteen hundred dollars per year is also voted for the Fish and Game Warden and his expenses. There is also a contingent fund of $1,500 to pay special deputy wardens. The total expenditures for fish culture and fish and game protection will average about $21,000 annually. The Fish Commission will ask for a special appropriation of $10,000 this winter."

Notwithstanding the fact that Minnesota appropriates $15,000 annually for fish and game, her people realize that, with her vast number of lakes and streams, more funds should be placed at the disposal of the authorities. Her Commissioners write that they confidently expect to secure a material increase and hope to double their appropriation. It may again

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be asked, has Minnesota advantages in her lakes and streams that are not found in California?

Although Pennsylvania's means of access to the Great Lakes are, comparatively speaking, very small, she has developed the industry there from $43,450 in 1880 to $211,122, in 1892; and, appreciating the value of her fisheries, has made liberal appropriations for their maintenance, as her rank in the following tables will show. A comparison of appropriations follows.

States.	Amount Appropriated per Sq. Mile Total Area.	Amount Appropriated per Sq. Mile Fresh-Water Area.
California	.13	11.34
Pennsylvania	.50	97.82
New York	1.34	55.04
Michigan	.54	21.04
Illinois	.18	15.38
Wisconsin	.36	12.77
Ohio	.09	12.26
Minnesota	.18	3.61
Indiana	.02	1.82

Table showing rank of the various States:

States.	Value of Products.	Amount Appropriated per Sq. Mile Total Area.	Amount Appropriated per Sq. Mile Fresh-Water Area.
California	6	17	17
Pennsylvania	18	8	2
New York	3	5	5
Michigan	13	7	7
Illinois	27	14	12
Wisconsin	19	11	14
Ohio	17	19	15
Minnesota	29	14	25
Indiana	28	26	27

Many Inland States, which do not compare with the Coast States for variety and abundance of fish, are also alive to the necessity of maintaining and protecting the supply, not alone from a commercial standpoint but that the sportsman and angler may seek her lakes and streams and thereby afford a source of revenue to her people. California can, with advantage, take a lesson from Colorado, Wyoming, and Vermont, although those States do not add materially to the fish food supply. They appreciate the advantages derived from well-stocked lakes and streams, Colorado appropriating $9,400 for the propagation and distribution of fish, and $6,000 for the protection of fish and game, or $55 per square mile of water area, while Vermont appropriates $7,000 for the same purpose, or $16.28 per square mile of water area; and Wyoming $5,200, or $16.51 per square mile. California appropriates $5.03 per square mile of water area, although we have lakes and streams which far surpass those of Colorado, Wyoming, and Vermont, in addition to our splendid extent of salt water. Other Inland States, such as Nebraska and Missouri, having waters suited only to the bass, perch,

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carp, and catfish, provide liberally for their propagation and protection, holding that it is well worth the money expended to have their waters stocked with these varieties, which, with one exception, receive comparatively no recognition as a food fish from the people of this State.

The amount of money appropriated by these Inland States per square mile of total area, fresh-water area, and total water area as compared to California, is clearly shown by the following table:

States.	Per Square Mile Total Area.	Per Square Mile Fresh-Water Area.	Per Square Mile Total Water Area.
California	**.13**	**11.34**	**6.00**
Colorado	.15	55.00	55.00
Wyoming	.05	16.51	16.51
Vermont	.73	16.28	16.28
Nebraska	.10	11.49	11.49
Missouri	.06	6.62	6.62

While the amount appropriated per square mile of total area is less in three of the above States, they all, with one exception, vastly exceed us in amount appropriated per square mile of water area. To fully appreciate the situation it must be borne in mind that we take the sixth rank in value of our products, while these States do not figure in the commercial fisheries at all. California ranks seventeenth in amount appropriated per square mile of total water area, while these States take rank in that particular, as follows: Colorado, second; Wyoming, seventh; Vermont, eighth; Nebraska, fourteenth; Missouri, sixteenth.

Bearing in mind that California has advantages which few other States can claim, a comparison places us with hardly an exception behind all of the Inland States which have taken up the question of the preservation of fish and game.

By reference to the table in the Appendix, it will be seen that the Southern States give this matter but little, if any, attention, and our various inquiries have developed the fact that their waters are being fast depleted. Some of them have Commissions, but without funds they are helpless in seeking to enforce the laws.

The Western Inland States are not behind in this matter. Colorado has already been referred to; and, with Wyoming and Nevada, has Fish Commissions which are doing good work, although the Commissions of two States last named have not the funds that the Colorado Fish Commission receive. Both Idaho and Montana have fish and game wardens appointed and paid by the several counties. The following table of comparisons of the Pacific Coast States speaks for itself. In 1893 Oregon appropriated $8,000 more for the use of the Fish Commission, but this is not available on account of the law having been repealed by mistake.

States.	Amount Appropriated.			
	Per Square Mile of Total Area.	Per Square Mile of Coast Waters and Coast-Line.	Per Square Mile of Fresh Water.	Per Square Mile Total Water Area.
California	**.13**	**12.75**	**11.34**	**6.00**
Washington	.26	5.77	19.57	4.46
Oregon	.05	13.43	3.17	2.56

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Rank of the States.

States.	Value of Products.	Amount Appropriated.			
		Per Square Mile of Total Area.	Per Square Mile of Coast Waters and Coast-Line.	Per Square Mile of Fresh Water.	Per Square Mile Total Water Area.
California	6	17	7	17	17
Washington	12	12	10	9	19
Oregon	14	22	6	26	23

The States which do not make appropriations are Alabama, Arkansas, Florida, Idaho, Kentucky, Louisiana, Mississippi, Montana, North Carolina, North and South Dakota, Rhode Island, Tennessee, and Texas. Several of these States, however, have Fish Commissions.

By reference to the table in the Appendix, the foregoing figures can be found, as well as much other information concerning all of the States which have taken up these matters.

THE VALUE OF THE CALIFORNIA FISHERIES.

The value of the fishery products of California can be best understood from an inspection of the statistics prepared by the United States Commission of Fish and Fisheries and by ourselves. These figures show the first value, or the amount that the fisherman received. It is to be regretted that no complete figures are at hand until 1880, as only by comparison can the increase in the industry be shown; but if that increase was as great prior to that time as since (and aside from the salmon fishery this was undoubtedly true), it indicates an increased development of the industry, which, with proper protection, should reach an unlimited figure. The total value of our fishery products in 1892 was $3,044,269; an increase of $1,193,555 over the output of 1880. The total amount of capital invested in the fisheries in 1892 was $2,543,162; an increase since 1880 of $1,403,487. In 1880 there were 3,094 men employed in the fisheries, as against 5,469 employed in 1892.

It is not generally appreciated that California took the eighth rank in the list of States in the value of her fisheries in 1880, and that in 1892 she had moved up to sixth place. California ranks as follows in the various branches: First in the seal and sea-otter fisheries; second in the whale fisheries, and would take the first place in this branch but for the fact that while a large part of the Massachusetts whaling fleet makes its headquarters at San Francisco and cruises in the Pacific Ocean, the catch of these vessels has been credited to Massachusetts, and the California figures represent only the yield of the vessels owned in this State. California ranks second in the crustacean fisheries; sixth in the molluscan; eighth in the reptilian, and thirteenth in the general food and bay fisheries. California is interested in six of the nine fisheries of the United States, which are valued at over $1,000,000 each annually, as follows:

Whale, $1,662,000; rank, second.

The Pacific salmon, $178,909; rank, fourth.

Mackerel, $14,174; rank, fourth.

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Oysters, $698,257; rank, sixth.
Clams, $27,108; rank, eighth.
Shad, $14,372; rank, twelfth.

Without following the higher rank California takes, comparatively, in the other fisheries of the United States (all of which were valued at over $50,000 each in 1892), we desire to call attention to the amount this State contributes to the total output of the most important:

Shrimp and prawn	$242,161
Crabs	102,900
Flounders	85,482
Cod	56,864
Herrings	55,795
Rockfish	52,540
Smelt	53,471

An adequate idea of the extent of California fisheries can best be afforded by reference, in detail, to the various fisheries along the coast, the amount of the investment represented, and the size and value of the catch. A statement of these facts, arranged, so far as possible, according to counties, will be found in the Appendix.

Our salmon fishery is of the greatest importance to us, as it furnishes a larger supply by 800,000 pounds than any other food fish, the catch being 4,848,816 pounds in 1892.

Hon. Marshall McDonald, U. S. Commissioner of Fish and Fisheries, visited the State in the summer of 1893, and made a careful examination of our salmon streams. He is alive to the importance of this fishery, and has urged upon us the necessity for a longer close season.

In making comparisons to show the value of our salmon catch we are obliged to depend upon those taken only from the Sacramento and San Joaquin Rivers. This, however, may not be considered a disadvantage, as the plants of fry have been made in those waters alone. Hatching operations were inaugurated in 1873, and, fortunately, we have data of the catch for 1875, which is early enough to show its value under natural conditions. During that year the take was 5,098,781 pounds. The result of the hatching and planting of over 2,000,000 fry per annum in the Sacramento River was shown in 1878, when the fish had commenced to return and were of a size to be taken. That the result of this work did not sooner become apparent may be attributed to the well-known fact that about four years must elapse before the salmon reach a size which fits them for commercial use. The take of 1878 was 6,520,768 pounds. This increase continued until 1883 (the date covered by the last figures at hand until 1888). The largest take recorded was in 1880, amounting to 10,837,400 pounds. The catch was but little smaller in 1881, 1882, and 1883, being over 9,000,000 each year. From this time up to 1888 we have no record, although we may infer that the take was about the same, from the fact that 6,622,978 were taken in that year, although the reports show that the salmon were not running some years as regularly as others.

In 1884, it became necessary to close the spawning station at Baird, as the salmon were prevented from ascending the Sacramento River to that point by the blasting operations above Redding, occasioned by the building of the railroad. Consequently, the planting ceased and this station was not operated until 1888. There was nothing to repair the depletion during that time, except the work done at the State hatchery in 1886 and 1887, which work was of necessity comparatively small. The

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result was that the catch decreased until the effects of the resumption of the artificial hatching again began to show in 1892, although in that year the catch was but 3,484,049 pounds. Since 1892, the increase of the take has been very marked, and the results of the planting of fry each year are again demonstrated.

The necessity of replacing the mature fish taken from the rivers by the hatching and the distributing of fry is again clearly demonstrated by reference to the operations at the canneries on the Sacramento River. In 1888, there were still returning to the river fish which had been distributed before it became necessary to close the station at Baird, but after that, and until 1892, fish were not still coming to keep the numbers good. In the fall of that year there was a decided improvement, and the canneries again began operations, after having been closed for a year, or during the fall run of 1891 and the spring run of 1892. Since 1892 the pack has steadily increased, as the result of a work in which the Commission takes much pride, while at the same time there has been a much larger demand for salmon in the markets of the State.

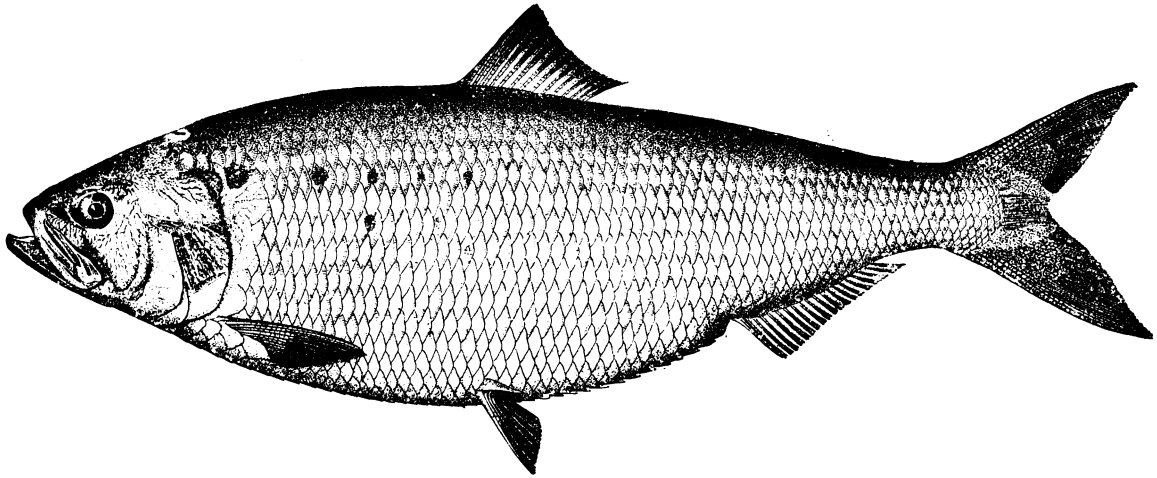
The following table shows the decrease in the pack to 1892 and the subsequent increase, which we hope to see continued:

	Pounds.	Cases.
1888	4,039,200	61,200
1890	1,618,471	25,065
1891	672,121	10,353
1892	170,425	2,281
1893	1,496,927	23,336
1894	1,940,009	28,463

The foregoing figures go to show in the most significant manner the necessity of continuing the efforts of this and former Boards to build up and perpetually maintain the commercial salmon fisheries. A primary consideration is to secure an extension of the close season, but beyond that is the need for a continuous appropriation of funds sufficient to maintain a patrol of the entire salmon waters of the State, thus rendering possible a thorough enforcement of the law during the spring and the fall runs. Salmon thus protected will be able to reach the headwaters of our streams, where their spawn can be taken in sufficient numbers for the State, through its hatching operations, to replace with young fry the mature fish which are taken each year.

As has already been said, a wonderful development is shown in most of the fisheries. The output of the oyster fisheries in 1880, for the entire Pacific Coast, was estimated to be but 15,000 bushels, valued at $10,000, while the returns for 1892 show the output of California alone to have been 178,645 bushels, which were valued at $698,257. This wonderful increase is due to the efforts at propagation made by various companies and individuals, as will be seen by reference to the very excellent article published in this report, which was prepared by Charles H. Townsend, under the direction of the United States Commissioner of Fish and Fisheries, and published in his report for 1891. So little is the value of the oyster industry known and appreciated by our people, that we believe it to be to the advantage of the State that all information possible should be disseminated. It will be seen, from a careful perusal of Mr. Town-

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SHAD. – *Alosa sapidissima.*

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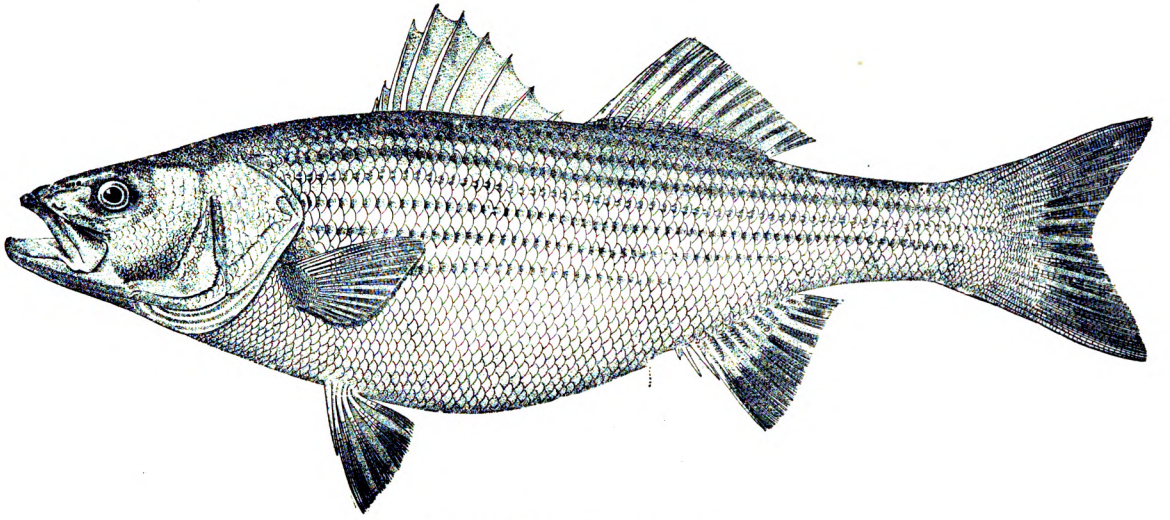
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STRIPED BASS.—*Roccus lineatus.*

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send's valuable article, that "there are possibilities for oyster culture in San Francisco Bay by methods entirely distinct from those now practiced."

There has been a most wonderful development in the shad fisheries, and this has resulted from the acclimatization of fish in the State. By reference to the statement of fish planted, it will be seen that there were but 834,000 shad introduced. They have since been abundantly able to take care of themselves without further planting. There is no value given to the 600 pounds which were marketed in 1880. In 1888 there were sold 90,871 pounds, valued at $6,513. This was increased in 1892 to 526,494 pounds, valued at $14,372. The amount of shad handled in the San Francisco market does not begin to express the number of pounds that could be handled did our people but value these fish as their quality merits. The fish dealers have found it necessary to limit the fishermen in their catch, in order to keep from overstocking the market. The first figures furnished us regarding the price of shad in the markets of California go to show that as high as $1.50 per pound was paid, and though the quality of the fish has greatly improved, the price in 1892 was but 3 cents a pound, the fishermen receiving but 1½ cents.

Probably the most wonderful results reached in the acclimatization of fish is shown by the plant in this State of but 450 striped bass. These fish were first introduced in 1879, when but 100 were planted. A second plant of 350 was made in 1882. They made no showing in the markets until 1888, when a few were offered and met with ready sale at $1 per pound. In 1892, the catch had increased to 56,209 pounds, which were valued at but $6,488. The striped bass show a marked increase in 1893, and the catch was still larger in the spring of 1894, when the retail price had dropped to 8 cents per pound. It is one of the best food fishes to be found in our markets, and bids fair, in time, to become one of the most valuable.

The little appreciated and much abused catfish is another variety that was introduced into our waters, and a species that shows marvelous development. It will be seen that there were but 144 planted in 1874. These have increased until the catch in 1892 amounted to 196,395 pounds, valued at $5,043. These fish bring a better market price in the city of Sacramento than our shad. Dr. Jordan has pronounced them to be one of the most delicious food fishes that are taken from our waters.

The development of the carp, which, like the catfish, do not take, with our people, the rank accorded them in the Eastern markets, has been large. Of these fish 66,100 pounds were marketed in 1892, having a value of $2,204. They probably never will figure largely in the value of our fish products, but they have proved of the greatest value as a food to striped bass.

Appended will be found a statement showing by months the number of pounds of salmon, striped bass, shad, carp, and catfish handled by the six largest dealers of the San Francisco market for 1893 and the first six months of 1894. These figures were compiled from the books of the dealers by agents of the United States Commission of Fish and Fisheries and our deputies. The table is interesting as showing the marked increase in the number of pounds of striped bass for the first six months of 1894 over 1893, the increase being no less than 28,703 pounds. It would be difficult to present a stronger argument in support of the Commission's work than that afforded by this table:

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Months.	1893.					1894.				
	Salmon	Striped Bass.	Shad	Carp	Catfish	Salmon	Striped Bass.	Shad	Carp	Catfish
January	137,460	3,041	2,774	624	1,175	128,556	14,177	41,266	10,142	4,117
February	93,263	2,752	8,781	519	1,766	103,801	12,572	11,767	4,755	1,696
March	139,401	5,190	10,019	4,356	2,988	163,131	9,002	17,747	6,798	4,766
April	374,478	8,351	32,389	3,101	3,705	211,552	9,638	39,115	2,839	5,290
May	325,170	7,232	80,557	560	3,265	242,126	9,413	57,823	767	2,978
June	70,216	4,353	36,184	1,469	2,155	138,675	4,820	22,027	699	2,630
July	149,217	2,950	3,319	4,570	2,299					
August	575,609	2,655	2,796	1,665	710					
September		8,517	698	1,132	5,800					
October	249,753	6,720	53,652	3,782	5,547					
November	183,789	10,473	96,310	5,969	3,932					
December	155,090	17,504	77,882	5,337	3,202					
Totals*	2,453,446	79,738	405,391	33,084	36,541	987,841	59,622	189,745	26,000	21,477

*These figures represent fish taken only in California waters.

APPROPRIATIONS.

The funds placed at the disposal of the Commission for the forty-fourth fiscal year were as follows:

Derived from licenses and fines paid into the Fish Commission Fund	$4,658 81
Appropriated for support and maintenance of State hatcheries	5,000 00
Appropriated for restoration and preservation of fish	5,000 00
Total	$14,658 81

During the forty-fifth fiscal year the moneys used to support the work of the Commission were as follows:

Fish Commission Fund	$4,106 38
Appropriated for support and maintenance of State hatcheries	7,500 00
Appropriated for restoration and preservation of fish	10,000 00
Total	$21,606 38

Annexed to and forming a part of this report will be found a detailed statement of all our expenditures, showing to whom and for what purpose the money was paid. In the office of the Board are duplicates of all the bills, which show further, we think, that the moneys at our disposal have been wisely and economically expended.

The work of the Commission we believe will demonstrate to you that the increase of our appropriations by the last Legislature was wise, and has resulted in much good to the fish industry of this State. In this connection should be considered the vast area of territory to which our appropriations are made to apply. California contains 158,360 square miles, surpassing the area of New York, Ohio, Massachusetts, Vermont, Maine, Connecticut, Rhode Island, and New Jersey, which combined only embrace an area of 153,130 square miles. It is a significant fact that these States make jointly for the protection of fish and game an annual appropriation of $129,929, as against $17,500, the total appropriation made by California to protect fisheries which have an annual product to the value of more than $3,000,000.

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ATTORNEY FOR THE BOARD.

In the work of the Commission many important legal problems arise demanding the assistance of a competent attorney. Suits have to be prosecuted against infringers of the law all over the State. Questions in reference to interstate commerce are frequently arising, and arguments in the Supreme Court on appeal have to be made. Moreover, in these and other matters the Board is constantly in need of legal advice and counsel.

On May 18, 1893, the Board engaged as its attorney and counselor, F. P. Deering, Esq., who, since that time, has occupied this position. Mr. Deering proceeded at once to make a compilation of the fish and game laws of the State of California, including all Acts of the Legislature and local laws in operation up to the year 1893. The statutes and ordinances were published by the State Printer under authority of the Board, and have been widely distributed. Attached to and made a part of this report is the attorney's record of all proceedings taken by him on behalf of the Commission.

DEPUTIES AND SUBORDINATES.

The Commission, in carrying out the work devolved upon it by law, has had occasion to employ the services of various deputies and other subordinates. In the selection of these men the Board proved fortunate; and without exception the men in the employ of the Commission have so conducted themselves as to secure from the means at our disposal the best possible results. The members of the Commission take pleasure in placing upon their work the seal of our official commendation. To this end brief reference will be made to the character and extent of the services rendered by each deputy or other subordinate during the period of his employment.

Extracts from the reports of the various deputies, as indicating the extent and character of their work, will be found in the Appendix to this report, and reference is hereby made to them as evidencing in greater detail the work of the Commission.

Thomas Tunstead was appointed in March of 1891 as the Chief of the Patrol Department. He was retired in October of 1893. This was rendered necessary by the state of our appropriations. Mr. Tunstead was concerned in 25 arrests. Unfortunately, he met with an accident in January of 1894, which resulted in his death. He was a sportsman well and favorably known and deservedly popular, and his death was deeply regretted by all who knew him. In the service of the Commission he was always both active and competent.

John P. Babcock, who was appointed a deputy in the spring of 1891, was made the Chief Deputy of the Patrol and Hatchery Departments on October 1, 1892. To him has been intrusted a general supervision of all of the employés of the Commission. He has regularly visited the State hatcheries and spawning stations, has directed the movements of the deputies in the Hatchery and Patrol Departments under the direction of the Commissioners, and since our last report has taken an active part in the arrest and prosecution of 43 offenders. Mr. Babcock has given his undivided attention to the business of the Commission, and has become most familiar with the details of the work in

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all departments. As a consequence, his various efforts in behalf of the Commission have given most satisfactory results.

J. W. Hartley acted as Assistant Secretary from October 1, 1892, until December of 1893, when he was retired.

Montgomery Godley, Jr., acted as Assistant Secretary from January, 1894, until May 1st, when he was retired.

A. G. Fletcher was appointed a Deputy in the Patrol Department in August of 1893, and assigned to duty in Southern California, with headquarters at Los Angeles. His duties under this appointment consisted in watching the markets, and examining the methods of market fishermen in the southern portion of the State. His efforts resulted in twenty-three arrests. On May 1, 1894, he was transferred to San Francisco, and appointed Assistant Secretary, and has since then been occupied with office duties, in addition to the outside work.

Some idea of the extent of the office correspondence of the Commission may be gained from a knowledge of the fact that there were 1,986 communications received, and 2,340 letters sent since the last report. All communications addressed to the Board demanding a reply were answered with the utmost dispatch.

A. W. Wilson was appointed a Deputy in the Patrol Department in February of 1893. Mr. Wilson has proved himself to be a very efficient officer. His duties have been mainly confined to the patroling of San Francisco Bay, Sacramento and San Joaquin Rivers, and Suisun and San Pablo Bays. He has caused the arrest of 54 offenders since his appointment.

George H. Koppitz was appointed a Deputy and License Collector for the Board in March, 1891. He was retired from December, 1892, until April, 1893, in order to save the funds for the more important spring work. Mr. Koppitz continued the license collecting until March, 1894, when he was permanently retired. He assisted in making 42 arrests during the forty-fourth and forty-fifth fiscal years.

W. R. MacFarland was appointed a Deputy in the Patrol Department in April of 1894, and in addition to his other duties was made License Collector. He was active in the spring work upon the river, and during the past summer made a careful examination of the methods in use among the market fishermen from San Francisco to San Diego. His work has been satisfactory. Since his appointment he has made 11 arrests.

A. T. Smith, of Eureka, was appointed a Deputy in the Patrol Department in November, 1892, and served the Commission faithfully and well until May of 1894, when he resigned, owing to the press of other business. He made 17 arrests.

W. P. Huestis, of Eureka, was appointed in July of 1894. He is believed to be well suited to the position of patrolman, and through his efforts the Commission expect to have the laws properly enforced on Eel, Mad, and Klamath Rivers.

James A. Richardson, who, for a number of years, had been connected with the State and National Commissions, was appointed Superintendent of the Sisson Hatchery in the fall of 1891, where he put into practical operation several ideas of his own with reference to the hatching and distribution of fish. He conducted that hatchery and the Shovel Creek station until September, 1893. During the fall of 1892 he designed and superintended the erection of the fishway on the dam in Klamath River,

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at Pokegama. In September, 1893, he was granted leave of absence on account of ill health. He resumed work in February of 1894 distributing fish. He was retired from the Commission on May 1, 1894.

E. W. Hunt, appointed in July, 1891, in the Hatchery Department, has been the Superintendent of the Bear Valley and Tahoe Hatcheries, and also acted as distributor. He is a competent, efficient, and faithful worker. In his work at the Tahoe station he was ably assisted by F. C. Boyce.

W. H. Allen acted as the assistant of the Bear Valley Hatchery during the spring of 1893 and 1894, when fish were being distributed. His work has been satisfactory.

W. H. Shebley, appointed in the Hatchery Department in January, 1892, acted as the Assistant Superintendent of the Sisson Hatchery and was the distributor until September, 1893, when he was appointed Superintendent of the Sisson Hatchery. He conducted the Shovel Creek spawning station in the spring of 1894. Mr. Shebley's management of the Sisson Hatchery has met with our hearty approval. He is a faithful and competent worker.

The great amount of work necessary to successfully handle the 8,000,000 salmon eggs in the Sisson Hatchery during the season of 1893–94, made it necessary to increase our force at that place. E. T. Sullivan and Frank Shebley were accordingly employed as assistants to the Superintendent. They have since continued in the employ of the Hatchery Department as distributors from the Sisson Hatchery. Their work has been satisfactory.

PATROL DEPARTMENT.

While in the matter of enforcement of laws for the protection of fish and game the Commission has not been able to do everything that might be desired, the members of the Board feel that their work has covered the most important part of their field for usefulness. As before explained, the Commission has chiefly aimed to protect the food-fish supply of the State, and to the work of their deputies in this regard they point with satisfaction.

The efficiency and value of the Commission have been most strongly evidenced by the thorough patrol maintained on the Sacramento and San Joaquin Rivers during the spring and fall runs of salmon. Testimony to the value of this patrol is furnished by a letter addressed to the Commission by Mr. Livingston Stone, who has in charge the U. S. Fish Commission station at Baird, on the McCloud River. Under date of November 30, 1893, Mr. Stone wrote to Chief Deputy Babcock as follows:

> The violent storm which set in last Sunday has put an end to our fishing and egg-collecting for this season. We have, nevertheless, taken upwards of 8,000,000 salmon eggs, beating the record of this station for all previous years, except 1875 and 1878, and the record of all other salmon-breeding stations in the United States for all previous years without exception.
>
> May I take this opportunity to express my belief that this unusual yield of salmon eggs is very largely due to the protection which has been given to the Sacramento River salmon by the State Fish Commission, and especially to the very efficient patrol of the river during the close season, which, if I am rightly informed, you have had personal charge of. You certainly merit the congratulations and the thanks of every one interested in preserving and multiplying the salmon of the Sacramento, for if the river had not been faithfully and vigorously patroled, no large number of breeding salmon could have reached this point, and only a comparatively few eggs could have been taken. The fact that so many eggs have been taken this year, proves not only the efficiency of the patrol work, but the value of the patrol work to this station directly. Hoping that you may be able to continue the good work in the future seasons with success, I am, etc.

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Thorough protection of the salmon during their stay in fresh water is as essential to their perpetuation as the maintenance of the hatchery. In fact, if a careful patrol is not maintained on the Sacramento River and in Suisun Bay during the salmon run it will be the inevitable result that after a few years sufficient fish will not reach the spawning waters to justify further operation of the Baird station. This fact is clearly demonstrated by the take of spawn at Baird in 1892 and 1893. For 1892 the take was 2,696,000, while in 1893 the amount exceeded 8,000,000; certainly a most remarkable increase. The explanation is to be found in the fact that in 1892 the Commission was able to protect only the lower portion of the Sacramento River during the August and September run. The run of fish was large, and the fact that so few eggs were taken at Baird affords evidence that the fish were caught at points on the river not patroled, and in consequence never reached the station. The work of the patrol during these months was as efficient as it could be made under the appropriation for the forty-fourth fiscal year, but it was not such a patrol as the importance of the salmon run demands at the hands of the State.

During the fall of 1893, under the new appropriation, it became possible for the Commission to maintain a thorough daily patrol of the river during the close season, from Redding to San Pablo Bay. The run of fish was about the same as during 1892, but thanks to the patrol, more than 8,000,000 eggs were taken at Baird. For the first time in the history of operations on the river, the patrol was truly efficient, there being little or no illegal fishing during the close season. In the work performed, the deputies of the Commission were given much valuable aid by the fishermen on the river. It is a pleasing sign that many of the more intelligent fishermen have come to regard the close season as being essential to the continuance of their business.

There were not as many arrests made on the Sacramento and San Joaquin Rivers, and Suisun and San Francisco Bays, during the forty-fifth fiscal year as during the forty-fourth fiscal year. From this fact, however, it is not to be inferred that the patrol was inefficient. Quite the contrary is proved. During the forty-fourth fiscal year our efforts were intermittent. We did not have at hand sufficient means to maintain a daily patrol. As a consequence, the fishermen presumed upon their knowledge of our inability to properly patrol the river and bay and ran the risk of being arrested. During the forty-fifth fiscal year, however, we were able to maintain both a day and a night patrol during the entire salmon run. The fishermen well knew that the launch with the patrol would pass over their drift on the tide, and that to place nets in the water would be sure to cause their arrest.

The fishermen, or at least a large portion of them, have no respect for the restrictions placed upon their vocation by the law. They do not understand the aim or purpose of the State in regulating the fisheries. They regard violations of the law as only a matter of arrest. If they believe they have an equal chance of making a favorable drift and of being caught, they will take the chance by placing their nets, especially if the run of fish is large and the patrol not regular. To maintain this patrol on the rivers and bays is an expensive part of the Commission's work, and occupies the greater portion of the time of the deputies in the Patrol Department.

In the work on the Sacramento and San Joaquin Rivers and the bays

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of San Francisco, San Pablo, and Suisun we have found it to the advantage of the patrol to make use of the launch "Hustler" and her captain, Henry Rowson, and have thus been able to cover the ground in a much more expeditious manner than would have been possible under other circumstances. The collection of licenses was made by the Patrol Department. The tables giving the number and the class of each license sold will be found in the Appendix.

Besides the license money, there has been paid into the State Treasury during the last two years $1,552.89 as the State's portion of fines collected for violations of the law. The increase of the fines for violation by the last Legislature has had a most salutary influence upon the acts of professional fishermen, although it has had the effect of decreasing the amount paid into the State Treasury. Not only are the fishermen less liable to run the risk of arrest, but more than that, when tried and convicted, they go to jail rather than pay the fine. It is this latter circumstance which causes a falling off in the amount contributed to the State Treasury. The experience of the Commission seems to establish that, in order to make the professional fishermen or market hunter respect the law, it is first necessary to cause his arrest and then to impose a penalty so severe that he must grow in time to realize that he cannot possibly come out ahead in the transaction.

The work in San Francisco Bay has been thorough and the laws have been well observed. These fisheries have been under the constant surveillance of our deputies. The methods employed by fishermen both in the bay and outside of the "Heads" have been carefully examined, and the Commission believe that to these fisheries has been accorded all the protection which the law affords. Complaints are often made, by persons not familiar with the law in the matter, or the methods in vogue among fishermen, of the destruction of young fish through the use of seines. It should be borne in mind, however, that wherever seines are used in fishing there must be some loss of young and immature fish, and such will continue to be the fact unless the State should resort to legislation entirely prohibiting the use of seines and bottom nets.

A primary aim of the Commission has been to destroy the commercial value of illegal work. To that end the large market centers of the State have been carefully watched to see that market men did not handle illegally killed fish or game. With this object in view we have maintained a daily patrol of the San Francisco markets since our last report. In so doing we realized the important fact that with the market for illegally killed fish and game once destroyed, poaching will cease to be a business.

Through the aid of an ordinance passed by the Board of Supervisors of Sonoma County, the Commission has been able to materially check the destruction of fish in the Russian River. After the passage of the ordinance we were able, during the winter and spring of 1893–94, to entirely stop the illegal capture of fish by professional fishermen.

The ordinance in question prohibited the taking with a seine any fish in the waters of Russian River, or its tributaries, from November 1st of each year to April 1st of the succeeding year. The deputies of the Commission saw that this ordinance was strictly enforced, and had the pleasure of seeing an illegal and destructive business entirely stopped.

In order to accomplish this desirable result the Commission was required, during the months of January, February, and March, to main-

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tain upon the river two deputies, who patroled both day and night such portions of the stream as permitted of the use of nets. In the enforcement of the law the deputies met with opposition. For a time feeling ran very high, but the law was maintained and all fishing with nets stopped. Tributary to Russian River there are upward of 1,500 miles of trout water. The destruction of net fishing at the mouth of the river has served to more thoroughly and effectually stock these waters than would be possible through the planting of young fry for several seasons.

The efforts of the Commission to enforce the anti-sawdust law on the Truckee River occasioned perhaps as much annoyance and met with more opposition than the work in any other part of the State. The work of the Commission in this regard is best explained by reference to the report of the attorney of the Board. There was comparatively little trouble so far as the sawmills themselves were concerned, independent of the Truckee Lumber Company. The problem that gave the greatest annoyance, the main cause of complaint, came from the practice of dumping planer shavings from the box factories into the river. Unfortunately, the word "shavings" is not included in Section 635 of the Penal Code. The proprietors of the mills and factories sought, therefore, to maintain that the word "shavings" not being included in the section, the disposition of them was not regulated. Fortunately the position taken by the Commission is now generally conceded, and at the present time the factories that were giving cause for complaint have discontinued the placing of shavings in the river and are erecting conveyors or burners for the shavings and refuse of their mills.

The enforcement of the law with regard to the catching and taking of fish in Donner, Independence, and Tahoe Lakes, and the Truckee River, during the close season, has been satisfactorily accomplished. The Commission caused the arrest and prosecution of the professional fishermen who operated at Independence Lake during May, contrary to the ordinance passed by the Supervisors of Sierra and Nevada Counties, which prohibited the taking of fish in any manner from these waters before the 1st of June. Although the men arrested were not convicted, the arrest had the effect of stopping all fishing on Independence Lake until the open season. Unless fishing in these lakes is prohibited by law until after June 1st, it is only a question of a few years when the supply will be exhausted.

The fisheries of Monterey Bay have been examined and the methods of fishermen carefully observed. The laws here, as elsewhere, have been enforced. Deputies of the Commission, in the discharge of their duty, arrested at Santa Cruz and Capitola several fishermen who were caught using set-nets. In the trials that followed, the Courts and the jurors did not sustain the Commission's contention, that the nets were anchored or set. The fishermen, however, seem to recognize that the position assumed by the Commission was correct, and have not since resorted to the objectionable method of fastening their nets.

During the spring of 1894 the Commission caused deputies to be sent into Santa Cruz, Monterey, Santa Clara, San Mateo, Marin, and Sonoma Counties, to examine the larger trout streams. Their duties were conscientiously performed, although they made but three arrests.

The efforts of the patrol in Southern California were highly satisfactory to the Commission, and resulted in a general observance of the law. The methods in vogue among fishermen in this part of the State

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were carefully examined and the markets regularly inspected. The arrest and conviction of several offending fish and game dealers had both a prompt and salutary effect on others.

In compliance with a request made of all the southern coast counties, and at our earnest solicitation, ordinances were passed by San Diego, Los Angeles, and Ventura, forbidding the taking and selling at all times of any lobster or craw-fish of less than one pound in weight, and making a close season from May 15th to July 15th in each year. For years so many small lobsters and so many egg-bearing females have been sent to the market that the fishing-grounds are fast becoming depleted. This regulation, making a close season for lobster, should become a State law.

The work of the Commission in Humboldt County during 1892 and 1893 was somewhat limited, although the fisheries were accorded ample protection. During the past season the Commission has placed in Humboldt County a paid deputy, who will devote his entire time to seeing that the fish and game laws are enforced.

The Commission since its last report has caused the erection, through its patrolmen, of twenty-two fishways on various streams. Deputies of the Commission have each year inspected the ladders of every important stream in the State. The most expensive ladder erected during the past two years was placed in the dam which crosses the Klamath River at Pokegama, in Siskiyou County. This ladder is 76 feet long and 18 feet wide, and permits the free passage of fish.

At all times the Commission has sought to protect the fish and game of the State so far as means allowed. As before remarked, it has been impossible to place in every section of the State paid men whose duty it should be to patrol streams and forest and field, to see that the laws were enforced. However, we have always sent a deputy to investigate well-authenticated reports of violations, and in this manner deputies have made numerous arrests. Where the evidence has not warranted an arrest, it has been the aim of deputies to arouse public sentiment. Through these efforts the Commission has secured as deputies, many outside men who serve without pay. These volunteer deputies have rendered good service in preventing violations which would otherwise have occurred without the Commission having the means to stop or punish them. At this time there are 160 men holding commissions and serving without pay. For their labor of love the Commission takes this opportunity to express its thanks. Space does not permit the publication of the entire list, but a few deserving of special mention are the following: Dr. H. W. Smith, Placerville; George Denison, Boulder Creek; William O'Neill, Truckee; Green Watson, Guerneville; C. M. Barnhardt, Santa Rosa; F. B. Persinger, Azusa; H. Cooley, Dunsmuir; George M. Gee, Redlands; A. E. Payne, Ontario; George M. Ord, Soquel; John B. Hollengsworth, Ukiah; Felix Jess, Santa Barbara; J. E. Friend, San Diego; William Sherwood, Marysville; F. G. Pierce, Livermore; Frederick Dell, Los Angeles; John E. Dyer, Colfax; and J. L. Harrison, Ventura.

HATCHERIES.

The Commission operated both the Sisson and Bear Valley Hatcheries during 1892–93 and in 1893–94. Under the increased appropriation for the forty-fifth fiscal year all the State hatcheries were operated. Both the Sission and Tahoe stations were run to their full capacity, and as a con-

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sequence the output of fry exceeded all previous work accomplished by the State in that direction.

The work of the Commission at the Sisson Hatchery for the fall season of 1892 began October 11th, when the first shipment of salmon eggs was received from the United States Fish Commission station at Baird. The first shipment numbered 300,900 eggs of the late summer run, all of which were received in good order. These eggs were hatched by October 21st, and were retained in the boxes for four months. The eggs of the fall, or late run, were received in December, during which month the United States Commission forwarded us 2,514,000 eggs. These were hatched and transferred to the nursery ponds with a loss of less than 6 per cent. The young fish were allowed to escape from the nursery ponds into the streams tributary to the headwaters of the Sacramento at will, and the last had left at the end of about four months.

On February 1, 1893, there was received at Sisson 27,000 spawn of the *Salvelinus fontinalis*. This was a part of the 300,000 *fontinalis* spawn that the Commission had agreed to exchange with Hon. George T. Mills, of the Nevada Fish Commission, for a like amount of Rainbow spawn from the Shovel Creek station. This spawn was hatched with a slight loss, and the fry were distributed in Castle Lake, Shovel Creek, and the headwaters of the Sacramento River in Siskiyou County.

The work of procuring Rainbow trout spawn during the spring of 1893 began at Beswick on March 17th, and the station was closed on June 12th. Deputy J. A. Richardson was in charge during the season. He took 1,776 fish in the traps and eyed 1,151,500 eggs, of which 716,500 were sent to the Sisson Hatchery and 340,000 to the Nevada Fish Commission. One lot of 95,000 eggs was hatched at the Beswick station and the fry placed in Shovel Creek. The spawn from Shovel Creek was hatched with a small loss. Distribution began on July 30th and ended on October 11th. The details of distribution appear in the accompanying tables, to be found in the Appendix.

On May 1, 1893, Deputies Hunt and Shebley were sent to Independence Lake, in Nevada County, to establish a station to take *Salmo mykiss* spawn. The traps and boxes were placed in position by May 10th, but the season being unusually late the fish did not begin running until June 28th. The run then continued until July 31st, or just a few days over one month. During that time our deputies succeeded in taking 842 fish, from which, however, only 124,325 eggs were fertilized. Of this total number 10,000 were hatched and placed in Warren's Lake, and 114,000 were sent to the Sisson Hatchery. The loss, on account of unfertilized eggs, both in shipping and in hatching, was about 17,860. The work at this station was a failure for the season, owing to no lack of effort on the part of our deputies in charge, but from the peculiar fact that the female fish outnumbered the males more than twenty to one. This resulted from the destructive work of professional fishermen, who begin fishing through the ice as early as the 1st of April. At this time the male fish being restless hover near the surface, presumably waiting for the ice to break, and are thus easily taken, while the females, heavy with spawn, remain upon or near the bottom and in deeper waters.

If this method of fishing through the ice is allowed to continue, it will unquestionably render Independence Lake worthless as a source of food supply. Already some effort has been made to secure the fish better

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protection. The Board of Supervisors of Nevada County, at the earnest solicitation of the Commission, passed an ordinance prohibiting the taking of any trout in that county before the first day of July. Aided by this ordinance, the Commission were enabled to stop all fishing through the ice in the spring of 1894. One of the strongest arguments in favor of the change in the trout season is the fact that the trout in Tahoe, Independence, and Donner Lakes, and the Truckee River have not finished spawning before the first of June. The market supply of trout for the entire State is derived almost entirely from this section, and if this indiscriminate slaughter at the spawning season is allowed to continue, there can be no doubt but that the fish supply of even so productive a body of water as Lake Tahoe will in a short time become greatly decimated if not entirely destroyed.

The Sisson Hatchery was transferred on September 13, 1893, to W. H. Shebley, who has been the Superintendent in charge ever since. Early in that same month arrangements were made for the reception of salmon spawn from the United States Fish Commission. The first lot of the summer run of salmon spawn was received on September 26th, and the last on October 13th. The total number of eggs received for this run was 1,734,000. The spawn was received in good condition, and was hatched with a loss of less than 0.0275 per cent. We were obliged to distribute this hatch much earlier than usual, in order to make room for the unusually large take of eggs of the fall run. Distribution began on November 13th, and was finished by the 23d. The table of distribution is annexed.

Mr. Livingston Stone, in charge of the United States Fish Commission station at Baird, began shipping the fall run of salmon eggs on December 4, 1893, and continued shipments up to December 30th. We received from this run 6,300,000 eggs, which were hatched with a loss of 209,916, or 0.0332 per cent. Our grand total of distribution for the season was 7,776,400. Distribution of the fry was made in the headwaters of the Sacramento River, as will be seen from the tables in the Appendix. We began the distribution on January 20, 1894, and the last were distributed on March 9th, with the exception of 1,170,000, which were placed in what is known as Sisson's Lake, where they were held for some time, and then allowed to escape of their own free will. The last of these fry left about the 1st of May.

This was unquestionably the most successful salmon hatch ever made by the California Commission. The previous largest hatch of any one season was 3,458,000 in 1888–89, as against 7,776,400 distributed during the season of 1893–94.

Mr. Stone's remarkable success in the taking of this spawn is in a great measure attributable to the efficient patrol that was rendered possible by the Commission's increased appropriation. The work of the U. S. Commission of Fish and Fisheries at Baird compares very favorably with the most successful previous seasons, as is shown by the table of the work at that station since it was established in 1873. Since that time the take of spawn has only exceeded the take of 1893 twice; *i. e.*, in 1875, when 8,750,000 eggs were taken, and in 1878, when the take was 14,000,000. In order to look after and handle this enormous amount of spawn, the Commission was obliged to temporarily increase their hatchery force. It was also found necessary to enlarge the hatchery by erecting a tank nursery building just south of the main building. This structure is

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70 feet long and 10 feet wide, and so constructed that it can be readily enlarged. It contains four tank nurseries, or rearing-boxes, in which the alevens were placed as soon as they came from the egg. These boxes are 12 by 5 and 2 feet deep. During the forty-fifth fiscal year, in addition to the improvements made in the buildings at the Sisson Hatchery, the hatching-troughs, settling-tanks, head-troughs, and flumes were replaced with new ones, at a cost of several hundred dollars. The grounds were suitably fenced and greatly improved and beautified with flowers, and the buildings painted. Numerous ground nurseries and nursery ponds were built for the retention of breeding-fish and small fry, and there are now in these nurseries salmon fry, yearling and two-year-old salmon, eleven large Dolly Varden trout, fry of the Dolly Varden, Loch Leven, Steel-head, Cut-throat, Eastern Brook and Rainbow trout, large Steel-heads and Rainbows, the *Salvelinus fontinalis-malma* hybrids, and the Golden trout.

This work has added much to the usefulness and general attractiveness of the station. The Commission desired to retain the Loch Leven and Eastern Brook trout and large-mouthed bass for breeding, and to provide suitable waters rented of J. A. Sisson a good-sized lake situated upon his property, about one quarter of a mile from the hatchery. From Peter Klink we rented a similar body of water upon his property. We hope to derive great benefit from the use of these ponds in our efforts to stock the State with Loch Leven and Von Behr trout, pike perch, and big-mouthed bass.

On February 19, 1894, Deputy W. H. Shebley was sent to Shovel Creek, at Beswick, in Siskiyou County, to place traps in position and begin the taking of trout spawn. The traps were in place by February 26th, when the run of fish began. From that date to May 21st, Mr. Shebley took 1,129,000 spawn, of which 120,000 were hatched at Shovel Creek and planted in that stream. Of the remaining eggs, 719,000 were shipped to the Sisson Hatchery; 250,000 were sent to the Tahoe Hatchery, and 40,000 eggs were sent at different times to the Mendocino County aquarium exhibit at the Midwinter Fair. In addition to the eggs taken at Beswick, there were shipped to the hatchery from Verdi, Nevada, on May 15th, 45,000 *Salmo mykiss*, and from the Tahoe station, during May, there was received 1,300,000 *Salmo mykiss*. These eggs were hatched with a loss of 5 per cent and were distributed as per tables attached.

During the spring of 1894, the Commission made a contract with Morrill Brothers, of Verdi, Nevada, for trout spawn. Under this agreement the Morrill Brothers forwarded 40,000 eggs to the Sisson Hatchery and 30,000 eggs to the Tahoe Hatchery.

