

(Pub. 1896)

1895

FORT GASTON AND SUBSTATIONS, CALIFORNIA (CAPT. WM. E. DOUGHERTY, U. S. A., SUPERINTENDENT).

During July and August only routine work was performed at the station and substation (Redwood). In September timbers were taken out for the construction of piers at the substation, and in October three piers were built in the bed of Redwood Creek just above the mouth of Minor Creek, and stringers and racks erected on the structure. The greatest care was taken to make this barrier substantial, yet the first high water that came (on December 1) undermined the pier and disabled the structure for the remainder of the season. It is believed that the pier system, or any system by which a considerable body of water is displaced, can not be made successful as a means of stopping the passage of fish in any of the streams of the Coast Range. The causes of this are that the streams all run in synclinal axes, the bed rock being from 80 to 200 feet beneath the bed of the stream (it is about 80 feet at Redwood), and that the current is so rapid and the volume of water so great during a rise that the undermining of the piers by the displaced water is inevitable. This system is successful at the Baird Station because McCloud River has a firm bottom.

The salmon began to run early in December, but hardly any were taken until the water was low enough to put a temporary dam in the creek. Eggs were taken during the season as follows: Salmon (from 80 females), 221,000; steelhead (from 138 females), 557,500; Von Behr trout (from 31 females), 20,800; rainbow trout (from 33 females), 16,321. Most of the salmon and steelhead eggs were taken at the substation, as there was no run of either kind in Trinity River, all the fish having been taken at the cannery at the mouth of Klamath River. Fishing and spawn-taking were suspended on May 6.

Fish and eggs were distributed during the year as follows:

Eggs distributed.

Consignee.	Species.	Number.
The consul of Japan at San Francisco, Cal.....	Steelhead.....	30,000
F. N. Clark, for Northville Station.....	do.....	91,850
S. P. Wires, for Duluth Station.....	do.....	100,000
J. W. Titcomb, for St. Johnsbury Station.....	do.....	25,000
Total.....		246,850

Fry distributed.

Applicant.	Point of deposit.	Species.	Number.
Humboldt Sporting and Recreation Club, Eureka, Cal.	Elk River.....	Rainbow trout.....	1,000
Do.....	Yager Creek.....	Von Behr trout.....	1,000
Country Club, San Francisco, Cal.	Streams in Marin County, Cal.....	do.....	3,000
U. S. F. C. assignment.....	Trinity River, California (60 miles from the ocean).	Chinook and silver salmon.....	150,000
Do.....	Redwood Creek, California (30 miles from the ocean).	do.....	70,000
Do.....	do.....	Steelhead.....	277,500

} 247,500

Rainbow trout.....
Von Behr trout.....
Eastern trout.....

During the year a fence; two ponds and 20 feet long in length was constructed to supply water supply from 18 by 42 feet, with porch full length were also subdivided.

The station work was begun and consist of log piers, triangular piers and largest pier having two center spans structures were built of material, and reinforced in height. Every structure permanent.

The water being low at the station, although the river. On November chinook and silver and 8 the water deepest part of the letting down one netting was put in was repaired by means of timbers. In February the structure to be dismantled, became so low that Mad River, 2 miles

Fishing ceased taken during the (180 females), 471.

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1895

PUBL. DATE 1896

YEAR ENDING
JUNE 30 1895

GHERTY, U. S. A.,

Brood stock and fry on hand June 30, 1895.

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Species.	Calendar year in which hatched.		
	1895.	1894.	1893.
Rainbow trout.....	14,000	6,000	200
Von Behr trout.....	10,000	800	12
Eastern trout.....	200		A few.

During the year the station grounds were extended and inclosed by a fence; two ponds, 15 by 60 feet, were constructed; a dam 5 feet high and 20 feet long was erected in Hospital Creek, and a flume 3,060 feet in length was constructed, which gives the station an independent water supply from Hospital Creek. At the substation a new hatchery, 18 by 42 feet, with a finished room for the keeper, 12 by 18 feet, and porch full length, storeroom, etc., was constructed. The large ponds were also subdivided.

KORBEL.

The station was closed from July 1 to September 15. On the 16th work was begun procuring timbers for the construction of a dam, to consist of log piers and stringers for the placing of the racks. Three triangular piers and two abutments, 6 feet in height, were erected, the largest pier having a base of 16 feet on the sides and 10 feet in rear, the two center spans being 40 feet wide, and the shore spans 30 feet. These structures were filled with loose rock, faced on the sides with rough material, and reinforced all round by a revetment of loose rock 2 feet in height. Every precaution was taken in order to make the structure permanent.

The water being low in October and November, no salmon reached the station, although great numbers were taken at the mouth of the river. On November 26 the first rain came, and early in December chinook and silver salmon became very plentiful. During December 7 and 8 the water rose rapidly, making a breach under the dam in the deepest part of the current 18 feet wide and nearly 10 feet deep, and letting down one side of the largest pier. A temporary dam of wire netting was put in as soon as the water subsided sufficiently, the breach was repaired by inserting bags of sand, and the pier carried up by means of timbers and rock. These repairs were completed on the 29th. In February the water again rose so high that the whole structure had to be dismantled, causing much loss of time. During March the water became so low that the fishing had to be done in the main channel of Mad River, 2 miles distant from the station.

Fishing ceased May 1 and spawn-taking on May 10. Eggs were taken during the season as follows: Chinook and silver salmon (from 180 females), 471,500; steelhead trout (from 105 females), 594,000.

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Salmon (from
500; Von Behr
males), 16,321.
substation, as
he fish having
river. Fishing

lows:

Species.	Number.
Steelhead.....	30,000
do.....	91,850
do.....	100,000
do.....	25,000
.....	246,850

Species.	Number.
trout.....	1,000
trout.....	1,000
.....	3,000
and silver	150,000
.....	70,000
.....	277,500

1896

Distribution of fish and eggs complete.

Applicant.	Point of deposit.	Species.	Eggs.	Fry.
Consul of Japan at San Francisco, Cal.....	.....	Steelhead.....	30,000.....	.....
U. S. F. C. assignment.....	Mad River.....	Salmon.....	.....	470,000
Do.....	do.....	Steelhead.....	.....	550,000

CLACKAMAS STATION, OREGON (W. F. HUBBARD, SUPERINTENDENT).

On account of the poor results attained on Clackamas River in the past few years, it was decided to discontinue operations there and to depend on Sandy River for the supply of eggs; also to operate, as an auxiliary station, the hatchery on the Siuslaw River, belonging to the Oregon Fish Commission.

SANDY RIVER.

A rack 400 feet long was built across the river to prevent the ascent of the salmon. Much difficulty was experienced in carrying on this work on account of sawlogs and cordwood, and it was found necessary to make a gate in the rack through which the logs and wood could be passed, also to build a boom 600 feet above the rack to direct them to the gate. A small, temporary hatchery was built and hatching-troughs erected, which were supplied with water from a spring brook not far distant. Heavy rains in the first part of September brought down an immense quantity of wood and logs, which broke the boom and carried away a large part of the rack, thus permitting the salmon collected to escape. The rack was repaired, and on the 18th of September 23,000 eggs were collected from six salmon. Additional rains caused a rise in the river, and on the 1st of October the rack was taken away again. As all of the salmon below the rack had passed up, operations were suspended