In April, 1894, Dr. C. H. Gilbert requested the Commission to obtain some eggs of Steel-head trout, to hatch the same and retain the fry in suitable nursery ponds where they could be allowed to attain a length of six or eight inches, when they will be large enough to afford an opportunity for determining their resemblance to our Rainbow trout. This, the Doctor explained, "would do more to settle a difficult question than anything else I can think of." The Commission therefore made application to the U. S. Commission for an assignment of Steel-head eggs from the Korbel station, situated on Redwood Creek, Humboldt County. The Commissioner graciously forwarded us 100,000 eggs, which were received in May. They were hatched and placed in nurseries, where they are doing nicely.

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In 1892, the Commission made application to the National Commission for an assignment of spawn of Loch Leven and Von Behr trout, and in 1894 received 30,000 Loch Leven eyed eggs. These eggs were hatched, and as before stated the fry placed in one of the rented lakes near the hatchery, where they will be retained for breeders, from which the Commission hopes to obtain fry in sufficient numbers to begin stocking the waters of the State. The Loch Leven and the Von Behr trout were first brought to the United States in 1872. They have since been successfully introduced into the waters of several Eastern States, and it is believed they will do well in the large streams of California.

WORK OF THE BEAR VALLEY HATCHERY.

The Bear Valley Hatchery is situated at Olema, in Marin County, and has proved of great service to the Commission, being operated in 1893 and 1894. On January 9, 1893, Deputy E. W. Hunt was ordered to place the hatchery in readiness for the reception of Eastern Brook trout (*S. fontinalis*) spawn, which the Commission had arranged to receive in exchange from the Nevada Fish Commission. Unfortunately, California has no lake suitably located where the Commission can procure the *S. fontinalis* spawn, and the supply handled by the Commission has been obtained entirely through the courtesy of Hon. George T. Mills, the Nevada Commissioner.

During January, the Commissioners received 226,000 eggs from Nevada. This spawn was in good condition and was hatched with a slight loss. Distribution of the fry began on April 4th and was completed May 17th, on which latter day the hatchery was closed.

During the fall of 1893, the Commission perfected an arrangement with the Nevada Fish Commission whereby we were to furnish the services of Deputy E. W. Hunt and assistant to operate in conjunction with the deputies of Commissioner Mills in the procuring of spawn from Marlette Lake, in Nevada. Under this arrangement the California Commission was to receive 60 per cent of all the spawn taken at the lake. A further agreement, that the spawn should be eyed by the California Commission, necessitated the erection of a temporary station in Carson City. Deputies Hunt and Sullivan reported at Carson City on October 7th, and with Deputy Close, of the Nevada Commission, went to Marlette Lake on October 19th. They began taking fish on the 20th and returned to Carson on November 16th, having taken 316,000 eggs as our share. The loss in transferring the spawn was 2½ per cent. This loss is not heavy, considering that Marlette Lake is some 15 miles distant from Carson City and the journey must be made over one of the roughest mountain roads in Nevada. Owing to the situation of the lake it was impossible to establish an eyeing station on the lake shore, and for that reason the spawn had to be transported to Carson City as soon as taken.

The loss of eggs in the Carson eyeing station was about 6 per cent. Of the spawn eyed at Carson, 206,500 were sent to the Bear Valley Hatchery during December, and 91,000 to the Sisson Hatchery on January 12, 1894. The Carson station was closed on January 13th, after taking an inventory. Deputy Hunt then reported at the Bear Valley Hatchery and took charge. The last of the ova was hatched on February 1st, and the fry began feeding on February 13th. The rains during the latter part of January were very heavy, and the creek that

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supplies the hatchery, which is ordinarily clear, was filled with sand and sediment, which for a time caused a considerable loss of spawn in the building. Shipping began on March 1st, and was completed by April 7th, when an inventory was taken and the hatchery closed.

Tables of distribution for the station are annexed.

TAHOE HATCHERY.

The appropriation for the forty-fourth fiscal year did not admit of our operating the Tahoe Hatchery during that season; but, under the increased appropriation for the forty-fifth fiscal year, we again resumed operations. The Commission sent Deputy E. W. Hunt and assistant to Tahoe City on April 2, 1894. Seining for spawn fish was commenced at the mouth of Taylor Creek, one of the large tributaries of Lake Tahoe, situated some 20 miles from the hatchery. Deputy Hunt continued to take fish at this point up to May 5th, capturing in all 2,300 spawn fish, from which he took 2,300,000 eggs. From June 18th to July 23d, Deputy Hunt and his assistant took, at the mouth of Blackwood Creek, 1,007 spawn fish, from which he stripped 850,000 ova. Unfortunately the females taken at the mouth of Blackwood Creek exceeded the males four to one, and a great many of the females he did not spawn, because of inability to impregnate the ova. This made a total "take" at the Tahoe station of 3,150,000 eggs of the Cut-throat trout. Of the eggs taken in May, 1,300,000 eyed ova were shipped to the Sisson Hatchery. The rest were planted in Tahoe, Donner, and Independence Lakes, the Truckee River, and other waters of the State, as will be seen from a reference to the table of distribution from the Tahoe Hatchery.

In addition to the 3,150,000 taken from the tributaries of Lake Tahoe, there were 250,000 eyed eggs shipped to this hatchery from Shovel Creek station in May, which eggs were hatched and the fry distributed in the Truckee Basin. This was the most successful operation ever conducted at the Tahoe station in any one season, and the work performed by Mr. Hunt and his assistant merited and received the hearty commendation of the Commission. It is the intention of the Commission to make some extended improvements at the station this fall, and to again operate the hatchery next spring and summer.

The results of the successful operation of the Tahoe Hatchery for the years 1888, 1889, and 1890, is made manifest by the large amount of trout taken and shipped from Lake Tahoe to the market in 1892, 1893, and 1894. There was shipped to the San Francisco market from Lake Tahoe in 1893, 37,500 pounds of fresh trout, while during the first six months of 1894, 27,400 pounds were shipped. This output does not include the thousands of pounds that are annually taken from the lake and served to visitors at the numerous hotels and camps.

YOSEMITE VALLEY.

The Commission hopes during the next season to erect in the Yosemite Valley a small branch hatchery, which can be operated at very slight expense to the State. From this hatchery we desire to further stock the waters of Yosemite and adjacent National Parks. The Commissioners in their past efforts to stock these streams have been greatly assisted by

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Washburn Brothers, proprietors of the Yosemite-Raymond stage line, who furnished the means of transportation, the ice, and such help as our men required, all without charge. To Thomas Hill, the artist, and the late Captain Wood, U. S. A., and Captain Gale, U. S. A., our thanks are due for the care of the fry delivered at Wawona and the distribution of the same with the aid of the Army pack trains stationed at the National Park. Numerous fine lakes and streams in these mountains heretofore without fish have been successfully stocked, and will, in a few years, furnish food and sport to the thousands of campers who annually seek this wonderful region in search of health and recreation.

DISTRIBUTION OF FISH.

All applications made to us for fish to be used in stocking public waters have been filled, with the exception of a few made in behalf of streams which we considered ill adapted for the purpose. It has been our constant aim to make the widest distribution possible, and to reach those localities which have not been previously stocked. At the same time we have been governed by a desire that the young fry should find their way into the waters most suitable for them, to the end that we might accomplish the best and most satisfactory results.

Did the space allotted to this report allow, we might quote from letters showing the most remarkable growth of Eastern Brook and Cut-throat trout and black bass in streams and lakes which had never before been stocked.

Our plans for distributing this season's hatch of Rainbow trout were greatly disturbed—in fact, completely upset—by the railroad strike. Not only did the rapid growth of the fish render it necessary that they should be given more space and attention, but at the same time we stood in need of room for the Cut-throat alevins, which were then hatching. We were therefore compelled to make an immediate removal of the Rainbow fry, and for lack of transportation facilities placed them in the headwaters of the Sacramento River, which should furnish splendid fishing in two years' time.

In making assignments of black bass this season it was our aim to introduce them, so far as possible, into waters which had not before been reached. By this method we are in hopes of giving the black bass the wide distribution which they merit.

Fry were taken in Russian River by Deputy Wilson, as we were confident that better results would be accomplished with the young fish, both in our being able to get a large number, and also in distribution. That the result justifies our belief in this regard will be clearly seen by a reference to the season's table of distribution.

The deputies in the Hatchery Department have had charge of the distribution of fish, although the subordinates employed in the patrol work have been called upon to assist in the long-distance shipments. The distribution of black bass this season was wholly made by men connected with the patrol. Of all the duties which our deputies are called upon to perform, that of distribution is the most arduous. The young fish require constant attention from the time they are hatched until they are planted, so that the deputies in charge, in addition to their actual work are constantly laboring under a feeling of great

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responsibility during the time occupied by the shipment, generally from two to three days.

Almost without exception applicants have been on hand with conveyances upon the arrival of the fish, and have given them a much wider distribution than would otherwise have been possible. Our employés engaged in this work have everywhere been received in the kindest manner, and report a rapidly increasing public interest in the work undertaken by the State through this Commission; expressions being heard on all sides of a wish to see our streams placed in the best possible condition.

To the end that the Board might act with intelligence in assigning fish to the public waters of the State, we adopted a blank form of application, which is mailed to persons requesting fish to stock streams and lakes in their respective localities of residence. When these applications are properly filled out and returned to our office they are placed on file until such time as the assignment of fish is made. At that time the applications are passed upon by the Board after a careful examination. The form of application adopted by the Board is as follows:

Applicants for fish for stocking public waters of the State must answer the following questions:

1. Name of applicant?
2. Post office address?
3. Variety of fish wanted?
4. To be distributed where?
5. Tributary to?
6. Flowing through what counties?
7. Are these waters public or private?
8. Is there any sawdust or other substances deleterious to fish emptied in the waters?
9. Give size of stream or lake.
10. Volume of water at time of drought.
11. Give highest temperature of water during year.
12. If stream, does it run through wild or cultivated lands?
13. If lake, what is depth and character of bottom?
14. What is the local sentiment in regard to enforcing fish and game laws?
15. Have fish of any kind been planted there?
16. How have they thrived?
17. What varieties of fish are now in these waters?
18. Give name of railroad station where fish are to be landed.
19. How many hours' travel, by heavy wagon, from railroad station to waters to be stocked?
20. Who will meet men in charge of fish at station?
21. Who will pay all local expenses?

All expenses of planting fish, including ice, cartage, help, and living expenses of attendants, from time of arrival at railroad station until returned thereto, must be paid by parties making application.

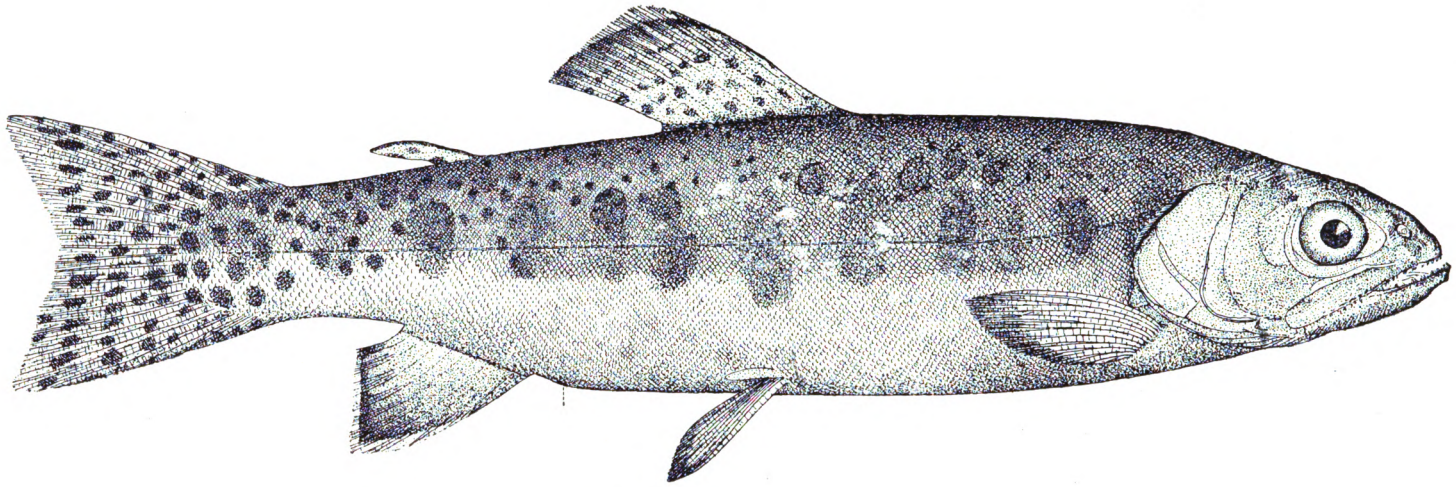
Fish are not planted in private waters, unless under contract whereby the Commission is given exclusive privileges of taking same, for public waters, for number of years.

(Signature of applicant:) ----------

CALIFORNIA FISH AT THE WORLD'S FAIR.

Acting with the U. S. Commission of Fish and Fisheries, our deputies, with the able assistance of Dr. C. H. Gilbert and a corps of Stanford University students, made, in 1893, a collection of living marine specimens for transportation to the aquarium at the World's Fair. The collection as it left California was pronounced by Dr. Gilbert to be the best living display of Californian marine specimens that he had seen. The collection was successfully taken to Chicago in the U. S. fish car No. 2, and thirty-two living specimens were placed in the aquarium in Chicago on June 22, 1893. Many of the specimens were strangers to the Atlantic coast, and the collection proved interesting alike to the public and to

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GOLDEN TROUT.—*Salmo mykiss agua bonita.*

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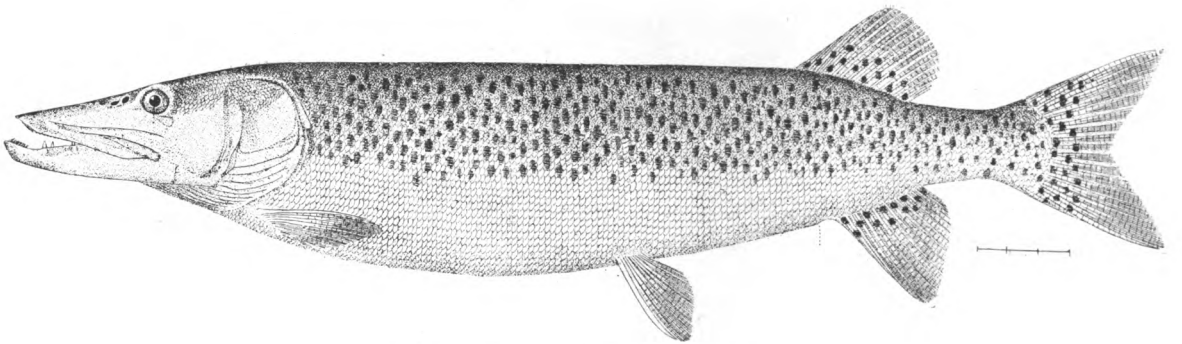
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MUSKALLUNGE.—*Lucius masquinongy.*

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scientists. The transportation of these thirty-two living forms of marine life for over two thousand miles was in itself an interesting and valuable experiment, and served to throw much valuable light on many mooted questions affecting the acclimatization of fish. It was thoroughly demonstrated that the possibilities in this direction have been by no means exhausted.

GOLDEN TROUT.

Since Dr. David Starr Jordan first described the Golden trout of Mount Whitney Creek, the Commission have been desirous of obtaining these fish for breeding purposes, in order that the species might be added to our mountain streams. In August of 1894, through the efforts of the Visalia Sportsmen's Club, and with the assistance of Lieutenant Deane, Corporal Moffitt, and Private Sholberg, Troop B, U. S. A., Mr. J. Sub Johnson, the Secretary of the Club, brought to San Francisco thirty-six fine specimens of these beautiful fish and delivered them to the Commission. They were at once transferred to the Sisson Hatchery, where we now have, in one of our breeding ponds, twenty-one healthy specimens, from which we hope to take spawn next season. We are encouraged to believe that our experiment with these rare and beautiful fish will prove a complete success.

MONGOLIAN PHEASANTS.

The Commission, appreciating the remarkable success achieved by the States of Washington and Oregon in the introduction of Mongolian pheasants, determined, early in the year, upon an experiment in the same direction. To that end we obtained, in the spring of 1894, sixty-seven birds, which were distributed in the various counties of the State where it is believed that they will do well. The birds were placed in charge of citizens who have built, as we required, aviaries where the parent stock will be kept for breeding. It is agreed and understood that all birds produced from this parent stock are to be liberated upon public grounds. We are in receipt of numerous reports that our experiment is meeting with success, that the birds are doing well and increasing in numbers. The remarkable fecundity of the pheasant is best evidenced by the issue of Oregon's experiment, which commenced in 1879 with the introduction of ninety-seven birds. Since that time the birds have so multiplied, in the course of natural increase, that they are now to be found in almost every valley of the State. Hundreds are killed for the Oregon markets and by sportsmen, but with reasonable legal protection the birds are well able to hold their own in point of numbers.

MUSKALLUNGE.

Much effort on the part of the Commission has been directed toward securing a continued increase of the food fishes of the State, both in numbers and variety. It was in pursuance of that effort that the Commission, in the spring of 1893, made application to the New York Board of Fish Commissioners for a shipment of muskallunge. The New York Commission very generously gave us 100,000 fry, which we were enabled, through the courtesy and assistance of Hon. Marshall McDonald, United States Commissioner of Fish and Fisheries, to bring to the coast

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in the United States fish car, No. 2. The National Commission even went so far, in its generosity, as to pay the entire expense of transporting the car to Ogden. We placed these fish in Lake Merced, the property of the Spring Valley Water Company, under an agreement that the fish were to be the property of the State, and that the Commission might be allowed to take such fish for spawning and distribution as they might desire. The fish were placed in the lake in seemingly good condition, but up to the present time all our efforts to find them with nets have been futile, and we are of the belief that none of them have lived.

There will be found in the Appendix drawings of fish introduced into the waters of the State since the organization of the Commission, as well as many varieties of salmon and trout of our own waters, over which there has been so much discussion. The descriptions of the new varieties of our mountain trout are from the pen of Dr. David Starr Jordan.

FOLSOM FISH LADDER.

The erection of a fish ladder at the dam of the Folsom Water Power Company, above Folsom, presents a difficult engineering feat. Legal steps have been taken in the matter, and we are assured by the water company that the project of their engineer, H. F. Knight, for a fishway will be undertaken and finished this winter, provided that the state of the river will admit of its being done. It is Mr. Knight's intention to blast out a water way on the north side of the river, to connect with the water gates at the north end of the dam, through which new channel there will run water sufficient to admit of the free passage of fish.

THE THANKS OF THE COMMISSION.

The members of the Commission desire to extend their thanks to Dr. David Starr Jordan and Dr. Charles H. Gilbert, of Leland Stanford Jr. University, for many acts of kindness and valuable assistance rendered in the classification of fish. To both of these gentlemen we are likewise indebted for efficient aid in the prosecution of various offenders arrested for the taking of young fish and the consequent spoliation of our waters. Dr. Jordan has also revised his excellent paper on "Salmon and Trout of the Pacific," in the light of more recent investigations made by Dr. Gilbert and himself; this paper is the recognized authority upon this fruitful subject, and we again make it a part of our report.

To the various railroads of the State our thanks are due for the free transportation of men and fish to various parts of the State. This aid has been invaluable, in that it has enabled the Commission to make a much more general distribution of fish than would otherwise have been possible. The Commission is also under obligation for assistance rendered by agents and employés of the various railroads and of Wells, Fargo & Co.

The Commission acknowledges a special debt of gratitude to Hon. Marshall McDonald, U. S. Commissioner of Fish and Fisheries, who kindly supplied us with the advance sheet of his reports for 1892. It is from these reports that we have taken the important statistics included in this report to show the value of California's fish products for that year.

We are also indebted to the National Commission for the salmon

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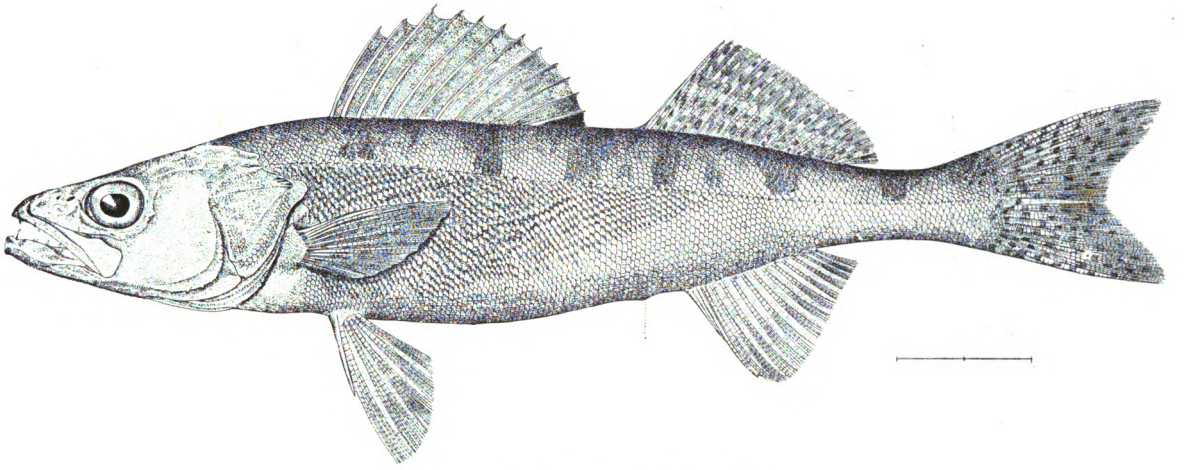
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WALL-EYED PIKE.—*Stizostedium canadense.*

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spawn taken at Baird station, on the McCloud River, and for supplies of fry and eggs of the Loch Levin, Steel-head, and other trout. The Commission also forwarded us a carload of muscallunge fry which they transported from the State of New York to Ogden, Utah, free of charge. We now have their promise to forward a carload of large-mouthed black bass and a brood of pike-perch for introduction into our waters. The National Commission maintain and operate the Baird station on the McCloud River and the stations at Hoopa, Redwood, and Korbel, in Humboldt County, at an expense exceeding $10,000 a year. Without the aid given us by the United States Commission of Fish and Fisheries we would be unable to operate the Sisson Hatchery in a satisfactory manner without a larger appropriation from the State.

The Commission is also indebted to and desires to thank the various wholesale fish dealers and canning companies for their kindness in allowing our deputies to gather from their books statistics of the fish handled by them. Special thanks are due to Messrs. Antoni, Costi & Co. for the free use of their steam fish boats and nets in collecting marine specimens for the aquarium display made at the World's Fair.

To the Hon. George T. Mills, Fish Commissioner of Nevada, thanks are due for supplies of *fontinalis* trout spawn, and for assistance rendered our deputies at Lake Tahoe.

For the supply of muskallunge sent to us in 1892, our thanks are due to the members of the New York Fish Commission.

We are indebted to the U. S. Coast and Geodetic Survey, through Prof. George Davidson and T. C. Mendenhall, LL.D., Superintendent, for figures relating to the coast-line of the various States.

We desire to express our thanks to Hon. H. C. Dillon, District Attorney of Los Angeles County, and his deputies, particularly Deputy M. W. Conkling, who have been of special service to us in our work in that county. Mr. Conkling prepared the very able brief which secured the decision from the Supreme Court on the question of imported deer meat and game.

CLUBS.

The Commission has been rendered valuable assistance by the various sportsmen clubs throughout the State. We can highly commend the organization of clubs upon the plan adopted by the Humboldt County Sportsmen and Recreation Club, the Creel Club of Los Angeles, the Visalia Sportsmen's Club, and many similar organizations. Such clubs can be and are of great assistance to the State in the enforcement of the game laws and in the building up of a local sentiment to maintain them. They are in no sense preserve clubs. The members fish in public waters and hunt upon public grounds, and their efforts are mainly confined to preserving the public interest in fish and game. The organization of such a club in each county of the State would result in a more general observance of the laws.

RECOMMENDATIONS.

The first and most important recommendation we have to make is, that for the forty-seventh and forty-eighth fiscal years, the Commission be given the same appropriation as was set aside for the forty-fifth and forty-sixth fiscal years. With this amount the Commission can fully protect the food-fish interests of the State and secure, not only the main-

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tenance, but the increase of those species which go to make up the value of the products.

In urging upon your attention the importance of an extension of the close season for salmon from August 1st to October 1st, thus adding to the present close season the month of August, the Commission has taken into consideration all of the interests concerned. We believe that the salmon can only be maintained in our rivers by the aid of artificial propagation, and in order to carry out this work the supply of eggs must be obtained in the headwaters of the Sacramento River. During the spring and late fall runs, no salmon eggs can be obtained, because of the high condition of the water, which makes it impossible to take the fish, consequently we must depend upon the summer run for our egg supply. Under the present law very few of the August fish reach the spawning beds on the McCloud River, and the supply of ova obtained from the run of fish will not maintain the supply in our rivers. Additional provision must therefore be made to obtain the necessary spawn. Only by closing the river to all during August and September can this be accomplished. Hon. Marshall McDonald, U. S. Commissioner of Fish and Fisheries, has repeatedly urged the importance of having this change made in our laws. Under date of September 12, 1892, the Commissioner, in writing of our statute which permits the catching of salmon in August, states the objection in this concise and forcible way:

> In its operation, the law causes great injury to the fish culture work at the Baird station, and it is prejudicial to the best interests of the salmon canners, because a large percentage of the fish at that date are badly deteriorated in flesh and altogether unfit for food. The greed of money-making may lead to the utilization of such fish, but the canning industry must necessarily be seriously injured thereby. * * * I greatly desire your coöperation in an effort to bring about a change in this California law, and believe that the interests of fish culture, as well as of the fisheries, will be subserved by a prompt movement in this direction.

We have no hesitancy in asserting this to be the most important change required in our fishery laws. It will be appreciated by all when it is known that our people annually consume over four million pounds of salmon; and that in the face of the work performed by the State and the National Commission to propagate and protect these fisheries, the catch shows a gradual decrease.

The convention for the revision of the fish and game laws, convened by you in San Francisco in April, 1894, after three days' discussion framed a bill to be presented to the Legislature. This bill meets with our hearty indorsement, and we trust that the Legislature in its wisdom may enact it, and that it may become the law of the State. The importance of the strict enforcement of our game laws is appreciated by the people. It no longer concerns the sportsmen alone. It affects the vast majority of our people who depend upon the market for their supply of game. They see that the market supply grows less every year, and the prices higher, and they demand that the season shall be more limited and the game better protected, that it may increase and afford a reasonable market supply. We have delayed too long in this important matter, and measures must be taken to preserve the supply we now have. Again, we ask why should we give this important matter less consideration than New York, Maine, Michigan, Colorado, and other States, which, in extent of territory, do not equal one third of California, and the game supply of which States does not figure in their markets, except as a luxury entirely beyond the mass of their people. This subject should be

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examined as affecting the food supply, not from the standpoint of sportsmen, because they indorse the legislation, and are the leaders in its advocacy.

The State of New York, in addition to its Fish Commission Fund, appropriates $22,050 for the support of twenty game wardens. Michigan, in addition to its Fish Commission, has also a game warden, who is paid $1,800 per year, and allowed to employ ten additional wardens, who are paid by the State. In addition, there are also three game wardens for each county, paid by the counties. Maryland spends $60,000 a year to protect her oyster interests. California is behind all the leading States of the Union in the matter of fish and game protection, though she has more game and fish to protect than nearly all of the others.

Your attention and the attention of the Legislature is called to the bill framed by the above mentioned convention, for other necessary changes and additions to the fish and game laws of our State.

There is in the State Treasury, to the credit of the Fish Commission Boat Fund, $1,100. This money came from the sale of the tug Governor Stoneman. It having been demonstrated that it is cheaper to hire a launch than to own one, and believing that the Commission will never make any use of the money as it now stands, we recommend that it be paid into the Fish Commission Fund.

Awaiting with confidence the granting of the requests suggested herein, and in the anticipation that the Legislature about to convene will, as heretofore, treat this great subject of fish culture with the serious consideration it deserves, and with our assurance to you that our labors have been fraught with the same pleasure that all of the State officials have experienced under the present administration, we remain,

Yours respectfully,

JOSEPH D. REDDING,
HUGH L. MACNEIL,
WM. C. MURDOCH,
Commissioners.

SAN FRANCISCO, September 1, 1894.

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APPENDIX.

		Page.
1.	Extracts from reports to the Board	37–64
2.	Fish distribution tables	65–72
3.	Statement of fish planted	73–75
4.	Financial statements	76–82
5.	Statement of licenses issued	83
6.	Location of the fisheries of the State of California	84–91
7.	Report of observations respecting the Oyster Resources and Oyster Fishery, by Chas. H. Townsend	92–108
8.	Statistics pertaining to the fisheries of the United States	109–110
9.	Brief *in re* Simon Maier deer case	111–118
10.	Supreme Court decision in deer case	119–124
11.	Salmon and Trout of the Pacific Coast, by Dr. David Starr Jordan, with plates	125–141
12.	Descriptions of new varieties of trout, by Dr. David Starr Jordan, with plates	142–143

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EXTRACTS FROM REPORTS OF F. P. DEERING, ESQ., ATTORNEY, AND THE DEPUTIES OF THE BOARD.

EXTRACTS FROM REPORT OF F. P. DEERING, ATTORNEY FOR THE BOARD.

[Under date of September 1, 1894.]

* * * Upon entering upon the duties of his office, your attorney found that there had been no recent compilation of the fish and game laws of the State, and that the legal business of the Commission had greatly accumulated, owing to the fact that no one had heretofore been appointed to act as attorney for the Board who would devote particular attention to these matters. The questions of special interest that demanded immediate consideration were:

First—The violation of the law forbidding the passing or allowing to pass into the waters of this State of sawdust, or other substances deleterious to fish.

Second—The compilation of the fish and game laws of the State, and the ascertaining what ordinances had been passed by the various Boards of Supervisors throughout the State, under the power conferred by the County Government Bill, giving authority to the Boards of Supervisors to pass fish and game laws.

Third—The consideration of the constitutionality of the Cold Storage Act.

Fourth—The legality of the provisions of the law directed to the prohibition of the sale of game brought from other States and Territories during our close season.

Fifth—The breaking up of the unlawful practice of dealing in deer hides.

Sixth—The enforcement of the provisions of the law in regard to kinds of nets and seines that may be used for salmon and shad fishing.

Seventh—The protection of salmon during the close season, when they are running up the streams for breeding purposes.

Eighth—The failure of dam owners to comply with the law regarding the construction of fish ladders.

All the foregoing matters have received the attention of your attorney, as hereinafter reported.

1. The violation of the law forbidding the passing of sawdust into the waters of the State was one of the most serious matters commanding the attention of the Commission. It was particularly flagrant upon the Truckee River, where several of the large mills upon that stream had openly violated the law for several years past, in spite of the efforts of the Commission to break up this unlawful practice. The managers and superintendents of mills had been arrested from time to time, but, owing to the influence of the milling industry in the counties where the

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trials were obliged to be had, convictions were impossible, and those guilty of an infraction of the law in the particular mentioned, believing that the Commission was powerless, persisted in dumping the sawdust into the river, to the destruction of one of the finest trout streams in the State. One of the first things your attorney did, under your instructions, was to direct his attention to this sawdust nuisance, and proceedings were commenced against milling corporations on the Truckee River violating the law, with a view to forfeiting the charters of these corporations. Believing that the State, which forbade individuals to pour sawdust into the river, would not create nor permit to exist a combination of individuals, in the form of a corporation, to do what it made it criminal in individuals to do, papers were prepared in the suit against the Truckee Lumber Company, one of the largest corporations on the Truckee River, and highest up the stream, setting forth the violation of the law in regard to sawdust, and asking that the charter of the corporation be forfeited, and that it be mulcted in damages to the amount of $5,000. This proceeding was an entire surprise to the corporation, and was productive of immediate negotiations on their part, with promises to abstain for all time from further violation of the law. Your attorney had correspondence with Mr. C. F. McGlashan, the attorney for the Truckee Lumber Company, who undertook, on behalf of the company, to cease the putting of sawdust, shavings, and other substances deleterious to fish into the Truckee River. Relying upon that promise, made on behalf of the company, your attorney agreed to suspend proceedings, in order to give the company an opportunity to do as it had agreed to do. These negotiations carried the matter over the milling season of 1893–94, and nothing further was done. The Commission and your attorney believed that the Truckee Lumber Company was acting in good faith in the matter until in August, 1894, when it was reported that the company was putting shavings from its factory into the river. Complaints for the arrest of the Superintendent of the Truckee Lumber Company were prepared and directed to be served. * * *

Your deputies found that the Truckee Lumber Company had broken its pledges, and the Commission caused Mr. Spaulding to visit San Francisco and confer with your attorney. The result was the immediate stoppage of the sawdust nuisance by this company and assurances, in the form of letters, not to repeat the same.

The suit above referred to, commenced against the Truckee Lumber Company for the forfeiture of its charter, is entitled The People of the State of California, by the Attorney-General, on the relation of Jos. D. Redding et al., vs. Truckee Lumber Company (a corporation), and was brought in the Superior Court of Nevada County, the principal place of business of the defendant. A demurrer to the complaint was interposed, which would raise the legal questions involved, and the suit stands in this condition, ready to be pressed at any time, in case of renewed violation by the defendant company of the sawdust law. The Commission was not desirous of breaking up the defendant corporation, nor of injuring it in its business if it would comply with the law, and I will proceed no further with the suit, so long as the defendant observes the law.

The present understanding with the defendant company is that it is to put in a burner and keep all of its sawdust, shavings, and refuse matter out of the Truckee River; and the company has been notified

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that upon the first renewal of the sawdust nuisance upon their part, the above suit will be pressed without further notice.

Notices to all the mill men between the Truckee Lumber Company's mill and the State line were served, and upon seeing the course taken with respect to the Truckee Lumber Company, all the mill owners below the Truckee Lumber Company have discontinued the practice which has given the Commission and the people of this State so much annoyance, and, at this writing, the Truckee River is running free from sawdust and shavings. * * *

So far as the sawdust nuisance on the Truckee River is concerned, your attorney believes that the successful results which have attended its contest with the Truckee Lumber Company will assure protection of fish in that stream, and the observance on the part of all mill owners of the law in that portion of the State. * * *

Correspondence has been had in regard to the violations of the sawdust law in other parts of the State. * * *

So far as your attorney is advised, in all places the violation of the law was stopped. As the largest mills throughout the State are operated by corporations, and as the proceeding which proved so effectual in the Truckee Lumber Company's case for the forfeiture of the corporation's charter, can be made to apply to any corporation created and doing business under the laws of this State, your attorney does not doubt that corporations may all be reached by this process and forced to observe the law. This will practically put an end to the sawdust nuisance throughout the State, and there are, at present, no cases of violation of the law reported.

2. The new edition of the fish and game laws of the State was found to be a necessity. Many of the Boards of Supervisors had exercised the power sought to be conferred upon them by Subdivision 29½ of Section 25 of the County Government Bill, giving Supervisors power "to make regulations for the protection of game and fish; when such regulations are made as provided in this section relating to game and fish, the laws of the State for the protection thereof are suspended in such county." (Statutes of 1891, page 306.) That same provision was reënacted by the Legislature of 1893, with two important changes. The words "and fish" were omitted after the word "game" in the statute of 1893, and the following clause was added: "and to regulate the size and kind of nets and seines to be used for fishing." (Statutes of 1893, page 358.) This clause in regard to nets and seines was designed to take the place of a similar provision in the Act of 1891, found on page 307 of the statutes of that year.

In order to ascertain the extent to which this power had been exercised by the various Supervisors throughout the State, your attorney began a systematic correspondence with the County Clerks throughout the State. * * *

That the people generally might receive as early information as possible in regard to the open and close seasons throughout the different counties, your attorney first prepared, and there was printed by the Superintendent of State Printing, a schedule showing the open and close seasons under the general laws of the State, and the changes (if any) which had been made therein by the ordinances which had been adopted by the several counties. This schedule was issued in the form of a card and distributed broadcast through the State, and in due course

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of time was followed by a complete compilation of the statutes, provisions of the code, and ordinances then in effect relating to the subject in question. This compilation was issued in pamphlet form in a volume of 142 pages. Since its issuance, several new ordinances have been adopted in the different counties, the substance of which has been communicated to the Commission as fast as the ordinances have been received from the County Clerks.

The existence of a varying and different open season in the different counties, subject to change at any time by the Supervisors, has given rise to a great deal of dissatisfaction, and the constitutionality of ordinances passed under the powers sought to be conferred by the Section 29½ above referred to, has been tested in two cases, which are now pending in the Courts of this State. One of them arose in the Superior Court of Sonoma County, where certain inhabitants of that county were arrested for violating an ordinance of the Supervisors of Sonoma County, designed to regulate fishing in the Russian River. The proceedings set on foot by the Fish Commission resulted in the conviction of those arrested, but the legality of the ordinance itself (as a constitutional exercise of power under Section 29½) has not yet been determined by the Superior Court of that county, owing to the fact that the same question is now under submission before the Supreme Court of the State. The case in Sonoma County is known as "The People vs. Silva." The case in the Supreme Court is known as "In re Asbill and others," and arises out of an effort on the part of the Commission to enforce the deer-skin law, and comes up on a conviction for its violation under an ordinance passed in Humboldt County.* This, in itself, will be of great value, as determining the question of the power of Supervisors over the subject of fish and game, and as immediately affecting the validity of the ordinances relating to those subjects now in existence, which number throughout the State fully fifty.

3. The killing of game during the open season and keeping it in cold storage for sale during the close season was one of the evils which the Commission was specially desirous of ending. An Act was passed at the last session of the Legislature making it a misdemeanor to keep in cold storage during the close season wild game. As soon as the open season closed in the spring of 1894 (in order to make a test case), you selected the largest cold storage company in San Francisco, and for that purpose caused search warrants to be issued, under which it was discovered that there were kept during the close season, by the Merchants Ice and Cold Storage Company, large quantities of wild duck and quail. The manager was at once arrested and conviction obtained in the Police Court upon a case stated. The matter was then taken to the Superior Court, where the question was very fully argued and discussed before Hon. James M. Trout, Department No. 8. The whole law on the subject was gone into, the accused being represented by Messrs. Dorn & Dorn, of this city, and after careful consideration, Judge Trout handed down his decision in favor of, and upholding the legality of the Cold Storage Act. This decision is a most important one, as a contrary ruling would have resulted in the killing during the open season of vast quantities of wild game which could not then have been disposed of, or sold, and

*The Supreme Court handed down its decision in this case on September 26, 1894, but dealt only with the wording of the complaint. The Court did not take up either the legality of the ordinance or the power of the county to pass same.

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would have been placed in cold storage for sale during the entire year. Such a practice, it can readily be seen, would have resulted, in a very short time, in the destruction of all the wild game throughout the State. The name of the case in which this important question was raised and settled is "The People vs. Swanberg."

4. The next important matter which was taken up for action was the arrest of marketmen who undertook to sell during the close season game which they claimed to have imported from neighboring States and Territories. It can readily be seen that if game could be imported the law forbidding the sale of game during the close season would be practically a dead letter, as much game would be killed in this State and claimed to have been brought from without its borders. A test case was made in Los Angeles. One Simon Maier was arrested for the sale of deer meat brought from Texas. A conviction was had in the Police Court, and, after careful argument by Deputy District Attorney Conkling, that conviction was sustained in the Superior Court of Los Angeles County. The case was then taken before the Supreme Court of the State on a writ of habeas corpus, and, after a full investigation of the matter, the Supreme Court handed down its decision on the first day of August, 1894, declaring that it was no defense that the game offered for sale during the close season had been brought from neighboring States and Territories, where it had been killed during the open season in those places. The brief prepared by Mr. Conkling and the decision handed down by the Court are of so great importance that they are given you herewith in order that they may be included in your report.

5. The slaughter of deer for their skins was a practice against which the law was specially directed, and in order to prevent it arrests were made in San Francisco, and the important Asbill case in Humboldt County brought, to which reference has already been made. The arrest of offenders of the law in this particular has resulted in making its violation very much less flagrant, and no cases have been reported to your attorney since the Asbill case, above mentioned.

6, 7. The use of illegal nets and seines for the purpose of catching shad and salmon, especially in the headwaters of the Sacramento River, has also received the attention of your attorney. Some difficulty has been occasioned in this respect by reason of an ordinance passed by the Supervisors of Tehama County, reducing the size of the meshes of nets to be used in salmon fishing from 7½ (the legal mesh) to 4 inches. When it came to the knowledge of the Commission that the Supervisors had taken this step, your attorney at once advised the Commission that in his opinion the ordinance was invalid, and in direct violation of the general law upon the subject, and so wrote to the District Attorney of Tehama County. While Subdivision 29½, already referred to, did confer upon the Supervisors the power to regulate the size and kinds of nets, your attorney considered that power to be one which could be exercised only in conformity to the general law, and not in conflict with it. That while the general law regulated the minimum size of meshes in nets to be used for fishing for salmon and shad, the Legislature did not wish to restrict the Supervisors of any county from requiring a still larger mesh.

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The power conferred by Subdivision 29½, and by Section 38 of the Act of 1891, authorized Supervisors to require a larger mesh than 7½ inches if they saw fit, but did not give them power to permit the use of a net with smaller mesh. This being the true meaning of the law, in the opinion of your attorney, deputies were dispatched to the headwaters of the Sacramento River during the close season of the last year, and upon its being known that the Commission would arrest for the use of nets with a less mesh than 7½ inches, the use of nets attempted to be authorized by the ordinance of Tehama County was abandoned. The county has passed a similar ordinance this year, and should the catching of salmon be attempted with nets having a mesh less than 7½ inches, the same course will be pursued this year as was successfully adopted last year, and in case of the use of nets by any one with a mesh of less than 7½ inches, arrests will be made and the legality of the Tehama County ordinance tested.

8. Your attorney has had occasion to send notices to the owners of dams, and those placing obstructions in the river, to construct and build the fish ladders required by law, in order to permit the passage of fish up the streams. Thus far, however, no failure to observe the notice sent has been brought to the attention of your attorney.

In addition to the above matters, your attorney has constantly advised with the deputies and the members of the Board in regard to their duties with respect to the construction of the various statutes and ordinances passed throughout the State. * * * Legal documents which the Board has had occasion to execute during the past year your attorney has also drawn. * * *

It is believed that with the breaking up of the sawdust nuisance throughout the State, the sustaining of the constitutionality of the Cold Storage Act, and the prevention of the sale of game brought from neighboring States, the past year has been the most important one in the legal history of the Commission.

EXTRACTS FROM REPORTS OF JOHN P. BABCOCK, CHIEF DEPUTY.

[Extract from Report for December, 1892.]

I visited the Presidio beach at least ten times during the month, and watched the men who drag their seines there, but they were as careful of small fish as the circumstances would admit of, and I saw nothing done that warranted an arrest. I visited the markets every morning. There has been some talk of the fish dealers selling small smelts for white bait. I was careful some time ago to send a number of these small fish to Dr. David Starr Jordan, and he says: "Of the fishes sent me by you, No. 1 is a goby (*Lepidogobius lepidus*). It is a common fish of San Francisco Bay, living on the sandy and muddy bottoms at a moderate depth. The specimens sent are adult, and the species does not grow much larger. I noticed that at the Palace Hotel and elsewhere, this fish is put on the table as 'white bait,' but it is far inferior to the real white bait, its bones being stronger and the flesh not very sweet. There is no objection to the sale of this fish.

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"No. 2 is the real smelt of the Pacific Coast, *Osmerus thaleichthys*. It is very similar to the smelt of the Atlantic Coast, but a little smaller, and if anything a little finer food fish. It, too, is occasionally sold, especially by the dealer Inguglia, as 'white bait.' It is as good as the young herring to which the name white bait really belongs, and far superior to the goby (No. 1). The specimens sent are full grown, and there can be no objection to their sale, although the species deserves a higher price than the market men usually get for it. If it is separated from the poorer fishes and kept clean and fresh, it is one of the best food fishes. It is not very plentiful here. As you know, the name smelt is commonly taken for another and very different fish, an excellent food fish, usually called smelt, but which should be called pescerey.

"No. 3 is the young of the green cod, or cultus cod (*Ophiodon elongatus*). The adult of this fish is common in the markets. It is not a first-class fish, but the young ones ought not to be sold."

The dealers have always told me the same, and say that these small fish are only found in the bay a few months in the year. The amount of criticism that we are subjected to and the amount of talk that is indulged in by men who think they know all about these matters, is only equaled by their ignorance. Dr. Jordan has been kind enough to classify for me all of the small fish that figure in the markets here, and the dealers have also been very kind in advising with me and have signified a willingness to protect the young fish. The number and size of striped bass in the markets during the month has never been equaled any season since I have been familiar with the markets. Most of the fish are caught about and above Antioch—between Antioch and Jersey Landing. It was between these points that the shad were first taken. The fact that striped bass are caught in the lower Sacramento and Russian River shows better than anything else that the fish have come to stay and will figure more and more in our markets each year.

[Extract from Report for January, 1893.]

The effect upon the price of fish of the parenzella or drag-net fishing outside of the heads was exemplified during the stormy weather, from the 25th to the 27th. The outside tugs could not come in during the heavy weather, and the retail price of flounders and sole went from 5 cents to 12½ and 15 cents per pound. These tugs do but little damage, as they fish entirely upon the banks outside of the heads. There is a cry raised that they are driving the net fishermen out of the bay and out of business, but they are certainly giving the people cheap fish with little or no injury to the supply. Speaking of the parenzella, Dr. Jordan says: "They have thus far been rather a blessing than otherwise to the people of San Francisco."

[Extract from Report for February, 1893.]

On the 28th, Deputy Wilson and myself went to Point Reyes in quest of the set-net that was reported as being clear across Tomales Bay, near the mouth of Paper Mill Creek. We went over several miles of the channel, but found no net, nor could we learn from any of the people that there had been any fishing there. Deputy Wilson remained and went up Paper Mill Creek, but found no one fishing.

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[Extract from Report for April, 1893.]

On April 3d, accompanied by Deputies Wilson and Koppitz, I left in the Launch "Hustler" for the Sacramento River. We visited the Chinese shrimp-fishing camp at San Pedro, and then went up through San Pablo Bay. At a point a mile or two west of Pinole, we overhauled and arrested A—— P—— for catching shad in a net the meshes of which were less than 7½ inches. We took the Italian to Pinole and entered a complaint before Justice of the Peace Dohmann. The trial came off on the 5th. The defendant was acquitted by a jury, in spite of our having sworn that we saw him take twenty shad from the net which we exhibited in court.

From Black Diamond we went over the Chipp's Island "drift" and at 2 P. M. were in the "Cut-off," where we found six nets in the water. The owners of the nets abandoned them and went into their camp at our approach, and no one there would admit the ownership of the nets, though Greek A—— made a proposition to pay us $50 per net if we would leave them in the water. We began taking the nets into the launch. The first one measured 400 fathoms, or 2,400 feet; the second one measured 340 fathoms. The launch would hold no more, but we began taking up another as a "bluff," and the owner, P—— G——, came out from the camp in his boat and claimed it. We arrested him and his net was placed in his own boat, which we took in tow, and then left for Benicia, leaving three nets in the water. The wind was blowing a gale at the time, and the sea in the "Cut-off" and Suisun Bay was very rough. We could not have remained in the "Cut-off" in so small a boat as the launch any longer than we did. * * *

The spring run of salmon is the largest in three years. There are three canneries running, and the markets are well supplied. The work of the State in propagating salmon is certainly producing good results. * * *

The patient and business-like treatment that the fishermen on the river have received at the hands of the present patrol has made friends of most of them, and the scenes of two years ago of fights and quarrels are no longer the result of a visit to their camp. * * * The patrol made seventeen arrests during the month of April.

[Extract from Report for May, 1893.]

Letters from Benicia informed me that the cases against the men who were arrested on April 30th had terminated in one man being convicted and sent to jail for fifty days. This is an old man who is substituted by the owners of one of the nets to save paying a $50 fine. The owners of the other nets have not come forward, and some question has been raised as to our right to confiscate these nets. We do not claim that right, but do claim that when a man is fishing illegally and abandons his net upon our approach in order to escape arrest, we have a right to hold his net as evidence to aid in his conviction whenever he is caught. The nets are not confiscated, but are held as evidence.

[Extract from Report dated August 7, 1893.]

Having accepted the invitation of Antoni, Costi & Co., to use their steam fishing-boat "Farragut" outside the Heads, in collecting live marine specimens for the United States Fish Commission exhibit at

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Chicago, on June 16th, I, in company with Dr. Gilbert, of the Leland Stanford Jr. University, and Deputy Wilson, left Fishermen's Wharf at 3 A. M., and ran to a point some four miles abreast of Point Reyes, where the parenzella net was placed in the water and dragged until noon, at which time we had secured sufficient living specimens to fill United States fish car No. 2. These specimens were placed in cans and barrels and we then proceeded direct to the old mole at Oakland, where we found the car awaiting us. After three hours of hard work we transferred the specimens to the car ready for transportation to Chicago on the train leaving at 5 P. M., June 16th. The crew of the "Farragut" did all in their power to further our efforts, and were exceedingly kind. I accompanied the car to Chicago, in accordance with permission granted by the Board. We arrived on the 20th of June, and turned over to the United States Commission in the Fisheries Building at Jackson Park, the following collection: 50 anemone, 12 star-fish, 1 wolf-fish, 2 sharks, 18 viviparous perch, 2 electric fish, 6 poggies, 6 sea-urchins, 7 viviparous cod, 6 crabs, 2 skates, 4 flounders, 12 naked mollusks.

Col. Marshall McDonald, Commissioner, was in Chicago upon our arrival, and expressed great gratification over the successful trip, saying that it was the most satisfactory made by the Commission, and the collection by far the most interesting that he had placed in the aquarium.

[Extract from Report for August, 1893.]

I went to Truckee on the night of the 21st, and after two days' consultation with Mr. Spaulding, the manager of the Truckee Lumber Company, and their attorney, Mr. McGlashan, we made the following agreement: The Truckee Lumber Company to have thirty days from September 21st in which to select the best method of burning the shavings and sawdust from their factory; that they would advise the Board of the machinery selected by them and give an estimate of the length of time required to place the same in their factory; that they would enlarge the sawdust flume running from their sawmill, and keep one man steadily engaged in watching the same and the dump up to October 1st; that they would burn their sawdust before they started up again. They also agreed to put two new fishways in their dam in the Truckee River. Mr. Spaulding signified his desire to comply with the requests of the Commission, and I believe the Board is at last nearing the end of their long fight with the sawmill men on the Truckee River.

I visited Lonkey's and the Richardson mills, and found no cause for complaint, though Lonkey does not always make use of his safe sawdust dump. The ladders in the Lonkey dam are in excellent condition. The Richardson ladder was somewhat broken down, and I remained there long enough to superintend its repair. The Tahoe Ice Company's ladder was not constructed according to the plan given them last year, but they were at work upon it on the 30th, and have no doubt placed it in good order by this time.

[Extract from Report for October, 1893.]

At 3 A. M. on the 18th inst., Deputy Wilson and myself arrested B. F—— at Fishermen's Wharf, in San Francisco, for having small striped bass in his possession. At 4:30 of the same morning we arrested S. T——, of the Clay Street Market, for the same offense. T—— gave us much trouble and we were obliged to call in the police in order to take

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him from the excited crowd of Italians whose stalls adjoin his. F—— pleaded guilty in Police Court No. 3, on the 19th, and was fined $5. T——'s case was set for the 25th of October, in Police Court No. 2, and on that day he demanded a jury trial, and the case was set for November 15th.

[Extract from Report for December, 1893.]

We borrowed a make-shift of a boat of Mr. King, at Russian River station, and started down the river at 2 P. M. of the 26th. It was raining and cold. One mile above Moscoe Cottage we beached the boat and walked down the shore to the point opposite the cottage, where we found a set-net in the river. We waited until dark for the owner to show himself, but were obliged to return to our boat without his having done so. We crossed the river and found shelter from the rain in an old cabin, where we remained until 3 A. M., when we again took the boat and drifted down the river to within a few hundred yards of the net. Here we watched until daylight, when we discovered A. B. S—— working the net. We drifted down upon him and were alongside his boat before he discovered our presence, when he became somewhat excited. We took up his net, and took him to Duncan's Mills. The man is well known and owns considerable property near Duncan's Mills. We took his boat, and, leaving the old tub that we had been using, went down to the mouth of the river, some eight miles, where we found and took up four good-sized nets that had been set in the stream. There were a number of men on the river in boats and around the fires on the shore, but they all disclaimed any knowledge of the owners of the nets. We took them up and returned to Duncan's Mills, and reached there at 5 o'clock. We had all the nets shipped to Santa Rosa, and I went there on the 29th and swore out a warrant for the arrest of A. B. S——, and also made complaint against John Doe, Richard Roe, etc., for using the unclaimed nets. It was very evident that our action was unpopular on all sides. We found our boat the next morning sunk in the river, with holes from six rifle bullets through its bottom. The people around Duncan's Mills were very free in offensive expressions of contempt for the law and our actions, and Mrs. S—— took occasion to say to me: "You will die on the river if you don't leave it and the fishermen alone." S——'s case is set for January 12, 1894.

[Extract from Report for January, 1894.]

The S—— case came up at Santa Rosa on the 12th, and the defendant was found guilty and fined $75. His attorney gave notice of an appeal, and the case will come up early in February.

[Extract from Report for February, 1894.]

The Board has been subject to no little criticism during the month for its failure to enforce the trout law. A thousand patrolmen would not be able to fully patrol the streams of the State. The poaching is chiefly done by people who live along the banks. The men in the employ of the Commission have, I believe, been active and have performed their duties faithfully, although they have been unable to detect any one in the act of catching trout or with trout in their possession. It is not a misdemeanor to *fish*, but to *catch* fish. When a stranger appears on any stream he is at once regarded with suspicion and is watched by the

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poachers, and no fish are killed while he is on the stream. This was demonstrated by Deputy Wilson and myself in Santa Cruz County, during the 8th, 9th, 10th, and 11th. We went from Santa Cruz to Watsonville, taking our rods and gum boots, and as anglers passed up and down the San Lorenzo River, Soquel Creek, Aptos Creek, and the Pajaro River. We found a number of men in Soquel Creek with spears in their possession, but they had no fish, and we were unable to do anything more than order them off the stream. They made no attempt to spear fish after we made our appearance.

[Extract from Report for March, 1894.]

I sent Deputy Wilson to Santa Cruz on the 24th, to look up the set-nets reported in Monterey Bay. He was there on the 24th and 25th, and reported that many fishermen set their nets on the reef in the bay, and that the nets were anchored with stones and extra heavy lead lines. We went to Santa Cruz on the 27th, and on the morning of the 28th arrested three of P—— Brothers crew and F. M——, and filed complaints against them. The preliminary examination was held on the 30th. The defense placed no witnesses upon the stand, and Justice Gardiner held all the men over to be tried before the Superior Court. The cases cannot come up for some weeks, as the calendar is full; but when they do come up for trial we shall have a good jury and an intelligent Judge, from whom we hope to get a legal definition of what constitutes a set-net.

I examined the Truckee Lumber Company's plant on the Truckee River, in company with A. S. Willis and Stewart McKay, on the 16th. The company were at work on the burners for both their sawmill and the factory. They agreed to have them in running order by June 1st. In the meantime the sawdust is run on to their old dump, and they have two men engaged in turning the stream every hour or so, confining all the sawdust to the dump.

On the 6th I procured a search warrant and investigated the Merchants' Ice and Cold Storage Company's warehouse, where I found large numbers of duck and quail. I took one duck and one quail for evidence, and swore to a complaint charging C. O. Swanberg, the President, with having violated the Cold Storage Act. The case was called on the 12th. Swanberg admitted the facts and was found guilty, and on the 14th was fined $20, or five days in jail. In order to test the law, the attorneys for the defense, Dorn & Dorn, allowed Swanberg to go to jail, and at once took out a writ of habeas corpus. The matter is to come up before Judge Trout. There is no question but that the game in cold storage was killed during the open season. No further action was taken in these cases pending Judge Trout's decision.

[Extract from Report for June, 1894.]

The Monterey Bay set-net cases were tried in Santa Cruz on the 6th, the trial thereof lasting two days. The case for the People was well handled by Mr. Lindsay, the District Attorney. The defendant was acquitted by the jury on the afternoon of the 8th. I am satisfied that the nets are set-nets, but believe it to be impossible to convince a Judge or a jury of the fact, as all of the net fishermen in the bay seem to be perfectly willing to perjure themselves in the matter. Wilson and

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myself came up from Santa Cruz on the 9th, and taking the launch "Hustler," the same afternoon proceeded to Collinsville, in order to try the cases of J—— and N——, who were arrested on the 28th of May, for fishing with their nets extending more than one third across the stream. The case was tried on the morning of the 9th, before a jury, in Justice Rice's court. The men were promptly acquitted. After the trial, we ran up the river, through Three-Mile Slough, thence up the San Joaquin River to Bouldin Island, where we remained over night. Sunday we ran up and down the river all day, and tied up at Black Diamond for the night. Dr. Hugh M. Smith, Statistician of the U. S. Fish Commission, accompanied us on the trip. He has been studying up the acclimatized fish, and was interested in seeing the water from which the striped bass supply is taken. He was astonished at the extent of our inland sea. Few people comprehend the miles of water contained in this basin at the confluence of the Sacramento and San Joaquin Rivers. The May run of salmon was still the talk of people along the river, and all expressed themselves as satisfied with the catch. It was the best month of the spring run, and the largest in four years.

[Extract from Report for July, 1894.]

Acting upon information furnished me, I went to Santa Rosa and Windsor on the 24th. After a day's investigation I arrested George Shier for having used explosives to kill fish in Russian River. I took him to Santa Rosa. Shier confessed his guilt in the presence of witnesses, and gave me the names of men who took part with him. I thereupon swore to a complaint charging Ira Robbins, Ira Smith, and John Reynolds with killing fish with explosives, upon which they were arrested. At the preliminary examination George Shier, Ira Robbins, and John Reynolds were held to appear for trial in the Superior Court of Sonoma County. Ira Smith was discharged by the Justice, although the testimony showed that he went to the river with Reynolds, Robbins, and Shier, in the same wagon; that he stood upon the bank of the river and saw the other men gather in the fish after the explosion, and that he came away from the river in the same wagon with them. The evidence of the guilt of these men is conclusive, and there does not seem to be any successful defense possible for them. If they are convicted it is to be hoped that the Judge will be more severe in his sentence than was the Judge in Ukiah, who fined the man convicted of the use of powder in Russian River $5, and added a warning that the next time he would be sent to jail.

[Extract from Report for August, 1894.]

On the 14th, I went to Truckee and found that the Truckee Lumber Company was dumping the shavings from their box factory into the river, as reported by Mr. Shain and Mr. Cummings. As witnesses I took W—— and S—— with me to the factory, and having secured the evidence desired, I went to Nevada City that night, and the next day consulted with District Attorney Ford and requested him to make out a complaint upon which I could arrest W. R. Spaulding, the manager of the company. Mr. Ford assured me of his willingness to prosecute the case, but said that he was so satisfied that the company would accede to our demand that they should keep the shavings out of the river, that he wished to telegraph Spaulding to come to Nevada City and talk the

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matter over. The telegram was sent and Mr. Spaulding, with his attorney, Mr. McGlashan, arrived on the morning of the 16th, and in conference with Mr. Ford and myself they took the astonishing position that the agreement made last year with the Commission did not include shavings. Both Mr. Spaulding and his attorney denied that the word "shavings" was used by either of them in the correspondence of last year, or in any conversation, and that the agreement referred only to the sawmill. Unfortunately, I did not have with me copies of their letters. After a conference of an hour or so, Mr. Spaulding requested that further legal proceedings be suspended for one day, in order that he might go to San Francisco to consult with the President of the company. I granted the request, and we came to the city. On the afternoon of the 17th, in Mr. Deering's office, Mr. Spaulding was confronted with the correspondence that he had denied. He said that Mr. McGlashan had deceived him in the matter. Mr. Spaulding, on behalf of the company, then agreed to the terms demanded by the Commission, and promised that they should be put in force on the 18th. In order that I should not again be deceived in the matter, I went to Truckee that night, and on the 18th saw the sawmill closed down and the dumping of shavings from the factory into the river discontinued. I remained on the ground for two days, and leaving Deputy Wilson on watch, returned to San Francisco. * * *

Wilson reported on the 30th that the company were carrying out their agreement, and that the river was free from floating shavings or sawdust. * * *

Deputy Fletcher and myself have been busily engaged during the last three weeks in compiling and arranging your thirteenth biennial report to the Governor.

REPORTS OF A. W. WILSON.

[Extract from Report for May, 1893.]

May 1st, in company with Deputy Hunt, I went to Truckee with 10,000 trout fry. We arrived there on the morning of the 2d, and were met by Stewart McKay and William O'Neill. The snow was very deep, and it was impossible for us to reach the stream they wished to stock, and we were obliged to place the fish in Cold Stream and Donner Creek, the outlet of Donner Lake. I left Truckee on the night of the 2d and reached this city on the 3d. From the 4th to the 17th I was in the city and around the bay, taking in the markets and wharves every morning, and visited the Chinese camps at South San Francisco, Hunter's Point, and San Pedro Point. The Chinese are all catching shrimps, and their catches are almost entirely free of small fish. * * *

On the 23d, 24th, 25th, and 26th, I went to Fishermen's Bay and through the wholesale markets each morning at 2 A. M. with Chief Deputy Babcock, trying to locate the men who bring small striped bass to market. On the morning of the 26th we found some forty small fish in the possession of an Italian. We arrested him and I swore out a complaint, and the case went over until the 31st, when he pleaded guilty and paid a fine of $10. From the 26th to the 31st I was engaged in the usual patrol duties in the city and on the bay shore.

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[Extract from Report for August, 1893.]

August 1st to 3d, I was on detail in the city and on the bay shore.

August 4th to 6th was in Santa Cruz and on the beach of Monterey Bay.

August 7th, in the city markets, on wharves and beach. August 11th, visited the markets and the Chinese camps at San Bruno. There are three boats fishing in this camp, but they have very few shrimps on their drying-beds. * * *

August 19th, left Antioch on the way to Rio Vista. On the way up the San Joaquin we arrested G. B—— for using sturgeon lines. We caught him in the act of stripping his lines; took up two of them, and returned to Antioch, where we swore out a complaint before Justice Gribble. The trial was set for the 23d and he was tried by a jury. The evidence was all that any Court could ask for, but the verdict was as usual in these cases, "not guilty." We ran the launch to Rio Vista for the night.

August 20th and 21st, we ran down the river and arrested three men for fishing for salmon on Sunday; took them to Collinsville, where they were held by Justice Rice. We then proceeded down the river and ran into the "Cut-off." We found the bay full of nets and boats; there must have been at least forty boats on the drift. We succeeded in overhauling two of them, but the wind was blowing a gale and there was such a heavy sea that we could not overtake any of the others. We did these men a great deal of damage, however, for in their hurry to get away from us many of them were obliged to cut their nets. There were four men in the two boats that we caught; we took them to Collinsville. On Monday morning they pleaded guilty and were fined $50 each, or fifty days in jail. They went to jail. One of the three men we took to Collinsville on the 21st was fined $100, the other two, $50 each, which they all paid. * * *

August 27th, left Collinsville at 3 A. M., and ran through the "Cut-off" into Suisun Bay. At the mouth of Montezuma Slough we found a net drifting in the water. A Greek came out from the camp and claimed the net. It was the only one in the water that morning. We took him to Collinsville and he pleaded guilty, and was fined $50 or fifty days in in jail. He went to jail.

August 29th, cruised through Carquinez Straits down to Vallejo, and then into San Pablo Bay and back to Martinez.

August 30th, Martinez to Black Diamond; Collinsville to Rio Vista.

August 31st, Rio Vista, Courtland, Sacramento.

[Extract from Report for September, 1893.]

The work of the patrol in the Sacramento River during the month of September was as thorough as was possible, and while I do not claim that we stopped all the fishing, I do claim that we prevented it in a great measure, and that no camp on the river was without fear, and that fishing, if any fishing was carried on, was in the night time, when the wind was high and navigation difficult. The men on every "drift" had signal men stationed on prominent points above and below their fishing grounds, and the approach of the launch or any strange sail was at once signaled by camp fires or gun shots. In spite of these signals we know that we did these illegal fishermen great damage; many of

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them are loud in their abuse of us, and openly state that they will have the political heads of the patrol. W—— Brothers approached Deputies Tunstead and Koppitz and offered to, as they expressed it, "square things" with them if they could be let alone. The work of Deputies Tunstead and Koppitz is covered by my report, as per instructions given me by your Chief Deputy. They at all times were willing and efficient, and stood the long watches with patience and good nature. The following is a detail of every day's cruise during the month:

September 1st, in Sacramento and vicinity.

September 2d, ran to Rio Vista, Clarksburg, and Walnut Grove.

September 3d, left Rio Vista at 4 A. M.; ran to Collinsville and then to Antioch.

September 4th, left Antioch early, went to Chipp's Island; thence to the "Cut-off," where we found a large net in the water, and took it up. The owners were not in sight. It was a net like they use on the Columbia River; much deeper than those used in the Sacramento. We took the net to Antioch, where we had it placed upon a rack on the 5th, and on the 6th we stored it at Collinsville. This net has never been claimed. * * *

September 13th, at Rio Vista ran up Cache Slough ten miles, back to Rio Vista at noon. Left for Collinsville, and at Toland's Landing we ran down two men who had their net out. They had been warned of our approach by the lookouts firing shotguns, and were putting the end of the net in the boat at the time we first sighted them. We gave chase and they ran into the tules, jumped out, and escaped. The boat they left was not fastened. We took it and the net to Antioch, where we tied up for the night. * * *

September 19th, at Antioch; ran up False River, Three-Mile Slough, back into the Sacramento River; and, on the Emmerton Drift, just above Toland's Landing, the signal men fired their shotguns. We crowded the launch for all she was worth and reached the "drift" before the men could get their net out of the water. We took it up and carried it to Winter's Island, where it was placed on the racks and dried. It contained forty-seven large salmon.

[Extract from Report for January, 1894.]

January 1st, I went to Russian River station, taking John Low as a boatman. We made the run of the river on the night of the 2d, arriving at the mouth before daylight. We found three nets anchored in the river, and there being no owners who would claim them we took them up and carried them to Duncan's Mills and shipped them as freight to Santa Rosa. In order to insure the safety of our boat we had it hauled to the station from the river and placed it in the warehouse at the N. P. C. R. R. We made the run of the river every day or night up to the 11th, but found no more nets. On the 12th I was in Santa Rosa giving my evidence in the case of the People vs. A. B. S——, the man arrested on the 26th. He was convicted. I returned to the river on the 13th with Chief Deputy Babcock, and we made the run of the river on the 14th. It began raining that night, and the river rose over 22 feet up to the morning of the 16th. I returned to the city that night, as fishing was out of the question. On the 25th we returned to the river and made the run every day until the 30th. The local sentiment at the mouth of

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the river is as bitter as ever, but the men have lost all heart and fishing for the present is stopped.

[Extract from Report for March, 1894.]

On the 13th I went back to Taylorville, on Paper Mill Creek, and began the removal of the jam at the dam. The high water wrecked the dam completely, but the damage was of such a character that few if any fish could pass save at extreme high water. I hired two men from the mill to help me remove the jam. We worked two days, and I went back on the 16th and concluded the work on the 17th. The fish were quick to take advantage of the opening that I had made, and two hours after there was not a large fish to be seen below the dam, although I should say there had been a hundred there before the opening was made.

REPORTS OF GEORGE H. KOPPITZ.

[Extract from Report for October, 1892.]

October 12th, acting under your instructions, Deputy Tunstead and myself proceeded to Redding, Shasta County, to investigate the manner of the taking of the large number of small-sized salmon which were being shipped to the markets of San Francisco. We arrived at Redding on the morning of October 13th, and immediately left for Hooker Flat, a small town some twenty miles below Redding, and, after having received the necessary information from Mr. ——, we left the same evening for Cottonwood. Proceeding from there on the following morning to a place on the river some 15 miles below, we arrived at the camp of the fishermen, who undoubtedly had heard of our arrival, as they were not fishing. In answer to our questions they said that they were in the habit of using a four-inch mesh net, which they were allowed to do by an ordinance passed by the Supervisors of Tehama County, and they showed us a clipping from a Red Bluff paper in support of their statement. We deemed it advisable to investigate the matter before making any arrests, and proceeded to Red Bluff at once. We were informed there by the District Attorney that such an ordinance had been passed, and although we explained to him that it was in strict opposition to the State law, he refused to prosecute, and we were obliged to return without making the arrests. On the 16th we proceeded to Tehama, thinking we might be able to catch some fishermen violating the Saturday-Sunday law. We had proceeded but about a mile down stream, when we came upon five fishermen at work. We arrested them and took them in, and their trials were set for the 25th, when they were convicted and fined $50 each, which was paid.

[Extract from Report for May, 1893.]

From May 8th to 11th I was in the vicinity of Martinez, Black Diamond, Bethany, San Joaquin, Lathrop, and Stockton, collecting licenses, and was quite successful. I discovered no illegal fishing at these points. At this season of the year the fishermen in that vicinity catch little else but shad. They are so plentiful in the San Joaquin River and the sloughs about Stockton that great numbers are taken out

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with pitchforks by the farmers. The price paid by the "hucksters" to the fishermen is half a cent per pound. They are sold in the markets at about 5 or 6 cents, and as the roe brings 15 cents per pound it makes a very profitable fish for the market. * * *

May 26th, accompanied by Deputy Fletcher, I left Los Angeles for Santa Monica to collect licenses at that point. We were compelled to walk along the beach for several miles to where the men were drawing seines, clad only in bathing suits, and, as they had no money with them, we were obliged to wait until they had finished fishing and then return with them to town. Arriving there they absolutely refused to take out a license, and I was compelled to arrest W. W. S——, the owner of the outfit. He was taken before Justice Twitchell, who permitted him to pay the costs provided he would take out his license. It would take an extra page to write a full account of the manner in which he treated us and to detail the abuse the Commission and all State officers in general received. I came in for my share, as usual.

[Extract from Report for September, 1893.]

Throughout the month of September, I was on the launch in company with Deputies Wilson and Tunstead patroling the Sacramento and San Joaquin Rivers. * * * Deputy Wilson was called to the city on the 15th. Having received information that salmon was being sold to the farmers in the vicinity of Marsh Landing, Deputy Tunstead and myself procured a team and drove there. We found two men there who had sixty-five salmon in their possession. We immediately arrested them and brought them before Judge Gribble. They were convicted a few days later and fined $100 each.

[Extract from Report for January, 1894.]

January 3d, in company with Deputy Babcock, I left for the Sacramento and San Joaquin Rivers on the launch "Hustler." We arrived at Martinez that night and left the next morning patroling the river as far as Roe Island, thence through the "Cut-off," but without finding any violations, notwithstanding the fact that it had been reported that the fishermen in that vicinity were using small mesh-nets. * * *

There are no salmon being caught in the vicinity of Old River, but striped bass are taken here in large numbers. They are very plentiful in the upper San Joaquin and Mokelumne Rivers, one man having caught eight hundred pounds in one week. I did not see any one fishing for bass, but I am informed that all the fishermen in that vicinity use a four-inch mesh net in taking them. * * *

January 8th and 9th I spent in the vicinity of Pinole and Martinez. Large numbers of shad are being caught here, but no salmon.

REPORTS OF W. R. McFARLAND.

[Extract from Report dated Antioch, April 14, 1894.]

We left Martinez on board the launch "Hustler" at 8 A. M. on the 11th, and went through the "Cut-off," visiting the Black Diamond Cannery and boarding fishing boats on the drift, and at 6 P. M. went into Antioch for the night. We collected four licenses at camps in the

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"Cut-off," seven from boats on the drift, five at the Black Diamond Cannery, and two in Black Diamond, besides taking several orders during the day.

[Extract from Report dated Rio Vista, April 17, 1894.]

We left Antioch this morning at 8 o'clock and ran directly to Collinsville. In that vicinity I collected eighteen licenses from boats on the drifts.

From thence we proceeded up the river, collecting two at Sherman Island, two at Emmerton drift, and six near Rio Vista, making a total of twenty-eight for the day's work. About Collinsville to-day all of the boats were making good catches of salmon, and above that place they were doing fairly well.

[Extract from Report dated Antioch, April 29, 1894.]

Yesterday at 5 A. M. we left Bouldin Island and ran up Old River, as we were informed that there were Chinese engaged there in illegal work. We proceeded up Old River as far as its junction with Reclamation Canal, passing three Chinese camps en route, but without finding any evidence of the alleged illegal fishing. We then ran up the canal some four miles to Middle River, and descended the canal again to Old River, without results, however, and from there continued to the ferry at Bethany. After collecting two licenses there we again ascended the canal to the head of Middle River; from there we went into the San Joaquin and down that river to Bouldin Island, where we arrived at 10:30 in the evening, having failed to discover any illegal work on the part of any one, notwithstanding the representations to the contrary.

[Extract from Report dated May 5, 1894.]

Tuesday morning, May 1st, we left Courtland at 7 o'clock and proceeded up the Sacramento River, keeping a close watch for licenses which we had previously missed. At Clarksburg we found a number of boats delivering salmon, all seeming to have done well. The fish were of extra large size, one weighing fifty-nine pounds, which was the largest we saw on the trip.

[Extract from Report dated June 1, 1894.]

On May 8th, I went to Independence Lake to investigate the reported illegal fishing. My business was to "buy wood" in that vicinity. I secured all the information regarding the fishing that was going on there without exciting suspicion, and succeeded in seeing the fish brought in from the lake the next morning. The men agreed to take me with them on their return, and I went to the lake, put on snowshoes, and accompanied them to their holes in the ice, even going so far as to put a line in myself. It was very pleasant to hear them declare what satisfaction it would be to throw any one into the lake who might come there to interfere with their work. Having secured the necessary evidence to convict, I returned to Sierraville, where complaints were filed. The men were tried on May 16th, before a jury, and as is usual in such cases were found not guilty; however, I feel confident that they will not again engage in their illegal work. They, of course, denounced me roundly for having imposed upon them in not declaring my business.

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REPORTS OF ARTHUR G. FLETCHER.

[Extract from Report for August, 1893.]

Two so-called sportsmen, G. S—— and F. J. O——, drove to Glendale on August 2d for the purpose of shooting doves. Quail as well as doves were exceedingly plentiful where they were hunting, and they could not resist the temptation to shoot them also. Word of this was brought to me, and Deputy Sheriff Doyle and myself drove out to where they were and found the report to be well founded. They had in their possession seven quail. We arrested them and started for Los Angeles. On the way to Glendale they did their best to induce us to accept a bribe and let them go, and failing in this they concluded to get away if possible. They turned off the road at the first convenient point; and, to make my report as short as possible, I will simply say that when we caught them we were obliged to use force to bring them back to Glendale. During the attempted escape Deputy Sheriff Doyle was struck several times. I took S—— in the buggy with me and the Deputy Sheriff followed with O——. We were obliged to turn them over to the Sheriff, as it was too late to find a Justice when we reached Los Angeles. They were arraigned on the afternoon of the 3d and given until the next day to plead, in order that their attorney might file a demurrer to the complaint. The demurrer was overruled and the examination set for the 9th. On that day they were discharged, notwithstanding the fact that we produced a witness who saw them shoot the quail, and that both Doyle and myself testified to the finding of the birds in their possession. They themselves admitted having shot the quail, but claimed it was done by mistake, and that six out of the seven birds had been bagged at once. It would no doubt have been the same had there been three times as many birds. The matter, however, has not been dropped. I was summoned before the grand jury on the 21st, and am in hopes that body will find a bill against them.

[Extract from Report for September, 1893.]

I arrested J. W. H——, a fish dealer, on the 9th, for handling salmon during the close season. He was tried on the 16th and convicted, as he could not show that the salmon was "refrigerated" for any other reason than to keep it *fresh*. * * *

The quail hunters were indicted by the grand jury on the 18th. In order to gain time their attorney filed a demurrer stating that the indictment did not show that the birds had not been killed prior to the close season. This was argued on the 26th, and much to every one's surprise the demurrer was sustained. I am sure you will feel as relieved as your deputy when a case can be carried to the Supreme Court and thus forever settle these questions and determine the constitutionality of the game laws.

[Extract from Report for December, 1893.]

In making my usual daily visits to the markets I found that one of the largest dealers in meat in Los Angeles had several deer hung up in his market on the 1st. I purchased some, securing a bill of sale, and then had a talk with the proprietor, Simon Maier. I found that the deer had been shipped by him from Texas, but not before he had consulted with his attorney and corresponded with Wells, Fargo & Co. relative to the law in the case. He was confident that it would be impos-

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sible for us to convict him, but as the law seemed plain, I determined to file a complaint and press the matter. The case was argued at length on the 8th (the People being ably represented by Deputy District Attorney Conkling), and taken under advisement by Police Judge Seaman. He handed down his decision on the 12th, and held that the defendant was not guilty under the law. Mr. Maier was as anxious as myself to have the question settled, as other dealers were handling venison—and showing way-bills to prove that the deer came from Texas—and complaints were being made on every hand. In order to settle the matter it was stipulated that a complaint should be drawn alleging that the deer was legally killed in Texas and brought into California to be sold. This was filed on the 18th. Mr. Maier pleaded guilty, and his attorneys immediately applied to the Superior Court for a writ of habeas corpus. Briefs were filed by them and by the District Attorney. I at once set about securing evidence against the other dealers who are selling venison, and am prepared to bring suit as soon as the Maier case is settled in the Superior Court. Deputy District Attorney Conkling feels confident that the case will be decided in our favor. He has devoted much time to the preparation of our brief and has handled the case admirably throughout. I am very much pleased with the attention all of our cases have received at the hands of the District Attorney. * * *

As a whole this has been rather a bad month for fish in the Los Angeles market. They have been very scarce, except during the second week, and then more were received than could be handled to advantage. One market man has for some time been putting the surplus in cold storage, and this month he has found a ready sale for them. These fish, however, did not present a good appearance, and would probably have found no sale had there been fresh ones in the markets. Smelt and bastard halibut have been the principal kinds caught, with a few rock-cod and surf-fish. Prices, 8 to 10 cents per pound.

[Extract from Report for January, 1894.]

Besides continuing my investigations at San Pedro and Redondo, I have this month thoroughly examined the methods in use at Port Harford, Santa Barbara, Ventura, and Hueneme, besides getting a great deal of information relative to the catch, markets, seasons, etc. The details of this trip have already been reported.

[Extract from Report dated March 17, 1894.]

As noted in a previous report, on or about the 20th of February, and for several days thereafter, large numbers of fish were driven ashore from Santa Barbara as far south as Newport Beach, dead or in a stupefied condition, the greatest number being found at Santa Monica, Redondo, and Long Beach. Upon investigation it appears that they were almost entirely so-called deep-water fish, principally barracuda, yellow-tail, and halibut; and that, while many were indeed washed ashore, the number was far less than reported. Many of these were still alive when washed ashore; and, the next wave taking them out, they swam off in a lazy manner. At Santa Monica on February 25th there was a vast school of barracuda lazily swimming about the wharf near the surface, in such condition that they were being hooked for the market with all sorts of contrivances; and these schools were also noticed

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off shore in many other localities. They were seen to stick their snouts out of the water as if in quest of air.

Many theories were at once advanced, the chief ones being that the fish were diseased, that dynamite was being used by the Italian fishermen, and that there had been a subterranean explosion. We will consider these theories in the order named. The fish were found to be in good condition—firm and with bright gills—and in no instance have I been able to learn that they were soft, flabby, or rotten when first found, as would necessarily have been the case had they been diseased. The story of their being dynamited seems to have started at Long Beach, and going there I traced it through a Spanish boy, who had heard a noise at one point and seen a splash at another when coming from Catalina Island a year ago. This story had gained ground from the fact that fishermen casting a seine there had felt a shock while in the water and had attributed it to a dynamite explosion. There are off the coast of Redondo what may be called oil wells, and a kind of petroleum can be found along the shore there at any time. It seems reasonable to suppose that new wells may have broken out after a subterranean explosion, filling the water with gas and petroleum; and it is a fact that the coast captains have seen oil floating on the water in localities where it has never been found before. The water being mixed with oil must needs affect the fish, killing some and stupefying others.

I had the pleasure, when at San Diego on the 10th instant, of meeting Captain Tanner, of the United States Fish Commission steamer "Albatross," and he very kindly gave me much information on this subject. Mr. Miller, of the "Albatross," gave the matter a thorough investigation and found that the air bladder of some of the fish that he examined had been broken, and that all of them showed traces of petroleum in the gills. He said that a subterranean explosion must have taken place, killing many of the fish by breaking the air bladder, and causing the water to be filled with oil and gases which killed or stupefied others. It is a well-known fact that fish cannot live with oil in their gills.

The story that the fish were diseased gained much headway; and, as the fact became known that many of them were being shipped to the markets, it so frightened the people that they refused to buy or eat any kind of fish, and the trade was cut down more than one half in all the markets, and indeed the dealers still feel the effects to a great extent.

[Extract from Report for March, 1894.]

On the 22d, I met Deputy Richardson in Los Angeles and took charge of the young Eastern Brook trout consigned to the Santa Ana River. He delivered four cans and one case, and they contained the finest lot of fish that I have seen. I arrived at Redlands that evening at 5:15, where I found a wagon waiting for me. We drove fourteen miles up into the mountains, arriving at Skinner's about 10 o'clock. Deputy Gee was waiting there with burros. We placed the fish for the night under running water, and the next morning left for the Santa Ana with the four cans on the burros. I left the case with Deputy Skinner and he distributed the fry in Mill Creek and its tributaries.

It took us all day to cover the twenty miles, over the mountains, to "Seven Oaks," on account of the snow drifts, many of which were fifteen feet deep. The burros, of course, found it very hard work to get through these drifts with their heavy load. It was a hard trip. On the way

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over we put half a can in Mountain Home stream, a tributary of Mill Creek, and the rest were generally distributed in the Santa Ana and its tributaries. There was a loss of only nine fish in one can, and the total loss was about 1½ per cent, which I think is exceptionally good, considering the hard trip, and the fact that the fish were three days and nights on their journey from the hatchery to their future home. The Santa Ana is an admirable trout stream, and the Eastern trout should do well there. The temperature of the water is 38°, and there is no danger of it running dry. * * *

Prior to March 1st notice was given the market men of Los Angeles not to keep any game in cold storage during the close season, and I also notified the manager of the cold storage warehouse to have it removed before that time. * * * On my return from San Diego I again visited the warehouse on the 20th, accompanied by several witnesses, and found that there was one box of quail and a large number of ducks still there; so I arrested the manager and also the market man who owned the game. They were arraigned on the 27th, pleaded not guilty, and their cases were set for trial April 19th.

[Extract from Report for April, 1894.]

One more step has been taken in the Simon Maier deer case this month, and I now look for a speedy termination. Judge Smith of the Superior Court of Los Angeles County handed down his opinion, a copy of which has already been forwarded to you, on the 10th, refusing to grant a writ of habeas corpus. It was a great surprise to most people, and is a decision which has done much toward molding public sentiment and placing the work of your honorable Board in a more favorable light in the southern part of the State. Mr. Maier gave notice that he would apply to the Supreme Court of the State for a writ of habeas corpus, and I understand that the petition was filed with the Clerk of that Court on the 16th. I am told we may look for a decision in from sixty to ninety days.

It was agreed with Maier at the time of his arrest that the other dealers should not be allowed to sell venison while he was forced to stand the expense of testing the law. With the aid of Deputy Gee, I secured the necessary evidence to convict the others while the venison was being handled. Complaints were filed on the 11th against F. Haniman and two others. The latter two pleaded guilty at once and were fined $20 each. Haniman asked to have his case set ahead until the Supreme Court could pass upon Maier's case, and this was done. * * *

The cold storage case came up on the 19th. Mr. Haniman, the market man, admitted the facts in the case and asked to have it continued until a decision could be rendered in the Maier deer case. As the same points are involved in both cases, I consented to this, and it was set for June 21st.

[Extract from Report for May, 1894.]

I made the rounds of the markets every morning looking for violations of the laws, and on the 17th I arrested Ah Lay in Washington Alley for having offered a lot of young cod, three and four inches in length, for sale. He was tried the same day in Judge Campbell's Court, found guilty, and sentenced to pay a fine of $100 or go to jail. He had no money and went to jail.

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REPORTS OF JAMES A. RICHARDSON.

[Extract from Report dated July 31, 1893.]

Inclosed please find statement of the quota of salmon eggs received from United States salmon station on the McCloud River and the hatching of the same at the Sisson Hatchery for the season of 1892–93. The first shipment of the season, 300,900 ova, was received October 11, 1892. This was the only shipment of the summer run received; the ova were remarkably perfect in every way. They were all hatched October 25th, and retained in the hatchery boxes for four months, with a total loss of less than 1 per cent. The first shipment of the eggs of the late run was received December 1st, and there were five shipments in all. The entire lot of eggs were hatched with a loss of 6 per cent. After being taken from the hatchery boxes they were retained in the nursery ponds until they were on an average about four months old. After the screens were removed many remained of their own free will until they were ten months old and were exceedingly healthy and lively, becoming very tame and feeding out of one's hand. At this age they would vary from two to four inches in length. These ponds were connected with the Sacramento River, two miles away, by Cold Creek, and by this means the fry eventually found their way to the ocean.

[Extract from Report dated January 24, 1894.]

As an experiment, 2,000 ova were obtained from a Dolly Varden (*Salvelinus malma*) and crossed with the *Salmo fontinalis*—the first time the cross has been made—and it was entirely successful. These fry are held near the Sisson Hatchery, and at one year of age they were very healthy and vigorous, and as black as night.

[Extract from Report for July, 1893.]

In feeding the fry, about fifty gallons of milk and over four hundred pounds of liver have been consumed. We would have used twice as much meat had it been possible to obtain it, but we were obliged to send out of town for nearly all that we used. On the 15th C—— Brothers were arrested for running sawdust into the Shasta River, and they were tried by a jury in Judge Autenriech's Court and acquitted. The jury came to the quick conclusion that every possible effort was being made to prevent sawdust from getting into the creek.

[Extract from Report for September, 1893.]

Acting under your instructions, I went to Pokegama on the 21st, to repair and make any changes necessary, and to build an addition to the fishway. This fishway was built when the river was at high-water mark, and of necessity was left incomplete, being minus three riffles which would bring it down to low water, thus making it impossible for the salmon to surmount the first riffle. Strange as it may seem, trout went over this riffle with less trouble and fuss than salmon. * * * The present addition makes the fishway seventy-six feet long, with a grade one foot in six, and seems to serve the purpose in as satisfactory a manner as could be wished for.

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REPORTS OF W. H. SHEBLEY.

[Extract from Report dated August 14, 1893.]

Acting under your instructions, Deputy Hunt and myself proceeded to Independence Lake to take ova there. We arrived at the lake on June 7th and found it two thirds covered with ice. We started from Boca on the 1st, but could not get any nearer that day than Corey's Station, four miles distant, on account of the snow, which covered the ground to a depth of from three to six feet. The market fishermen were fishing through the ice, which was still strong enough to enable them to go on it without danger. From early spring until the ice gets too soft, the market fishermen take a great many trout. They cut holes through the ice and fish with short hand lines. Nearly all the fish taken this way are males. The females at this season are heavy with ova, and naturally feed on the bottom. The males, as the spawning season approaches, become restless and active, swimming near the surface, where they are caught and shipped to market. This method of fishing is fast depleting our mountain lakes, and especially Independence Lake, because it is comparatively easy of access. The fish are carried from here on hand sleds over the snow before the roads are opened.

We opened the road on the 10th of June, and took our material for the trap down to the lake. We immediately commenced work on it, and in four or five days had it secured. The bed of the creek is of sand and fine gravel, and it was very difficult to make the trap tight. The fish commenced running on the 28th of June. From this day to the 31st of July we caught 842 fish, of which record was kept. We caught quite a number of others and put them above the trap, as they were not of any use to us. There was a great preponderance of female fish over males, about twenty females to each male. We took 124,325 ova. When we could not get males, we agreed to stock Warren Lake with 10,000 eggs, provided the fishermen would give us the use of all the males they caught. As they were desirous of having this lake stocked, they agreed to this and gave us all they caught, which was only about a couple of dozen. We kept our word with them and stocked the lake on July 30th.

[Extract from Report dated September 30, 1893.]

I wish here to acknowledge the aid and many courtesies extended to the Commission by applicants for fish. Almost without exception, teams have been in waiting upon our arrival to transport the fish from the railway stations to the water. In several instances, where the streams were located in almost inaccessible places, the applicants would work for hours carrying the cans to the water. In every place we visited, the people gave us a welcome and seemed more than ever to appreciate the work of the Commission.

[Extract from Report dated November 5, 1893.]

Since my last report, conditions strange and heretofore unknown to me have come to the salmon alevins in this hatchery. Two or three days after hatching, a white spot appears on the right side of the body on a line directly below the dorsal fin, at a place where the umbilical sac and body unite. It is about the size of No. 6 shot and is disc-shaped. The umbilical sac is covered with small brown spots about the

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size of a pin point. As soon as I discovered this strange condition, I immediately commenced a thorough examination to see if I could find the cause. The troughs, tanks, and all parts of the water system were kept thoroughly clean and everything was done that was possible to aid in the prevention of the growth of fungus. I tried every experiment that I could think of to discover fungus either on the troughs or on the alevins and ova, but failed to find any. The appearance of the alevins led me to think that the eggs had been roughly handled during their transportation here. Hon. Livingston Stone, Superintendent of the United States Hatchery on the McCloud River, who is authority on the diseases of fish, accompanied by Chief Deputy Babcock, arrived here day before yesterday, and after a careful examination of the alevins and ova and the general condition of the hatchery, Mr. Stone concurs with me in my opinion that the cause is rough handling in transporting the spawn. He found no fault with our method of hatching and said no blame could be attached to us as far as the work of the hatching was concerned. It is now ten days since the first appearance of this condition and no deaths have resulted as yet. I think the greater number will outgrow it.

[Extract from Report dated December 1, 1893.]

I am glad to say that the queer disease which seem to have affected the salmon shortly after they were hatched out was entirely outgrown by them and the fish became strong and vigorous.

[Extract from Report dated January 12, 1894.]

The salmon ova of the fall run which is now in the hatchery are coming out in fine condition and the tank nurseries are doing good service. We place the alevins in them as soon as they are hatched, and when large enough we will distribute a number of them in the streams of this vicinity, as we have not nursery room enough for all of them. We have received from the late fall run of salmon 6,300,000 eggs. Our estimate is a little larger than Mr. Stone's, as we overrun his measure. We received 1,734,000 eggs from the early run, which makes a total for the season of 8,034,000 eggs, the largest hatch ever undertaken by the California Fish Commission.

[Extract from Report dated March 23, 1894.]

On the 19th of February, I proceeded to open Shovel Creek eyeing station, after getting the traps, weirs, and eyeing apparatus in order. I placed Mr. E. T. Sullivan in charge of the work of taking spawn.

February 26th, the fish were running in considerable numbers and the work of taking spawn began. From that day up to the 11th instant 500,000 eggs were taken. The water turned cold and stormy and the fish stopped running on the 14th. From the 14th to the 20th it stormed continuously, and on the 15th the water became so high in Shovel Creek that a section of the trap had to be cut out to save it from being entirely washed away. It did no material damage, except the extra labor in repairing it. The weather is now getting warmer and a run of fish may be looked for in a few days.

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[Extract from Report dated March 31, 1894.]

I send you with my report for March the record of work taking trout spawn at Shovel Creek station. For convenience I have added to the table the record of three days' work in February.

Record of Work Taking Trout Spawn at Shovel Creek Station, Beswick, Siskiyou County, for month of February and March, 1894.

1894.	Trout Taken—A. M.		Trout Taken—P. M.		Trout Spawned.		Number of Eggs.	Water Temperature.		Remarks.
	M.	F.	M.	F.	M.	F.		Lowest.	Highest.	
Feb. 26	17	16	----	----	----	----	----------	38	40	---------- Clear.
27	25	25	----	----	----	----	----------	38	44	---------- Clear.
28	152	140	----	----	25	22	45,000	37	45	---------- Raining.
Mar. 1	52	48	32	30	42	35	50,000	37	41	------ Wind southeast; raining P. M.
2	12	15	10	10	35	21	20,000	36	37	---------- Snow, four inches A. M.
3	----	----	----	2	----	----	----------	33	37	---------- 8° above zero.
4	2	----	----	----	----	----	----------	37	39	-- Two inches of snow during night.
5	----	----	----	----	20	15	15,200	37	38	-- Two inches snow, hard wind P. M.
6	----	----	----	----	----	----	----------	34	42	---------- No fish, morning cold.
7	4	13	----	----	58	18	25,000	39	40	---------- Rain and snow.
8	----	----	8	21	----	----	----------	40	42	---------- Fish running P. M.
9	30	76	14	41	40	96	110,000	38	40	---------- Rained during night.
10	9	16	10	23	45	40	65,000	38	41	---------- Cloudy all day.
11	22	28	33	65	18	36	45,000	40	43	---------- Clear.
12	42	53	----	----	90	105	170,000	40	44	---------- Clear A. M., cloudy P. M.
13	90	99	----	----	40	69	105,000	40	42	---------- Squall A. M., clear P. M.
14	19	14	----	----	10	11	10,000	38	43	---------- Creek rising.
15	29	27	1	7	8	12	15,000	40	42	---------- Heavy rain, creek rising.
16	1	3	----	----	6	7	7,000	38	40	---------- Squally with sunshine.
17	----	----	----	----	----	----	----------	37	40	---------- Changeable; trap went out.
18	----	----	----	----	----	----	----------	38	41	---------- Two inches snow.
19	----	----	----	----	----	----	----------	37	39	---------- Snowing all day; repaired trap.
20	----	----	----	----	----	----	----------	37	42	---------- Clearer to-day.
21	----	----	6	7	5	6	9,000	37	42	---------- Clear all day, north wind.
22	1	2	4	2	5	5	7,000	37	43	---------- Cold and clear, north wind.
23	3	7	7	13	6	5	7,000	38	44	---------- Clear and warm, creek rising.
24	10	17	14	15	10	18	20,000	39	46	---------- Clear, warm spring day.
25	10	19	18	32	----	----	----------	39	46	---------- Warm, creek still rising.
26	7	21	8	49	15	39	45,000	40	47	---------- Showers P. M.
27	14	48	16	27	20	23	25,000	42	46	---------- Creek rising, wind south P. M.
28	----	----	5	19	8	11	10,000	42	46	---------- Water high in creek; raining.
29	----	----	----	----	----	----	----------	42	42	---------- Rain; creek very high.
30	----	----	----	----	----	----	----------	40	44	---------- Warm, high water.
31	----	----	----	----	16	28	35,000	40	44	---------- Changeable.
Totals	551	686	188	373	523	622	840,200			

[Extract from Report dated June 7, 1894.]

The Shovel Creek eyeing station was closed on the 4th instant. The fry that were hatched there, 120,000 in number, were distributed in Shovel Creek on the 1st and 2d. The Klamath River is higher than it has been for years. The crib at the mouth of Shovel Creek was carried away by the water several days ago.

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REPORTS OF E. W. HUNT.

[Extract from Report dated Olema, March 31, 1893.]

The weather has been very severe for the greater part of the month, the creeks in the neighborhood being very high and roiley. Cold Stream, which is usually very clear, was roiley for a week, and it was very hard to see the fish in the hatchery. After the weather cleared up and I could make an examination I found that the condition of the water had not made any material difference in the loss, which, up to date, is about 1¼ per cent. I commenced feeding on the 10th. The fish have begun to feed and are doing very well. I received a list of applications from your honorable Board and orders to get my cans in readiness to start in shipping as soon as the fish were large enough. I began shipping at once and will continue the work until the fish are all out of the building, when I will report in full, giving the names of applicants, number of fish, streams, and location of same.

[Extract from Report dated Carson City, January 15, 1894.]

Acting under your instructions, I started for Carson City, Nevada, on October 7th, for the purpose of taking Eastern Brook trout (*Salmo fontinalis*) spawn. * * *

On the 19th I met Mr. Close, Superintendent of the Carson Hatchery, who was to accompany me and coöperate in the work of securing this spawn. We started for Marlett Lake, fifteen miles distant, over a very rough road. On our arrival we commenced repairing the seine and impounding weir to hold fish in until the time to take spawn. From the 20th to the 27th we fished with varying success, depending on the condition of the weather and the run of the fish. When the weather was stormy or very cold the fish did not run. The total number of fish caught during this interval was 950. On the 27th we examined the fish in the weir and stripped 103 ripe females for our share, and started with the ova for the hatchery at Carson. * * * From the 13th to the 16th we caught 134 fish, and stripped 78 for our share. The weather was now very threatening, and the indications were that there would be a big storm. On the 15th the lake was frozen over with ice to a depth of 1¾ inches. At this season of the year a heavy fall of snow may be expected at any time, and if we were caught it would be very difficult to get the spawn, apparatus, and even ourselves from the lake. Mr. Close thought it advisable for us to pack up our things and start for Carson, which we did. The maximum temperature at the Carson Hatchery was 45° and the minimum 39°; average, 42°. The loss in carrying green spawn to the hatchery was 2½ per cent, which left us a total of 316,875. * * * The loss in Carson during the eyeing process was 6 per cent, leaving a balance of 297,862. I made three shipments in all, 206,862 going to the Bear Valley Hatchery and 91,000 to the Sisson Hatchery. The Hon. George T. Mills was kind and courteous to us, and lent us all the assistance in his power.

[Extract from Report dated March 31, 1894.]

January 17th, I arrived at Bear Valley Hatchery and found the ova and young fish in Mr. Allen's care doing as well as could be expected under the circumstances, as the weather had been very stormy and threat-

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ening. Upon examination I found the dam full of gravel and debris. It needed to be cleaned immediately, which was done. In a few days there was a much worse storm, which filled the dam and reservoir with gravel and sediment again, causing the work of cleaning, etc., to be repeated. * * *

From January 25th to February 1st, the weather was pleasant. The last ova hatched on February 1st. The young fish are doing very well and look strong and healthy, although they are growing rather slowly, on account of the water being so very cold. I commenced to feed the oldest fish on February 13th.

[Extract from Report dated Carson City, April 5, 1894.]

I arrived in Carson yesterday, and have made arrangements to have my paraphernalia taken to Tahoe to-morrow. The road is not yet open all the way for wagons. I go over half the way by wagon, and from there by sleigh. There is no chance to get in by Truckee for at least one month. There are quite a number of fish in the Truckee River, and parties about Reno are catching nice strings.

[Extract from Report dated Tahoe City, August 1, 1894.]

April 2d: Acting under your instructions, I started with my assistant, Mr. F. C. Boyce, to open the Tahoe Hatchery for the purpose of taking *Salmo mykiss* ova.

April 6th: Started from Carson City for Tahoe by way of Glenbrook. The mountains are still covered with snow, making it necessary to transfer the load several times from wagon to sleigh. After a very hard trip we arrived at Glenbrook, and that night went from there by steamer to Tahoe City.

April 7th: Inspected the buildings and found them in a very good state of preservation, although the inside of the hatchery was in a very bad condition, owing to its long idleness. The troughs, etc., were badly warped and checked, and all had to be re-nailed, caulked, and painted. * * *

April 12th: Commenced seining, and continued until May 5th. Caught in the above period in the neighborhood of 2,300 trout. They averaged 1½ pounds to the fish, and were about equally divided as to sex. They averaged 2,000 eggs to the fish, making 2,300,000 eggs taken at that station. The eggs were transported to the hatchery in eight lots—three by steamer and five in a row-boat. It took us six hours to make the trip by row-boat. The loss in transporting the green spawn to the hatchery was 2 per cent. Finished operations and moved seine, cars, etc., to Blackwood Creek, which was the next point of operation. * * *

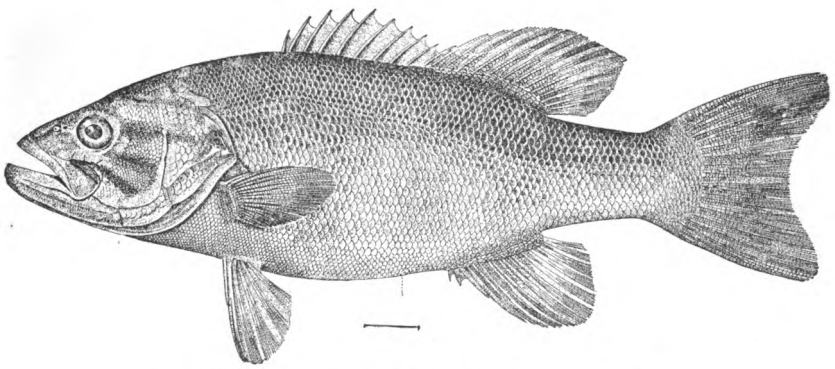
June 22d: The trap was completed and the first fish caught. From that date until July 24th, we had varying success with the trap, and caught on an average of thirty fish per day. The run of this year compares favorably with that of four years ago, when we last took spawn at that point. We took 850,000 eggs, making a grand total for the season of 3,150,000. The alevins were strong and healthy and developed very fast. The loss at Blackwood up to date has been very light. The shipping report will follow as soon as the work is completed.

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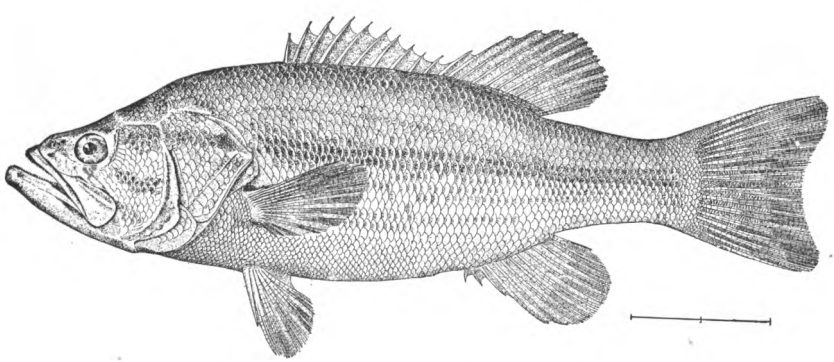
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SMALL-MOUTHED BLACK BASS. *Micropterus Dolomien.*



LARGE-MOUTHED BLACK BASS.—*Micropterus Salmoides.*

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FISH DISTRIBUTION.

DISTRIBUTION OF THE SUMMER AND FALL TAKE OF SALMON—1892.

Date.	Distribution.	Number of Fish.
1893.		
April 1..	Allowed to escape at will from nursery ponds into Sacramento River, via Cold Creek	2,554,450

DISTRIBUTION OF THE SUMMER TAKE OF SALMON—1893.

Date.	Distribution.	Number of Fish.
1893.		
Nov. 13..	Wagon Valley Creek	125,000
Nov. 13..	Cold Creek	125,000
Nov. 13..	Sulloway Creek, at junction of Cold Creek	125,000
Nov. 13..	Sulloway Creek, at P. Klink's ranch	128,000
Nov. 14..	Sulloway Creek, at junction of Big Spring Creek	120,000
Nov. 14..	West Fork Sacramento River, between Stevens' Bridge and Box Cañon	195,000
Nov. 14..	Sulloway Creek, near County Road Bridge	130,445
Nov. 15..	Wagon Valley Creek, above Sulloway's ranch	110,000
Nov. 15..	Cold Creek, near Williams' ranch	110,000
Nov. 15..	Sulloway Creek, below County Road Bridge	110,000
Nov. 15..	Castle Creek	112,000
Nov. 16..	Cold Creek, near Odell's	100,000
Nov. 16..	Sulloway Creek	50,000
Nov. 16..	Sacramento River, at 18th Crossing California and Oregon Railroad	106,230
Nov. 23..	Sulloway Creek	39,640
	Total	1,686,315

DISTRIBUTION OF FALL TAKE OF SALMON—1893.

Date.	Distribution.	Number of Fish.
1894.		
Jan. 20..	Big Spring Creek	100,000
Jan. 21..	Cold Creek, near Odell's	100,000
Jan. 21..	Sulloway Creek, at junction of Cold Creek	100,000
Jan. 21..	Big Spring Creek	100,000
Jan. 22..	Cold Creek	100,000
Jan. 22..	Big Spring Creek, at junction of Sulloway Creek	100,000
Jan. 22..	Sacramento River	100,000
Jan. 22..	Wagon Valley Creek	100,000
Jan. 23..	School-house Creek	100,000
Jan. 23..	Cold Creek, at Williams' ranch	100,000
Jan. 23..	Sulloway Creek, at junction	80,000
Jan. 23..	Wagon Valley Creek	120,000
Jan. 26..	Sacramento River	100,000
Jan. 26..	Junction of Sulloway and Cold Creeks	100,000
Jan. 28..	Wagon Valley Creek	100,000
Jan. 30..	Sacramento River	100,000
Feb. 1..	Junction of Sulloway and Cold Creeks	150,000
Feb. 1..	Wagon Valley Creek	150,000
Feb. 3..	Sacramento River	150,000
Feb. 5..	Sacramento River	150,000

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DISTRIBUTION OF FALL TAKE OF SALMON, 1893—Continued.

Date.	Distribution.	Number of Fish.
Feb. 12..	Big Spring Creek	150,000
Feb. 13..	School-house and Sulloway Creeks	150,000
Feb. 24..	Cold Creek, below bridge	150,000
Feb. 26..	Sulloway Creek	150,000
Feb. 26..	Sacramento River	200,000
Feb. 27..	Sacramento River	100,000
Feb. 27..	Castle Creek	100,000
Feb. 28..	Castle Creek	100,000
Feb. 28..	Sacramento River, near 18th Crossing	100,000
Mar. 3..	Sulloway Creek, at Klink's ranch	100,000
Mar. 3..	Sulloway Creek, at junction	100,000
Mar. 3..	School-house Creek	100,000
Mar. 3..	Cold Creek	100,000
Mar. 6..	Cold Creek	100,000
Mar. 6..	Sacramento River, near 18th Crossing	200,000
Mar. 7..	Castle Creek	100,000
Mar. 7..	Big Spring Creek, at junction	100,000
Mar. 8..	Castle Creek	100,000
Mar. 8..	Sacramento River	100,000
Mar. 9..	Sulloway Creek, at junction	140,000
Mar. 9..	Sacramento River, near 18th Crossing	180,000
Mar. 9..	Wagon Valley Creek	100,000
Mar. 23..	Placed in Sisson Lake and released from time to time	1,170,084
	Total	6,090,084

DISTRIBUTION OF EASTERN BROOK TROUT (*Salvelinus fontinalis*) FROM BEAR VALLEY HATCHERY, SPRING OF 1893.

Date.	Distribution.	Number of Fish
1893.		
April 4..	Paper Mill Creek, Marin County	10,000
April 4..	Lagunitas Creek, Marin County	10,000
April 5..	Dry Creek, Napa County	2,000
April 5..	Napa Creek, Napa County	2,000
April 5..	Rector Creek, Napa County	2,000
April 5..	Milliken Creek, Napa County	4,000
April 8..	Little Castle Creek, Siskiyou County	25,000
April 10..	San Lorenzo River and tributaries, Santa Cruz County	5,000
April 16..	East and West Austin Creeks, Sonoma County	10,000
April 18..	Big Sulphur Creek, Sonoma County	10,000
April 18..	Little Sulphur Creek, Sonoma County	10,000
April 20..	Lake north of Towle Station, Placer County	5,000
April 20..	Blue Cañon Creek, Placer County	5,000
April 20..	South Fork American River, Placer County	5,000
April 20..	South Fork Yuba River, Placer County	10,000
April 25..	Kern River, Kern County	10,000
April 28..	Tule River, Tulare County	10,000
May 1..	Donner Creek, Nevada County	10,000
May 1..	Prosser Creek, Nevada County	5,000
May 1..	Alder Creek, Nevada County	5,000
May 5..	Yosemite Valley streams	25,000
May 17..	Santiago Creek, Orange County	10,000
May 17..	Trabuco Creek, Orange County	10,000
May 17..	Lake Hemet, Riverside County	1,000
May 17..	Brown's Creek, tributary to San Gabriel River, Los Angeles County	3,000
May 17..	Creel Club Creek, tributary to San Gabriel River, Los Angeles County	10,000
May 17..	Bear Creek, tributary to San Gabriel River, Los Angeles County	12,000
	Total	226,000

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DISTRIBUTION OF EASTERN BROOK TROUT (*Salvelinus fontinalis*) FROM SISSON HATCHERY, DURING SUMMER OF 1893.

Date.	Distribution.	Number of Fish.
1893.		
June 15..	Angel Creek, tributary to McCloud River	8,000
June 26..	Headwaters Trinity River	2,000
June 30..	Castle Lake, Siskiyou County	3,000
July 1..	Butte Creek, Siskiyou County	1,500
Sept. 2..	Stevens Creek, Siskiyou County	500
Sept. 5..	Shovel Creek, Siskiyou County	2,500
Sept. 24..	Castle Lake, Siskiyou County	2,500
Oct. 4..	Squaw Creek, tributary to McCloud River	3,500
Nov. 1..	Antelope Creek, Siskiyou County	2,000
	Total	25,500

DISTRIBUTION OF EASTERN BROOK TROUT (*Salvelinus fontinalis*) FROM BEAR VALLEY HATCHERY, DURING MARCH AND APRIL, 1894.

Date.	Distribution.	Number of Fish.
1894.		
March 2..	South and Middle Forks Kaweah River	20,000
March 5..	East and West Austin Creeks, Marin County	10,000
March 7..	Kern River and tributaries	2,500
March 8..	Pauma Creek, San Diego County	10,000
March 8..	Lake Hemet, Riverside County	10,000
March 11..	Garcia Creek, Monterey County	7,500
March 11..	Carmelo River, Monterey County	7,500
March 14..	Four headwater tributaries to Ventura River	7,500
March 16..	Dry, Napa, and Milliken Creeks, Napa County	10,000
March 17..	Sulphur Creek, Sonoma County	5,000
March 17..	Pieta Creek	5,000
March 22..	Santa Ana River and tributaries, San Bernardino County	12,500
March 22..	San Gabriel River and tributaries, Los Angeles County	10,000
March 22..	Agua Blanco and tributaries, Ventura County	2,500
March 27..	Little Sulphur Creek, 6 miles above Geyserville	10,000
March 30..	Cold Stream, tributary to Donner Creek	20,000
March 30..	Blue Cañon Creek, Placer County	2,500
March 30..	North Fork of American River, Placer County	2,500
March 30..	Main Fork of American River, Placer County	2,500
April 7..	North Fork of Fresno, tributary to San Joaquin River	5,000
April 7..	Chowchilla River, tributary to San Joaquin River	2,500
April 7..	Headwaters Merced River, above Wawona	15,000
	Honolulu, Hawaiian Islands	1,000
	Total	181,000

DISTRIBUTION OF EASTERN BROOK TROUT (*Salvelinus fontinalis*) FROM SISSON HATCHERY, SPRING OF 1894.

Date.	Distribution.	Number of Fish.
1894.		
May 9..	Shovel Creek, Siskiyou County	25,000
June 21..	McCloud River	20,000
July 6..	Big Spring and Cold Creeks, Siskiyou County	10,000
July 10..	Sacramento River	30,000
	Total	85,000

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DISTRIBUTION OF RAINBOW TROUT (*Salmo irideus*) FROM SISSON HATCHERY, DURING SUMMER OF 1893.

Date.	Distribution.	Number of Fish.
1893.		
July 30	Carmelo River, Monterey County	20,000
Aug. 2	Truckee River, Placer County	20,000
Aug. 5	North Fork of American River	10,000
Aug. 5	South Fork of Yuba River, Placer County	10,000
Aug. 8	Soda Creek, Shasta County	20,000
Aug. 8	Transferred to nursery ponds	75,000
Aug. 9	Napa River and tributaries, Napa County	10,000
Aug. 12	Sonoma Creek, Sonoma County	20,000
Aug. 15	Cache Creek, Yolo County	10,000
Aug. 16	South and Middle Forks of Tule River, Fresno County	10,000
Aug. 18	Nursery ponds	30,000
Aug. 18	Tributaries to Eel River	13,000
Aug. 20	Nursery ponds	50,000
Aug. 21	Pickens Creek, Los Angeles County	10,000
Aug. 21	Malibu Creek, Los Angeles County	5,000
Aug. 21	San Antonio Creek, Los Angeles County	10,000
Aug. 23	Mark West Creek, Napa County	20,000
Aug. 25	Nursery ponds	62,000
Aug. 27	Austin Creek, Sonoma County	20,000
Aug. 27	Ward Creek, Sonoma County	10,000
Aug. 29	Susser Creek, Monterey County	10,000
Aug. 30	Los Baños Creek, Santa Clara County	10,000
Aug. 30	Slagas Creek, Santa Clara County	10,000
Aug. 30	Nursery pond	75,000
Sept. 3	Kaweah River, Tulare County	15,000
Sept. 3	Kern River, Kern County	10,000
Sept. 3	Santa Paula Creek, Ventura County	10,000
Sept. 3	See-Saw Creek, Ventura County	5,000
Sept. 9	Cucamonga Creek, Los Angeles County	10,000
Sept. 9	White Water Creek, San Bernardino County	10,000
Sept. 9	Strawberry Creek, Riverside County	10,000
Sept. 12	Pauma Creek, San Diego County	10,000
Sept. 12	Big and Alder Creeks, Nevada County	20,000
Sept. 27	Bolivar Creek, San Mateo Creek	20,000
Oct. 1	Sacramento River, near Sisson	10,000
Oct. 2	Carmelo River, Monterey County	12,500
Oct. 2	Junction Carmelo River and Los Gatos Creek, Monterey County	7,500
Oct. 11	Tributaries Sacramento River	64,000
	Total	754,000

DISTRIBUTION OF RAINBOW TROUT (*Salmo irideus*) FROM SISSON HATCHERY, DURING SUMMER OF 1894.

Date.	Distribution.	Number of Fish.
1894.		
June 2	Shovel Creek, Siskiyou County	70,000
June 3	Shovel Creek, Siskiyou County	50,000
June 13	Shelly Creek, tributary to Smith River, Del Norte County	5,000
June 13	Patricks Creek, tributary to Smith's River, Del Norte County	15,000
June 13	Lake Earl, Del Norte County	2,500
June 13	Moscher Creek, tributary to Elk River, Del Norte County	2,500
June 15	Huckleberry Creek, Siskiyou County	30,000
June 16	Angel Creek, Siskiyou County	25,000
June 17	McCloud River, below the Falls	25,000
June 18	Squaw Creek, tributary to McCloud River	25,000
June 19	McCloud River, near Horseshoe Bend	25,000
June 25	Los Uvas, Santa Clara County	15,000
June 25	Pajaro River, Santa Clara County	15,000
June 25	Elk Creek, Siskiyou County	5,000
June 28	Sacramento River, near Smithson	20,000
June 28	Soda Creek, Shasta County	14,000
June 29	Sulloway Creek, Siskiyou County	25,000
June 30	Castle Creek, Shasta County	28,000

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DISTRIBUTION OF RAINBOW TROUT FROM SISSON HATCHERY—Continued.

Date.	Distribution.	Number of Fish.
June 30..	Sacramento River, near Castella	20,000
July 2..	Sacramento River, near Box Cañon	50,000
July 6..	School-house Spring Creek, Siskiyou County	25,000
July 6..	Cold Creek, below Odell's, Siskiyou County	14,000
July 13..	Wagon Valley Creek, Siskiyou County	25,000
July 27..	Junction of Sulloway and Cold Creeks, Siskiyou County	50,000
July 27..	Sacramento River, near Dunsmuir	30,000
July 27..	Castle Creek, Shasta County	20,000
July 27..	Paper Mill Creek, Marin County	15,000
July 27..	Laguinitas Creek, Marin County	10,000
Aug. 3..	Castle Lake, Trinity County	20,000
Aug. 3..	Sacramento River, near Castle Crag	20,000
Aug. 6..	Shasta River, Siskiyou County	2,000
Aug. 6..	Sacramento River, near Smithson	20,000
Aug. 6..	Sacramento River, near Castle Crag	15,000
Aug. 6..	Soda Creek, Shasta County	15,000
Aug. 9..	Sacramento River, near Dunsmuir	30,000
Aug. 10..	Sulloway Creek, near Klinks, Siskiyou County	22,000
Sept. 28..	Cold Creek, Siskiyou County	10,240
	Total	810,240

DISTRIBUTION OF RAINBOW TROUT (*Salmo irideus*) FROM TAHOE HATCHERY DURING SUMMER OF 1894.

Date.	Distribution.	Number of Fish.
1894.		
July 6..	Truckee River, 2½ miles below Tahoe City	75,000
July 18..	Truckee River, ½ mile below Tahoe City	15,000
July 28..	Bear and Squaw Creeks, tributary to Truckee River	25,000
Aug. 5..	Fallen Leaf Lake and Taylor Creek, Tallac	36,000
Aug. 6..	Cascade Lake, Tallac	30,000
Aug. 11..	Fallen Leaf Lake, Tallac	34,000
Aug. 13..	Lake near Alta, Placer County	15,000
Aug. 14..	Blackwood Creek, tributary to Lake Tahoe	15,000
Aug. 15..	Bear Creek, tributary to Truckee River	10,000
Aug. 15..	Five Lakes Creek, tributary to Middle Fork of American River	15,000
	Total	270,000

DISTRIBUTION OF INDEPENDENCE LAKE TROUT (*Salmo mykiss*) FROM SISSON HATCHERY, DURING SUMMER OF 1893.

Date.	Distribution.	Number of Fish.
1893.		
Sept. 18..	Marble Fork, tributary to Kaweah River	20,000
Sept. 19..	Shovel Creek, tributary to Klamath River	3,000
Sept. 24..	Castle Lake, Siskiyou County	3,000
Sept. 25..	Various streams in Yosemite Valley	25,000
Sept. 30..	Lake Hemet, Riverside County	10,000
Oct. 2..	Russian River, Mendocino County	25,000
Oct. 5..	American River, near Placerville	10,000
	Also Distributed from Independence Lake.	96,000
July 30..	Warren Lake, Nevada County	10,000
	Total	106,000

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DISTRIBUTION OF CUT-THROAT TROUT (*Salmo mykiss*) FROM SISSON HATCHERY, DURING SUMMER OF 1894.

Date.	Distribution.	Number of Fish.
1894.		
June 25..	Las Uvas Creek, Santa Clara County	10,000
June 25..	Pajaro River, Santa Clara County	5,000
June 25..	Coyote Creek, Santa Clara County	5,000
June 28..	Sacramento River, near Dunsmuir	6,000
June 30..	Cold Creek, Siskiyou County	50,000
June 30..	Wagon Valley Creek, Siskiyou County	50,000
July 2..	West Fork of Sacramento River, Siskiyou County	50,000
July 2..	Sulloway Creek, Siskiyou County	80,000
July 3..	West Fork of Sacramento River, Siskiyou County	20,000
July 5..	Junction of Cold and Sulloway Creeks	64,000
July 6..	Spring Creek, Siskiyou County	20,000
July 7..	McCloud River, Siskiyou County	50,000
July 9..	Wagon Valley Creek, Siskiyou County	34,000
July 13..	Sacramento River, near Box Cañon, Siskiyou County	75,000
July 27..	Streams and lakes in Yosemite Valley	25,000
July 31..	Sacramento River, near Smithson	40,000
Aug. 2..	North Fork of Kaweah River tributary, Tulare County	10,000
Aug. 2..	East Fork of Kaweah River tributary, Tulare County	15,000
Aug. 2..	Tule River, Tulare County	25,000
Aug. 5..	Rector Creek, Napa County	5,000
Aug. 5..	Hagen's Creek, Napa County	5,000
Aug. 5..	Dry Creek, Napa County	10,000
Aug. 5..	Milliken Creek, Napa County	10,000
Aug. 5..	Sarcos Creek, Napa County	10,000
Aug. 5..	Napa Creek, Napa County	10,000
Aug. 6..	Griffens Creek and Shasta River, Siskiyou County	5,000
Aug. 7..	Pluton River, Sonoma County	25,000
Aug. 7..	Sulphur Creek, Sonoma County	25,000
Aug. 10..	Sacramento River, near Castle Crag	20,000
Aug. 10..	Soda Creek, Shasta County	10,000
Aug. 10..	Castle Creek, Shasta County	10,000
Aug. 13..	Strawberry Lake, Golden Gate Park, San Francisco	25,000
Aug. 13..	Arroyo Valle, Alameda County	25,000
Aug. 13..	San Lorenzo River, Santa Cruz County	25,000
Aug. 18..	Soquel Creek, Santa Cruz County	15,000
Aug. 18..	Los Gatos Creek, Santa Clara County	10,000
Aug. 21..	Mill Creek, tributary to Kings River, Fresno County	5,000
Aug. 21..	Middle Fork of Kaweah River, Tulare County	5,000
Aug. 21..	Clover Creek, tributary to Middle Fork of Kaweah River, Tulare Co.	10,000
Aug. 21..	Marble Fork, tributary to Middle Fork of Kaweah River, Tulare Co.	5,000
Aug. 24..	Lake Hemet, Riverside County	15,000
Sept. 5..	Pieta Creek, Mendocino County	30,000
Sept. 10..	Cold Creek, Mendocino County	50,000
Sept. 15..	Walker Valley Creek, Mendocino County	50,000
Sept. 22..	Wagon Valley Creek, Siskiyou County	25,000
Sept. 22..	Cold Creek, Siskiyou County	25,000
Sept. 22..	Lagunitas Creek, Marin County	26,750
Oct. 10..	Stony Creek, Colusa County	50,000
	Total	1,277,750

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DISTRIBUTION OF TAHOE TROUT (*Salmo mykiss*) FROM TAHOE HATCHERY, DURING SUMMER OF 1894.

Date.	Distribution.	Number of Fish.
1894.		
July 5..	Burton Creek, tributary to Lake Tahoe	65,000
July 6..	Burton Island, Lake Tahoe	65,000
July 7..	Saxon's Point, near Old Mill, Lake Tahoe	65,000
July 8..	Ward Creek, tributary to Lake Tahoe	65,000
July 9..	Sea Gull Point, Lake Tahoe	65,000
July 11..	Smith's Point, Lake Tahoe	65,000
July 13..	Observation Point, Lake Tahoe	65,000
July 21..	Blackwood Creek, tributary to Lake Tahoe	67,000
July 24..	Donner Lake, 3 miles north of Truckee	50,000
July 26..	Donner Lake, 3 miles north of Truckee	50,000
July 28..	Bear Creek, tributary to Truckee River, 5 miles west of Tahoe	12,500
July 28..	Five Lakes Creek, tributary to Middle Fork of American River, Placer County	12,500
July 29..	Independence Lake, 16 miles north of Truckee	50,000
July 30..	Independence Lake, 16 miles north of Truckee	50,000
Aug. 3..	McKinney's Creek, tributary to Lake Tahoe	50,000
Aug. 4..	In Lake Tahoe, near the snag at McKinney's	50,000
Aug. 13..	Lake near Alta, Placer County	15,000
Aug. 15..	Meek's Bay, Lake Tahoe	63,000
Aug. 17..	Sugar Pine Point, Lake Tahoe	61,200
Aug. 27..	Squaw Creek, Placer County, tributary to Truckee River	25,000
Aug. 27..	Five Lakes Creek and Small Lakes, tributary to American River, Placer County	25,000
Aug. 28..	Donner Lake, 3 miles north of Truckee	50,000
Aug. 29..	North Fork of American River and tributaries, near Blue Cañon, Placer County	50,000
Aug. 31..	South Fork of Yuba River, near Cisco, Placer County	50,000
Sept. 1..	Webber Lake, 26 miles north of Truckee	50,000
Sept. 3..	Susanville, Susan River, Lassen County, and west branch North Fork of Feather River, Plumas County	50,000
Sept. 5..	Brush, Slab, and Rock Creeks, Placerville, El Dorado County	25,000
Sept. 8..	Ward Creek, tributary to Lake Tahoe	50,000
Sept. 8..	Blackwood Creek, tributary to Lake Tahoe	50,000
Sept. 10..	Squaw Creek, tributary to Truckee River	25,000
Sept. 10..	Truckee River, 6 miles below Tahoe City	25,000
Sept. 12..	Lake Merced, San Francisco County	25,000
Sept. 12..	New Crystal Springs Lake, San Mateo County	25,000
Sept. 17..	Agua Blanca Creek, Ventura County	10,000
Sept. 17..	Piru Creek, Ventura County	5,000
Sept. 17..	Sespe Creek, Ventura County	2,500
Sept. 17..	Santa Paula Creek, Ventura County	2,500
Sept. 17..	Coyote Creek, Ventura County	2,500
Sept. 17..	Matilija Creek, Ventura County	7,500
Sept. 17..	Chino Creek, San Bernardino County	5,000
Sept. 17..	Mill Creek, San Bernardino County	5,000
Sept. 17..	Snow Creek, Riverside County	5,000
Sept. 24..	Blue Lakes, Lake County	50,000
Sept. 26..	American River, above Folsom	15,000
Sept. 29..	Blue Lakes, Lake County	30,000
Sept. 29..	Lagunitas Creek, Marin County	10,000
Sept. 29..	Paper Mill Creek, Marin County	10,000
Oct. 1..	Rubicon River	30,000
	Total	1,706,200

DISTRIBUTION OF BLACK BASS DURING SUMMER OF 1893.

Date.	Distribution.	Number of Fish.
1893.		
July 12 ..	Lake near Rodeo, Contra Costa County	135
Aug. 11 ..	Buena Vista Lake, Kern County	20
	Total	155

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DISTRIBUTION OF BLACK BASS DURING SUMMER OF 1894.

Date.	Distribution.	Number of Fish.
1894.		
May 16 ..	Piedmont Water Co.'s reservoir, Oakland	200
May 18 ..	West Lake City Park, Los Angeles	600
May 18 ..	Irvine Lake, Tustin, Orange County	500
May 18 ..	La Fuentes Rancho, Santa Barbara	600
May 18 ..	Ponds west of Daggett, San Bernardino County	500
May 18 ..	Freeman's Pond, Centinella, Los Angeles County	150
May 18 ..	Ross Pond, Glendale, Los Angeles County	50
May 18 ..	Garvey Lake, San Gabriel, Los Angeles County	500
May 18 ..	Pomeroy Lake, Burbank, Los Angeles County	150
May 18 ..	Jennings Pond, Clearwater, Los Angeles County	50
May 18 ..	Kinney's Pond, Sierra Madre, Los Angeles County	50
May 21 ..	Lake Yosemite, Merced County	1,000
May 21 ..	Elk Beyo, Tulare County	400
May 21 ..	Kaweah River, Tulare County	500
May 21 ..	Bravo Lake, Tulare County	400
May 21 ..	Coss Creek, Tulare County	200
May 21 ..	San Joaquin River, near Herndon, Fresno County	1,000
May 30 ..	Freshwater Lake, Humboldt County	2,000
May 30 ..	Stony Lake, Humboldt County	500
	Total	9,350

SUMMARY OF DISTRIBUTION OF FISH DURING THE TWO YEARS ENDING SEPTEMBER 1, 1894.

Variety.	1893.	1894.
Salmon	2,554,450	7,776,400
Eastern Brook trout	251,500	266,000
Rainbow trout	754,000	1,080,240
Cut-throat trout	106,000	2,983,950
Black bass	155	9,350
Muskallunge	93,000	
Total	3,759,105	12,115,940

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STATEMENT OF FISH PLANTED BY BOARD OF FISH COMMISSIONERS.

In addition to the fish shown by the following statement to have been brought from the East in the aquarium car in 1874, Mr. Livingston Stone transported and planted 23 small tautogs and one can of small salt-water eels. In 1877 there were also planted 100 "awa," natives of the Hawaiian Islands (*chanos*). In bringing fish from the Eastern coast to this State special cars were provided in 1874, 1879, 1880, 1888, and 1893.

When the comparatively small number of fish which have been planted is considered, together with the great success attending these experiments, the failures, if they may be called such, sink into insignificance. Those from which no results can be said to have come are the plants of white-fish, land-locked salmon, silver eels, and lobsters. The plants of Eastern salmon and glass-eyed perch cannot well be classed as failures, as a fair trial has never been made with either of those species. There can be no doubt of the result of the success of the plants of shad, carp, catfish, and striped bass, as will be seen by numerous references made in this report to their abundance.

Besides the forty million and odd salmon which have been planted by the State Commission, there have been many millions distributed by the United States Fish Commission and by parties who have made application to them for fry.

The shad were all presented to the State by the U. S. Fish Commission, which bore a part or all of the expenses attending the transportation and planting of the same, with the exception of those fish brought in 1871 and 1876. The total expense of these two plants was borne by this State.

All the white-fish eggs are sent us from Lake Michigan stations through the courtesy of the U. S. Commissioner.

But 450 striped bass, which stood the long journey across the continent, have ever been planted; and they, like the black bass, of which but 107 were originally planted, have found congenial homes in our waters. The original plant of 144 catfish seems to have given results equaled only by the striped bass. It will be noticed that wide distribution was given this species in later years.

Five attempts have been made to introduce the Eastern lobster into Pacific waters. As the result of three of these attempts there were planted off the coast of the State 357 adult lobsters and 104,000 embryos. The first attempt, under the joint direction of the United States and California Commissions in 1873, was a total failure, because of the wrecking of the train near Omaha. The second and third attempts, in 1874 and 1879, were made under the sole auspices of the California Commission. The first three shipments were under the supervision of Mr. Livingston Stone; and, considering the fact that lobster transportation was then a new experiment, the shipments were a success. The fourth

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attempt was conducted jointly by the United States and California Commissions, and the lobsters were successfully transported in a United States fish car. In addition to 332 lobsters planted in 1888 near Monterey and at Trinidad Light-house, there were also planted 104,000 embryos, which were hatched from eggs brought at the same time. The 223 lobsters transported at the fifth trial were planted in waters adjacent to Oregon and Washington. While these attempts are apparently without results, they have been worth many times the expenditure in the experience and the information gained from them. It has not been positively determined as yet that the Eastern lobster is not thriving in our waters, although the chances and presumptions are against it.

Most of the carp now swimming in our streams and sloughs are the progeny of eight fish imported from Germany in 1872 by R. A. Poppe, of Sonoma, who did a thriving business in their sale for stocking purposes. The 88 fish planted in 1877 were received from the Department of Agriculture of Japan in exchange for trout eggs. The U. S. Commission delivered 298 to us in 1880, and the subsequent plants made by the Commission (but 383 fish altogether) were from the young of these fish. In addition to these, over 2,000 were delivered to private parties throughout the State.

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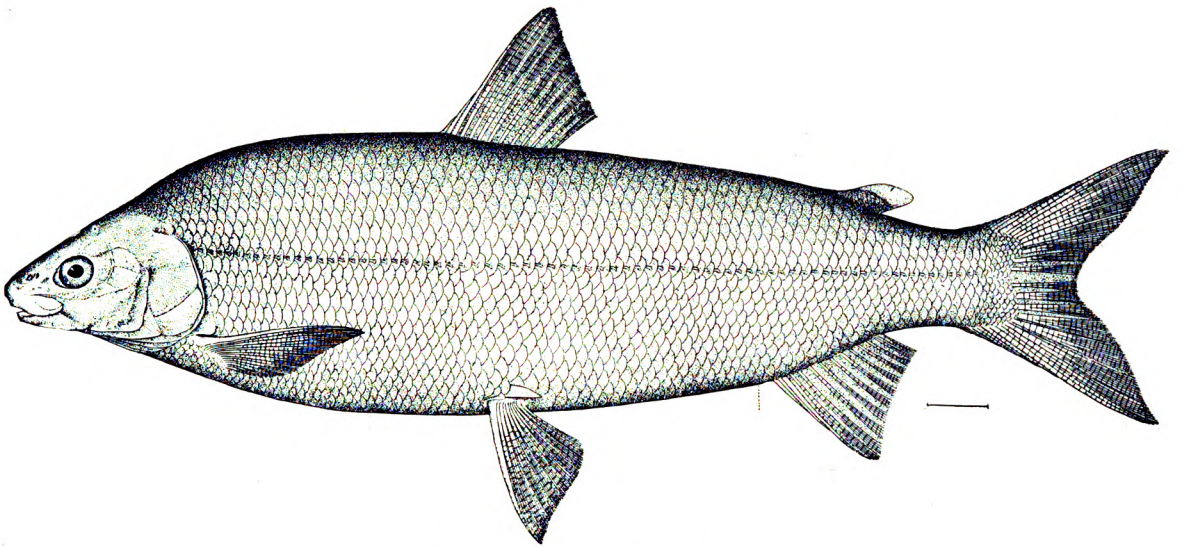
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WHITEFISH.— *Coregonus clupeiformis.*

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STATEMENT OF FISH PLANTED BY THE BOARD OF FISH COMMISSIONERS FOR THE STATE OF CALIFORNIA, SINCE ITS ORGANIZATION.

Year.	Quinnat Salmon (*Oncorhynchus tschawytscha*)	Trout.			Shad (*Alosa sapidissima*)	Whitefish (*Coregonus clupeiformis*)	Striped Bass (*Roccus lineatus*)	Black Bass (*Micropterus dolomieu*)	Catfish (*Ameirus nebulosus*)	Silver Eels (*Anguilla chrysypa*)	Eastern Salmon (*Salmo salar*)	Glass-eyed Perch (*Stizostedion vitrium*)	Eastern Lobster (*Homarus americanus*)	Land-locked Salmon (*Salmo salar sebago*)	Carp (*Cyprinus carpio*)	Muskallunge (*Lucius masquinongy*)
		Rainbow (*Salmo iridens*)	Cut-throat (*Salmo mykiss henshawi*)	Eastern Brook (*Salvelinus fontinalis*)												
1871					*15,000*											
1872			22,000	*6,000*		**25,000*										
1873					*35,000*											
1874	850,000							*85*	*144*	*12*	*305*	*16*	*4*			
1875	2,000,000			**60,000*		**20,000*										
1876	2,000,000				*99,000*											
1877	2,200,000	45,000		**133,000*	*110,000*	**300,000*			8,400						*88*	
1878	2,500,000	33,500		**70,000*	*115,000*									**50,000*		
1879	2,300,000	61,200	50,000			**565,000*	*150*	*22*	39,000	*4,000*			*21*			
1880	2,225,000	32,000		**41,500*	*240,000*				10,050						*298*–12	
1881	2,420,500	23,600			*220,000*	**230,500*			2,662					**20,100*		
1882	1,680,000						*300*		500	*10*					71	
1883	600,000	95,000				**500,000*									300	
1884		214,000							500					**25,000*		
1885		150,000														
1886	1,200,000	100,000														
1887	200,000	2,000,000	500,000													
1888	1,290,000	50,000	601,000										*332*			
1889	2,168,000		1,027,000					500								
1890	1,320,000	996,000	873,000	**83,000*				357								
1891	2,798,250		88,000													
1892	2,651,000	506,500		*†317,000*												
1893	2,554,450	754,000	106,000	**251,500*				155								*93,000*
1894	7,776,400	1,080,240	2,983,950	*†266,000*				9,350								
Totals	40,733,600	6,141,040	6,250,950	1,228,000	834,000	1,640,500	450	10,469	61,256	4,022	305	16	357	95,100	769	93,000

Italics show fish and eggs that were brought from without the State.
† Eggs were hatched by Commission.
* Eggs were taken by Commission in Nevada and hatched at our hatcheries.

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FINANCIAL STATEMENT.

APPROPRIATION FOR SUPPORT AND MAINTENANCE OF THE STATE HATCHERIES.

Warrants Drawn during Forty-fourth Fiscal Year, ending June 30, 1893.

1892.			
July	1—Amount appropriated		$5,000 00
Aug.	3—J. W. Hartley, salary, July	$15 00	
	R. E. Wilson, expenses	95 30	
	10—E. W. Hunt, salary and expenses, July	156 20	
	W. H. Shebley, salary and expenses, July	127 40	
	24—J. A. Richardson, salary and expenses, July	161 35	
	E. D. Stewart, salary, July	77 50	
Sept.	1—J. Caire, wire cloth, etc	9 58	
	7—J. A. Richardson, salary and expenses, August	153 95	
	E. D. Stewart, salary and expenses, August	96 75	
	9—John Nelson, hauling fish and cans	36 00	
	W. H. Shebley, salary and expenses, August	150 40	
	E. W. Hunt, salary and expenses, August	156 50	
	13—S. C. Mills, salary and expenses, August	58 40	
	Union Ice Company, ice for shipping	35 63	
	22—Sisson, Crocker & Co., supplies	62 81	
	30—E. W. Hunt, salary and expenses, September	151 75	
	W. H. Shebley, salary and expenses, September	130 15	
	J. A. Richardson, salary and expenses, September	153 95	
Oct.	31—E. W. Hunt, salary and expenses, October	29 00	
	J. W. Hartley, salary and expenses, October	67 90	
	W. H. Shebley, salary and expenses, October	118 80	
	E. D. Stewart, salary and expenses, September	45 75	
	J. A. Richardson, salary and expenses, October	155 50	
	C. W. Wickham, carpenter labor	38 50	
	S. Kaufman, stenographic services	67 70	
Nov.	10—Overland Monthly Company, plates for reports	25 00	
	17—W. E. Sell, office rent, September	25 00	
	30—H. W. Spaulding, stenographic services	11 30	
	J. A. Richardson, salary and expenses, November	143 00	
	W. H. Shebley, salary and expenses, November	57 00	
	4—J. J. Deane, office rent, November	37 50	
Dec.	31—J. W. Hartley, salary and expenses, December	85 10	
	J. A. Richardson, salary and expenses, December	165 80	
1893.			
Jan.	3—J. J. Deane, office rent, January	37 50	
	9—W. H. Shebley, salary and expenses, December	143 95	
Feb.	1—Jerry Adams, supplies, Bear Valley Hatchery	11 45	
	W. H. Allen, salary, January	40 00	
	T. E. Sullivan, salary, January	47 50	
	J. A. Richardson, salary and expenses, January	173 15	
	L. C. Nilson, shipping salmon eggs	64 50	
	E. W. Hunt, salary and expenses, January	156 25	
	3—Livingston Stone, maturing and packing salmon eggs	169 20	
	6—W. H. Shebley, salary and expenses, January	129 45	
	18—H. L. Macneil, expenses	95 30	
Mar.	1—E. W. Hunt, salary and expenses, February	127 55	
	J. W. Hartley, salary and expenses, February	71 10	
	J. A. Richardson, salary and expenses, February	165 95	
	W. C. Murdoch, expenses	49 90	
	2—J. J. Deane, office rent, March	37 50	
	6—W. H. Shebley, salary and expenses, February	137 00	
	31—J. A. Richardson, salary and expenses, March	124 78	
	E. D. Stewart, salary, March	67 00	
Apr.	4—W. H. Shebley, salary and expenses, March	114 50	
	E. W. Hunt, salary and expenses, March	135 00	
		$5,000 00	$5,000 00

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Warrants Drawn during the Forty-fifth Fiscal Year, ending June 30, 1894.

1893.				
July	1—Amount appropriated			$7,500 00
Aug.	1—J. A. Richardson, salary and expenses, July		$161 05	
	E. D. Stewart, salary and expenses, July		82 15	
	15—E. W. Hunt, salary and expenses, July		114 50	
	W. H. Shebley, salary and expenses, July		108 00	
Sept.	4—J. A. Richardson, salary and expenses, August		198 32	
	J. W. Hartley, salary and expenses, August		70 90	
	J. J. Deane, office rent, September		30 00	
	L. J. Griffen, food for fry		29 82	
	Whitter, Fuller & Co., paint, etc.		25 00	
	E. D. Stewart, salary and expenses, August		141 45	
	J. H. Sisson, ice for shipping		21 50	
	16—E. W. Hunt, salary and expenses, August		170 35	
	W. H. Shebley, salary and expenses, August		157 45	
	18—W. C. Murdoch, expenses		54 80	
	M. Harney, stenographic services		13 00	
	27—J. H. Sharp, rent of Tahoe Hatchery to July 1, 1894		50 00	
	30—E. W. Hunt, salary and expenses, September		220 15	
Oct.	3—Whittier, Fuller & Co., asphaltum paint		4 50	
	9—W. H. Shebley, salary and expenses, September		207 65	
	J. M. Bowles, supplies, repairs to cans		29 50	
	E. D. Stewart, salary, 17 days, September		42 50	
	10—J. A. Richardson, salary and expenses, September		132 85	
	11—T. E. Sullivan, salary, September		24 00	
	18—Sisson Mill and Lumber Co., lumber and supplies		29 64	
	J. D. Redding, expenses		80 00	
Nov.	1—E. D. Stewart, expense hauling		5 00	
	A. E. Montgomery, carpenter labor		40 00	
	D. L. Oliver, labor		55 00	
	W. D. Sisson, hauling fish and cans		42 65	
	W. H. Shebley, salary and expenses, October		143 15	
	4—T. E. Sullivan, salary and expenses, October		91 50	
	6—E. W. Hunt, salary and expenses, October		212 84	
	22—S. S. Bass, expense on account of salmon eggs		60 00	
Dec.	1—T. E. Sullivan, salary and expenses, November		92 75	
	A. E. Montgomery, carpenter labor		41 85	
	F. L. Montgomery, carpenter labor		21 54	
	E. W. Hunt, salary and expenses, November		167 35	
	D. L. Oliver, labor		55 00	
	W. H. Shebley, salary and expenses, November		112 75	
	George T. Mills, expense of obtaining spawn		188 87	
	A. Green, painting Bear Valley Hatchery		45 00	
	9—W. D. Sisson, hauling eggs and cases		57 05	
	J. J. McDonald, material, Independence Lake		38 05	
	Mrs. L. M. Sisson, rent of Sisson Lake		50 00	
	Whittier, Fuller & Co., oil and paint		11 00	
1894.				
Jan.	2—L. J. Griffen, labor		42 10	
	D. L. Oliver, labor		40 00	
	W. H. Shebley, salary and expenses, December		177 05	
	Frank Shebley, salary and expenses, December		58 35	
	J. A. Richardson, expenses, December		4 50	
	T. E. Sullivan, salary and expenses, December		79 90	
	Sisson Mill and Lumber Co., lumber, nails, etc.		103 15	
	J. Caire, wire cloth		39 60	
	5—W. D. Sisson, hauling eggs and cases		17 75	
	E. W. Hunt, salary and expenses, December		243 35	
Feb.	1—T. E. Sullivan, salary, January		60 00	
	Frank Shebley, salary, January		50 00	
	D. L. Oliver, labor, January		40 00	
	W. D. Sisson, hauling eggs and cases		66 50	
	W. H. Shebley, salary and expenses, January		168 58	
	E. W. Hunt, salary and expenses, January		173 30	
	W. H. Allen, salary, January		65 00	
Mar.	1—E. L. Oliver, labor, February		40 00	
	Frank Shebley, salary, February		64 50	
	E. W. Hunt, salary and expenses, February		109 00	
	W. H. Shebley, salary and expenses, February		165 07	
	T. E. Sullivan, salary and expenses, February		68 25	
	28—David Hun, supplies		2 50	
	Holbrook, Merrill & Stetson, fish shipping cases and repairs		77 50	
	Amounts carried forward		$5,686 98	$7,500 00

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1894.		Amounts brought forward	$5,686 98	$7,500 00
April	2—T. E. Sullivan, salary and expenses, March		106 00	
	Whittier, Fuller & Co., paint		35 80	
	J. Caire, wire cloth		37 76	
	E. W. Hunt, salary and expenses, March		147 50	
	W. D. Sisson, hauling fish and cans		77 15	
	John Nelson, hauling fish and cans		39 00	
	Frank Shebley, salary and expenses, March		81 00	
	D. L. Oliver, labor, March		40 00	
	W. H. Shebley, salary and expenses, March		148 70	
May	1—W. H. Shebley, salary and expenses, April		131 55	
	Holbrook, Merrill & Stetson, repairs to cans		2 50	
	T. E. Sullivan, salary and expenses, April		105 00	
	Frank Shebley, salary and expenses, April		80 00	
	W. P. Fuller & Co., asphaltum paint		8 00	
	8—E. W. Hunt, salary and expenses, April		319 62	
	F. C. Boyce, salary and expenses, April		75 50	
June	1—W. H. Shebley, salary and expenses, May		137 24	
	Frank Shebley, salary and expenses, May		65 50	
	T. E. Sullivan, salary and expenses, May		105 00	
	8—E. W. Hunt, expenses, May		70 20	
			$7,500 00	$7,500 00

APPROPRIATION FOR RESTORATION AND PRESERVATION OF FISH IN THE WATERS OF THE STATE.

Warrants Drawn during the Forty-fourth Fiscal Year, ending June 30, 1893.

1892.				
July	1—Amount appropriated			$5,000 00
Aug.	1—S. C. Mills, salary and expenses, July		$59 05	
	John P. Babcock, salary and expenses, July		119 05	
	3—George H. Koppitz, salary and expenses, July		115 65	
	Thomas Tunstead, salary and expenses, July		130 25	
	W. E. Sell, office rent, July		25 00	
	16—S. Kaufman, stenographer		38 80	
	17—J. W. Hartley, salary and expenses, July		54 05	
Sept.	1—George H. Koppitz, salary and expenses, August		163 55	
	Thomas Tunstead, salary and expenses, August		169 25	
	J. W. Hartley, salary and expenses, August		15 00	
	J. P. Babcock, salary and expenses, August		150 80	
	2—A. Hayward, office rent, August		25 00	
	10—W. A. Bacon, supplies, camera, and fixtures		80 00	
	28—Jos. D. Redding, expenses		68 10	
	S. Kaufman, stenographer, compiling report		182 35	
	30—J. P. Babcock, salary and expenses, September		119 95	
	S. C. Mills, salary and expenses, September		60 70	
Oct.	1—George H. Koppitz, salary and expenses, September		172 30	
	J. W. Hartley, salary and expenses, September		15 00	
	J. J. Deane, office rent, October		37 50	
	Thomas Tunstead, salary and expenses, September		167 40	
	31—F. M. Bacigalupi, salary and expenses, October		11 90	
	J. P. Babcock, salary and expenses, October		150 50	
Nov.	5—Thomas Tunstead, salary and expenses, October		137 25	
	17—H. S. Crocker Company, stationery		23 00	
	George H. Koppitz, salary and expenses, October		114 40	
	30—F. M. Bacigalupi, salary and expenses, November		115 50	
	J. P. Babcock, salary and expenses, November		141 10	
	J. W. Hartley, salary and expenses, November		82 60	
Dec.	1—George H. Koppitz, salary and expenses, November		107 25	
	J. J. Deane, office rent, December		37 50	
	14—Thomas Tunstead, salary and expenses, November		124 00	
	31—J. P. Babcock, salary and expenses, December		130 95	
1893.				
Jan.	1—George H. Koppitz, salary and expenses, December		101 00	
	3—Thomas Tunstead, salary and expenses, December		27 50	
Feb.	1—Thomas Tunstead, expenses, January		34 50	
	J. P. Babcock, salary and expenses, January		171 25	
	J. W. Hartley, salary and expenses, January		69 35	
	17—J. J. Deane, office rent, February		37 50	
Mar.	3—J. P. Babcock, salary and expenses, February		148 85	
	A. W. Wilson, salary and expenses, February		35 00	
		Amounts carried forward	$3,870 15	$5,000 00

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1893.	Amounts brought forward	$3,870 15	$5,000 00
Mar. 31	—J. W. Hartley, salary and expenses, March	110 15	
	J. P. Babcock, salary and expenses, March	129 70	
	A. W. Wilson, salary and expenses, March	104 65	
April 3	—J. J. Deane, office rent, April	37 50	
May 1	—George H. Koppitz, salary and expenses, April	117 70	
	A. W. Wilson, salary and expenses, April	124 90	
	J. P. Babcock, salary and expenses, April	186 35	
June 1	—J. P. Babcock, salary and expenses, May	151 60	
	George H. Koppitz, salary and expenses, May	162 25	
	Balance not used	5 05	
	Totals	$5,000 00	$5,000 00

Warrants Drawn during the Forty-fifth Fiscal Year, ending June 30, 1894.

1893.			
July 1	—Amount appropriated		$10,000 00
Aug. 1	—G. H. Koppitz, salary and expenses, July	$114 15	
	J. P. Babcock, salary and expenses, July	115 00	
	J. W. Hartley, salary and expenses, July	89 85	
	M. Hearney, stenographer	13 00	
	J. J. Deane, office rent, August	30 00	
15	—A. W. Wilson, salary and expenses, July	128 00	
Sept. 5	—J. P. Babcock, salary and expenses, August	150 05	
	G. H. Koppitz, expenses, July	9 70	
	G. H. Koppitz, salary and expenses, August	139 05	
9	—Thomas Tunstead, salary and expenses, August	83 65	
	Henry Rowson, launch "Hustler"	140 00	
11	—H. L. Macneil, expenses	11 00	
30	—J. P. Babcock, salary and expenses, September	169 50	
	Henry Rowson, launch "Hustler"	210 00	
	J. W. Hartley, salary and expenses, September	71 55	
	J. J. Deane, office rent, October	30 00	
Oct. 2	—Thomas Tunstead, salary and expenses, September	159 10	
	A. W. Wilson, salary and expenses, August	135 30	
	A. W. Wilson, salary and expenses, September	220 05	
7	—G. H. Koppitz, salary and expenses, September	154 50	
9	—H. Martin, labor, fish ladder	22 75	
	J. Gilpin, labor, fish ladder	22 75	
	Klamath River Lumber Co., fish ladder, lumber	61 92	
	A. G. Fletcher, expenses, August	2 20	
	A. G. Fletcher, expenses, September	8 35	
10	—M. Hearney, stenographer	13 00	
11	—F. P. Deering, attorney, salary and expenses, July	243 70	
	F. P. Deering, attorney, salary and expenses, August	202 10	
	F. P. Deering, attorney, salary and expenses, September	104 75	
18	—H. L. Macneil, expenses	20 00	
Nov. 1	—F. P. Deering, attorney, salary, October	100 00	
	Thomas Tunstead, salary and expenses, October	116 75	
	J. W. Hartley, salary and expenses, October	60 00	
	S. Kaufman, stenographer	19 20	
	J. P. Babcock, salary and expenses, October	168 60	
	G. H. Koppitz, salary and expenses, October	115 55	
	A. G. Fletcher, salary and expenses, August and Sept.	200 00	
	A. W. Wilson, salary and expenses, October	114 75	
14	—A. G. Fletcher, salary and expenses, October	50 00	
	J. C. Irvine, badges for patrolmen	13 00	
Dec. 1	—J. P. Babcock, salary and expenses, November	153 55	
	A. W. Wilson, salary and expenses, November	102 00	
	J. W. Hartley, salary and expenses, November	60 00	
	J. J. Deane, office rent, November	30 00	
	F. P. Deering, attorney, salary and expenses, November	300 00	
9	—A. G. Fletcher, attorney, salary and expenses, November	62 20	
1894.			
Jan. 2	—M. Hearney, stenographer	26 00	
	H. L. Macneil, expenses	14 65	
	J. P. Babcock, salary and expenses, December	188 80	
	A. W. Wilson, salary and expenses, December	150 80	
	F. P. Deering, attorney, salary, December	100 00	
	Livingston Stone, hauling 4,390,000 salmon eggs	175 60	
	G. H. Koppitz, salary and expenses, November	104 00	
	G. H. Koppitz, salary and expenses, December	180 60	
	A. G. Fletcher, salary and expenses, December	55 30	
	S. Kaufman, stenographer	34 50	
	Amounts carried forward	$5,570 82	$10,000 00

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1894.	Amounts brought forward	$5,570 82	$10,000 00
Jan.	5—Charles H. Gilbert, expenses, November and December	63 55	
	J. J. Deane, office rent, December	30 00	
Feb.	1—A. W. Wilson, salary and expenses, January	126 75	
	G. Watson, expenses, January	25 00	
	John Low, labor and expenses, January	103 25	
	F. P. Deering, attorney, salary, January	100 00	
	G. H. Koppitz, salary and expenses, January	112 20	
	J. P. Babcock, salary and expenses, January	200 40	
	S. Kaufman, stenographer	60 00	
	2—J. J. Deane, office rent, January	30 00	
	A. G. Fletcher, salary and expenses, January	99 40	
	3—J. C. Irvine, badges, patrolmen	13 65	
Mar.	1—A. G. Fletcher, salary and expenses, February	66 20	
	8—S. Kaufman, stenographer	81 15	
	J. J. Deane, office rent, February	30 00	
	A. W. Wilson, salary and expenses, February	144 45	
	J. P. Babcock, salary and expenses, February	160 30	
	Livingston Stone, hauling salmon eggs	64 40	
	G. H. Koppitz, salary and expenses, February	116 80	
	M. Godley, Jr., salary and expenses, February	65 73	
	J. J. Deane, office rent, March	30 00	
	20—B. Wilson & Co., cloth for posters	15 15	
April	2—A. W. Wilson, salary and expenses, March	149 35	
	J. P. Babcock, salary and expenses, March	178 25	
	M. Godley, Jr., salary and expenses, March	76 84	
	J. A. Richardson, salary and expenses, March	162 40	
	J. C. Parker, launch "Belvedere"	40 00	
	3—A. G. Fletcher, salary and expenses, March	93 35	
	5—G. H. Koppitz, salary and expenses, March	21 40	
	13—S. Crocker, salary and expenses, March	122 50	
	J. J. Deane, office rent, April	30 00	
	17—Union Ice Company, ice, March and April	15 25	
	24—J. A. Richardson, salary and expenses, February	80 40	
	30—M. Godley, Jr., salary and expenses, April	115 00	
	S. Kaufman, stenographer	41 25	
	J. J. Deane, office rent, May	30 00	
May	1—Wm. C. Murdoch, expenses	28 30	
	M. Hearney, stenographer	23 00	
	J. P. Babcock, salary and expenses, April	166 35	
	A. G. Fletcher, salary and expenses, April	94 80	
	Henry Rowson, launch "Hustler"	250 00	
	5—A. W. Wilson, salary and expenses, April	147 50	
June	1—J. P. Babcock, salary and expenses, May	145 95	
	A. W. Wilson, salary and expenses, May	130 05	
	A. G. Fletcher, salary and expenses, May	97 45	
	W. R. McFarland, salary and expenses, May	164 20	
	J. Low, salary and expenses, May	71 50	
	S. S. Bass, transferring fish to Truckee	28 25	
	J. J. Deane, office rent, June	30 00	
	30—A. G. Fletcher, expenses, June	7 46	
	Balance on hand	150 00	
	Totals	$10,000 00	$10,000 00

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FISH COMMISSIONERS' FUND.

Warrants Drawn during the Forty-fourth Fiscal Year, ending June 30, 1893.

1892.			
July 1	Amount on hand		$163 64
	Receipts into fund		4,495 17
	J. P. Babcock, salary and expenses, June	$152 10	
	S. C. Mills, salary and expenses, June	55 90	
	G. H. Koppitz, salary and expenses, May	111 50	
14	G. H. Koppitz, salary and expenses, June	140 25	
	J. W. Hartley, salary	15 00	
18	Thomas Tunstead, salary and expenses, May	128 90	
26	T. Price & Son, analysis of sample water	25 00	
	Thomas Tunstead, salary and expenses, June	152 00	
	W. H. Shebley, salary and expenses, June	111 80	
	E. W. Hunt, salary and expenses, June	144 55	
	E. W. Stewart, salary, June	75 00	
	A. Hayward, office rent, June	25 00	
	T. E. Sullivan, salary, June	60 00	
Aug. 3	J. A. Richardson, salary and expenses, June	154 35	
	T. E. Sullivan, salary, July	10 50	
Sept. 1	Whittier, Fuller & Co., 70 gallons of naphtha	14 00	
	J. G. Woodbury, salary, March 31 to April 17, 1892	70 83	
28	Joseph D. Redding, expenses	153 60	
Oct. 11	Warner Harris, salary, December, 1890	100 00	
Nov. 12	John Nelson, hauling fish, etc., May	23 00	
June 1	Union Ice Company, ice in May	11 40	
	Ora Hardman, salary, Bear Valley Hatchery, May	15 00	
2	S. Grendi, lumber, Bear Valley Hatchery	9 73	
	Andrew Howe, labor, Bear Valley Hatchery	40 00	
1893.			
Jan. 1	T. W. O'Neill, painting license tags	28 00	
3	A. Carlisle & Co., stationery	34 65	
16	Joseph D. Redding, expenses	81 55	
Feb. 1	Henry Cowell & Co., supplies	10 90	
Mar. 2	S. Kaufman, stenographer	17 70	
4	L. J. Griffen, labor and material, Sisson Hatchery	65 50	
April 3	H. C. Chipman, painting license tags	212 80	
16	J. A. Richardson, expenses, March	1 97	
19	Henry Rowson, launch "Hustler"	170 00	
May 4	J. W. Hartley, salary and expenses, April	75 75	
	E. D. Stewart, salary and expenses, April	75 00	
	J. A. Richardson, salary and expenses, April	134 50	
	W. H. Shebley, salary and expenses, April	155 21	
	J. J. Deane, office rent, May	37 50	
	M. Hearney, stenographer	13 00	
	S. Kaufman, stenographer	14 60	
5	W. H. Allen, salary, Bear Valley Hatchery	60 00	
	E. W. Hunt, salary and expenses, April	189 15	
June 1	W. H. Allen, salary, May	28 00	
	A. W. Wilson, salary and expenses, May	109 50	
	E. D. Stewart, labor, May	75 00	
	J. W. Hartley, salary and expenses, May	69 15	
	M. Hearney, stenographer	13 00	
	J. J. Deane, office rent, June	30 00	
	E. W. Hunt, salary and expenses, May	157 65	
5	W. H. Shebley, salary and expenses, May	130 36	
	S. P. R. R. Co., transporting muskallunge from Ogden	234 60	
30	Balance on hand	634 36	
	Totals	$4,658 81	$4,658 81

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FISH COMMISSIONERS' FUND.

Warrants Drawn during the Forty-fifth Fiscal Year, ending June 30, 1894.

By balance on hand, July 1, 1893			$634 36
Receipts into fund			3,472 02
1893.			
June 1	W. C. Murdoch, expenses	$28 55	
7	J. A. Richardson, salary and expenses, June	185 15	
30	J. P. Babcock, salary and expenses, June	129 90	
	J. W. Hartley, salary and expenses, June	91 30	
	S. S. Bass, transporting fish	6 00	
	J. J. Deane, office rent, July	30 00	
	E. D. Stewart, salary and expenses, June	80 95	
	M. Hearney, stenographer	13 00	
	S. P. R. R. Co., transportation of U. S. fish car	83 00	
	A. W. Wilson, salary and expenses, June	154 00	
	J. D. Redding, expenses	73 70	
July 5	F. P. Deering, attorney, salary and expenses, June	250 00	
	J. A. Richardson, salary and expenses, June	152 15	
	Geo. H. Koppitz, salary and expenses, June	125 85	
11	W. H. Shebley, salary and expenses, June	115 75	
	E. W. Hunt, salary and expenses, June	141 75	
15	Union Ice Company, ice	15 50	
	S. Kaufman, stenographer	27 30	
Sept. 11	H. L. Macneil, expenses	16 50	
30	A. G. Fletcher, expenses, May	33 15	
20	J. A. Richardson, expenses, August	7 70	
Oct. 26	J. C. Irvine, patrolmen's badges	16 90	
Dec. 7	J. G. Woodbury, rent of grounds, Tahoe Hatchery	50 00	
1894.			
Jan. 18	H. S. Crocker Co., printing and stationery	27 65	
Feb. 1	Holbrook, Merrill & Stetson, supplies	12 50	
Mar. 1	Swan & Stein, painting extra license tags	11 25	
9	H. C. Chipman, painting license tags	195 00	
May 5	W. R. McFarland, salary and expenses, April	134 13	
8	H. S. Crocker Co., office supplies	9 56	
	J. C. Irvine, patrolmen's badges	16 25	
June 1	Mary C. Rowson, launch "Hustler," May	70 00	
	Justinian Caire, supplies for Tahoe Hatchery	34 00	
	W. P. Fuller & Co., paint, Sisson Hatchery	7 75	
	L. J. Griffen, labor, Sisson Hatchery	55 12	
	D. L. Oliver, labor, Sisson Hatchery, May	24 09	
8	W. D. Sisson, hauling fish and spawn, May	14 00	
	E. W. Hunt, salary and expenses, May	153 74	
	F. C. Boyce, salary and expenses, May	60 00	
	C. F. Selvage, salary and expenses, May	74 00	
30	Balance on hand	1,379 24	
	Totals	$4,106 38	$4,106 38

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STATEMENT OF LICENSES ISSUED.

AMOUNT RECEIVED FROM LICENSES FOR THE YEAR ENDING APRIL 1, 1893.

Class.	Received of Controller.	Value of Each.	On Hand April 1, 1892.	Sold During the Year.	Total Value of Licenses Sold.	Commissions Paid for Collecting.	Net Amount Paid the State.
A	600	$5 00	68	532	$2,660 00	$85 10	$2,574 90
B	50	7 50	22	28	210 00	7 50	202 50
C	50	10 00	44	6	60 00		60 00
D	50	12 50	18	32	400 00		400 00
E	50		46	4	90 00		90 00
Totals	800		198	602	$3,420 00	$92 60	$3,327 40

AMOUNT RECEIVED FROM LICENSES FOR THE YEAR ENDING APRIL 1, 1894.

Class.	Received of Controller.	Value of Each.	On Hand April 1, 1893.	Sold During the Year.	Total Value of Licenses Sold.	Commissions Paid for Collecting.	Net Amount Paid the State.
A	700	$5 00	130	570	$2,850 00	$67 50	$2,782 50
B	50	7 50	29	21	157 50	1 10	156 40
C	50	10 00	41	9	90 00	1 50	88 50
D	50	12 50	23	27	337 50		337 50
E	50		50	0			
Totals	900		273	627	$3,435 00	$70 10	$3,364 90

AMOUNT RECEIVED FROM STURGEON LICENSES FOR THE YEAR ENDING OCTOBER 1, 1894.

Received of Controller.	Value of Each.	Number Sold.	Amount Collected.	Net Amount Paid the State.
100	$10 00	61	$610 00	$610 00

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LOCATION OF THE FISHERIES OF CALIFORNIA.

SAN DIEGO COUNTY.

This is the extreme southernmost county of the State, and has a coast-line of about 57 miles. Most of the fishing is conducted in two indentations of the coast, known as San Diego Bay and False Bay, although fishing off the coast for barracuda and other varieties of open-sea fish cuts no small figure. Captain Collins, of the United States Fish Commission, reported extensive Chinese fisheries in San Diego in 1888. These fisheries have since been abandoned, however, and at this time there are comparatively few Chinese connected with the industry.

The fisheries of the county chiefly center in San Diego City, where most of the catch is marketed in a fresh condition. A considerable number of bonito are taken, and after being salted are shipped to San Francisco. The chief species of this region are barracuda, flounders, bonito, yellow-tail, smelt, and rock-fish. The most important of these is the barracuda, of which 309,614 pounds were taken in 1892. The total value of the fishery products in 1888, when the output of the industry seemed at its height, was $63,068 80. This represented an increase of $5,459 80 over 1880. The fisheries of 1892 show a decrease of $15,530 80.

In 1888 there were employed in the fishery industry, 22 vessels, of which 9 were engaged in the outside fisheries, and used troll lines almost entirely. The others, together with 43 small boats, were engaged in and about the bay fishing with seines and gill-nets as well as troll lines. Pots and traps are also used for catching the craw-fish or "spiny" lobster. There was in 1888 an increase of 43 vessels and boats over 1880; while in 1892 there was a further increase of 22.

The total investment in 1892 was $41,067, an increase of $8,242 over 1888, and of $31,267 over 1880.

During 1888 there were employed in the industry 159 men, as against 92 in 1892, and but 47 in 1880.

In the winter of 1888–89 the United States Fish Commission steamer "Albatross" discovered what is known as the Tanner Bank, some 45 miles from San Diego. A thorough examination was made at the same time of the Cortez Bank, some 12 miles south of Tanner Bank, developing the fact that many valuable food fish can be taken at both places. There seems to be no limit to the outside supply of fish, although the bay has been sadly depleted during the past few years. We take pleasure in reporting the passage of local ordinances which promise in time to restore the standing of the bay fisheries.

ORANGE COUNTY.

There are no figures for Orange County until 1892, as it was up to that time a part of Los Angeles County, and its fishery products are included in that county's output. The county, however, possesses fisheries of no inconsiderable extent. Along the coast-line of 20 miles

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there are many sandy beaches, all of which furnish good grounds for surf fishing. The favorite location with fishermen is Newport Beach. It is persistently dragged with seines and the catch shipped to inland markets in a fresh condition. There were in 1892 engaged at this point 12 men, who used six small boats, valued, together with their gear, at $750. In 1892 the total value of the fishery product of the county was $3,025. The chief catch was of smelt, the amount taken being 25,621 pounds.

LOS ANGELES COUNTY.

Los Angeles County in 1892 ranked ahead of all the counties south of San Francisco in its fishery product. Its coast-line has an extent of about 100 miles, and except in the northern part of the county, its shores are generally low, with sandy beaches. The principal indentations are San Pedro and Santa Monica Bays, and the breakwater at San Pedro helps to make the only good harbor for fishing boats in the county. The principal fishing stations are Alamidos Bay, San Pedro, Wilmington, Portuguese Bend, Redondo, Santa Monica, and Catalina Island. Surrounding the latter is one of the most important fishing-grounds on the coast. The island is situated some 18 miles distant from the main land, and the banks in the channel afford splendid grounds for barracuda, yellow-tail, flounder, and rock cod. The fishing boats used are small boats and undecked, and the majority are feluccas. Gill-nets are used to a greater extent than any other kind of gear, especially in taking smelt and barracuda, although hand lines (including trolls) and trawls are operated from most of the fishing centers. Surf seines are also operated to a large extent in Santa Monica Bay. The principal species taken are barracuda, mackerel, smelt, sardines, and the "spiny" lobster. The majority of the catch is sent to the markets of Los Angeles and the interior in a fresh condition, although a large proportion of the sardines and mackerel, and some bonito, are canned by the California Fish Company. This company has erected extensive buildings at East San Pedro, and is placing upon the market a sardine which is said to be as fine as any of the Eastern sardines.

There were 234 men employed in the fishing industry in 1892, an increase of 181 since 1880, and 97 since 1888. They used 13 vessels and boats in 1880, 69 in 1888, and 124 in 1892. The total investment of capital in 1880 was $2,005, and this had increased in 1888 to $15,835, and in 1892 to $49,261. The value of the fishery products in 1888 was $41,901, while $49,541 represented the value in 1892.

VENTURA COUNTY.

Captain Collins reported Ventura County without a single professional fisherman, in 1888. Although this county has a coast-line of about 36 miles, there are but two points, Hueneme and Ventura, at which fishing has ever been carried on, and they are so unprotected that the few fishermen located there have a hard time to save their property in times of storm. This accounts for the poor showing which this county makes. In 1892 there were four men located in Ventura County, who used troll lines entirely, taking barracuda, rock-fish, and halibut. Their catch was all disposed of in a fresh condition in the

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local markets, and was valued at $1,960. The total investment of capital in this county in 1892 was $885.

SANTA BARBARA COUNTY.

The coast-line of Santa Barbara County is upwards of 100 miles in length, and stretching parallel with the coast about 20 miles distant is a group of islands. Between these and the main land lies the stretch of water known as Santa Barbara Channel, one of the best fishing-grounds on the Pacific Coast. Here barracuda, bonito, rock-fish, and other species are taken. Santa Barbara has important "spiny" lobster fisheries, as will be seen from the fact that 154,850 pounds were taken in 1892. Large numbers of these are shipped to the San Francisco markets, which derives from this locality their chief supply. Troll-lines are used in the channel in the winter, and also in taking barracuda and yellow-tail in the summer. Gill-nets are employed chiefly in the winter time, and seines are operated on the beach during the summer. Crawfish are taken in hoop-nets in the summer, and the regular pot made of laths is used in the winter.

There were 26 vessels and boats used in this county in 1892, an increase of 2 since 1888, and of 21 since 1880. The value of the investment in 1880 was $7,350. In 1888, on account of the abandonment of the whale fisheries, this amount had decreased to $4,452. In 1892, on account of the increase of the food fisheries, the value had reached $10,315. The city of Santa Barbara is the chief fishing center, and a majority of the fish caught are consumed there in a fresh condition, the surplus only being sent to San Francisco. The same species are taken in this county as in the counties farther south, and were it possible for the fish to be marketed, the catch might be increased to unlimited figures.

SAN LUIS OBISPO COUNTY.

The coast-line of San Luis Obispo County is some 80 miles in length, and unfortunately is without a good harbor, although the bay at Port Harford affords some protection for fishing craft. This county was the seat of extensive whale fisheries in years past, but at this time there are no men engaged in that fishery. At the present time Port Harford is the chief fishing center, being the only point from which the product can be shipped. This is unfortunate, as it necessarily limits the catch which might otherwise attain an unlimited figure, as there is apparently no lack of supply. The species caught do not vary much from those taken farther south. The sea-bass is one of the most important species of this county. Rock-fish of numerous varieties are also taken in great numbers, and constitute a large part of the entire catch, 104,500 pounds being taken in 1892. Flounders, pompano, king-fish, perch, and other varieties are caught in small quantities. The rock-fish are taken with trawls, and drift-nets are used for the other varieties, although barracuda and some others are caught by trolling. There were 38 men engaged in fishing in this county in 1892, using 16 boats. These boats, together with the gear used, were valued at $5,615. The value of the food fish in 1892 was $8,487, a slight increase over 1888, and an increase of nearly $6,000 since 1880.

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MONTEREY COUNTY.

The coast-line of Monterey County stretches north from its junction with San Luis Obispo County in an almost unbroken line, until the shore makes an abrupt curve at the south end of Monterey Bay. The high mountains of the Santa Lucia range run parallel with the shore, and render fishing impossible on that part of the coast. Point Pinos shelters the lower end of Monterey Bay, thus affording protection to the chief fishing center of the county.

Captain Collins says: "Monterey Bay is celebrated for its abundance of fish, and is especially noted for being apparently the limit of migration for many species that abound north and south of this point. Of the many species found in abundance farther south, few are ever seen in great numbers north of Monterey Bay. It is said that many northern species, among which the salmon is included, are generally rarer south of this point, and are sometimes not found."

Drag-seines, gill-nets, and hand-lines are chiefly used by the white fishermen, as are also drift-nets during the summer time. The Chinese use the trawl and also small purse-seines in taking squid, which are abundant in their season. Rock-fish, flounders, and smelt are the species chiefly taken during the winter, but the same species are taken here as farther south during the summer. Almost the entire catch of the white fishermen, as well as a part of that taken by the Chinamen, is shipped to San Francisco in a fresh condition. Squid are dried by the Chinese, and sent to San Francisco, from whence they are shipped to China. There were 121 men employed in this county in 1892, using 84 vessels and boats. The total amount of capital invested was $32,145, an increase of $27,000 since 1880. The value of the product was $61,000 in 1892.

SANTA CRUZ COUNTY.

The fishing of Santa Cruz County is chiefly carried on in the bay of Monterey, where there are, in places, some sandy beaches, although the cliffs in many places are so high that they offer no shelter or landing-place for shipping craft. The chief fishing centers are Santa Cruz, Capitola, and Aptos. The same methods are employed here, and the same species caught, as in Monterey County. Salmon and shad are here, however, more abundant than in Monterey County. During the summer of 1893, the fishermen in Monterey Bay reaped a rich harvest during the great salmon run. There were but 25 fishermen in this county in 1888, but this number was increased to 60 in 1892. In the latter year they used 55 boats, which, together with their gear and shore property, were valued at $10,000. Their catch that year was valued at $14,168, the chief species taken being rock-fish, 172,220 pounds.

SAN FRANCISCO FISHERIES.

At and about San Francisco are located the most extensive fisheries to be found on the coast. Captain J. W. Collins, of the U. S. Commission of Fish and Fisheries, has said: "As a whole, San Francisco and vicinity may be considered one of the leading fishing centers of the United States, and its possibilities for development in that direction are

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believed to be very great." (See Report on Fisheries of the Pacific Coast, 1891.)

The geographical features of San Francisco are particularly favorable to the development of the fisheries. A review of San Francisco fisheries, however, is naturally made to include the adjacent counties of Alameda, San Mateo, Santa Clara, Contra Costa, Solano, Sonoma, Marin, Sacramento, Tehama, and Shasta. The headquarters of the fishing industry in most of these counties is at San Francisco.

The marine fisheries of this region are so important as to exceed in value of combined products the value of fish taken at all similar fisheries on the Pacific Coast. In addition to the large local fisheries, San Francisco is also extensively interested in the whale, fur-seal, and cod fisheries, the products of which reach a very considerable value.

The extent and importance of the shore or local fishing-grounds of San Francisco may best be appreciated when it is considered that the entire area included within San Francisco, San Pablo, and Suisun Bays, constitute good fishing-ground. Extensive fisheries are also maintained outside the heads, from Pigeon Point to Point Reyes, and as far west as the Farrallon Islands; also in Tomales Bay, the Sacramento and San Joaquin Rivers, and numerous tributary sloughs. These waters contain many species of fish, crustaceans, mollusks, and so forth, and afford the fisherman some kind of a catch for every month in the year. So extensive is the supply of fish from all sources that in the matter of the market prices there is never any cause for complaint from the consumers.

San Francisco is the chief fishing center of this entire region, although salmon fishermen work from nearly every town of any size on the Sacramento River. By far the greater number of men, however, make their headquarters in San Francisco, going from there to the various fishing-grounds and then returning in time to market their catch in a fresh condition.

There are two salmon canneries in operation at the present time, upon the Sacramento River, one at Benicia, and the other at Chipp's Island. These canneries take about one fourth of the salmon catch of the Sacramento River, the balance being forwarded to the San Francisco market in a fresh condition.

Several Chinese camps are located at different points on San Francisco and San Pablo Bays. The Chinese are principally engaged in catching shrimp, which are dried and then exported to China and the Hawaiian Islands.

Until a few years ago there were several large stations devoted to the curing of cod. The business was then quite extensive, but of late years it has been permitted, for various reasons, to decline, until now the station at California City is the only one in operation. The decrease in the value of the product commenced prior to 1888, and has continued ever since.

San Francisco is the headquarters of the Pacific whaling fleet, and of many vessels engaged in sealing operations. Space does not permit of an extensive outline of these fisheries, which fact is to be regretted, as there is much of interest that might be written.

Besides the sloops used for carrying oysters to market, and salmon to the canneries, and the steam tugs employed for outside fishing, nearly all of the fishing craft used are small boats, the greater number being feluccas. The regular salmon boat is in use on the Sacramento River.

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On account of the great variety of fish caught, and the character of the different fishing-grounds, nearly all kinds of gear are used. The large paranzella nets are hauled upon the banks off Point Reyes by steam tugs, and take the greater proportion of flounders and soles. Many of the fishermen use troll lines and trawls the greater part of the year in fishing outside the heads for cod and rock-fish. Gill-nets are operated wherever the fish happen to be temporarily abundant. The salmon, smelt, herring, and shad, as well as several other varieties, are taken in this manner.

Smelts and sardines are also taken with seines, and in the upper Sacramento gill-nets are used as seines in taking the salmon. The sturgeon are taken on sturgeon lines to which are attached large hooks. Hoop nets are used in taking the crabs.

While many of the varieties are taken in all parts of San Francisco and San Pablo Bays, some points furnish much better fishing for some varieties than others. Smelt are found in the greatest abundance in the southern portions of San Francisco Bay. The salmon are chiefly taken in the Sacramento River and adjacent sloughs, and in Suisun Bay, although good catches are sometimes made in San Pablo Bay. A favorite locality for flounders is in the northern part of San Pablo Bay. The principal catch of sturgeon is made in Suisun Bay, although these fish are also found in San Francisco and San Pablo Bays, and in the lower Sacramento River. Shad are found in those localities where salmon are taken. Striped bass, carp, and catfish are most abundant in the San Joaquin River and adjacent sloughs. Some idea of the immense number of fish taken from these waters may be gained from the following figures for 1892:

Cod	2,274,565 pounds.	Rock-fish	644,372 pounds.
Sardines	703,130 pounds.	Shad	491,394 pounds.
Sturgeon	718,017 pounds.	Salmon	3,484,049 pounds.
Smelt	1,506,103 pounds.	Flounders	3,557,113 pounds.
Herring	4,376,887 pounds.	Clams and mussels	2,654,800 pounds.
Crabs	2,750,000 pounds.	Shrimp and prawns	5,315,075 pounds.

Naturally the San Francisco market is at all times well supplied with fish. It is true of this market, as of all others on the coast, that for lack of proper handling when caught, the fish, by the time they are offered for sale, are far from being as fresh as they should be. No ice is used, and very rarely are the fish cleaned before being sent to the market. This results from the great plenitude of fish, and from the fact that fishermen are able to market their catch within such short distance of the place of capture.

Flounders, rock-fish, perch, carp, and sturgeon are found in the market at all seasons. Salmon and smelt are also found throughout the year, the former, however, being more plentiful during the summer months, and the latter during the winter. Shad are very abundant from October to June, and only about one third as many are taken as could be were these fish in greater demand. Sardines and mackerel are very abundant during the summer. Many fish are sent from San Francisco to the markets of the interior, and the exports of dried and canned fish amount to many thousand pounds a year. The large majority of the men engaged in the fishing in this region are natives of the countries of Southern Europe, and almost the entire number are foreigners.

It would be much more satisfactory had we the figures at hand to

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make a comparison of the different branches of the fisheries of this region, but, unfortunately, in compiling the data no division has been made prior to 1892.

There were 4,430 men engaged in the fishery industry in this territory in 1892, an increase of 171 since 1888. In 1888, there were 1,023 vessels and boats used, and in 1892, the number had decreased to 900. There was an investment of $2,541,730 in 1888, and although the amount invested in the whaling fleet had fallen off nearly a million dollars in 1892, there was a decrease of but $206,897 in the total investment. In 1892 the value of the product was $2,793,535, a decrease of $1,402,329, on account of the decline in the whale and seal fisheries. This still leaves, however, the extremely large valuation of $2,793,535 to be credited to this region, which is justly considered one of the finest in the world, not only because of the large variety of fish at hand, but, moreover, because of its magnificent possibilities.

Aside from the benefits our people derive directly from the food fisheries, it must be remembered that we are so situated as to be able to send the products of this industry to foreign lands, and thus add a considerable amount to the income afforded by domestic trade. Until the establishment of the new steamship lines from northern points a few years ago, a considerable portion of the output from British Columbia and the Columbia River was shipped to foreign countries from San Francisco. These shipments have not only ceased since steamers commenced running from Oregon, Washington, and British Columbia, but more than this, because of favorable transportation rates, some of the dried and shell-fish products of San Francisco fisheries have been sent north for export, instead of being shipped, as formerly, direct from San Francisco. The following table shows a decided decrease of exports in 1893, because the low prices for canned salmon in England and the British Provinces made it advantageous for the dealers to place their season's pack on the home market:

Exports of Fish from San Francisco in 1892 and 1893.

	1892.	1893.
Codfish	$26,681 00	$21,412 00
Dried fish	34,439 00	27,043 00
Salmon, canned	1,810,567 00	621,336 00
Salmon, in barrels	46,986 00	44,157 00
Other canned fish	10,715 00	9,828 00
Oysters	9,655 00	7,432 00
Other shell-fish	226,063 00	188,532 00
Totals	$2,165,106 00	$919,740 00

PLACER AND NEVADA COUNTIES.

The fishery interests of Placer and Nevada Counties are confined to the fresh-water varieties, and consist almost entirely of trout, though a few white-fish are taken. The principal market supply is taken with trolls in Lake Tahoe, the use of nets being prohibited, otherwise the white-fish of this lake would figure quite extensively in our markets.

In 1893, there were 30 persons engaged in market fishing at Lake Tahoe, and their apparatus is valued at $2,250. There were shipped

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to the San Francisco market in 1893, 37,500 pounds of lake trout (*S. mykiss*), valued at $4,700.

In the first three months of the season of 1894, a total of 27,410 pounds were marketed, of which 4,500 pounds were taken in April, 10,500 pounds in May, and 12,350 pounds in June, for which the fishermen realized a net amount of $3,428. These figures do not include the thousands of pounds served to guests at the many hotels on the lake, nor those carried away by the many sportsmen who yearly visit these waters, of which no record is kept.

A considerable number of pounds of trout are annually caught by market fishermen in Donner and Independence Lakes and the Truckee River, and shipped to the San Francisco markets, the amount of which we have been unable to obtain.

MENDOCINO COUNTY.

The shores of this county are high and rocky, and are ill adapted to the fishing industry. During the winter months, however, large quantities of steel-heads are caught in the waters of the county, and in 1893 there were several men engaged in this pursuit.

HUMBOLDT COUNTY.

The fisheries of Humboldt County are principally confined to Humboldt Bay and Eel and Mad Rivers, although there are fisheries of note in the vicinity of Trinidad Light-house, which have come into notice within a few years. The jetties built at the entrance of Humboldt Bay have had a marked effect upon the outside fishing, and it is believed the catch can be considerably increased.

The salmon fisheries are of the first importance, the fish being mostly taken in the Eel and Mad Rivers. There is no spring run of salmon in these rivers, and the catch is all made in the fall. The main part of the salmon catch is shipped to San Francisco in a fresh condition, as the cannery located on Eel River has not been operated for some years.

The principal marine species taken are flounders, smelts, halibut, rock-fish, and cod. Large quantities of crabs and clams are annually taken.

The chief species taken in 1892 were as follows: Flounders, 145,873 pounds, valued at $2,917; salmon, 1,082,517 pounds, valued at $32,875; crabs, 112,320 pounds, valued at $3,900.

The total fish products for 1892 were valued at $47,038, an increase of $15,000 over 1888. The value of the apparatus in use in 1880 was $18,010, and this had increased to $26,390 in 1892. There were 320 persons employed in the fisheries in 1892.

DEL NORTE COUNTY.

The only fish taken in this county are those which are chiefly caught in the Smith and Klamath Rivers. The output of the canneries on these rivers in 1892 amounted to 282,250 pounds. These fish are chiefly taken in gill-nets, and in 1892, 118 men were employed during the fall season, using 25 boats. The investment in gear and shore property that year was $31,900, and the catch was valued at $5,988.

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REPORT OF OBSERVATIONS RESPECTING THE OYSTER RESOURCES AND OYSTER FISHERY OF THE PACIFIC COAST OF THE UNITED STATES.

By CHARLES H. TOWNSEND.

[Extract from Report of U. S. Commissioner of Fish and Fisheries for 1889-91.]

CALIFORNIA.

SAN FRANCISCO BAY.

The oyster industry of the Pacific Coast, exclusive of the trade in the small indigenous species, has never extended beyond the limits of the bay of San Francisco, where it has been restricted to the growing or fattening of seed or yearling oysters, brought annually in large quantities from the Atlantic Coast and kept in the waters of the bay until they attain a marketable size. Although this method of supplying the market has been practiced by the oyster-dealers of San Francisco for many years, so that since the completion of the first overland railroad there has constantly been a supply of Eastern oysters in the bay, it has generally been understood that there was no natural increase of the species, its alleged failure to propagate being usually attributed to the low temperature of the water. Some recent studies of the oyster-beds and of the physical conditions of the bay of San Francisco by myself, under the direction of the United States Commissioner of Fish and Fisheries, have yielded data sufficient to warrant a review of the entire subject in a new light.

The interesting fact that oysters do propagate in San Francisco Bay, in certain favorable localities at least, calls for some explanation as to the long acceptance by the public of the statement that there has been no natural increase. This state of things may have resulted from one or more of the following conditions, perhaps in part from all of them, namely: The popular knowledge of the low temperature of the water as compared with the same latitude on the Atlantic coast; the peculiar situation of the localities where the imported oysters were laid out; the enemies they were known to have in Pacific waters; and the lack of sufficient public interest to demand the study and outlay necessary to discover the real truth respecting the life of the Eastern oyster in California waters. Doubtless one reason for the lack of information necessary to effect a change in the method of handling oysters is the fact that all the minor firms engaged in the business were early merged into one or more important companies, which, having practically the control of the entire oyster industry of the Pacific Coast, had no need to change the methods of a business already profitable. Importations of seed oysters from Atlantic waters have therefore been made annually almost to the present time, while it is by no means proven that seed oysters can not be raised in that region. The methods of nearly twenty years ago are

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still in vogue, the only advancement made being the larger scale on which the business is now conducted. * * *

In view of the great success that attended the introduction of certain Atlantic species of mollusks and fishes into the waters of California, such as the soft-shelled clam, shad, striped bass, carp, catfish, etc., there was reason for expecting similar results from the introduction of the oyster. The investigations of this subject have simply disclosed the facts that the oyster has to some extent adapted itself to the new habitat in common with the other introduced species, and that in spite of many unfavorable conditions it is slowly increasing. Future study with reference to oyster culture on the Pacific Coast should be made in the light of these facts.

Temperature.—The popular belief that the low temperature of the water of San Francisco Bay has prevented the increase of the oyster is not based on any exact information on the subject. The temperature of the bay in the vicinity of the city of San Francisco, usually not much higher in summer than in winter, was early assumed to be too low for oyster propagation and, from the lack of special evidence of oyster increase, this gradually became the common explanation to casual inquirers about the matter, no one making any attempt to disprove it, although the spat from imported oysters has, it seems, been developing and growing in secluded places, doubtless from the very start. The oyster growers apparently keep no record of temperatures, or of other observations that would throw light upon the physical conditions of the bay during the different seasons of the year.

Mr. M. B. Moraghan, an oyster dealer of San Francisco, says that the temperature at his oyster-beds at Millbrae ranges from 58° to 65° F. At the extreme southern end of the bay the summer temperature has recently been found to be much higher, ranging from 67° to 74° F. for July and August. My personal observations on the temperature were of course limited to times when the "Albatross" happened to be in port, and as this never occurred in summer the most important season is as yet but little understood. The importance of studying this subject is evident when the influence of the marked rainy and dry seasons of California upon the waters of the bay is considered. Although the water never reaches the summer warmth of corresponding latitudes on the Atlantic coast, the temperature is more equable than that of most places upon the Atlantic coast where oysters grow, and the extremes of temperature are within those of such regions. It may be that the temperature during the spawning season of the oyster, which is of course the critical period, is low enough to seriously limit the quantity of spat developed, but this can readily be determined by a careful study of the beds at the proper season, which has not yet been done.

Experiments in the artificial propagation of the oyster indicate that the nearer the temperature to 70° the more likely is success. During the latter part of October, 1890, I found the temperature of the southern part of the bay, near Belmont, to be usually 61° F. On the same dates, in the region of San Mateo, a few miles nearer the sea, it was 1° lower; while at California City, still nearer, it was 57°. Recent observations have shown, however, that the water temperature is much lower in October than in the midsummer season. It is altogether probable that the extreme southern portions of the bay, 20 or 30 miles back from the sea, are several degrees warmer at all seasons than those farther north, since the region is more sheltered from sea winds, and the strong breezes

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of San Francisco are less noticeable there. The French system of *claires* would furnish still warmer water than any of the bays of California.

The following table of observations upon the temperatures of water and air in the Golden Gate, at 7 A. M., for ten years, 1874 to 1883, is taken from Davidson's "Pacific Coast Pilot":

Table showing the Temperature of the Water and Air in the Golden Gate for 10 years, from 1874 to 1883, inclusive.

[Observations taken daily at 7 A. M., and reduced to monthly means.]

Months.	Water.	Air.	Water—Air.
January	50.49°	46.89°	+3.60°
February	50.99	49.21	+1.78
March	52.49	51.98	+0.51
April	54.28	54.72	—0.44
May	56.46	58.33	—1.87
June	58.35	60.27	—1.92
July	58.88	58.78	+0.10
August	59.23	58.00	+1.23
September	59.68	58.86	+0.82
October	57.83	57.30	+0.53
November	54.66	52.40	+2.26
December	51.94	48.58	+3.35

Professor Davidson says: "The lowest temperature of the water is for the month of January, 50.49°; and the highest for the month of September, 59.68° F.," and he adds that "the temperature of the air follows very closely that of the water."

Hourly water temperatures taken by the "Albatross" at the foot of Market Street and at the Union Iron Works, San Francisco, for limited periods, indicate a slightly higher temperature than in the Golden Gate. Temperatures taken by the same vessel at Mare Island, where the water is more subject to the influence of the Sacramento River, show a much lower temperature.

A series of temperatures taken in Oakland Creek from September 7, 1890, to May 20, 1891, at 4 A. M. daily, range from 49.8° for December to 64.9° for September.

Recent summer temperatures taken by authority of the United States Commissioner of Fish and Fisheries at the extreme southern end of the bay, through the coöperation of the Morgan Oyster Company, have yielded valuable information, the water of that part of the bay having been found to have a summer warmth amply sufficient for the propagation of the oyster. The important table of temperatures from this locality is condensed to means of ten days from a lengthy series of daily observations at both high and low tide.

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Temperature at the Oyster-Beds one mile from Dumbarton Point, San Francisco Bay July 12 to October 12, 1891.

Date.	Air Temperature.	Surface-Water Temperature.		Range of Water Temperature.
		High Tide.	Low Tide.	
	°F.	°F.	°F.	°F.
July 12 to 19	68.0	69.6	71.9	67 to 73
July 20 to 29	68.9	70.9	71.9	69 to 74
July 30 to August 8	67.3	69.5	69.7	68 to 72
August 9 to 18	68.4	70.3	70.7	68 to 72
August 19 to 28	72.3	71.4	72.0	69 to 74
August 29 to September 7	66.8	70.7	69.1	67 to 72
September 8 to 17	66.4	67.8	68.0	64 to 71
September 18 to 27	65.7	66.1	67.3	64 to 70
September 28 to October 7	64.2	65.6	62.9	58 to 70
October 8 to 12	61.9	63.2	64.0	62 to 65

Peculiar Situation of the Oyster-Beds.—There are at present no Eastern oysters in San Francisco Bay that are not laid upon tide lands, or so-called mudflats, completely exposed at the time of low tide. The principal reason for the selection of such situations is that the beds may be readily fenced in by closely set stakes to protect them from the depredations of the stingray (*Myliobatis californicus*), which enters the bay every spring and is the principal enemy of the oyster in these waters. In this complete dependence for oyster-growing upon tide lands, frequently left dry, is doubtless to be found one explanation of the slow increase of the species. The California summer is absolutely dry and rainless. It is a season of cloudless skies and regularly recurring heat in the daytime; therefore, an oyster-bed at this season, when the tide is out, is exposed not merely to the air, but to a heat sufficient to dry the moisture off from all the oysters in sight, and perhaps injure the majority of the spat that might have been attached to their shells. If embryo oysters, set free on the beds, drift with the receding tides to deeper waters outside the stake-protected area of the flats, they are exposed to the stingrays when they have attained sufficient size.

Stingrays, and the Stake Protection Employed against them.—The California stingray (*Myliobatis californicus*) enters San Francisco Bay in large numbers in the spring and remains until late in the fall. It is said to be as destructive to oysters in these waters as the starfish is on certain parts of the Atlantic coast. It has heavy flat teeth, arranged in a sort of pavement in each jaw, and is essentially a feeder on shellfish. Its presence requires the fencing in of all the oyster-beds in the bay with closely set stakes about 12 feet long, which are driven about 4 feet into the ground. When a broken stake allows a school of stingrays to raid an oyster-bed, the surface, after the tide has gone out, presents much the appearance of a field that has been rooted by hogs. Sometimes the oystermen, discovering their presence, manage to entrap them inside the line of stakes, and thus destroy many of them during one low tide.

Fencing oyster-beds against stingrays constitutes another heavy expense to the California oystermen, in addition to the annual outlay for seed oysters from the Atlantic coast. The fences must be looked after constantly and kept in repair. The heavy winds that sometimes during the winter season cause vessels in San Francisco Bay to drag

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their anchors do great damage to the fences of the oystermen, which they must manage to have in good condition by the time the stingrays reappear in the bay.

I do not know how late in the fall stingrays continue to menace the oysters, but I netted a few small specimens in San Pablo Bay as late as November 7, 1890. They first appear in April.

The danger from stingrays is probably overestimated, in view of the natural increase of oysters upon wide tracts unprotected by stakes.

Other Enemies of the Oyster.—The drill (*Urosalpinx cinerea*) has not become troublesome upon the oyster-beds of San Francisco Bay until very recently, and even now is abundant only in the southern part of the bay. The oystermen showed me heaps of shells, all more or less drilled with small holes, in evidence of its ravages. At the Belmont beds I had no difficulty in gathering a quart of these mollusks in less than ten minutes by merely turning over the large oysters when the water had receded from the beds. Sometimes half a dozen were to be found on a single oyster. With its minute "tongue-file" this creature drills a hole through the oyster's shell, and inserting its proboscis into the opening, barely large enough to admit a pin, it feeds directly upon the soft parts.

This destructive animal may have been introduced much earlier than the oystermen suppose, as a few individuals accidentally imported among the original oysters would require several years to increase to the present numbers. Mr. Moraghan informed me that there were no drills upon his beds at Millbrae, which, as stated above, are much nearer the sea than the Belmont beds. If they are restricted to the Belmont beds, as seems to be the case, it would pay the oyster growers to pick them off as far as possible. Any gathering of drills that would keep them in check is important, as their increase will cause great loss in the future.

Two species of crabs are found upon the San Francisco oyster-beds, one of which is exceedingly abundant, but their presence has probably no effect upon the oysters.

Large numbers of shells were found honeycombed by the boring sponge.

The starfish has never proved troublesome to the oyster-beds of the bay, and, in fact, is seldom found upon them. It is doubtful if it occurs, except as a straggler, farther south in the bay than the wharves of San Francisco and Oakland, and requires no special mention in this connection, as its presence upon a bed would be readily detected at low water, when stray specimens would be picked off by hand and disposed of effectually. The original bedding-grounds for oysters at Sausalito, being so close to the sea, were sometimes visited by starfish, but they were not considered troublesome.

Preparation of Ground for Laying Out the Oysters.—The mudflats are always more or less prepared for oyster-ground by gangs of workmen, who level the surface by removing the elevations and filling in the depressions. This is done, of course, when the proposed oyster-bed is laid bare at low tide. There seems to be very little improvement of the ground by the use of old shells of the Eastern species. Mr. Moraghan returns the shells from his restaurant stands in the California Market in San Francisco to his beds at Millbrae, but he uses them for filling depressions, and does not distribute them over the beds as spat-collectors.

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Fixation of Spat.—Not only are the chances for the fixing of spat diminished by the use of ground in some places where there are very few old shells upon the bottom, but almost all of the shells of *Ostrea virginica* are returned from the marketmen to the principal oyster company, who sell them for the manufacture of lime, instead of using them for the improvement of the beds. These shells of Eastern oysters, if returned to the beds where they were grown, or to other portions of the bay, would certainly increase the chances for the fixation of spat set free from the beds where adult oysters are growing. It is probable that careful attention to this matter of increasing the fixing surface required by the young oyster might make just the difference between rapid self-propagation and the present slow increase.

So far as has been ascertained, no recent attempt has been made by any one to collect the spat of *Ostrea virginica* in San Francisco Bay, and it is evident that the prevailing impression that there is no propagation of the species here is not founded upon conclusions based upon actual investigations. Previous to my first examination of the oyster-beds, a gentleman as keenly alive to matters of public interest as any one in California, and a member of the original Tide Lands Commission, said to me, "You will find that the oyster does not propagate here." A general impression had simply grown into a widespread belief. With the exception of a few persons connected with the management of the oyster business, the men employed in the industry know little of the subject outside of the peculiar methods practiced in California.

Hundreds of thousands of bushels of oyster shells have been distributed over the bottom of Long Island Sound in deep water, as cultch to which the oyster spat could attach itself, with the very best results. Strewing the shells of Eastern oysters in the slightly deeper waters just outside the existing beds upon the tide lands, and in other parts of the bay, might furnish the lacking element in these waters, viz., fixing-surfaces for spat. Young oysters found in such situations could be taken up before the next annual appearance of the stingray, and used as seed oysters in the customary way. It would seem that there are possibilities for oyster culture in San Francisco Bay by methods entirely distinct from those now practiced there.

Evidences of Natural Propagation.—One of the first indications I had of the natural propagation of the oyster was the finding of young oysters six months or a year old upon beds where those three or four years old were kept. They were in most instances attached to clusters of dead shells of the small native oyster. Very few were to be found attached to adult specimens of *Ostrea virginica*, but this may be explained by the fact that such oysters are frequently handled and "laid out" to keep them well upon the surface and prevent any settling in the mud. The handling is done in order to select and clean the largest for market, the others being also cleaned of the ever-accumulating native oysters, which would involve the destruction of such small Eastern oysters as might be among them upon the shells of the large oysters.

The fact of young Eastern oysters being attached to anything is proof that they grew in the bay where they were found, for oysters do not have the power of fixing themselves a second time. All these small oysters are knocked off the large shells with a small cleaning hatchet, and the operation is a necessary one, as the extremely productive natives

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cluster upon the large species in such numbers as to greatly interfere with their growth.

In October, 1891, I discovered some oysters of large size in certain sloughs of the south bay, where they had long escaped the stingrays in consequence of bars which shut off the sloughs from all but the highest tide. These were the largest oysters seen at San Francisco, and had evidently lain there for several years. More recently I obtained a quantity of oysters, apparently two years old, in Oakland Creek. As the oyster-beds maintained there several years ago by Mr. Doane, now of the Morgan Oyster Company, have long since been abandoned and the stakes removed, it is evident that a limited number of oysters have found conditions suitable for their development and growth, even in this muddy place. They are no longer found on the mudflats, where they were originally kept, but live in the mud of the channel, from which I obtained them with tongs.

Mr. Cleveland Forbes, of the Spring Valley Water Company, informed me that several years ago he found full-grown Eastern oysters upon the piles of an old narrow gauge railroad trestle, across a slough near Dumbarton Point, and that the men of his party frequently found many upon banks composed of shells of the native species, near where the pipes of the company cross the bay.

Mr. H. D. Dunn has recently reported through the press the discovery of a full-grown Eastern oyster near Mile Rock in the Golden Gate.

It is possible that during the long time Eastern oysters have been kept in the bay they have become in a measure acclimated, and that there is a constantly increasing tendency to propagate; that is, the progeny of oysters grown here become hardier with each generation and better adapted to the colder but more equable waters.

During my latest examinations of the bay (May and June, 1891) Eastern oysters, very large and old, were found in the following places near the sites of former oyster-beds: Several adhering to the piles of the narrow gauge railroad trestle across San Leandro Bay; a few upon the rocks at the extreme north point of Sheep or Brooks Island, near low-water mark; a few upon the rocks at Point San Pedro (at entrance to San Pablo Bay). Those from San Leandro Bay doubtless originated as spat from the oyster-bed near the entrance to that bay, at the end of the bay northwest from the island. Those from Sheep Island had merely drifted as young across the half mile of distance from the old beds near Ellis Landing, while the San Pedro oysters originated upon the beds between Marin Island and Point San Quentin, a couple of miles distant.

Mr. H. D. Dunn informed me that wild Eastern oysters had been reported to him from some other place near Point San Pedro, but I did not discover them, being without a pilot. These finds are very interesting, as showing not only the breeding of the oyster in various parts of the bay, but that the species began breeding several years ago when oysters were laid out in those northern parts of the bay. At Point San Pedro oysters are directly exposed to the influences of the Sacramento River. But the largest and most important tract of oyster propagation is in the region of the natural shell-banks of native oysters along the east side of the bay, beginning at Bay Farm Island and extending well southward and off into deep water. Here wild Eastern oysters may be found during the low tides that expose the outer portions of the shell-

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banks. At this place they are numerous, and when the tides are sufficiently low it is possible to gather them by the score, ranging in size from yearlings to those several years old. This deposit is at least four miles removed from the nearest site of a former oyster bedding-ground, and there is no doubt about the oysters upon the whole tract being of volunteer growth. A channel several feet wide separates this tract from the old bed on the north, while it is nearly ten miles to the nearest beds on the south.

Examination of two or three hundred oysters gathered in this region shows the fixing surface for the spat to have been the shells of the native oyster (*Ostrea lurida*). Indeed, there is nothing on this whole bank but clean shells of the native species. The bank is exposed to heavy seas during the season of strong winds, and many Eastern oysters doubtless become buried beneath the easily drifted shells of the small natives. It is probable that there is a very great production of Eastern oysters here that we know nothing of, as the whole tract is accessible to stingrays, which prey upon every kind of shell-fish outside of the stake-protected beds. It is also probable that the heavy seas which at times sweep across this shallow section of the bay, and actually break up the clusters of native oysters by rolling them toward the beaches, have an injurious effect upon newly fixed Eastern spat by burying them beneath the drifting shells.

Considerable quantities of wild Eastern oysters are annually gathered upon this and other shell-banks in the bay. They are retailed in Oakland and Alameda at $1 50 per hundred, or sold to the oyster companies, who lay them out on their fenced beds for further growth. They are obtained when unusually low tides happen to expose them. No tonging or dredging is done, the oyster being gathered by hand. The work is performed chiefly by boys. I have no means of knowing the quantity of oysters derived from this source.

It appears, therefore, that there are other parts of San Francisco Bay as good for oyster-culture as those now inclosed, and that the increase of wild oysters now growing there would be more rapid if they were inclosed and afforded similar protection from heavy seas, stingrays, etc.

Spawning Season.—It is not unlikely that the oyster spawns here as early as on the North Atlantic coast, as the warming to which adult oysters are often exposed early in the spring during low tides must have a tendency to hasten the process. I have not examined them earlier than the 1st of May, but from that time until July 15th, plenty of them are to be found ripe with eggs. Of other months I cannot speak personally. Dr. H. W. Harkness, President of the California Academy of Sciences, informed me that during one year he examined many oysters from the market stalls with the microscope, and he expressed the belief that oysters could be found with eggs during most months of the year. Opinions of oystermen differ as to the duration of the spawning season, but from April to August seems to be the decision of the majority.

Notes on the General History of the Oyster Industry of San Francisco Bay.—Live oysters were first brought here by A. Booth, of Chicago, about the year 1870, when the first overland railroad was completed. Afterwards, from time to time, others engaged in the introduction of Eastern oysters, and they eventually brought only supplies of seed oysters, which were bedded until they became marketable.

Corville & Co. established an oyster-bed a short distance south of Point

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San Bruno about 1872. This place was subsequently owned by Swanberg & West, who had both Eastern and Willapa Bay oysters at Pinole Point at one time.

Doane & Co. once had Shoalwater Bay oysters a short distance north of Point San Bruno, but they were lost during a "northeaster," and the locality was abandoned. The same firm kept both species of oysters in Oakland and Alameda Creeks, but these localities were abandoned with the increase of traffic and on account of sewers.

Before the introduction of the Eastern species, oyster dealers in San Francisco maintained a trade in Willapa Bay oysters, which is continued up to the present time. As these oysters are obtained readily from their natural beds, no attempt is made to propagate them here; they are simply freshened before they are marketed. The localities originally used for bedding oysters by Morgan & Co., Doane & Co., Swanberg & West, and other firms now consolidated with the Morgan Oyster Company, viz.: Sausalito, Point San Quentin, Sheep Island, and Oakland and Alameda Creeks, have all been abandoned in favor of localities south of San Francisco, where the nearest are from 10 to 15 miles removed from the influence of the Sacramento River, and where they are almost free from deposits of sediment. There was always a large percentage of loss from oysters settling in the mud at the old localities. I examined all these old beds, but found no oysters on any of them.

When oysters are removed from certain localities to others better suited to their fattening, the shells of the native oysters are knocked off them with a light, long-bladed, adz-shaped instrument adapted to the purpose.

In the frequent transplanting of oysters may be found another feature of their treatment tending to reduce propagation; many Eastern oystermen consider "plants" (transplanted oysters) infertile for a year or two. If there is truth in this the extent to which oysters are moved at San Francisco must certainly have its influence.

Seed oysters are brought to San Francisco in the fall by fast freight. Not more than 10 per cent loss is expected under ordinarily favorable circumstances. The mere freezing of the liquid about the oyster is not considered injurious. In illustration of the length of time cold or frozen oysters may remain out of water without losing their vitality, Mr. Morgan told me that from a number of carloads of oysters consigned to his company one car was lost through some mistake and turned up in St. Louis. When it finally arrived at San Francisco, after being two months on the way, and the frozen oysters were bedded, it was found that there was but little more loss than in shipments of ordinary duration.

A new company, the Chesapeake Oyster Company, a branch of the International Oyster Company of New York, has lately begun the shipment of fresh marketable oysters to San Francisco, and at present has a quantity of them deposited at Sausalito.

Quantity of Oysters Put upon the Market.—Statements on this subject were conflicting. Certain oyster dealers said that there were from 350 to 400 boxes of oysters (containing 200 full-grown oysters to each box) put upon the San Francisco market daily; while from the statements of certain outsiders, it appeared that the quantity was much greater. Neither did I learn what proportion to this amount the shipments to outside towns bear. From certain sources I heard that there were about 100 carloads of seed brought west annually, while others discredited this statement and placed the amount at half that number.

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The consumption of Eastern oysters on the Pacific Coast has greatly increased of late years, while the rate of importation of seed oysters has not; in fact, after considerable inquiry, the conclusion is that it has decreased; so we may infer that the beds, although not self-sustaining, are nevertheless contributing something in the way of natural increase to meet the demand.

The market for oysters in San Francisco is good, and all that are produced sell readily. They are ordinarily packed in boxes containing 200, worth $4 per box. It will be seen that they cost twice as much as on the Atlantic coast, where choice oysters are worth $1 per hundred, and good oysters, not specially selected, can usually be bought for 75 cents per bushel. Californians will undoubtedly consume more oysters when they get them at Eastern prices.

Oysters are always in season in California, the sales and prices being the same in summer as in winter.

The Pacific Coast Native Oyster (*Ostrea lurida*).—This small oyster abounds in San Francisco Bay, where it is utterly worthless as compared with the oyster from Washington. It is present upon all the bedding-grounds of the Eastern species. When the latter are permitted to lie too long undisturbed they become coated with the small shells of *O. lurida*. There are extensive deposits of this species in the shallow waters all along the western part of the bay, and their dead shells washed ashore by the high seas that accompany the strong winds of the winter season have formed a white glistening beach that extends from San Mateo for a dozen or more miles southward. So abundant are they that this constantly increasing deposit of shells covers everything alongshore and forms bars extending into the bay.

Schooners frequently carry away loads of them for the making of garden walks and for other purposes to which old oyster shells are adapted. Quantities are ground up and scattered about poultry ranches. The supply is unfailing. Their small size and thin, light shells permit them to be readily drifted about the bay, and thus render them unsuitable as collectors of the spat of Eastern oysters. They break apart and disintegrate, and shift so freely when exposed to heavy waves that they cannot be considered good fixing-surfaces for the large species when in exposed places. If the banks formed of these little shells could be protected from the heavy waves by some firm outside barrier, and be covered with an abundance of large shells not so likely to drift, a permanent bed might readily be formed. The Eastern oysters laid out on the natural shell-banks in some places are frequently rolled along the bed and washed high and dry upon the beaches. The original bedding-grounds along the east side of the bay have been abandoned mainly on this account.

It is possible that I have not attached sufficient importance to the evil of overcrowding by the remarkably fertile native species. This little oyster, naturally adapted to these places, finds the large shell of the Eastern oyster a fixing-surface specially adapted to its needs. It is thus protected from the bad results attendant upon the changing surface of its natural shell-banks; it has the advantage of the protection of the fences; it is nearer to the muddy bottom, from which much of its food is derived, and yet is lifted by the shell of the large oyster to a safe height above that bottom, where the under shells of a cluster of any species of oyster would be smothered in the mud. So closely do these

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indigenous oysters crowd upon the shells of the large species that when a heap of the latter have been cleaned for market the accumulated parasites almost equal in bulk the edible species. Doubtless they are responsible for crowding many of the young of the less adaptive Eastern species completely out of existence.

The native oyster (*O. lurida*) grows twice as large at Willapa Bay, Washington, as it does at San Francisco, and is constantly misnamed the "California oyster." But no use is made of the small California coast oyster, except as its shells are utilized in the ways previously mentioned.

The Morgan Oyster Company.—This company now maintains six important stations or groups of oyster-beds in San Francisco Bay, where oysters imported from the Atlantic coast are kept until they reach a marketable size. All are situated in the southern part of the bay, and are from 15 to 35 miles back from the Golden Gate. At each of these localities there is a comfortable building for housing the employés. Each station is supplied with fresh water by an artesian well, which usually elevates the water a few feet above high tide, windmills being added at three of the stations to raise the water to tanks. At four stations (Dumbarton, San Bruno, Millbrae, and Alvarado, the last now abandoned) the houses are built upon piles, and are 1 or 2 miles from the nearest land. At the other stations they are upon islands or the shores of the bay. There are several inclosed oyster-beds near each of the houses, varying in extent from 50 to 100 acres each. I had no means of knowing the actual extent of the oyster-beds of this company, but will roughly estimate the territory fenced in by stakes at 1,500 or 2,000 acres. This should, perhaps, be regarded as a guess rather than as an estimate.

The station known as San Bruno was established by Corville & Co. about 1872. It was subsequently owned by Swanberg & West, and finally passed into the hands of the Morgan Oyster Company.

The establishment at Millbrae dates from 1874, and is one of the most valuable. The house is nearly 2 miles off shore, and is connected by telephone with the city office.

Dumbarton was begun in 1877 and may be considered the most important station of all. The oyster-beds here are the most remote from the sea. There is probably sufficient warmth of water here in summer to admit of more extensive oyster-spawning than elsewhere. South of this point the tide water backs up many sloughs and creeks far inland, where it can become warm, and there is little doubt that future tests will show this to be decidedly the warmest part of the bay and the best adapted for raising seed oysters.

Alvarado place, about 8 miles north of this and in a very exposed situation, has been abandoned on account of the heavy seas, caused by winter winds, to which it was subjected. The South Belmont place was started in 1877 and North Belmont in 1884. The last, founded by Doane & Co., was later consolidated with the Morgan Oyster Company, of which Mr. Doane is now the field superintendent. The San Mateo oyster station has been in operation for five or six years. The employés are moved from station to station as the beds at different places require attention.

Seed oysters are usually laid out at the Dumbarton beds or the Belmont beds (all of which are near the head of the bay) for a couple of

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years, and are then transferred to the beds at Millbrae and San Bruno for the final year before being put on the market, as the latter localities are supposed to be better adapted to fattening them.

This company employs a schooner, quite a fleet of sloops or "plungers," many scows or barges, and some floats. No retail stands or restaurants are operated. They have considerable territory in Willapa Bay, Washington, devoted to the cultivation of the Washington coast oyster (*Ostrea lurida*). Large regular shipments of this species are made to San Francisco. The wholesale oyster business of the company is transacted at a commodious building on Third Street, San Francisco, from which oysters, opened or in the shell, are supplied to the hotels and restaurants of the city, and boxed or canned, are shipped to all the large towns of the Pacific region, from Victoria to San Diego, and from Salt Lake to Honolulu.

Oyster Establishment of M. B. Moraghan.—Mr. M. B. Moraghan, an importer, planter, and wholesale and retail dealer in oysters in the California Market, San Francisco, established his oyster bedding-ground at Millbrae about 1882, where he owns 200 acres and leases 900 acres of tide lands. Much of the product of these beds is used at his restaurant stalls in the California Market. The methods of the Morgan Oyster Company, previously described, apply also to this place.

Vessels.—The vessels employed are schooners, sloops, scows, floats, and a few small row-boats.

The floats are large barges with the bottom plank sufficiently separated to admit the water freely. They are used as temporary receptacles for oysters that have been culled and cleaned, and to keep them fresh while awaiting transfer to market. They are kept afloat by "air boxes," *i. e.*, air-tight compartments along the sides and ends, and, in extra large floats, lengthwise through the middle. The bottom is made of 3-inch square timbers separated by half-inch spaces. The float thus constructed has a free circulation of water among the oysters stored in it, and will hold great quantities of them in a fresh and healthy condition. Floats are constructed in varying sizes adapted to the requirements of each station, the large double floats with central air box being usually 40 feet long by 20 wide. The single compartment floats are about half this size.

The scows are used in tonging up oysters and for sorting and otherwise handling them. They are shallow and flat-bottomed, with sides very slightly tapering from the middle to the square ends. The flush decks slope a little toward the low rail strip at the sides. Each end is fitted with a large iron ring, through which the heavy propelling poles are passed and driven by hand into the mud to steady it in tonging. In this operation the scow is gradually moved broadside across the oyster-bed, permitting a thorough taking-up of all oysters in its course, which is previously laid out by occasional light poles set up on the bed at low tide. When loaded, the scow is pushed alongside the float and moored to it until its oysters are culled. Scows are made in different sizes, with decks averaging 8 feet by 24 feet.

The sloops or "plungers" in use are built upon several models, some of them with flush decks and a large central cockpit divided by a center-board. A larger size is a keel boat with low deckhouse. Both forms are commonly cat-rigged. They are employed for general transportation between the oyster stations and to carry oysters to market.

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A good-sized schooner of unusually light draft has been built by the Morgan Oyster Company for oyster work in the bay, and has been found very efficient.

When the tide goes out and all these craft are left high and dry upon the tide lands, the workmen, putting on leather-soled rubber boots for wading in the mud, are employed in leveling or otherwise improving the surface for oyster bedding.

Employés.—Usually about 100 men are employed upon the oyster-beds of San Francisco Bay, this number being considerably increased at certain times. They are recruited from the ranks of the sea-going class, nearly always numerous about the wharves of San Francisco, and are constantly changing, none of them developing into regular oystermen. About 90 per cent of them are of Scandinavian origin.

San Pablo Bay.—The most diligent dredging from a steam launch failed to reveal any shell life, except clams, upon the bottom of San Pablo Bay. The native oyster, *O. lurida*, so abundant in San Francisco Bay, particularly far south of the city, was not found here at all. It is probable that it formerly lived here, for there are extensive deposits of shells of this species to be seen in the faces of the bluffs along the west side of Mare Island fronting on San Pablo Bay. Nearly all the supply of soft-shelled clams is derived from the mudflats of San Pablo Bay. This species is apparently as abundant here as if it had always existed in these waters.

While San Pablo Bay appears to be devoid of shell life, except clams, it is rich in shrimps and fishes.

The muddy character of the bottom is due to its being a favorable place for the waters of the Sacramento River to expand and thereby deposit the sediment carried by its current. The river maintains a deep channel along the south side of the bay on its course to the sea, but when it meets an incoming tide at the entrance to San Francisco Bay its muddy flood is spread all over the broad extent of San Pablo.

Mr. M. Manson, engineer for the Harbor Commission, states that the shoaling of San Pablo Bay dated from the time of hydraulic mining, but that since the cause of debris has been removed the bay has improved and will doubtless continue to do so. He recommended an examination of the west side of San Pablo Bay with reference to the possibility of its being made bedding-ground for oysters, but as far as I was able to examine it there were no indications of firm bottom like that of the west side of San Francisco Bay.

Mr. McNear, proprietor of the wharves at McNear's Landing, on San Pablo Bay, once laid out Eastern oysters upon a narrow mudflat near the landing, but lost most of them from continued rough weather, during which they were either washed upon the beach or covered by soft mud. The experiment was not repeated.

Though I have as yet found no oysters in San Pablo beyond McNear's Landing, the discovery of many Eastern and Willapa Bay oysters about the narrows at the entrance to the bay is interesting as showing the propagation of oysters exposed to the fresh water of the river, and is an indication that something might be done for oyster-culture in San Pablo Bay if firmer bedding-grounds can be secured.

Tide Lands.—The sale of the tide lands of San Francisco Bay has hitherto been considered as exercising a retarding influence upon the development of the oyster industry, as well as of other branches of

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business. These lands, surveyed and sold by the State at $1 25 per acre, have gradually passed into the hands of the larger oyster companies. This is especially true of the extensive flats in the southern part of the bay most available for the present system of laying out oysters, and the managers of the Morgan Oyster Company informed me that they owned about all that they considered valuable for their method of growing oysters. Many consider the sale of the tide lands an injustice to the people. It is said that the railroad companies are proprietors in tide lands to such an extent that the city of Oakland is greatly handicapped for water frontage and wharf facilities.

The law permitting the sale of the tide lands is not, however, an unmixed evil, for while it might lead to monopoly it would allow oyster-planters to reap the harvests they sow. It is now conceded by many who have long upheld the system of public dredging in the Chesapeake region, that private cultivation must be provided for before there can be any marked increase in the oyster supply.

The Tide Land and Water Front Company of San Francisco are proprietors of the tide lands to a considerable extent, and offer them for sale at the uniform price of $25 per acre. Notwithstanding the fact that much desirable oyster bedding-ground is already fenced in, there is still much good oyster ground unoccupied in the southern part of the bay. In the Long Island Sound region, where the oyster ground can be bought or leased from the States, the system of private ownership of the beds has been found perfectly practicable and very advantageous.

In reply to inquiries respecting the value of the tide lands now inclosed and used by the oyster growers of San Francisco, Mr. Moraghan writes me:

> The price depends upon the location, the kind of bottom, whether mud, shell, or sand, etc., and more than all, upon the improvement or amount of labor bestowed on the land. We have some beds that are worth fully $1,000 per acre to us, as we have been improving and working upon them for the past ten years in bringing them to their present condition.

Mr. Moraghan adds that unimproved tide land, such as is used in the Californian method of bedding oysters, is very cheap, being worth $10 per acre, and that such lands can be had adjacent to the best inclosed beds for $20 per acre.

Suggested Introduction of Other Species of Oysters.—With evidence at hand of the propagation of our own oyster (*O. virginica*) in California, the introduction of foreign species seems superfluous; but Prof. George Davidson and Mr. H. D. Dunn, of San Francisco, both of whom have resided in Japan, have frequently spoken to me of the large oyster of Japan in connection with the subject of oyster-growing in California. Professor Davidson sends the following note on this subject:

> The oyster I knew in Japan was found in the vicinity of Nagasaki, where I was stationed during the three months October, November, and December, 1874, and part of January, 1875. The oyster is there very large, full, and well flavored. I obtained some shells that were fully 12 inches long. I tried to interest some of our steamship captains to bring them to San Francisco, but at that time the trip frequently consumed a full month, with a change of steamer at Yokohama, and they doubted the success of such an experiment. With the present more rapid transportation and a better knowledge of their treatment en route, I think it very advisable to try and introduce them to the Pacific Coast.

The introduction of oysters from Japan would probably not be difficult, as a great many species of shell-fish from that region are identical with California species.

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Attempts have been made by oyster growers in San Francisco Bay to introduce the large oysters of the Yaqui River lagoons and other parts of western Mexico, which strikingly resemble *O. virginica*, but a large percentage of the oysters died on the voyage. The change from the warm waters of that latitude to the bay of San Francisco was supposed to be too great, even if they survived the voyage. I can testify to the large size, good flavor, and great abundance of the Yaqui River oysters from personal experience. They are so abundant that we frequently loaded the dingey of the "Albatross" by merely gathering them from the borders of the shell heaps exposed everywhere at low tide. The temperature of the water while we were there (March 31st and April 1, 1889) ranged from 69° to 73° F. Now that there is railroad connection between Guaymas, Mexico, and San Francisco, the introduction of these oysters by rail might give better results.

Table showing the Temperature of the Water in the Vicinity of the Natural Oyster-Beds near the Mouth of the Yaqui River, Mexico, March 31st and April 1, 1889.

Locality and Time.	Air.	Water.	Locality and Time.	Air.	Water.
Off Algodones Lagoon.			Apr. 1, 4 a. m.	65	67
Mar. 31, 12 m.	73	69	Apr. 1, 5 a. m.	65	69
Mar. 31, 1 p. m.	71	72	Apr. 1, 6 a. m.	64	69
Mar. 31, 2 p m.	71	73	Apr. 1, 7 a. m.	65	69
Mar. 31, 3 p. m.	72	73	Apr. 1, 8 a. m.	66	69
Mar. 31, 4 p. m.	71	72	Apr. 1, 9 a. m.	71	72
Mar. 31, 5 p. m.	73	72	Apr. 1, 10 a. m.	73	74
Mar. 31, 6 p. m.	72	72	Apr. 1, 11 a. m.	73	73
Mar. 31, 7 p. m.	71	70			
Mar. 31, 8 p. m.	70	70	*Off Yaqui River.*		
Mar. 31, 9 p. m.	69	70	Apr. 1, 12 m.	71	73
Mar. 31, 10 p. m.	69	69	Apr. 1, 1 p. m.	72	73
Mar. 31, 11 p. m.	68	68	Apr. 1, 2 p. m.	72	73
Mar. 31, 12 p. m	70	70	Apr. 1, 3 p. m.	73	73
Apr. 1, 1 a. m.	69	68	Apr. 1, 4 p m.	74	73
Apr. 1, 2 a. m.	65	68	Apr. 1, 5 p. m.	74	73
Apr. 1, 3 a. m.	65	68			

It should be stated that the hourly temperatures taken by the "Albatross" were not in Algodones Lagoon or in the mouth of Yaqui River, but at the ship's anchorage, a mile or two outside, in the Gulf of California.

In December, 1890, a large shipment of oysters was made from Acapulco to San Francisco, but most of them died on the way. The few that reached market were considered good. This species was doubtless the *Ostrea iridescens*, a large oyster common in the vicinity of Acapulco.

Australian Oysters.—A sack of oysters was recently brought to San Francisco by a steward of one of the Australian steamers. These oysters were sold by M. B. Moraghan at his stand in the California Market and were considered as good as Eastern oysters.

Suggestions.—In view of the fact that there is considerable propagation among the oysters of San Francisco Bay and that no attempt has been made to collect spat, it would be desirable to experiment in the vicinity of the most southerly beds of the bay with a variety of spat-collecting surfaces. There are many suitable channels, creeks, and tracts of deep water close to the beds. Bundles of brush could be anchored outside the lines of stakes about the beds or in the creeks, and floating collectors could be moored anywhere; these could be made scow-

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shaped, the sides and ends of coarse timbers of any sort, and the bottom of wide-meshed wire netting; such a craft, loaded with all the shells it could conveniently float, could be towed anywhere, and might be large or small. In view of the existence of stingrays, this pattern of collector or the brush collectors would be safest, to say nothing of the ease with which they could be inspected for presence of spat.

If there were fixing-surfaces of any description in the creeks or sloughs that extend from the southern part of the bay far back toward San José, Redwood, Belmont, Newark, and through the marsh lands generally, it is probable that oysters would attach. When the cold tide flows in across the extensive sun-heated flats in the spring time, it warms rapidly and fills the creeks with water of a much higher temperature than is found elsewhere in the region of the bay. The warm water flowing across the oysters brings them into spawn very suddenly when the weather conditions are favorable. My attention was called to this fact by the oystermen.

The creeks are, without exception, very muddy and absolutely without any firm surfaces upon which drifting oyster spat might settle. These creeks are similar in character. Most of them retain a considerable depth of water at low tide. They are named on the charts of San Francisco Bay as follows: Union City Creek, Coyote Creek, Beard Creek, Mud Creek, Alviso Slough, Redwood City Creek, Steinberger Creek, Angela Creek. Quantities of brush from the drier lands, just back of the marshes through which they flow, could readily be deposited in them as spat-collectors. From the fact that oysters have been taken from the timbers of two or three old trestles that cross them, we might reasonably expect favorable results from a careful experiment with brush collectors.

Should it finally be found advantageous, these creeks could readily be sown with quantities of shells of the native oyster from the shell heaps about the shores of the bay. That the native species have never penetrated into them is no argument against the propagation of the Eastern species there. Occasional specimens have already been found growing there, and the creeks may prove as favorable to them as similar creeks are on the Atlantic coast.

The proper time for placing collectors in San Francisco Bay is yet to be determined.

OTHER BAYS OF THE CALIFORNIA COAST.

In Tomales Bay, Messrs. Weinard and Terry laid out about seventeen carloads of Eastern oysters in 1875. They remained there only two or three years, until all were marketed or removed to more accessible places in San Francisco Bay. The experiment was not repeated. Captain Lawson, one of the oldest residents upon Tomales Bay, says that these oysters lived and fattened as well apparently as those in San Francisco Bay. They were laid out at Millerton Station, near the southern end of the bay, where some of the stakes used in fencing the bed are still standing. There is perhaps no reason why the extensive mudflats of Tomales Bay should not be used for laying out oysters in the same manner as is done in San Francisco. The bay is nowhere very deep. With two or three good-sized streams flowing into it, the natural conditions ought to prove very similar to those of San Francisco. It is 18 miles

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long and averages 2 in breadth. There are no signs of the propagation of Eastern oysters there, although *Ostrea lurida* is not uncommon.

From correspondents in Southern California I have recently learned that Eastern oysters are reported as propagating in San Diego Bay. A few years ago a quantity of oysters were placed there, and they still remain in good condition. It is said also that a lot of Mexican oysters, brought in a steamer from Guaymas several years ago, were found to be dying rapidly when the vessel arrived in San Diego Harbor, and were thrown overboard. It is claimed that survivors from this accidental planting are occasionally found. This bay, more than 400 miles south of San Francisco Bay, is much warmer, and it might be that the oyster of the Gulf of California, which failed to live in the cold water of San Francisco Bay, would be a success in San Diego Bay. The greater part of this bay is shallow and there are extensive mudflats. There are no constant streams flowing into it, though False Bay, immediately north of it, receives San Diego River, a stream which disappears in mid-summer.

Humboldt Bay, 200 miles north of San Francisco, is a large and shallow bay that may be found available for oyster growing when the question of temperature has been studied. By far the greater area of this bay consists of tide lands, exposed at low water. My personal recollection of Humboldt mudflats, visited in 1885, is that they are altogether firmer than those of San Francisco, the bottom being more sandy.

Ballona Bay, near Santa Monica, in Southern California, is a small bay where, I am informed, oysters have been placed and found to grow well, but it is not known whether they breed there. A report upon the small bays about Wilmington, near Los Angeles, has already been published by the Fish Commissioners.*

* Report upon certain investigations relating to the planting of oysters in Southern California. By Charles H. Gilbert. Bull. U. S. F. C., 1889, pp. 95-98.

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STATISTICS PERTAINING TO THE FISHERIES OF THE UNITED STATES.

Showing Value of Products, Land and Water Areas, Amount of State Appropriations, and Amount Appropriated per Square Mile of Land and Water Areas.—Compiled by A. G. Fletcher.

	Value of Fishery Products	Square Miles of Area	Miles of Coast-Line	Square Miles of Coast Waters (Bays, Gulfs, etc.)	Square Miles of Rivers and Streams	Square Miles of Lakes and Ponds	Square Miles of Water Area	Amount Appropriated	Amount per Square Mile Total Area	Amount per Square Mile Coast Waters and Line	Amount per Square Mile Fresh Water	Amount per Square Mile Total Water Area and Coast Line
Massachusetts	$7,531,194	8,315	760	125	60	90	275	$15,700	$1 89	$17 74	$104 67	$15 17
Maryland	6,460,759	12,210	706	1,850	500	----------	2,350	10,000	*5 73	*27 39	20 00	*22 91
New York	5,041,259	49,170	544	450	300	900	1,550	66,050	1 34	66 45	55 04	31 54
Virginia	3,641,282	42,450	766	1,780	520	25	2,325	3,000	07	1 18	5 50	97
New Jersey	3,625,890	7,815	715	515	120	35	670	12,000	1 54	9 76	77 42	8 66
California	3,044,731	158,360	1,097	540	240	1,600	2,380	17,500	‡13	‡12 75	‡11 34	‡6 00
Maine	2,225,806	33,040	1,463	545	300	2,300	3,145	16,500	50	8 22	6 35	3 58
Connecticut	1,871,413	4,990	152	25	80	40	145	9,000	1 80	50 85	75 00	30 30
Washington	934,940	69,180	1,738	1,380	560	360	2,300	8,000	†26	†5 77	†19 57	†4 46
Michigan	934,005	58,915	----------	----------	260	1,225	1,485	31,983	54	----------	21 54	21 54
Oregon	868,406	96,030	285	50	500	920	1,470	4,500	05	13 43	3 17	2 56
Ohio	618,683	41,060	----------	----------	140	160	300	3,679	09	----------	12 26	12 26
Pennsylvania	495,153	45,215	----------	----------	200	30	230	22,500	50	----------	97 82	97 82
Wisconsin	399,685	56,040	----------	----------	420	1,170	1,590	20,300	36	----------	12 77	12 77
Delaware	250,865	2,050	104	340	60	----------	400	500	24	1 13	8 33	99
South Carolina	202,602	30,570	947	215	180	5	400	1,025	03	88	5 54	76
Georgia	123,563	59,475	444	150	300	45	495	500	01	84	1 45	53
New Hampshire	91,481	9,305	19½	----------	80	220	300	4,000	43	205 13	13 33	12 52
Illinois	28,836	56,650	----------	----------	515	135	650	10,000	18	----------	15 38	15 38
Indiana	21,693	36,350	----------	----------	330	110	440	800	02	----------	1 82	1 82
Minnesota	6,238	83,365	----------	----------	360	3,800	4,160	15,000	18	----------	3 61	3 61
Vermont	----------	9,565	----------	----------	50	380	430	7,000	73	----------	16 28	16 28
Colorado	----------	103,925	----------	----------	270	10	280	15,400	15	----------	55 00	55 00
Nebraska	----------	76,855	----------	----------	630	40	670	7,700	10	----------	11 49	11 49
Iowa	----------	56,025	----------	----------	450	100	550	3,000	05	----------	5 45	5 45
Missouri	----------	69,415	----------	----------	630	50	680	4,500	06	----------	6 62	6 62

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STATISTICS PERTAINING TO THE FISHERIES OF THE UNITED STATES—Continued.

	Value of Fishery Products	Square Miles of Area	Miles of Coast-Line	Square Miles of Coast Waters (Bays, Gulfs, etc.)	Square Miles of Rivers and Streams	Square Miles of Lakes and Ponds	Square Miles of Water Area	Amount Appropriated	Amount per Square Mile Total Area	Amount per Square Mile Coast Waters and Line	Amount per Square Mile Fresh Water	Amount per Square Mile Total Water Area and Coast Line
Wyoming		97,890			85	230	315	5,200	05		16 51	16 51
Kansas		82,080			380		380	500	01		1 32	1 32
West Virginia		24,780			135		135	500	02		3 70	3 70
Nevada		110,700			35	925	960	1,500	01		1 56	1 56

* In figuring, $60,000 is added. This is revenue received from oystermen, and is used in protecting the oyster industry.
† In figuring, $10.000 is added. This is revenue received from permanent contrivances for catching salmon.
‡ In figuring, $3,500 is added. This is revenue received from net fishermen.

EXPLANATORY.

The amounts shown by this table are, with few exceptions, the appropriations for 1893. To these amounts should be added the sum derived from fines in almost every State—not large amounts, but still a source of revenue.

The figures of the coast waters include the sinuosities only, although each State has jurisdiction three miles from shore. For convenience, the length of coast-line is added to the square miles of coast water area, in estimating amount allowed per square mile of same, instead of multiplying that length by three before adding. This is, perhaps, a better method, because of the fact that the protection given to coast waters is, with few exceptions, along the shore.

The value of products given are for 1892, and taken from "Statistics of the Fisheries of the United States," by Dr. H. M. Smith, of the U. S. Commission of Fish and Fisheries. The coast-line figures were furnished by the U. S. Coast and Geodetic Survey.

The areas of land and water are taken from L. P. McCarty's "Annual Statistician," and are approximate areas made from careful estimates at the Bureau of Statistics, Washington, D. C.

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THE SIMON MAIER DEER CASE.

BRIEF ON BEHALF OF FISH COMMISSIONERS, RESPONDENT.

IN THE SUPREME COURT OF THE STATE OF CALIFORNIA.—IN RE SIMON MAIER, ON HABEAS CORPUS.

The petitioner was arrested on a warrant issued out of the Police Court of Los Angeles City, on a complaint under Section 626, Penal Code (amendments 1893, p. 280), charging him with having sold one pound of venison; and it was further alleged in the complaint that the venison was cut from a deer which had been killed in Texas and imported into this State whole.

The petitioner seeks his discharge on the ground that the facts stated do not constitute a public offense, and makes the following objections, which I will consider in this order:

1. That the section of the code does not apply to game taken and killed out of the State.
2. That it conflicts with the Constitution of the State of California.
3. That it is in conflict with the Constitution of the United States.

I.

Section 626, P. C. (Amendments 1893, p. 278), means what it says: "Every person in the State of California who shall at any time sell, or offer for sale, the hide or meat of any deer, etc., shall be guilty of a misdemeanor."

The chapter of the code under which Section 626 is found is entitled, "Violation of the Laws for the Preservation of Game."

From this petitioner claims it is shown that the object of the law was the preservation of game, and that the Legislature could not have had in mind the preservation of game out of the State of California, and that therefore it did not mean to prohibit the selling of game killed outside the State. But the prohibition of the sale of game from without the State will and does help to preserve native game. Native game is neither branded nor ear-marked. No man can tell a New Mexico deer from a California deer. And experience has shown in every State in the Union that as long as deer meat is allowed to be sold at all, the native deer will be slaughtered. Our laws on the subject of killing game began in this State in 1852. (Stats. 1851–3, page 895, and has since been amended as follows: Stats. 1854, page 55; 1857, page 89; 1871–2, page 433; 1880, amendments to Penal Code, page 41; 1883, page 80; 1887, page 236; 1891, page 472; 1893, page 280.)

An examination of these amendments shows that they have been made stricter and stricter, in 1880 first making the possession of game during the close season *prima facie* evidence of guilt, then providing that it should be unlawful to have possession of game during the close season,

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then providing in 1893, especially as to deer, that no person should sell deer meat at any time in California, and providing that every cold storage company, market-man, or other person who should have game in his possession during the close season, should be guilty of a misdemeanor. If anything was necessary to show the intent of the Legislature to absolutely prohibit the sale of game during the close season, the last mentioned clause of the law of 1893 (Stats. 1893, p. 280), relating to cold storage companies, etc., would assuredly show it.

It is a matter of such common knowledge that the Court will take judicial knowledge of it, that our laws have been made thus strict, for the reason that otherwise it would be absolutely impossible to prevent the extermination of native game. There are no brands or ear-marks on California game whereby they can be distinguished from the game of other States. They are clandestinely caught in one part of the State, clandestinely shipped to another part of the State, and as the conscience of the pot-hunter has been proved by experience to be elastic, especially where there is no possible fear of contradiction, the extermination of native game was rapidly taking place when the present stringent laws were passed. And they were passed, as would appear from the various amendments shown, for the purpose of preventing a fraud which it was impossible otherwise to check.

I say, therefore, that the law in question must be construed, being amendatory of existing laws, with a view of accomplishing the end sought by the Legislature, and of remedying the defect in the previously existing law which merely made possession *prima facie* evidence of guilt. If the present law is to be construed the same as the old law, which merely forbade the killing of game in California during the close season and made its possession during the close season *prima facie* evidence of guilt, what was the amended law passed for, and what effect is to be given to the last amendment passed by the Legislature?

Section 626, P. C., as it stood prior to the amendment of 1883, merely made the possession during the close season *prima facie* evidence of guilt. The amendment of 1883 struck out the provision making possession *prima facie* evidence of guilt and made the possession a crime, and so the law has since stood. So that under the existing law, either the possession itself is a crime, or else in a prosecution under the law the people must absolutely prove, beyond a reasonable doubt, that the game possessed was taken in the State contrary to law. Such a construction would nullify the law and make it of no effect.

This amending the game law by striking out the provision making possession *prima facie* evidence, etc., was the very point discussed by the Court in the case of *Whitehead* vs. *Smithers*, 21 Moak's English Reports, 458, and the Court there held as we have herein argued, and the case is exactly in point, in fact precisely like the case at bar.

In this country, in the States of New York, Illinois, Ohio, and Missouri, similar statutes to Section 626, P. C., have been held to mean what they say and to make the possession of game during the close season punishable by law, no matter where the game was caught. (*Phelps* vs. *Racey*, 60 N. Y. 10; *Wagner* vs. *People*, 97 Ill. 333; *Roth* vs. *State*, 7 Ohio Ct. Ct. 62; *State* vs. *Randolph*, 3 Cent. L. J., 187; *State* vs. *Judy*, 7 Mo. App. 524; *State* vs. *Farrell*, 23 Mo. App. 176.)

The cases holding the contrary may all be distinguished from the case at bar. In the Massachusetts case (*Com.* vs. *Hall*, 128 Mass. 410), the

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Court cited the case of *Phelps* vs. *Racey*, *supra*, and did not disagree with the conclusion there reached, but the Massachusetts Supreme Court distinguished the Massachusetts law from that prevailing in New York, and the decision is based on the peculiar wording of the Massachusetts statute, and on the further fact that as the Massachusetts statute made the possession of the game *prima facie* evidence of guilt, it could not be construed to also make it conclusive evidence.

The Pennsylvania, Michigan, Maine, and Oregon cases cited to the contrary, show the same differences in the law construed as that last noted in the Massachusetts case. The law contains a provision making possession *prima facie* evidence of guilt, and how can such a provision be reconciled with a construction that the possession itself is criminal and the accused not permitted to show that the game came from out of the State? Those decisions were correct under the law there construed. The Oregon decision is, like the Massachusetts, based principally on the peculiar wording of the statute. The Ontario case is the only one left, and even in that case the Court hedged on the peculiar wording of the Ontario statute.

It is worthy to be added, in this connection, that a case has recently arisen, and is now pending in our Police Court, where a party during the close season caught lake trout from Lake Tahoe on the Nevada side and shipped them into Los Angeles, where they were sold by a dealer at retail. The catching of trout in Nevada, even from Lake Tahoe, cannot be prohibited by our Legislature; so that if petitioner's contention is correct all of California Lake Tahoe trout may be caught from the Nevada side during the close season and sold in California, and thus California trout exterminated from the Nevada shore by the aid of California appetites and markets, and our State is powerless to prevent their destruction. And this, although the catching of those same trout would be unprofitable, and would cease if they could not be sold in the California markets, they being the principal markets for all the Pacific Coast.

II.

Does Section 626, P. C., conflict with the Constitution of the State of California?

It is a well-settled rule that the State Legislature has all power not denied it in the State Constitution or given to Congress by the United States Constitution. Therefore, it is necessary to support the petitioner's contention that he point out some article or section which the law conflicts with; just what provisions of our Constitution the section under consideration conflicts with.

Counsel for petitioner in his brief regales us with numerous decisions relative to police power granted by constitutions, charters, etc., but nowhere speaks of the reserved and inherent police power which rests in the people themselves and which they exercise through the State Legislature. The police power granted to city and county governments is an entirely different thing from the reserved police power of the State. The right of a City Council to legislate depends on its city charter, which, as a grant of power, is strictly construed, and the City Council can only act within the scope of the authority granted, which, in almost all cases, is to "make all reasonable and necessary police and sanitary regulations."

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And under such a grant, of course, the Courts have a right, and it is their duty, to decide whether any questioned regulation is necessary and reasonable.

The power of the State Legislature is entirely different. It is the People of the State of California represented in Senate and Assembly—and the power of "the People" is restricted only by the Constitution. What provision of our Constitution is violated by the law in question? Certainly none if not the first article of the first section of the Constitution: "All men are by nature free and independent and have certain inalienable rights, among which are those of enjoying and defending life and liberty, acquiring, possessing, and protecting property, and pursuing and obtaining safety and happiness."

Now, to allow all the game of the State to be exterminated, would be to deprive the citizens of the State of one means of enjoyment of life; to say they shall not be exterminated to some extent, perhaps, like every law, deprives some one of one means of enjoying life. Between these extremes comes the true province of the Legislature to so *regulate natural rights* that the greatest happiness to the greatest number will be attained. "The power to determine what is necessary and appropriate legislation to accomplish the end of government" is vested in the Legislature. (*Ex parte Smith and Keating*, 38 Cal. 702.)

"If the Legislature abuse this power to make laws and *to judge of their necessity and reasonableness*, the remedy lies, under our form of government, with the people through the ballot-box." (*Idem.;* affirmed *In re Lineshan*, 72 Cal. 114.)

A great many laws have been held to be constitutional which, in some sense, deprived individuals of the privilege of enjoying life in a certain manner.

Private business, innocent business, lawful business, such as that of hackmen, marketmen, warehousemen, has been restricted in various ways, and such laws have been held constitutional, and such decisions are all placed upon the ground that such employment is "affected with public interest." (*Munn* vs. *People*, 69 Illinois, 80–91; affirmed in U. S. Supreme Court, *Munn* vs. *People*, 94 U. S. 113–125.) Surely the selling of game is "affected with public interest."

"The State has a right to determine what employments shall be permitted, and to forbid those which are deemed prejudicial to general good." (Cooley Const. Limitations, page 743.)

It is not contended that to hold that the complaint in this case states a public offense will interfere with any property which the petitioner had prior to its enactment—any vested right—but petitioner contends that with full knowledge of the law he may purchase deer meat and retail it in this State, even though it is necessary for the preservation of game in this State that the same may be not done—even though it is against the interest of the public.

Mr. Cooley, after considering the effect of prohibitory liquor laws, where property before held innocent and lawful is confiscated and its owner deprived of his hitherto lawful employment, says: "A statute which can do this must be justified upon the highest reasons of public benefit; *but whether satisfactory or not, the reasons address themselves exclusively to the legislative wisdom.*" (Cooley Const. Limitations, page 721.)

Prohibitory liquor laws have been repeatedly held constitutional by

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our Courts, although they were regulations of natural rights. But petitioner contends that the sale and use of intoxicating liquors affects the morals of the community, while it does not injure the property of the State, its native deer, to allow deer meat to be sold which was killed outside the State. It will be seen, however, that it is not the use of intoxicating liquors which affects the morals of the community, for no one pretends that any man becomes worse because he takes a drink of intoxicating liquor. It is not its use but its abuse which causes Legislatures to put a ban upon its sale. It is not that the mere sale of liquors necessarily destroys health or morals, but that experience has shown that evil does follow the general sale of intoxicating liquors, and that such evil cannot be prevented but by prohibiting the sale of intoxicants absolutely. Just so while the sale of foreign killed deer does not *ipso facto* injure the native deer, the abuse of such a privilege will. What will follow from allowing such an exception to the law we all know, and the Legislature evidently knew.

And in Indiana it has ever been held that a law is constitutional which prohibits a man from catching fish from his own waters of which he is sole proprietor, and for the reason that it is "affected with public interest." (*Gentile* vs. *State*, 29 Ind. 409.)

Counsel in his brief, by his quotations, seems to intimate that the prohibition of the sale of deer meat in this State is to "prohibit a business," the prosecution of which inflicts no damage on others.

We contend not only that the Legislature is the judge of that matter, but that as a matter of fact to allow such a business to be carried on will inflict damages on others, because it can but result in the extermination of California deer, and if any different result could in reason have been expected, the Legislature would not have passed the law. Surely the extermination of California deer will inflict damage on the whole people of the State, and such regulation certainly is "required for the protection of public interest."

And the constitutionality of just such legislation as that here questioned has been expressly affirmed in *Am. Ex. Co.* vs. *People*, 31 C. L. J. 271; *Phelps* vs. *Racey*, 60 N. Y. 10; *State* vs. *Randolph*, 3 C. L. J. 187; *Roth* vs. *State*, 7 Ohio Ct. Ct. 62.

III.

Is Section 626, P. C., in conflict with the Constitution of the United States?

The complaint in this case shows that it was the whole deer which was imported, and after importation the "original package" was broken.

The famous "Original Package Case," *Leisy* vs. *Hardin*, 135 U. S. 100, has settled our law on that subject, and it did not overrule *Phelps* vs. *Racey*, 60 N. Y. 10, or the *License cases*, 5 Howard (U. S.), 504, except so far as original packages were concerned. And since *Leisy* vs. *Hardin*, numerous cases have been decided holding that when the original package is broken the article ceases to be one of interstate commerce. (*State* vs. *Kibling*, 22 Atlantic R. 613; *Com.* vs. *Schollinberger*, 27 Atlantic R. 30; *Com.* vs. *Gagne*, 26 N. E. 449; *Com.* vs. *Gay*, 26 N. E. 571.)

In conclusion, I will say that if the law in question cannot be sustained, then our Fish and Game Commission might as well be dissolved and all game laws repealed, for experience has shown that without the

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provision in question it is utterly useless to attempt the preservation of game.

I have annexed hereto the opinion of the honorable Judge who heard and decided this case when it was pending in the Superior Court.

Respectfully submitted.

H. C. DILLON,
District Attorney.

By M. W. CONKLING, Deputy.

OPINION OF THE SUPERIOR COURT.

IN THE SUPERIOR COURT OF THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA.—EX PARTE SIMON MAIER.

This is an application on the part of petitioner for his release on *habeas corpus*, the defendant having been arrested upon a criminal complaint filed in the Police Court in this city charging him with violation of the game laws of this State.

The complaint charges that "on the 18th day of December, 1893, at and in the city of Los Angeles, State of California, the defendant did willfully and unlawfully sell to one John Doe, whose true name is unknown, etc., one pound of deer meat, which said pound of deer meat was then and there by the said Simon Maier cut from the carcass of an entire deer, which said deer had been theretofore brought by said Maier from the State of Texas, in which State said deer had been lawfully killed."

The law for the preservation of game in this State is found under Section 626, Penal Code, and that particular clause of said section which defendant is alleged to have violated reads as follows: "Every person in the State of California who shall at any time sell, or offer for sale, the hide or meat of any deer, * * * shall be guilty of a misdemeanor."

It is claimed on the part of the defendant that the complaint charges him with no crime; that Section 626 has reference only to deer killed within the State of California, and counsel urge upon the Court, with great ability, such a construction of our statute.

And, for a second contention, it is urged with equal force that if our Legislature intended what the language of the section seems to import, then the Act is unconstitutional and void, as being inhibited by Article 1, Section 8, Paragraph 3, of the Constitution of the United States, which provides: "Congress shall have power to regulate commerce with foreign nations and among the several States," etc.

As to the first contention, that the Legislature intended the Act to apply only to deer killed within our State, I think a review of the Acts and amendments thereto of the laws for the preservation of game in this State, must lead to the inevitable conclusion that the present Act was intended to convey the plain import of its language; for, so far as any ambiguity or uncertainty are concerned in the language itself, there exists none, and there is no room for construction from that view.

But it is urged, if the language of the Act leads to an absurdity or to the violation of unalienable or constitutional rights, and such conclusions can be avoided and the Act sustained, such construction should be

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given. Undoubtedly this is a sound rule of construction, and whether it should be invoked in this case depends upon the question as to whether the plain reading and import violates any natural or constitutional right that defendant may have.

Our first game law was passed in 1852, and has been amended, modified, and changed from time to time, in 1854, 1857, 1871, 1880, 1883, 1887, 1891, and the present Act was passed in 1893. An examination of these laws and amendments must convince any one that each successive Act was intended to be more explicit and comprehensive than the one preceding it. During a portion of that time the law made the possession of game in the close season *prima facie* evidence that it was killed in this State, again providing it should be unlawful to have possession of game during the close season, and lastly, in 1893, making it unlawful to sell deer meat at any time anywhere in the State. The last Act also provides that every cold storage company, market-man, or other person who should have game in his possession during the close season, is guilty of a misdemeanor. So that I am satisfied the Legislature intended to inhibit the sale of deer meat throughout the State irrespective of the place where the animal was killed.

Is the Act unconstitutional? Many cases have been cited from United States reports, but none bearing directly on the point; that is, I am aware of no case where the Federal Courts have passed on the game laws of the States.

The United States Courts have held, as in *Minnesota* vs. *Barber*, 136 U. S. 313, that a State cannot pass a law restricting or interfering with the free importation of beef or healthy cattle from one State to another; that any law, under the pretext of inspecting cattle and beef, which practically prevents such importation, is in violation of the section of the Constitution quoted above, and an unwarrantable interference with interstate commerce; and there are several Federal cases of like import deciding the same question.

But those cases must be distinguished from the case at bar, in this: No State can prohibit the sale of healthy beef, mutton, grain, and those common necessaries of life. It does not come within the police powers of the States to thus legislate. Such laws invade the first fundamental law of organized society, viz.: to own and dispose of property. But all property has not the same status. Intoxicating liquors are property, but it has long since been decided by the Courts that a State may prohibit their manufacture and sale under its police powers, to protect the lives and well-being of its citizens. The wild game of a State is quite different from beef, mutton, pork, and grain—different in its relation to man in most of those conditions and surroundings that apply to the former. It has never been denied that a State had ample powers to protect and preserve its game. It comes directly within its police power. Counsel for defendant cites the case of *Bowman* vs. *C. & N. W. Ry. Co.* This is the celebrated Iowa case, in which the Supreme Court of the United States held invalid an Iowa statute prohibiting the importation of intoxicating liquors into the State.

That statute forbid any common carrier to bring into the State for any person or persons or corporation any intoxicating liquors from any other State or Territory; and the Supreme Court held the Act void, as being an unwarrantable interference with interstate commerce; going beyond the limits of its own territory and legislating against those out-

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side its borders, and the Court says: "The section of the statute of Iowa, the validity of which is drawn in question, does not fall within the legitimate exertion of the police power; it is not an exercise of the jurisdiction of the State over persons and property within its limits; on the contrary, it is an attempt to exert that jurisdiction over persons and property within the limits of other States. It seeks to prohibit and stop their passage and importation into its own limits, and is designed as a regulation of commerce before the merchandise is brought to its border. * * * It is not a regulation confined to the purely internal and domestic commerce of the State. It is not a restriction which only operates upon property after it has become mingled with and forms part of the mass of the property within the State. * * * But the right to prohibit sales, so far as conceded to the States, arises only after the act of transportation has terminated, because the sales which the State may forbid are of things within its jurisdiction."

In short, that decision holds that all articles of legitimate commerce over which the police powers of a State extend, though a State may not prevent their importation and sale in bulk, but when mingled with the property of the State it becomes subject to the laws of the State. So that if this case has any bearing on the one at bar, it is that when the venison was placed upon the block and retailed out, it was subject to the law the same as if killed in this State.

It will be observed that the Act in question does not attempt to interfere with importation, but simply makes it unlawful to sell deer meat in the State.

When we come to the decisions of the State Courts on this question they are divided in opinion, Michigan intimating that such Acts are unconstitutional and void, while Ohio, New York, Illinois, and Missouri hold similar Acts valid.

I believe it best for the people of this State that the law be sustained. The wild game of the State belongs to the whole people of the State. Under the common law the game belonged to the sovereign. The game in our State does not belong to any one individual or set of individuals, but to the sovereignty. The Legislature exercises that sovereignty in trust for us, and have a right to say what shall be or not be as to our game.

I am satisfied that any less stringent game law would expose our game, and especially our deer, to destruction. The law as it stands is necessary to preserve the deer of our State from extinction. Any other or less stringent law could be so easily evaded as to render it inoperative and farcical.

I am therefore of the opinion that the law is a reasonable exercise of the police powers of the State, and valid, and that the petitioner must be remanded, and it is so ordered.

B. N. SMITH,
Judge.

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SUPREME COURT DECISION.

[No. 21,116. In Bank.—Filed August 1, 1894.]

EX PARTE SIMON MAIER, ON HABEAS CORPUS.

For petitioner, Hunsaker, Goodrich & McCutcheon.

For respondent, H. C. Dillon, District Attorney.

Petitioner was arrested and is held in restraint under a warrant issued out of the Police Court of the city of Los Angeles, based on a complaint charging him, under Section 626 of the Penal Code, with unlawfully selling, on the 18th day of December, 1893, at said city, one pound of deer meat, which meat the complaint alleges "was then and there, by said Simon Maier, cut from the carcass of an entire deer, which said deer had been theretofore brought by said Simon Maier from the State of Texas, and in which State said deer had been lawfully killed." Petitioner asks for his discharge on *habeas corpus*, upon the ground that the complaint does not state a public offense; and, if that be true, there is no question but that he is entitled to his discharge in this proceeding. (*Ex parte Corryell*, 22 Cal. 179; *Ex parte Harrold*, 47 Cal. 129; *Ex parte Kearney*, 55 Cal. 212.)

Section 626 is one of the provisions of the Penal Code for the preservation and protection of the wild game of this State, and the particular paragraph or subdivision of the section under which petitioner is charged (as amended, Stats. 1893, p. 280) reads: "Every person in the State of California who shall at any time sell, or offer for sale, the hide or meat of any deer, elk, antelope, or mountain sheep, shall be guilty of a misdemeanor." Petitioner contends that this provision of the statute, properly construed, does not prohibit the sale of deer meat lawfully taken without the State, but has reference solely to deer killed within this State; that the law is intended to protect game within the State, not to prohibit the importation and sale of game from other States. With this contention we are unable to agree. It is true the law is intended for the protection of the game within the State, but it by no means follows from that fact that it is not the intention, as a means to accomplish that very end, to prohibit the sale of the meat of the animals procured elsewhere. The statute is perfectly plain and unambiguous in its terms, and is sufficiently broad and comprehensive to include the inhibited article wheresoever taken or procured. It does not confine itself in terms or by implication to the meat of deer killed in this State, but denounces as unlawful the sale of the meat of *any deer;* and there is nothing elsewhere in the statute tending to give it a more restricted sense. The language is too plain to leave room for construction, and we are not at liberty, even if so disposed, to place a limitation upon the meaning of the Legislature which its language will not support. But we have no doubt that the Legislature intended exactly what its words import. Aside from the explicit language in which this particular provision is couched, an examination of the various changes which these sections of the Code relating to protection of game have undergone at the hands of the Legislature, is persuasively convincing of the intention to do just what this Act does by its terms, entirely prohibit traffic in the meat of these game animals within the State, no matter where killed. And it need hardly be suggested that such a provision, if enforced, will

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lend great aid to the attainment of the object sought. The facility and ease with which the statutes for the protection of game have been evaded in the past is a matter of common knowledge. Deer and other game have been slaughtered during the close season and foisted upon the market as game procured without the State, and owing to the practical impossibility in the great majority of cases of proving with certainty the source from which it was procured, the attempted enforcement of the statutes for its protection has largely proven abortive. These and like considerations no doubt actuated the Legislature in the premises, and induced the enactment of the statute in its present stringent form. And we know of no good reason why it should not be held to mean what it says. Similar statutes in other States have received a like construction. In *Magner* vs. *The People*, 97 Ill. 331, involving a statute of Illinois making it unlawful to sell or have in possession quail and certain other game birds during the close season, and which was not in terms limited to birds taken in the State, it was contented, as here, that the statute did not condemn the possession or sale of the birds taken and killed beyond the limits of the State, and shipped into the State for sale. But the Court held that the statute must be taken as comprehending within its terms the prohibited game, no matter where taken. It is there said: "But it is argued that this cannot be the fair construction, because such a prohibition does not tend to protect the game of this State. To this there seems to be two answers: (1) The language is clear and free of ambiguity, and in such case there is no room for construction—the language must be held to mean just what it says. (2) It cannot be said to be within judicial cognizance that such a prohibition does not tend to protect the game of this State. It being conceded, as it tacitly is, by the argument, that preventing the entrapping, netting, ensnaring, etc., of wild fowls, birds, etc., during certain seasons of the year, tends to the protection of wild fowls, birds, etc., we think it obvious that the prohibition of all possession and sales of such wild fowls or birds during the prohibited seasons would tend to their protection, in excluding the opportunity for the evasion of such law by clandestinely taking them, when secretly killed or captured here, beyond the State, and afterwards bringing them into the State for sale, or by other subterfuges and evasions."

The Court of Appeals of New York held to the same effect under a statute very like ours, saying: "The penalty is denounced against the selling or possession after that time [close of the open season] irrespective of the place of killing." (*Phelps* vs. *Racey*, 60 N. Y. 10.) In *Whitehead* vs. *Smithers*, 2 C. P. Div. 553, Lord Coleridge held that under an English statute for the protection of British game which made it unlawful to sell or have in possession plover during the close season, a party who imported the dead birds from Holland and sold them in the British market came within the prohibition of the statute, and said: "It is said it would be a strange thing for the Legislature of the United Kingdom to interfere with the rights of foreigners to kill birds. But it may well be that the true and only mode of protecting British wild fowl from indiscriminate slaughter, as well as protecting other British interests, is by interfering indirectly with the proceedings of foreign persons. The object is to prevent British wild fowl from being improperly killed, and sold under pretense of their being imported from abroad." See also *State* vs. *Judy*, 7 Mo. App. 524, and *State* vs. *Farrell*, 23 Mo. App. 176.

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The cases relied upon by petitioner are clearly distinguishable from the cases referred to above. In most of them, as in *Comm.* vs. *Hall*, 28 Mass. 410, and *People* vs. *O'Neil*, 71 Mich. 325, the statutes under consideration contained a provision making possession of the game during the close season *prima facie* evidence of a violation of the law, and the construction of the prohibitive features of the statute largely turned upon the effect of that provision. In *Comm.* vs. *Hall*, which is followed by the Michigan case, it is said: "Saying that possession should be *prima facie* evidence necessarily implies that it shall not be conclusive; if the mere possession of birds, during the time within which the taking or killing of them is prohibited, of itself constituted an offense under the previous sections of the statute, to say that such possession would be *prima facie* evidence would be superfluous if not absurd." And it is held that the statute must therefore be construed as referring only to game unlawfully taken within the State during the close season. As suggested by counsel for the People, our statute contained a similar provision up to 1883, when the Legislature by an amendment (Stats. 1883, p. 80) eliminated it, thereby evincing an intention to remove from the law anything calculated to qualify or limit its otherwise plain and explicit terms. We have no doubt that the intention of Section 626 is to prohibit the sale of deer meat brought from without, as well as that taken within the State.

Nor do we think that in giving the Act this effect it contravenes the Constitution of this State as being in excess of the police power of the State. The wild game within a State belongs to the people in their collective sovereign capacity; it is not the subject of private ownership, except in so far as the people may elect to make it so; and they may if they see fit absolutely prohibit the taking of it, or any traffic or commerce in it, if deemed necessary for its protection or preservation, or the public good. To this extent it is conceded that the State may go. But it is contended that to go further and prohibit the sale of game lawfully killed elsewhere and brought here as private property is in effect to destroy private property, and that this is going beyond a proper exertion of the police power. While it is true that the power to regulate is not the power to destroy, in its absolute sense, it is, nevertheless, true that the right to regulate frequently and as a necessary sequence carries with it the right to so control and limit the use or enjoyment of private property as to amount to its destruction. In the case of *Phelps* vs. *Racey*, *supra*, the same objection was raised, and it is there said: "The objection of a want of power in the Legislature to pass the Act is not tenable. It is not in conflict with the State Constitution, within the case of *Wynehamer* vs. *People*, 13 N. Y. 378. That case involved the validity of the prohibitory liquor law, and determined that such law, so far as it applied to and substantially destroyed property in liquors owned or possessed at the time the Act took effect, was in violation of the provision of the State Constitution which declares that no person shall be deprived of life, liberty, or property without due process of law; but impliedly, if not necessarily, it affirmed the power if the law had only applied to liquors subsequently manufactured and acquired. Here the property was acquired subsequent to the passage of the Act, and with the presumed knowledge of its provisions and conditions. The Legislature may pass many laws the effect of which may be to impair or even destroy the right of property. Private interest must yield to the public advantage.

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All legislative powers, not restrained by express or implied provisions of the Constitution, may be exercised. The protection and preservation of game has been secured by law in all civilized countries, and may be justified on many grounds, one of which is for purposes of food. The measures best adapted to this end are for the Legislature to determine, and Courts cannot review its discretion."

And these principles have been repeatedly upheld. In some instances their enforcement may work hardship, but we see no such result here. The statute does not prevent a party from importing all the venison he wants for his own use or consumption if he desires to do so. It simply says that for the better protection of the rights of the people in these wild animals, and as a means of preventing their destruction, the meat shall not be a lawful article of sale. There can be no serious injury to any one under such a regulation. If any person imports the meat of the deer into the State he does it with his eyes open and a knowledge of the purposes for which the law permits it, just as the petitioner did here. Under such circumstances he cannot complain if he is prevented from making a use of the article which the Legislature has declared to be detrimental to the well-being of the State. As suggested in *Phelps* vs. *Racey*, *supra*, he acquired the property after the passage of the Act, and his rights in it are necessarily subject to the regulations imposed upon its use.

It is further strenuously urged, however, that the Act so construed violates the Constitution of the United States, in that it is an attempt to regulate interstate commerce—a subject wholly committed to Congress. But after a very careful consideration of the numerous authorities cited in support of this view, we do not think the statute open to this objection. It is true its enforcement may indirectly or incidentally affect to some extent traffic in the inhibited article between the people of this and other States, but that of itself is not sufficient to bring it within the objection urged. The right of the States, under the very comprehensive police power reserved to them under our dual system of government, to regulate and control their own internal affairs, including trade, to the reasonable advantage and good of their people, is conceded and upheld in all the cases in which the questions growing out of the right of the Federal Congress to regulate interstate commerce has arisen. The only difficulty has been in defining the limitations of that power. In *Railroad Co.* vs. *Husen*, 95 U. S. 470, it is said: "We admit that the deposit in Congress of the power to regulate foreign commerce and commerce among the States was not a surrender of that which may properly be denominated police power. What that power is it is difficult to define with sharp precision. It is generally said to extend to making regulations promotive of domestic order, morals, health, and safety. As was said in *Thorp* vs. *The Rutland and Burlington Railroad Co.*, 27 Vt. 149: 'It extends to the protection of the lives, limbs, comfort, and quiet of all persons and the protection of all property within the State according to the maxim *Sic utere tuo ut alienum non lædas*, which, being of universal application, it must of course be within the range of legislative action to define the mode and manner in which every one may so use his own as not to injure others.' It was further said that by the general police power of a State 'persons and property are subjected to all kinds of restraints and burdens, in order to secure the general comfort, health, and prosperity of the State;

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of the perfect right of the Legislature to do which no question ever was, or upon acknowledged principles ever can be made, so far as natural persons are concerned.'" "Many Acts of a State" (say the Court further in that case) "may indeed affect commerce, without amounting to a regulation of it in the constitutional sense of the term. And it is sometimes difficult to define the distinction between that which merely affects or influences and that which regulates or furnishes a rule for conduct." And in the celebrated cases commonly designated as "The License Cases," 5 How. 504, it is held that the fact that a regulation may incidentally and to a certain extent affect commerce between the States, does not affect its validity. In *Pierce* vs. *New Hampshire* (one of the License Cases, *supra*), Mr. Justice Woodbury, in one of the opinions of the majority of the Court in discussing this power of the States, says: "The subject of buying and selling within a State is one as exclusively belonging to the power of the State over its internal trade as that to regulate foreign commerce is with the General Government, under the broadest construction of that power." "The idea, too, that a prohibition to sell would be tantamount to a prohibition to import, does not seem to me either logical or founded in fact. For even under a prohibition to sell, a person could import, as he often does, for his own consumption and that of his family and plantations; and also, if a merchant extensively engaged in commerce often does import articles with no view of selling them here, but of storing them for a higher and more suitable market in another State or abroad." In the subsequent case of *Bowman* vs. *C. & N. Ry. Co.*, 125 U. S. 465, the same Court held a statute of Iowa, which forbid any common carrier to bring into the State for any person or corporation any intoxicating liquors from any State or Territory, void, as being an unwarrantable interference with interstate commerce and not a legitimate exercise of police power, in that it was more than a regulation of its own internal affairs or an exercise of the jurisdiction of the State over persons and property within its limits; "it is an attempt" (say the Court) "to exert that jurisdiction over persons and property within the limits of other States. It seeks to prohibit and stop their passage and importation into its own limits, and is designed as a regulation of commerce before the merchandise is brought to its border. * * * It is not a regulation confined to the purely internal and domestic commerce of the State. It is not a restriction which only operates upon property after it has become mingled with and forms part of the mass of the property within the State. * * But the right to prohibit sales so far as conceded to the States arises only after the act of transportation has terminated, because the sales which the State may forbid are of things within its jurisdiction." And it is held that the State cannot, under the guise of a police regulation, prevent the importation of legitimate articles of commerce and trade. And in the later case of *Leisy* vs. *Hardin*, 135 U. S. 100, it was held that it not being within the power of the State to prohibit the importation of lawful commodities, neither can she prohibit the sale by the importer of such commodities upon their receipt by him, since the right to sell any article imported was an inseparable incident to the right to import it. But this right of sale was distinctly limited to the right of the importer to sell or dispose of the article imported in its original, unbroken package or condition as brought by him into the State, and the principle is in that case, as in *Bowman* vs. *C. & N. Ry. Co.* and the other cases

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cited, distinctly upheld, that the authority of Congress over any article of commerce imported into a State ceases "when the importer has so acted upon it that it has become incorporated and mixed up with the mass of property in the country, which happens when the original package is no longer such in his hands," and that thereupon the property becomes subject to the jurisdiction of the State and affected and controlled by its regulations. Tested by these principles we cannot see wherein the statute, applying its provisions to the case made in the complaint, is open to the objection that it attempts to or does regulate interstate commerce. Petitioner imported the meat into the State, broke the original package, and put the commodity upon the market. It thereupon became property strictly subject to State regulation and control, and falls within the denunciation of the statute. Whether petitioner could have sold the meat as an entire carcass is a question which does not confront us, and which it is not, therefore, necessary to determine.

We think the complaint states a cause of action, and it follows that the petitioner should be remanded.

It is so ordered.

VAN FLEET, J.

We concur:

McFARLAND, J.,
GAROUTTE, J.,
HARRISON, J.,
BEATTY, C. J.,
FITZGERALD, J.

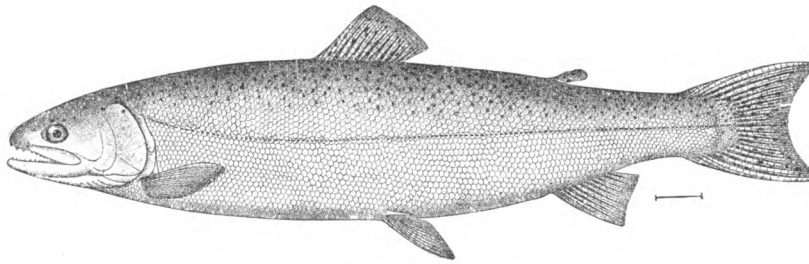
DeHaven, J., being absent, did not participate in the foregoing decision.

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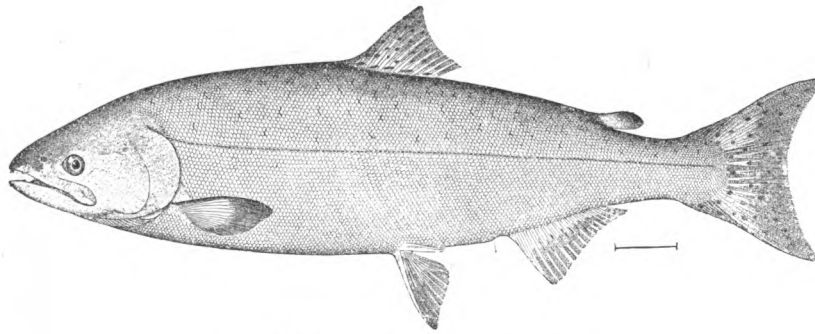
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STEELHEAD TROUT.—*Salmo gairdneri.*



QUINNAT SALMON.—*Onchorhynchus chonicha.*

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SALMON AND TROUT OF THE PACIFIC COAST.

By Dr. DAVID STARR JORDAN, President of the Leland Stanford Junior University.

Of all the families of fishes, the one most interesting from almost every point of view is that of the *Salmonidæ*, the Salmon family. As now understood, it is not one of the largest families, as it comprises less than a hundred species; but in beauty, activity, gaminess, quality as food, and even in size of individuals, different members of the group stand easily with the first among fishes.

The *Salmonidæ* are found only in the North Temperate and Arctic regions, and within this range they are everywhere almost equally abundant wherever suitable waters occur. Some of the species, especially the larger ones, are marine and anadromous, living and growing in the sea, and ascending fresh waters to spawn. Still others live in running brooks, entering lakes or the sea when occasion serves, but not habitually doing so. Still others are lake fishes, approaching the shore or entering brooks in the spawning season; at other times retiring to waters of considerable depth. Some of them are active, voracious, and gamy, while others are comparatively defenseless and will not take the hook.

All the *Salmonidæ* feed upon fish; the smaller ones upon worms, insects, and small fish; the larger forms on fishes and crustacea—whatever they can find. The eggs of the species are much larger than in fishes generally, and the ovaries are without special duct, the eggs falling into the cavity of the abdomen before they are excluded. The large size of the eggs, the fact that they do not stick together, and the ease with which they may be impregnated, render all the *Salmonidæ* peculiarly adapted for artificial culture.

We may divide the *Salmonidæ* into ten genera: *Coregonus*, the White Fish; *Arggrosomus*, the Ciscoes; *Plecoglossus*, a little annual fish which is found in the waters of Japan, born in the spring, runs up the rivers in the summer, and dies in the following winter, only the young surviving; *Brachymystax*, a large and scarcely known salmon-like fish in the waters of Siberia; *Stenodus*, the Inconnu, a large, weak-toothed salmon found in the Mackenzie River; *Hucho*, the Huchen, or Rothfisch of the River Danube, a large, voracious, pike-like salmon, which seems to be little known either to naturalists or to anglers; *Oncorhynchus*, the Pacific Coast Salmon, or Quinnats; *Salmo*, the Salmon and Black-spotted or true Trout; *Cristivomer*, the Great Lake Trout with gray spots; and *Salvelinus*, the Charr, or Red-spotted Trout. The Grayling, *Thymallus*, usually classed with the Trout, belongs to a different family, *Thymallidæ*, well distinguished by the structure of its skull and dorsal fin.

Of these, the various fishes commonly known as salmon and trout belong to the last four genera. The others need not be further mentioned in the present discussion. In order to get a better idea of the proper application of the various vernacular names that are used in America, it is necessary to go back to Europe, the source from which these names

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have been drawn. First, we have a large fish, common in the salt waters of Northern Europe, spending most of its life near the shores in regions where the water is cold and clear, and ascending the rivers in the spring when the high water comes down from the mountains, going through rapids with great force, leaping cataracts, and finally casting its spawn on the gravelly bed of a small stream. This was known to the Latin writers as *Salmo*, the word coming from *solio*, which means "to leap," and in the different languages which are derived from the Latin having as its name some form of the word "salmon." The scientific name of this fish is *Salmo salar*.

Very similar to the salmon in all technical respects, like it having black spots over the surface of the body and rather large silvery scales, is a smaller fish which rarely descends to the sea, and makes its home in the rivers and lakes throughout Northern and Central Europe. This fish was known by the name of *Fario* to the old Latin writers, the most important of whom, in this regard, was Ausonius, who wrote feelingly and poetically of the fishes of the River Moselle. From the Latin word "fario" comes the German name "forelle." This fish is the trout of all English writers, the trout of Izaak Walton, and its scientific name is *Salmo fario*.

Half way between the salmon and the trout there is a large trout which lives mostly in the estuaries of the rivers, sometimes mistaken for salmon, sometimes for trout, rarely ascending the rivers very far, and seldom venturing far into the sea. This is the Trutta of the Latin authors; from this name the word "trout" is derived. Curiously enough, the word "fario," in its various forms, has come to be the name of the trout in all the German* and Scandinavian countries, while derivatives of the word "trutta" are applied to the same fish in the Latin† countries and with the English. The scientific name of this large fish, half salmon and half trout in appearance, altogether trout in fact, is *Salmo trutta*, and to this fish properly belongs the name of salmon trout. Very lately English writers have questioned the distinction between the European trout and salmon trout. The opinion is growing that the salmon trout is the sea-run form of the same fish. If this view is correct, the salmon trout is to be called *Salmo trutta;* the brook form *Salmo trutta fario*.

There are thus in England, whence our names have come, three species or forms of black-spotted silvery salmonoids: (1) The salmon, largest of all and anadromous, that is, running up the rivers to spawn, and living in the sea; (2) the trout, living in the brooks and the lakes only; (3) the salmon trout, which stands between the two, with the appearance of trout and the habits of salmon. All three belong to the genus *Salmo*, and the only difference of any importance between the salmon and the trout, so far as structure goes, lies in the fact that the salmon sheds the teeth on its vomer, that is, the middle part of the roof of its mouth, as it grows older, while in the trout these teeth are preserved throughout the life of the animal. Living in salt water and feeding on large fishes and crustacea, the salmon is the more vigorous, with coarser and more oily flesh, but this difference becomes of small importance as a matter of distinguishing species.

Besides these three, there is another and a finer fish, found in the

* German, Forelle; Danish, Forelse, etc.
† French, Truite; Spanish, Trucha; English, Trout, etc.

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LOCH LEVEN TROUT.—*Salmo trutta levenis.*

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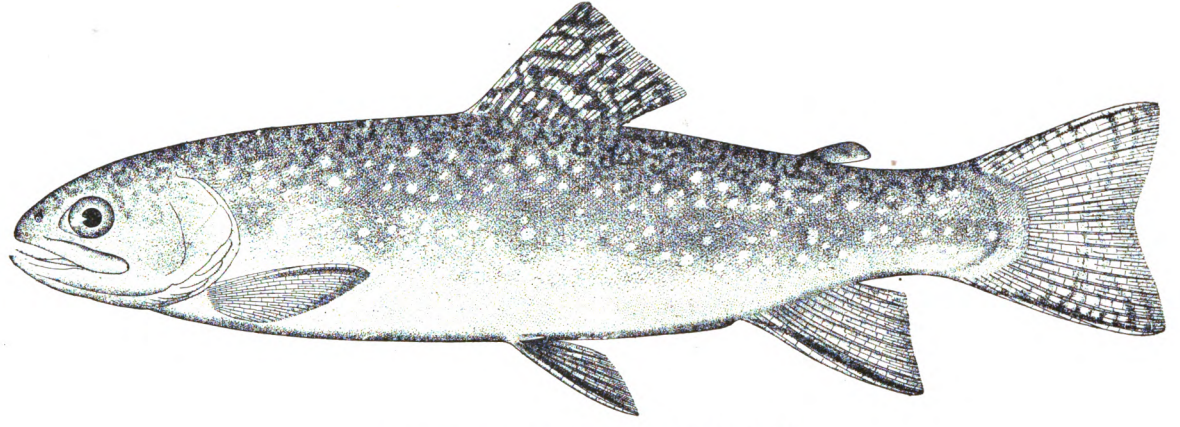
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EASTERN BROOK TROUT.—*Salvelinus fontinalis.*

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coldest and clearest lakes of the Alps and of Northern Europe, dark colored and spotted with bright red, the scales so small that they seem as mere impressions in the slimy skin, so that the average fisherman does not recognize their existence. This is a finer and more beautiful fish than any of the trout, and in most waters it is very much less abundant. This fish is known in England as the Charr, and on the Continent it has, in Germany, the name of Saibling or Sälbling (both words from the low Latin name *Salvelinus*, which again is a sort of diminutive of *Salmo*—a little salmon). In France it is called the Ombre Chevalier, which come from the Latin name *Umbla*, from *Umbra*, shade, given to the same fish in allusion to its dark colors and its love of shady places in the lakes and brooks. This charr differs from all the trout in various anatomical respects, the most notable of which is the entirely different form of its vomer, a character which could only be satisfactorily described by a series of comparative drawings. This character of the vomer distinguishes the genus *Salvelinus*, to which the Saibling belongs. Its scientific name is *Salvelinus alpinus*.

Knowing these names of salmon, trout, salmon trout, and charr, our ancestors came to America. The name "charr" was doubtless unfamiliar to most of them, for the charr is scarcely found in England except in the lake districts of Cumberland. For this reason it has never been in common language applied to any American fish. It was as unfamiliar to them as the name *Barracuda* would be to an Illinois farmer.

Our ancestors found, running up the rivers of the Atlantic Coast, a large fish precisely like the salmon of Europe; in fact, the very same thing. So they naturally and correctly called it Salmon. In the fresh waters of New England and New York, in all the clear streams throughout the Alleghany region, and in the lakes of Canada and to the northwest, our forefathers found a red-spotted, fine-scaled, dark-colored speckled beauty. Having found no real trout with black spots and large scales in the rivers, and having forgotten the name of "charr," they gave to this fish the name of trout, or speckled trout, or brook trout, and in spite of the fact that in reality it is not a trout but a charr, the name of brook trout is likely to adhere forever to the *Salvelinus fontinalis*.

Real trout there are none on our Atlantic Coast, salmon trout is likewise wanting, but the name salmon trout is often given to the brook trout, or charr, which has run out into the sea. The same name is also often given to another fish, a very large, coarse species, which has no parallel in Europe, with spots of gray or cream color. This fish is found in all the lakes, from Alaska and British Columbia to Maine, across the northern half of our continent. This is the Great Lake trout (*Cristivomer namaycush*), and, except for its large size and comparative coarseness, it would never be mistaken either for trout or salmon. The name salmon trout is wholly inapplicable to it.

In the lakes of Greenland and the eastern part of British America, the European charr (*Salvelinus alpinus*) is as abundant as it is in Europe—a fact which has been only lately made manifest, and even yet there is some question whether the European charr which are found in certain lakes in New Hampshire and Maine have not, some time or other, been brought over and planted there from Europe.

In the lakes of Maine, and on to the north as far as the Arctic Circle, there is still another charr, smaller and finer than the European one,

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the Blue-back trout of the Rangeley Lakes, known as *Salvelinus oquassa*.

Thus, instead of one salmon, one salmon trout, one trout, and one charr, of Europe, we have in the Eastern States the same salmon, the same charr, and two other charrs, one Great Lake trout, but no true trout and no salmon trout.

In coming to the Pacific Coast, the settlers of California brought with them from the East names to which they had been accustomed, but found none of the fishes to which these names belong. Salmon they found, similar in habits and in value as food, but some of them larger, finer, and vastly more abundant than any of the salmon of Europe. The salmon of California differ from all the rest of the salmon family in the fact that the number of rays in the anal fin is from fourteen to twenty, while in all the salmon and trout on the other side of the Atlantic, this fin contains no more than eleven rays. The usual number is nine or ten. The Pacific Coast salmon have also an increased number of branchiostegal rays, an increased number of gill-rakers, and a much larger number of pyloric cæca, or pancreatic glands, attached behind the stomach. These fishes are therefore, in strictness, not salmon at all, but something more intensely salmon than the salmon of Europe itself is. They have therefore been placed in another genus, known as *Oncorhynchus*. For the lack of any other common name they are always spoken of and will always be canned, as long as the canning industry lasts, under the name of salmon. The Chinook name *Quinnat* was early applied to them, and if we feel the need of some other name to distinguish them from real salmon, we may call the Pacific Coast salmon Quinnat or Quinnat Salmon. These species of Quinnat salmon all live in the ocean, ascend the rivers in the spring and summer, spawn in fresh water in the fall, the young, as soon as they are able to swim, floating tail foremost down the river and growing rapidly as soon as they reach the ocean and the peculiar ocean food. There are five species of these Quinnats, which will be described farther on.

Besides the salmon, the settlers of California found in the brooks an abundance of what they called trout. These are black-spotted, silver-scaled, and in every way they closely resemble the trout of Europe; at the same time they are wholly unlike the charr, or so-called trout, of the Eastern States. The name trout by rights belongs to these fishes, and they are placed in the genus *Salmo*. The three forms or species of trout found in the Pacific waters will be mentioned farther on. One of these is so similar to the salmon trout of Europe that it might fairly be called, as it often is called, by the same name.

A charr is also found in Pacific waters, but as the name "charr" had been wholly forgotten by our ancestors, they could only call this, like the others, a trout. In Oregon the red-spotted trout, or charr, is distinguished by the name of Bull Trout. In California it had, for a long time, no distinctive name. The landlady at the hotel at the Upper Soda Springs, at the time of the Dolly Varden craze, noticing the gaudy colors of this California charr, proposed to call it the Dolly Varden trout. This name coming to the notice of Professor Baird, then United States Fish Commissioner, pleased his fancy. At that time I was in Washington engaged in the classification of the trout in the Smithsonian Institution. Professor Baird asked me to give this species the common name

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of Dolly Varden trout, and so, in the books at least, Dolly Varden trout it is to this day.

Turning back to the Quinnat salmon, or the salmon of the Pacific Coast, we often find persons puzzled to distinguish its young from the various forms of trout. Any person who can count and will take the trouble to learn which of the fins is the anal fin—the one on the lower side, just behind the vent—can distinguish the young Quinnat salmon from any form of trout. All the so-called salmon of the Pacific Coast, all the Quinnats or species of *Oncorhynchus*, have an increased number of rays in the anal fin, from fourteen to twenty, not counting the stubs or rudiments in front of the first ray. All forms of trout in whatever country, all the charrs, and the Atlantic Coast salmon have in this fin but nine or ten or eleven fully developed rays. This is a matter of some importance, in view of the fact that the fishery laws of this State discriminate between trout and salmon, permitting the catching of the one when to take the other is forbidden.

The existence of large salmon-like fishes in the Pacific has long been known. The different species were first recognized about one hundred and fifty years ago (1731) by that most exact of early observers, Steller, who described and distinguished them with perfect accuracy, under their Russian vernacular names. In 1792 the German compiler Johann Julius Walbaum gave scientific names to all the salmon and trout which travelers had described. For these salmon of Kamtschatka he used the Russian names as scientific appellations. After Steller and Walbaum, Pallas (1811), another excellent observer, recognized these same species and gave them other names. Since the time of Steller and Pallas, writers of all degrees of incompetence, and writers with scanty material, or with no material at all, have done their worst to confuse our knowledge of these salmon, until no exact knowledge of any of the species remained. In the current system of a few years ago,* the breeding males of the five species known to Steller and Pallas, constituted a separate genus of many species (*Oncorhynchus*, Suckley); the females were placed in the genus *Salmo*, and the young formed still another species of a third genus, called *Fario*. This was supposed to be a genus of trout. The young breeding males (*grilse*) of one of the species (*Oncorhynchus nerka*) made still a fourth genus, designated as *Hypsifario*. Not one of the writers on these fishes of thirty years ago knew a single species definitely, at sight, or used knowingly in their descriptions a single character by which species are really distinguished. Not less than thirty-five nominal species of *Oncorhynchus* have already been described from the North Pacific, although, so far as is now known, only the five originally noticed by Steller really exist. The descriptive literature of the Pacific salmon is among the very worst extant in science. This is not, however, altogether the fault of the authors, but it is in great part due to the extraordinary variability in appearance of the different species of salmon. These variations are, as will be seen, due to several different causes, notably to differences in surroundings, in sex, and in age, and in conditions connected with the process of reproduction. The writer and his associate, Prof. Charles H. Gilbert, have had, under the auspices of the United States Fish Commission, better opportunities to study the different species of *Oncorhynchus* than had fallen to the lot of any previous ichthyologists. Entirely

*See report U. S. Pacific R. R. Explorations, 1858.

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similar conclusions have been independently reached by Dr. Tarleton H. Bean, of the United States Fish Commission, who has several times visited Alaska for the purpose of investigating its salmon fisheries, and whose means of studying the different species has been as extensive as ours. It is very gratifying to see that the results of these different sets of observations agree in all essential respects; they also agree fully with the observations made so long ago by Steller.

There are certainly five distinct species of *Oncorhynchus* inhabiting both shores of the North Pacific. There is no evidence of the existence of any more on either the American or the Asiatic side. These species may be called: (1) The Quinnat, or King Salmon, (2) the Blue-back Salmon, or Red-fish, (3) the Silver Salmon, (4) the Dog Salmon, and (5) the Humpback Salmon; or (1) *Oncorhynchus tschawytscha*, (2) *Oncorhynchus nerka*, (3) *Oncorhynchus kisutch*, (4) *Oncorhynchus keta*, and (5) *Oncorhynchus gorbuscha;* these being the scientific names conferred on them by Walbaum. All these species are now known to occur in the waters of Kamtschatka as well as in those of Alaska and Oregon. These species, in all their varied conditions, may usually be distinguished by the characters given below. Other differences of form, color, and appearance are absolutely valueless for distinction, unless specimens of the same age, sex, and condition are compared.

The King salmon, or true Quinnat, or Chinook salmon (*Oncorhynchus tschawytscha*), has, at three years old, in the Columbia, an average weight of 22 pounds, but older individuals weighing as high as 70 to 100 pounds are occasionally taken. In the Sacramento its average weight is 16 pounds, and it grows still smaller to the southward. It has about 16 anal rays, 15 to 19 branchiostegals, 23 (9+14) gill-rakers on the anterior gill arch, and 140 to 185 pyloric cæca. The scales are comparatively large, there being from 130 to 155 in a longitudinal series. In the spring the body is silvery, the back dorsal fin and caudal fin having more or less of round black spots, and the sides of the head having a peculiar tin-colored metallic luster. In the fall the color is often black or dirty red, and the species can then only be distinguished from the Dog salmon by its technical characters. Its southern limit is, so far as known, the Ventura River.

The Blue-back salmon (*Oncorhynchus nerka*) usually weighs from 5 to 8 pounds. It has about 14 developed anal rays, 14 branchiostegals, and 75 to 95 pyloric cæca. The gill-rakers are more numerous than in any other salmon, the number being usually about 39 (16+23). The scales are larger, there being 130 to 140 in the lateral line. In the spring the form is plumply rounded, and the color is a clear, bright blue above, silvery below, and everywhere immaculate. Young fishes often show a few round black spots, which disappear when they enter the sea. Fall specimens in the lakes are bright red in color, hook-nosed, and slab-sided, and bear little resemblance to the spring run. This species appears to be sometimes land-locked in mountain lakes, in which case it reaches but a small size. Such specimens, called "Kokos" by the Indians, have been sent us from Lake Whatcom, Washington, by Mr. T. J. Smith, of Whatcom. Similar specimens have been sent in from other mountain lakes. This land-locked mountain form has changed considerable from the original stock, and is sometimes regarded as a distinct species, *Oncorhynchus kennerlyi*. The Blue-back salmon is

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rarely seen south of the Columbia River, and probably never in California. In Alaska it far outnumbers all other kinds.

The Silver salmon (*Oncorhynchus kisutch*) reaches a weight of 3 to 8 pounds. It has 13 developed rays in the anal, 13 branchiostegals, 23 (10+13) gill-rakers, and 45 to 80 pyloric cæca. There are about 127 scales in the lateral line. In color it is silvery in spring, greenish above, and with a few faint black spots on the upper parts only. In the fall the males are mostly of a dirty red. This species is not common south of the Columbia, but is sometimes taken in California.

The Dog salmon (*Oncorhynchus keta*) reaches an average weight of about 12 pounds. It has about 14 anal rays, 14 branchiostegals, 24 (9+15) gill-rakers, and 140 to 185 pyloric cæca. There are about 150 scales in the lateral line. In the spring it is dirty silvery, immaculate, or sprinkled with small black specks, the fins dusky. In the fall the male is brick-red or blackish, and its jaws are greatly distorted. This species and the next are most common to the northward, and are not often taken in California.

The Humpback salmon (*Onchorhynchus gorbuscha*) is the smallest of the species, weighing from 3 to 6 pounds. It has usually 15 anal rays, 12 branchiostegals, 28 (13+15) gill-rakers, and about 180 pyloric cæca. Its scales are much smaller than in any other salmon, there being 180 to 240 in the lateral line. In color it is bluish above, silvery below, the posterior and upper parts with many round black spots. The males in the fall are red, and are more extravagantly distorted than in any other in the *Salmonidæ*.

Of these species the Blue-back predominates in Fraser River, and in the Yukon River, the Silver salmon in Puget Sound, the Quinnat in the Columbia and the Sacramento, and the Silver salmon in most of the streams along the coast. All the species have been seen by us in the Columbia and in Fraser River; all but the Blue-back in the Sacramento and in waters tributary to Puget Sound. Only the King salmon has been noticed south of San Francisco. Its range has been traced as far as Ventura River. Of these species, the King salmon and Blue-back salmon habitually "run" in the spring, the others in the fall. The usual order of running in the rivers is as follows: *nerka*, *tschawytscha*, *kisutch*, *gorbuscha*, *keta*.

The economic value of the spring-running salmon is far greater than that of the other species, because they can be captured in numbers when at their best, while the others are usually taken only after deterioration. To this fact the worthlessness of *Oncorhynchus keta*, as compared with the other species, is probably wholly due.

The habits of the salmon in the ocean are not easily studied. King salmon and Silver salmon of all sizes are taken with the seine at almost any season in Puget Sound. This would indicate that these species do not go far from the shore. The King salmon takes the hook freely in Monterey Bay, both near the shore and at a distance of six to eight miles out. We have reason to believe that these two species do not necessarily seek great depths, but probably remain not very far from the mouth of the rivers in which they were spawned. The Blue-back and the Dog salmon probably seek deeper water, as the former is seldom or never taken with the seine in the ocean, and the latter is known to enter the Strait of Fuca at the spawning season, therefore coming in from the open sea. The great majority of the King salmon, and nearly

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all the Blue-back salmon, enter the rivers in the spring. The run of both begins generally at the last of March; it lasts, with various modifications and interruptions, until the actual spawning season in November, the time of running and the proportionate amount in each of the subordinate runs varying with each different river. In general, the runs are slack in the summer and increase with the first high water of autumn. By the last of August only straggling Blue-backs can be found in the lower course of any stream; but both in the Columbia and in the Sacramento the Quinnat runs in considerable numbers, at least till October. In the Sacramento the run is greatest in the fall, and more run in summer than in spring. In the Sacramento and the smaller rivers southward, there is a winter run, beginning in December. The spring salmon ascends only those rivers which are fed by the melting snows from the mountains, and which have sufficient volume to send their waters well out to sea. Those salmon which run in the spring are chiefly adults (supposed to be at least three years old). Their milt and spawn are no more developed than at the same time in others of the same species which are not to enter the rivers until fall. It would appear that the contact with cold fresh water, when in the ocean, in some way causes them to run toward it, and to run before there is any special influence to that end exerted by the development of the organs of generation. High water on any of these rivers in the spring is always followed by an increased run of salmon. The salmon canners think, and this is probably true, that salmon which would not have run till later are brought up by the contact with the cold water. The cause of this effect of cold fresh water is not understood. We may call it an instinct of the salmon, which is another way of expressing our ignorance. In general, it seems to be true that in those rivers and during those years when the spring run is greatest, the fall run is least to be depended upon.

As the season advances, smaller and younger salmon of these species (Quinnat and Blue-back) enter the rivers to spawn, and in the fall these young specimens are very numerous. We have thus far failed to notice any gradations in size or appearance of these young fish by which their ages could be ascertained. It is, however, probable that some of both sexes reproduce at the age of one year. In Fraser River, in the fall, Quinnat male grilse of every size, from eight inches upwards, were running, the milt fully developed, but usually not showing the hooked jaws and dark colors of the older males. Females less than eighteen inches in length were rare. All of either sex, large and small, then in the river, had the ovaries or milt developed. Little Blue-backs of every size, down to six inches, are also found in the upper Columbia in the fall, with their organs of generation fully developed. Nineteen twentieths of these young fish are males, and some of them have the hooked jaws and red color of the old males.

The average weight of the Quinnat in the Columbia in the spring is twenty-two pounds; in the Sacramento, about sixteen. Individuals weighing from forty to sixty pounds are frequently found in both rivers, and some as high as eighty or even one hundred pounds are recorded. It is questioned whether these large fishes are those which, of the same age, have grown more rapidly; those which are older, but have for some reason failed to spawn; or those which have survived one or more spawning seasons. All these origins may be possible in individual cases; we

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are, however, of the opinion that the majority of these large fishes are those which have hitherto run in the fall, and thus having spawned not far from the sea, have survived the spawning season of the previous year.

Those fish which enter the rivers in the spring continue their ascent till death or the spawning season overtakes them. Probably none of them ever return to the ocean, and a large proportion fail to spawn. They are known to ascend the Sacramento to its extreme headwaters, about four hundred miles. In the Columbia they ascend as far as the Bitter Root Mountains, and at least to the Spokane Falls, and their extreme limit is not known. This is a distance of six to eight hundred miles. At these great distances, when the fish have reached the spawning grounds, besides the usual changes of the breeding season, their bodies are covered with bruises, on which patches of white fungus develop. The fins become mutilated, their eyes are often injured or destroyed, parasitic worms gather in their gills, they become extremely emaciated, their flesh becomes white from the loss of oil; and as soon as the spawning act is accomplished, and sometimes before, *all* of them die. The ascent of the Cascades and the Dalles probably causes the injury or death of a great many salmon.

When the salmon enter the river they refuse to take bait, and their stomachs are always found empty and contracted. In the rivers they do not feed, and when they reach the spawning grounds their stomachs, pyloric cæca and all, are said to be no larger than one's finger. They will sometimes take the fly, or a hook baited with salmon roe, in the clear waters of the upper tributaries, but there is no evidence known to us that they feed when there. This question* is still disputed, and additional evidence on the subject is much needed. Only the Quinnat and Blue-back (there called Red-fish) have been found at any great distance from the sea, and these (as adult fishes) only in late summer and fall.

The spawning season is probably about the same for all the species. It varies for each of the different rivers, and for different parts of the same river. It doubtless extends from July to December. The manner of spawning is probably similar for all the species, but we have no data for any except the Quinnat. In this species the fishes pair off; the male, with tail and snout, excavates a broad, shallow "nest" in the gravelly bed of the stream, in rapid water, at a depth of one to four feet; the female deposits her eggs in it, and, after the exclusion of the milt, they cover them with stones and gravel. They then float down the stream tail foremost. As already stated, a great majority of them die. In the headwaters of the large streams, unquestionably all die; in the small streams, and near the sea, an unknown percentage probably survive. The young hatch in about sixty days, and most of them return to the ocean during the high water of spring.

The salmon of all kinds, in the spring, are silvery, spotted or not, according to the species, and with the mouth about equally symmetrical in both sexes. As the spawning season approaches, the female loses her silvery color, becomes more slimy, the scales on the back partly sink

* The present summer, 1894, has been spent by Dr. Gilbert on the Columbia, for the purpose of securing light on this and other subjects connected with the natural history of the salmon. Much valuable information should be derived from his report of his work.

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into the skin, and the flesh changes from salmon-red and becomes variously paler from the loss of oil, the degree of paleness varying much with individuals and with inhabitants of different rivers. In the Sacramento the flesh of the Quinnat, in either spring or fall, is rarely pale. In the Columbia a few with pale flesh are sometimes taken in spring, and a good many in the fall. In Fraser River the fall run of the Quinnat is nearly worthless for canning purposes, because so many are "white-meated." In the spring very few are "white-meated," but the number increases toward fall, when there is every variation, some having red streaks running through them, others being red toward the head and pale toward the tail. The red and pale ones cannot be distinguished externally, and the color is dependent on neither age nor sex. There is said to be no difference in the taste, but there in no market for canned salmon not of the conventional orange color.

As the season advances, the difference between the males and females becomes more and more marked, and keeps pace with the development of the milt, as is shown by dissection. The males have (1) the premaxillaries and the tip of the lower jaw more and more prolonged, both of the jaws becoming, finally, strongly and often extravagantly hooked, so that either they shut by the side of each other like shears, or else the mouth cannot be closed. (2) The front teeth become very long and canine-like, their growth proceeding very rapidly, until they are often half an inch long. (3) The teeth of the vomer and tongue often disappear. (4) The body grows more compressed and deeper at the shoulders, so that a very distinct hump is formed; this is more developed in *Oncorhynchus gorbuscha*, but is found in all. (5) The scales disappear, especially on the back, by the growth of spongy skin. (6) The color changes from silvery to various shades of black and red, or blotchy, according to the species. The Blue-back turns rosy red, the Dog salmon a dull blotchy red, and the Quinnat generally blackish. The distorted males are commonly considered worthless, rejected by the canners and salmon salters, but preserved by the Indians. These changes are due solely to influences connected with the growth of the reproductive organs. They are not in any way due to the action of fresh water. They take place at about the same time in the adult males of all species, whether in the ocean or in the rivers. At the time of the spring runs all are symmetrical. In the fall all males, of whatever species, are more or less distorted. Among the Dog salmon, which run only in the fall, the males are hook-jawed and red-blotched when they first enter the Strait of Fuca from the outside. The Humpback, taken in salt water about Seattle, have the same peculiarities. The male is slab-sided, hook-billed, and distorted, and is rejected by the canners. No hook-jawed females of any species have been seen. It is not positively known that any fully hook-jawed old males survive the reproductive act. If any do, the jaws must resume the normal form.

On first entering a stream the salmon swim about as if playing. They always head toward the current, and this appearance of playing may be simply due to facing the moving tide. Afterwards they enter the deepest parts of the stream and swim straight up, with few interruptions. Their rate of travel at Sacramento is estimated by Stone at about two miles per day; on the Columbia at about three miles per day. Those who enter the Columbia in the spring and ascend to the mountain

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rivers of Idaho, must go at a more rapid rate than this, as they must make an average of nearly four miles per day.

As already stated, the economic value of any species depends in great part on its being a "spring salmon." It is not generally possible to capture salmon of any species in large numbers until they have entered the rivers, and the spring salmon enter the rivers long before the growth of the organs of reproduction has reduced the richness of the flesh. The fall salmon cannot be taken in quantity until their flesh has deteriorated; hence the Dog salmon is practically almost worthless, except to the Indians, and the Humpback salmon is little better. The Silver salmon, with the same breeding habits as the Dog salmon, is more valuable, as it is found in the inland waters of Puget Sound for a considerable time before the fall rains cause the fall runs, and it may be taken in large numbers with seines before the season for entering the rivers. The Quinnat salmon, from its great size and abundance, is more valuable than all the other fishes on our Pacific Coast taken together. The Blue-back, similar in flesh, but much smaller and less abundant, is worth much more than the combined value of the three remaining species of salmon.

The fall salmon of all species, but especially of the Dog salmon, ascend streams but a short distance before spawning. They seem to be in great anxiety to find fresh water, and many of them work their way up little brooks only a few inches deep, where they perish miserably, floundering about on the stones. Every stream, of whatever kind, has more or less of these fall salmon.

It is the prevailing impression that the salmon have some special instinct which leads them to return to spawn in the same spawning grounds where they were originally hatched. I have not yet found any positive evidence of this in the case of the Pacific Coast salmon, and we do not believe it to be true. It seems more probable that the young salmon hatched in any river mostly remain in the ocean, within a radius of twenty, thirty, or forty miles of its mouth. In their movements about in the ocean, these may come into contact with the cold waters of their parent rivers, or, perhaps, of any other river, at a considerable distance from the shore. In the case of the Quinnat and the Blue-back, their "instinct" seems to lead them to ascend these fresh waters, and, in a majority of cases, these waters will be those in which the fishes in question were originally spawned. Later in the season the growth of the reproductive organs leads them to approach the shore and search for fresh waters. Still the chances are that they may find the original stream. But undoubtedly many fall salmon ascend, or try to ascend, streams in which no salmon were ever hatched. In little brooks about Puget Sound, where the water is not three inches deep, are often found dead or dying salmon, which have entered them for the purpose of spawning. It is said of the Russian River and other California rivers, that their mouths, in the time of low water in summer, generally become entirely closed by sand-bars, and that the salmon, in their eagerness to ascend them, frequently fling themselves entirely out of water on the beach. But this does not prove that the salmon are guided by a marvelous geographical instinct, which leads them to their parent river in spite of the fact that the river cannot be found. The waters of Russian River soak through these sand-bars, and the salmon instinct, we think, leads them merely to search for fresh waters. This matter is

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much in need of further investigation; at present, however, we find no reason to believe that the salmon enter the Rogue River simply because they were spawned there, or that a salmon hatched in the Clackamas River is more likely, on that account, to return to the Clackamas than to go up the Cowlitz or the Des Chûtes. In the hatchery on Rogue River numerous fishes have been marked, set free and then caught again. But what becomes of those not recaught, no one can say. Such experiments should be tried on the Columbia, to test the return of fishes not only to the parent basin, which can be readily accounted for, but to the original tributary in which they were spawned. Such experiments must be made before we can have confidence in the geographical accuracy of the "homing instinct" of salmon, or of any other fishes.

In regard to the diminution of the number of salmon on the coast, Dr. Gilbert and myself published in 1880, in the report of the United States Census Bureau, the following observations: "In Puget Sound, Fraser River, and the small streams, there appears to be little or no evidence of diminution. In the Columbia River the evidence appears somewhat conflicting. The catch in 1880 was considerably greater than ever before (nearly five hundred and forty thousand cases of forty-eight pounds each having been packed), although the fishing for three or four years had been extensive. On the other hand, the high water of that year undoubtedly caused many fish to become spring salmon which would otherwise have run in the fall. Moreover, it is urged that a few years ago, when the number caught was about half as great as in 1880, the amount of netting used was perhaps one eighth as much. With a comparatively small outfit the canners caught half the fish; now with nets much larger and more numerous, they catch them nearly all, scarcely any escaping during the fishing season (April 1st to August 1st). Whether an actual reduction in the number of fish running can be proved or not, there can be no question that the present rate of destruction of the salmon will deplete the river before many years. A considerable number of Quinnat salmon run in August and September, and some stragglers even later; these are all which now keep up the supply of fish in the river. The non-molestation of this fall run therefore does something to atone for the almost total destruction of the spring run. This, however, is insufficient. A well-ordered salmon hatchery is the only means by which the destruction of the salmon fisheries of the Columbia can be prevented."

Since this was written the over-fishing has gone on steadily, the number of nets used is two or three times as great as it was in 1880, while the catch has steadily fallen off. Seines are now used freely in the Columbia, as well as salmon wheels and other appliances by which great numbers of young salmon, too small for use in the canneries, are destroyed. The utter disappearance of the salmon fishery of the Columbia is only a question of a few years unless some vigorous means is taken to prevent over-fishing, to prevent the destruction of young fish, and to replenish the losses from all these causes. The same story of the destruction of the rich fisheries of the Columbia will be told again in the Fraser River and in the Yukon, and in every other stream where unlimited fishing is allowed, and where no adequate effort is made to keep up the supply. Just as the forests are wantonly and thoughtlessly destroyed by early settlers and by lumbermen, just so the fisheries of this coast will go under the hands of the canner.

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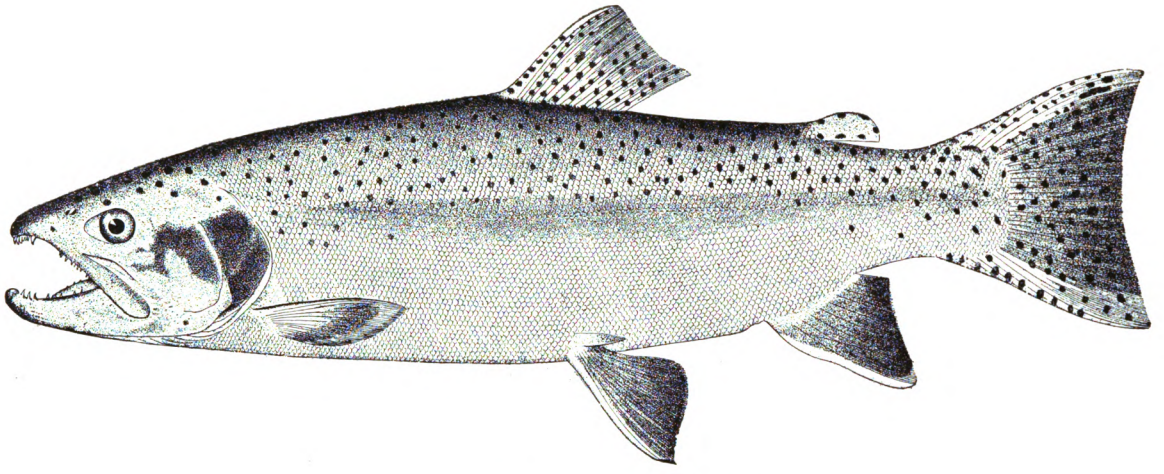
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RAINBOW TROUT, ADULT MALE.—*Salmo iridens.*

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Of the American trout, the one which most nearly approaches the European *Salmo fario*, is the Rainbow trout of California, *Salmo irideus*, as it was named some forty years ago by Dr. W. P. Gibbons, of Alameda, or *Salmo gairdneri irideus*, as it now seems best to call it, for its relation to the Steel-head seems to be that of a variety rather than a distinct species. The name Rainbow trout is simply a translation of the Latin name *irideus* given by Dr. Gibbons, and in default of any better common name this name is likely to last. The distinctive characters of this trout lie mainly in the large scales (about one hundred and thirty-five) in a lengthwise series, in the comparatively small mouth and plump body. The color is bluish, the sides silvery, usually with a red lateral band, and marked with reddish and dusky blotches. The young, as in all trout, are crossed by dark bands, which are, in every case, a mark of immaturity. The red mark of the Cut-throat trout this species seldom shows. The typical trout of the Coast Range never shows it at all. In the Rainbow trout the head, back, and upper fins are sprinkled with round black spots, which are very variable in number. In specimens taken in the sea, this species, like most other trout in similar conditions, is bright silvery, and sometimes immaculate. This species is especially characteristic of the waters of California. It abounds in every clear brook from the Mexican line northward to Mount Shasta, and perhaps farther. No specimens have been anywhere obtained to the eastward of the Cascade range or of the Sierra Nevada. It varies much in size, specimens from Northern California often reaching a weight of six pounds, while in the Rio San Luis Rey, the southernmost locality from which I have obtained trout, they seldom exceed a length of six inches. Although not an anadromous species, the Rainbow trout frequently moves about in the rivers, and it often enters the sea. All of the small trout which I have seen from the streams of the Coast Range belong to this species, which is the common trout of California, and is found in the coastwise streams as far as Puget Sound. Four notable varieties of this species have been described from California waters. The true *irideus* is the trout of the Coast Range streams. Dr. Gibbons' specimens came from San Leandro Creek, in Alameda County.

The Shasta trout, *Salmo gairdneri shasta*, is the common trout of the Upper Sacramento, the Rainbow trout of fish culturists. It is larger than the Coast Range trout, deeper in body, and shows traces of the red cut-throat mark. Its scales are also somewhat smaller.

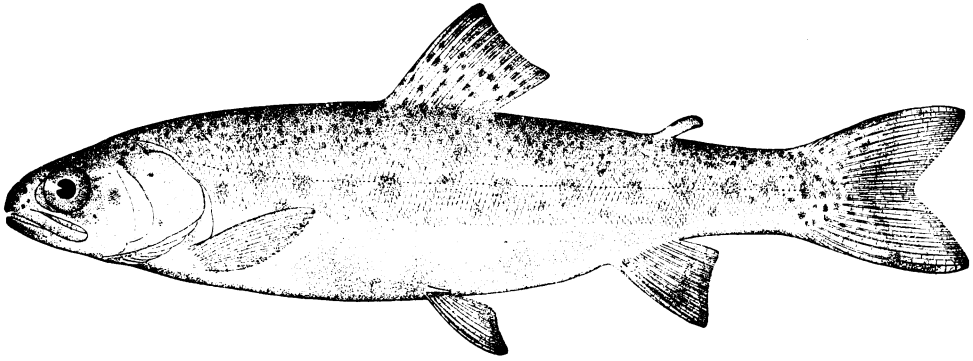
In the McCloud River and other tributaries of the Upper Sacramento, there is still another form of trout, known to the Indians as No-Shee, or Nissuee. Its scientific name is *Salmo gairdneri stonei*, the species having been sent to me by Livingston Stone, the capable Director of the United States Hatchery at Baird. The No-Shee is a large trout, with scales almost as small as those of the Cut-throat trout. Its black spots are few and mostly scattered on the posterior half of the body. According to the Indians, it is common in places on McCloud River, but I have seen only three specimens. In Kern River the common large trout is also small-scaled, but with the spots scattered over the body and the cut-throat mark distinct. This form, first brought in by Dr. Gilbert, is *Salmo gairdneri gilberti*. A singular offshoot from it is the "Golden trout" of the upper tributaries of Kern River; a beautiful inhabitant of the mountain meadow brooks and waterfalls, *Salmo gairdneri aguabonita*. The Kern River trout, *gilberti*, shows many points of resem-

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blance to that form of the Cut-throat trout (*Salmo mykiss pleuritacus*) which inhabits the Colorado Basin. This resemblance has led to the suggestion which I have elsewhere developed that the trout of California came to the State across the deserts from the Colorado to the San Joaquin; thence, changing with circumstances, it has spread through the basins of the San Joaquin and Sacramento, and through the streams of the Coast Range. From these waters it has spread northward along the coast, invading and occupying the territory of its ancestors, the Cut-throat trout. Now the Cut-throat, the Rainbow, and the Steel-head can be found together in the same waters all the way from Humboldt Bay up to Puget Sound. If it were not for the Kern River trout and other intermediate forms, no one would question the right of the Rainbow and Cut-throat to be called different species. But following the forms from river to river throughout their range no one can tell where one form leaves off and the other begins. There is, as already stated, some reason to believe that our American trout are immigrants from Siberia, the Cut-throat trout being close to the original stock. The trout still crosses Bering Sea, and there is no obstacle to its dispersion through the streams of Alaska, British Columbia, Washington, and Oregon. From the Columbia its course across Two Ocean Pass to the Yellowstone and the Upper Missouri has been distinctly traced by Dr. Evermann. From the Upper Missouri it seems to have entered the North Platte. From the South Platte it has crossed to the Rio Grande and thence to the upper tributaries of the Colorado. From the Colorado Basin it may have entered Colorado. In the glacial epoch the climate of the deserts of San Bernardino and Mono Counties must have been very different from what it is now. We may imagine these desert sinks filled up with glacial lakes, by which the trout might have easy access to waters now seemingly remote. The trout of the Great Basins of Utah and Nevada were evidently derived from those of the Snake River. There is plenty of geological evidence that these basins had an outlet to the north at a period not very remote.

Another California trout is the so-called Steel-head, often known in California as salmon trout, a fish really very much like the salmon trout of Europe. The name Steel-head seems to me preferable because it is given to no other fish. The name comes from the color of its head and the hardness of the bones of its skull as compared with the bones of the Quinnat salmon. The Steel-head is found very abundantly in the mouth of the Columbia and other rivers at the time of the salmon run. Its usual weight in the Columbia is about twelve pounds, but it occasionally reaches twenty or twenty-five pounds. The fishes seen in the river mouth at the time of the early salmon runs are evidently spent fishes. They are lean and lank, the flesh is pale and poor, and the bones are hard, for all of which reasons it is, or ought to be, rejected by the canners, although there is no doubt that the Steel-head, when taken at its best, may be one of the finest of all trout. It certainly reaches a larger average size than any other real trout in any country. Its scientific name is *Salmo gairdneri*, named for Dr. Gairdner, of Fort Vancouver, a bright young naturalist in his day, in the employ of the fur company. Dr. Gairdner first discovered the species and sent it to John Richardson. The fact that these fishes are spent in the spring would indicate a spawning time later than that of the salmon—probably midwinter—they are probably found in the rivers at this time, because

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RAINBOW TROUT, YOUNG.—*Salmo irideus.*

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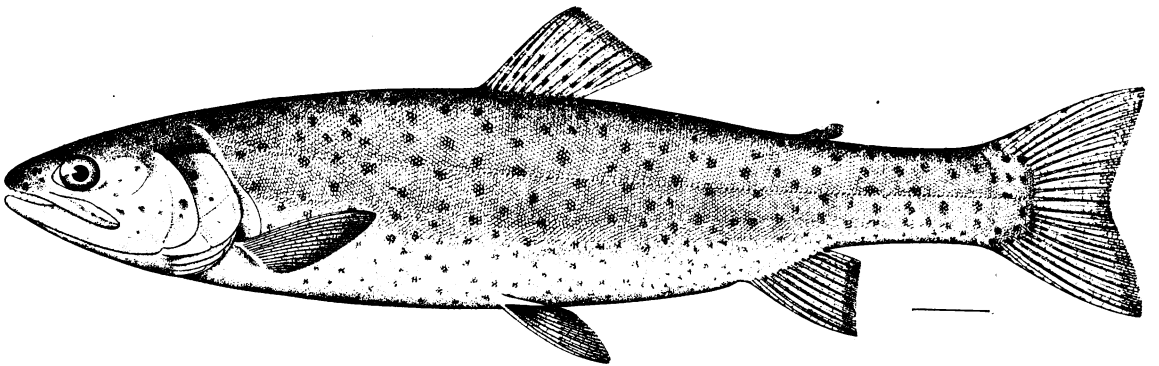
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CUT-THROAT OR TAHOE TROUT.—*Salmo mykiss.*

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they are returning toward the sea. Steel-heads are most abundant in the Columbia, but they are common in the Sacramento, as well as in the Klamath, the Eel River, and the streams about Monterey. It is not unlikely that the most of the trout in the coastwise streams of northwestern California belong to this species.

Comparing the Steel-heads with the Rainbow trout, I find no differences, other than that the former is of much larger size, and has a larger mouth, and its caudal fin is square at tip instead of forked. But the tail becomes less forked and the mouth larger with age in all species of salmon and trout. If a Rainbow trout were to reach the size of the Steel-head, it ought to acquire characters similar to those of the latter species. It is not at all unlikely that the Steel-head is simply a Rainbow trout which has descended into the sea and which has grown larger and coarser, and acquired somewhat different form and habits on account of its food and its surroundings. If this be true, the very young Steel-heads would not be distinguishable from the young Rainbow trout, and I do not know a single structural character of any kind by which the two may be separated. Dr. Gilbert writes me that at Astoria he can distinguish young Steel-heads in the brooks from the Rainbow trout that live with them. In California neither he nor I have yet been able to do this. In every other case of closely related species there is some mark, some difference in the number of scales or bones, by which we can tell the species of trout, the one from the other; but in the case of the Steel-head there is absolutely no such difference. The Rainbow trout is a small, plump fish, found in the fresh-water streams, and having certain peculiarities of form and coloration. In every internal respect, in every bone and every part of its structure, the Steel-head and the Rainbow trout agree. It is still one of the unsettled problems connected with the fisheries of California whether the Steel-head is a distinct kind of trout, or whether any Rainbow trout, placed in the ocean or the river mouth, and allowed to feed on the rich food which the salmon gets, would not, in time, develop into a Steel-head regardless of the form of its parents. The evidence, so far as it is in, is conflicting. There are some things which go to show that the two are distinct fishes. Other evidence would show that they are simply forms of the same thing, and a still more thorough study of the coastwise streams of this State is necessary before this point can be settled. If the two are absolutely the same, then the name *Salmo irideus* must drop from our lists, because the Steel-head was first introduced to science and the name of *Salmo gairdneri* is the oldest.

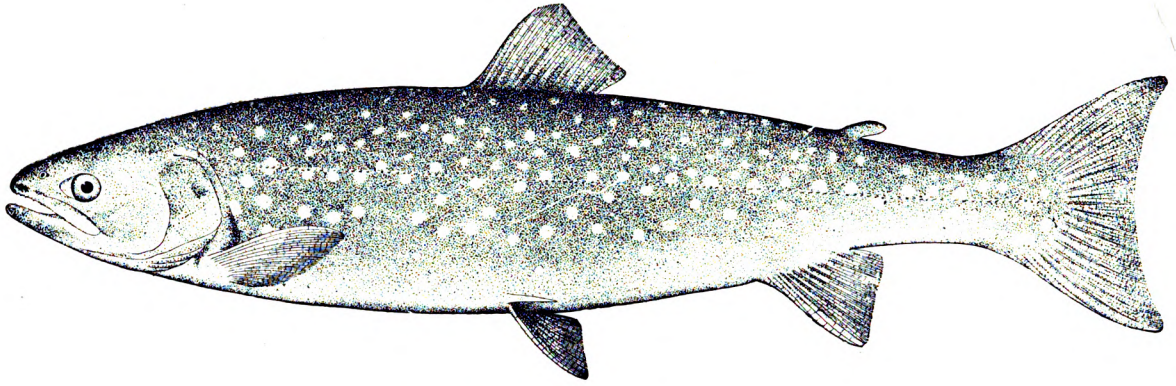
The remaining trout of this coast is the species known as the Cutthroat trout, or *Salmo mykiss*. This is the longest known of the American trout, having been discovered first by Steller, who gave it the Russian name of *mykiss*, which science has preserved. It is the most widely distributed of all our trout, being found throughout Alaska, Kamtschatka, in all the streams of Washington and Oregon, in the northwestern part of this State, throughout the rivers of the Great Basin of Utah, in all the streams on both sides of the Rocky Mountains until we come to the desert lands, where the washes of sand make the streams uninhabitable to any trout, and thence extending its range southward in the mountains as far as the springs in Chihuahua, the southernmost point reached by any trout in any country. Throughout this vast area some form of the *Salmo mykiss* is found. It is subject to very great variations according

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to the character of the water, according to the food which it receives, and according to various other less known circumstances. It is, however, in all this region, substantially the same fish. In some places it reaches a weight of twenty-five or thirty pounds. In the southernmost limit of its range it never becomes more than a fingerling, but everywhere in this whole great region every specimen retains more or less distinct traces of the same mark—a deep scarlet blotch on the half-concealed membrane between the two branches of the lower jaw—the mark which has suggested the name of Cut-throat trout. The same red mark at the throat is the sign manual of the Sioux Indian. This identity is recognized in the Dakotas, where Sioux and trout are found together. It has much smaller scales than the Rainbow trout or the Steel-head. In fact, it has smaller scales than any other of the known species of trout, although much larger than the scales of any of the charrs. In a longitudinal series along the side the usual number is about one hundred and seventy. Excepting the red blotch and the presence of black spots somewhere, all other details of coloration are extremely variable. As we go eastward the spots tend to bunch themselves more and more on the tail, so that in eastern Colorado, on the Rio Grande and the Platte, most specimens that are taken are spotted almost entirely on the tail. In Washington and Oregon the spots are usually evenly divided over the back, and in the trout of Lake Tahoe they commonly cover the belly also. In California the Cut-throat has been positively found only in Lake Tahoe, in the Feather River, and in the streams of the northwestern part of the State. Its southern limit along the coast seems to be in Humboldt County. It is in Elk River and Mad River, and in the lagoons near the sea. I am told that it has not been taken in Eel River, where only the Rainbow and its double, the Steel-head, are found. It will probably be found to be the common trout of Lassen and Modoc Counties, and perhaps along the east slope of the entire Sierra Nevada. The largest known specimens have been taken in Lake Tahoe and in the salt water about Puget Sound. About Puget Sound it is a very common fish. As in the case of all trout entering salt water, these sea-run individuals are more silvery and less spotted than those found in the mountain streams and the lakes. The presence of salt water in all fishes destroys the black spots and markings which are found in fresh water, replacing them by a uniform silvery hue. The same effect is noticeable when trout enter alkaline lakes. Thus, the trout of Utah Lake are more silvery than those which inhabit any of the surrounding streams, the waters of Utah Lake, in the summer at least, being milky with alkali.

The remaining fish of this family to which I need refer, is the Dolly Varden trout, or charr, which is the finest of the trout-like fishes on this coast. It is found in the Upper Sacramento, and thence along the line of the Cascade range as far as Kamtschatka. It often enters the sea, where it loses its spots and becomes plain silvery gray. I have myself obtained a specimen, weighing eleven pounds, near Seattle, in Puget Sound, but in the mountain streams specimens weighing even a single pound are comparatively rare. It is true of all the trout that their size depends upon the conditions. They all grow large in the sea, and in the little mountain brooks their size corresponds to their advantages; every trout, large or small, is perfect so far as he goes. The Dolly Varden trout is scarcely different from the Eastern Brook trout, the slight difference being, on the whole, to his advantage. It is rather plumper

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DOLLY VARDEN TROUT.—*Salvelinus malma.*

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in body than the brook trout of the East. The red spots are found on the back as well as on the sides, and the back and upper fins do not show the dark green marblings which are characteristic of *Salvelinus fontinalis*. In food, in body, and in gaminess, the Dolly Varden, or *Salvelinus malma* (this, too, a Russian name, first given it by Steller), is not inferior to its Eastern cousin.

Everywhere on the Pacific Slope, in every clear stream of the Cascade, the Sierra Nevada, the Coast Range, Rocky Mountains, and all their flanking ranges, some variety of trout abounds. This region should be the Mecca of anglers as it is of all lovers of the beautiful and the sublime in nature. In the East the trout or charr has almost passed away. The "trout hog" has devoured him, and the angler is turning his hand unwillingly to black bass and tarpon, as the successor of Izaak Walton fills his basket with gudgeon and chub. Says Myron W. Reed, a veteran angler:

"This is the last generation of trout fishers. The children will not be able to find any. Already there are well-trodden paths by every stream in Maine, in New York, and in Michigan. I know of but one river in North America by the side of which you will find no paper collar or other evidence of civilization. It is the Nameless River. Not that trout will cease to be. They will be hatched by machinery, and raised in ponds, and fattened on chopped liver, and grow flabby and lose their spots. The trout of the restaurant will not cease to be. He is no more like the trout of the wild river than the fat and songless reed-bird is like the bobolink. Gross feeding and easy pond life enervate and deprave him. The trout that the children will know only by legend is the gold-sprinkled living arrow of the white water; able to zigzag up the cataract; able to loiter in the rapids; whose dainty meat is the glancing butterfly."

But on the Pacific Slope the rivers are still many and the anglers are few. The "trout hog" is with us, but Mother Nature is too much for him. For a hundred generations she will be strong enough to make good whatever mischief he may do.

In writing on the trout of California, one does not willingly lay down the pen at the end. The most beautiful of fishes, the most charming of lands, where the two are connected, one wishes to say something better of them than has yet been said. It is with regret that he lets fall the pen in confession of inability to say it.

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DESCRIPTIONS OF NEW VARIETIES OF TROUT.

By Dr. David Starr Jordan.

THE NO-SHEE TROUT.

(*Salmo irideus stonei*, Jordan.)

Anal rays, 11. Depth of body contained four times in its length. Pectoral, $1\frac{1}{8}$ in head. Eye large, $4\frac{1}{2}$ in head. Maxillary, $2\frac{1}{10}$. Distinguished from *Salmo irideus* by its small scales, the number of scales in a longitudinal series being about 155, 82 before dorsal, where they are small and imbedded, 25 above lateral line. Teeth fewer and smaller than in the Rainbow trout. Those on the vomer in a single zigzag series. Axillary scales of ventral small. Upper parts plain greenish. Spots few, and confined chiefly to the posterior part of the body; spots small and sparse on the dorsal, adipose fin, and caudal; a red lateral band, usually distinct; cheeks and opercles with red, no red between branches of lower jaw.

Described from a specimen 14 inches in length, collected by Mr. Livingston Stone in McCloud River at Baird, California. This form is well known to the Indians and fishermen on the Upper Sacramento, where it is known as the No-Shee. The name Nissuee is said to be used for the same fish by the Indians in Siskiyou County. According to Mr. Stone, the Indian fishermen say that it is abundant in the McCloud River, about eight miles above Baird. The trout are larger in size than the ordinary *irideus*, one having been taken that weighed 12 pounds. A second specimen sent by Mr. Stone is deeper in color, the red lateral band very distinct (female taken in May). The scales rather large (140) and irregularly placed.

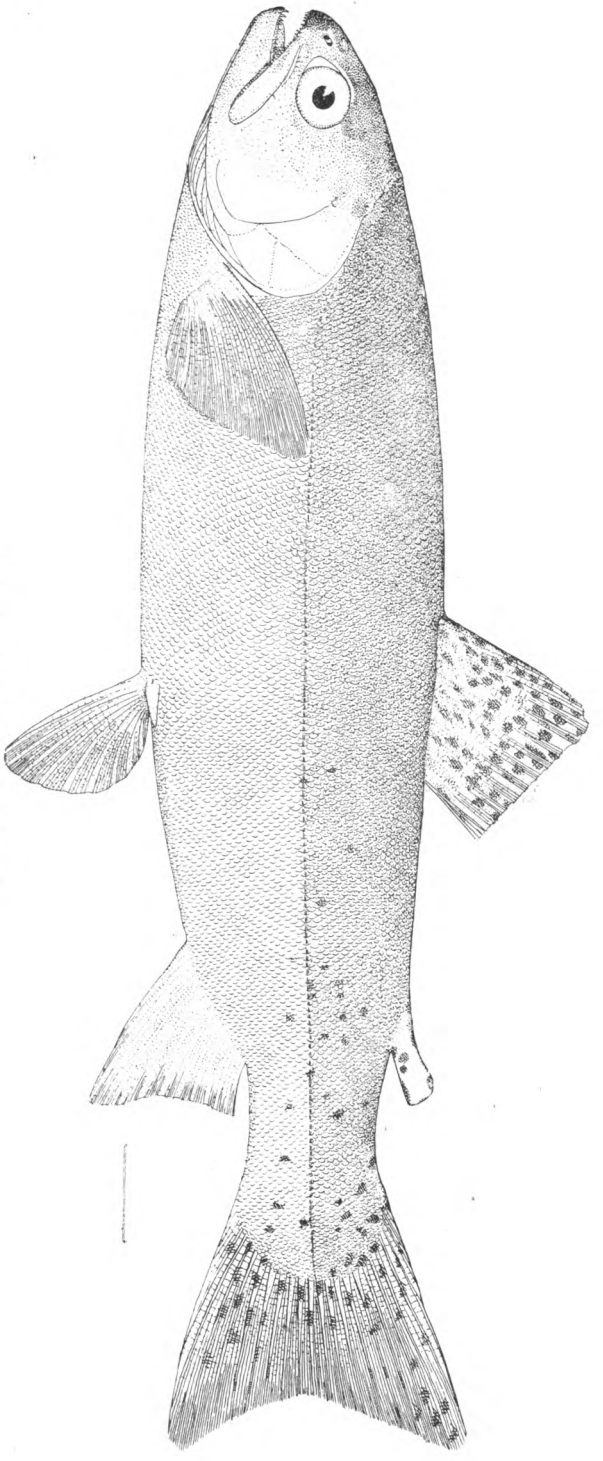
This variety of Rainbow trout is named for Livingston Stone, Director of the United States fish hatchery at Baird, Shasta County, California, one of the most successful workers in practical fish culture in our country.

McCLOUD RIVER TROUT; SHASTA TROUT.

(*Salmo gairdneri shasta*, Jordan. Rainbow Trout of the Fish Culturists.)

Body comparatively short and deep, compressed. Head short, convex, obtusely ridged above. Mouth comparatively small, the broad maxillary scarcely reaching beyond the eye, except in old males; the maxillary is about $1\frac{3}{4}$ in head in males, 2 in females. Eye large, about 5 in head. Vomerine teeth in two alternating series; hyoid teeth wanting. Dorsal fins moderate; caudal distinctly lunate or slightly forked. Scales intermediate in size between those of the Coast Range trout (*Salmo gairdneri irideus*) and those of the Cut-throat trout; the usual number of transverse series about 145. Head, 4 in length; depth, $3\frac{4}{5}$. D. 11, A. 10 or 11.

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NO-SHEE TROUT.—*Salmo irideus stonei.*

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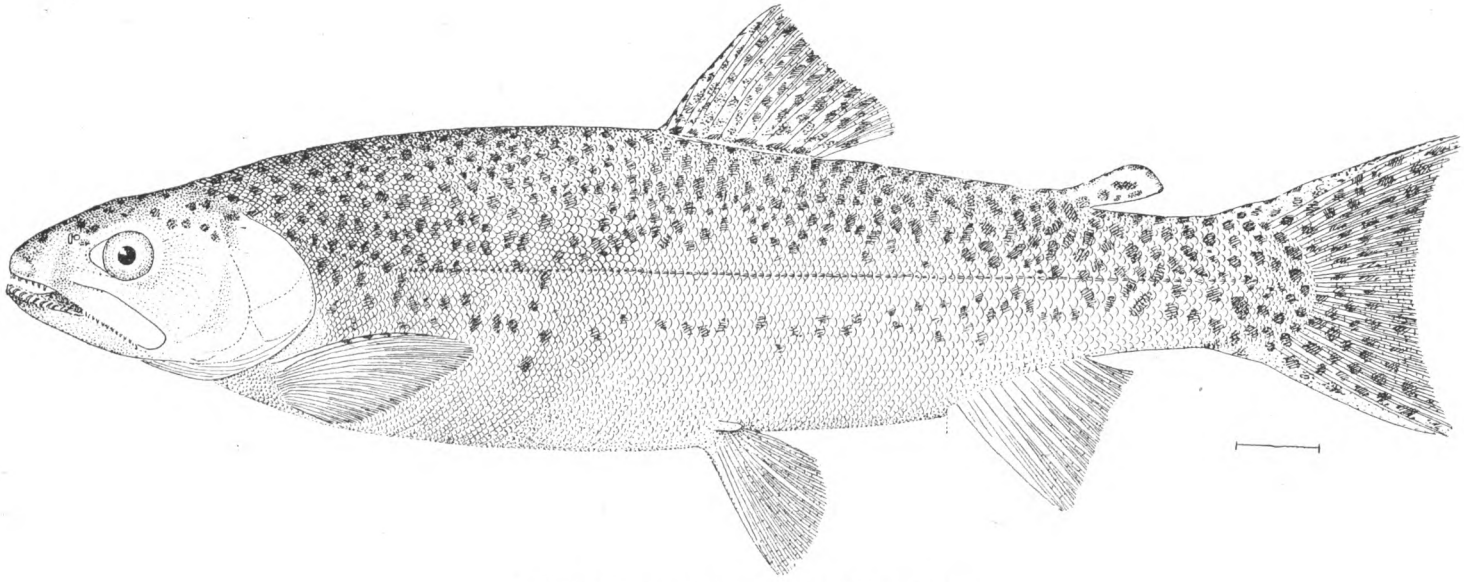
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McCloud River Trout. — *Salmo gairdneri shasta.*

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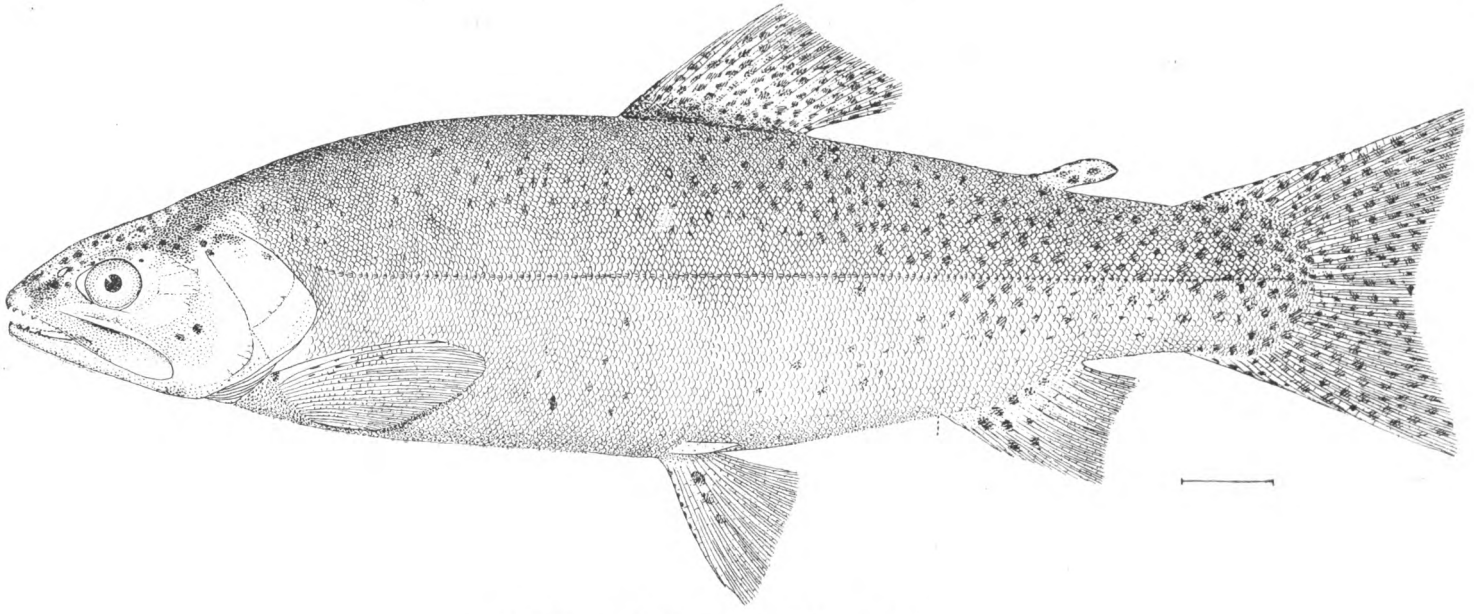
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KERN RIVER TROUT.—*Salmo gairdneri gilberti.*

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Color greenish above, with bright reflections, silvery below; above everywhere profusely but irregularly spotted; spots present on head; spots on caudal small; belly nearly plain. Males, and usually females, also with a broad red lateral band and red blotches; much red on cheeks and opercles; fins usually not red; usually a trace at least of orange dashes between branches of lower jaw.

This name is given to the trout of the Upper Sacramento, the types having been sent by Mr. Livingston Stone from the United States fish hatchery on the McCloud River at Baird. This form has been largely planted in other streams, both east and west, under the name of Rainbow trout. The name Rainbow trout is a translation of the name *Salmo irideus*, first applied by Dr. Gibbons to trout taken in San Leandro Creek in Alameda County. The name *irideus* belongs therefore to the Coast Range trout, which differs slightly from the Shasta trout above described. The scales are larger in *irideus*, usually about 130, and there is no trace of the "cut-throat" marks under the lower jaw. In what degree the two forms intergrade we cannot say as yet, and the present arrangement is only tentative until the various forms of the Rainbow trout are better known. Only a complete survey of the trout-bearing waters of California and neighboring States can give us accurate knowledge of the relationship of the different forms.

THE KERN RIVER TROUT.

(*Salmo gairdneri gilberti*, Jordan.)

This trout, inhabiting the deeper parts of Kern River, is very similar to the Shasta trout, differing in the still smaller scales, which are nearly as small as in typical *Salmo mykiss*, in about 165 transverse series. The body is robust, the mouth moderate in size, the back and sides profusely and rather finely spotted anteriorly and posteriorly, and there is in adult specimens more or less orange between the branches of the lower jaw, this mark being faint or wanting in the young. Upper ray of pectoral spotted; belly nearly or quite immaculate.

This form of trout seems intermediate between the ordinary Rainbow trout, or California trout, and the forms known as Cut-throat trout. It is abundant in the Kern River Basin, in the river channels, and reaches a weight of 5 to 6 pounds or more.

The specimens examined by us were collected by Dr. Charles H. Gilbert, for whom the form is named.

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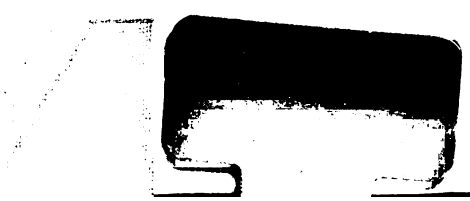
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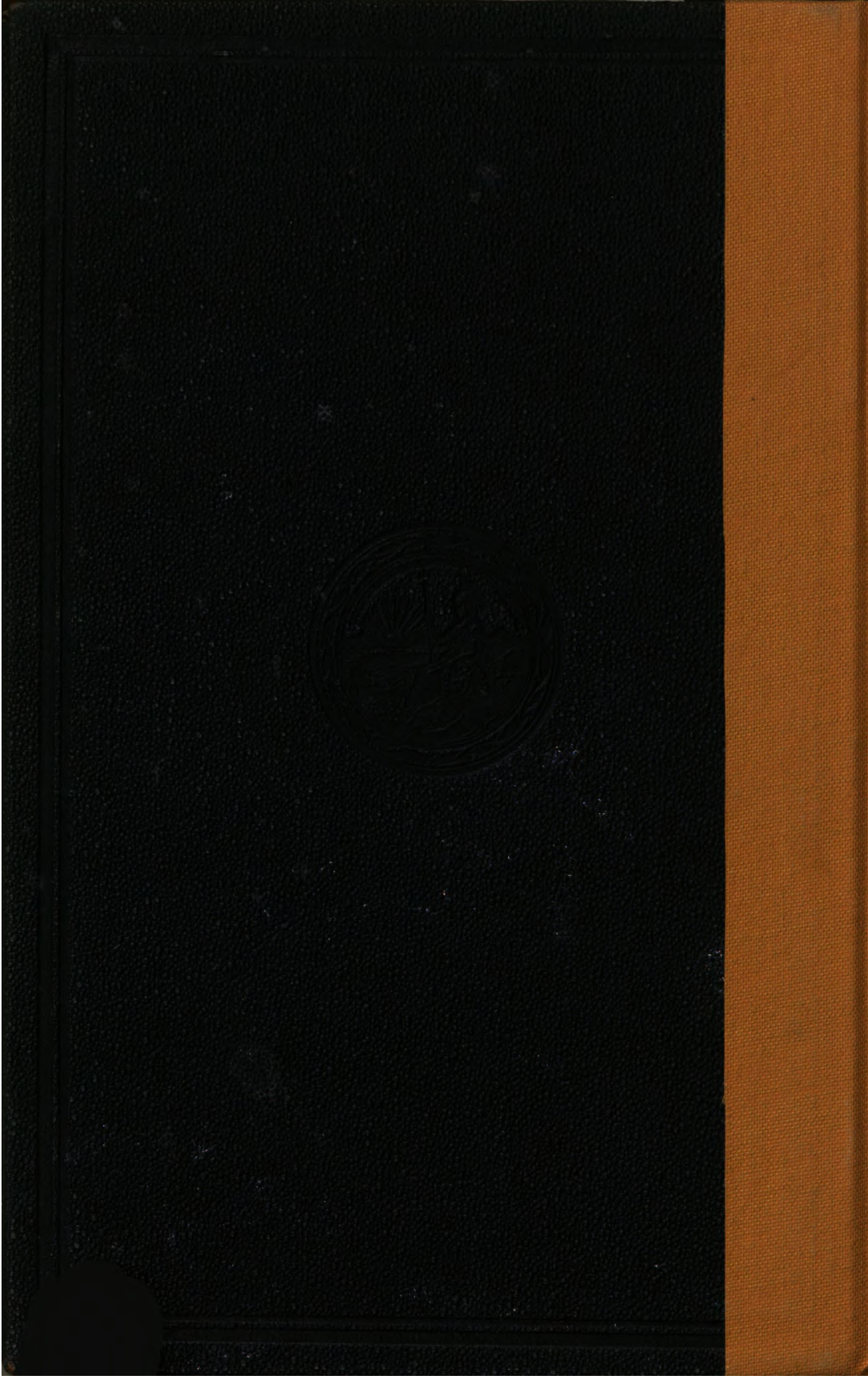
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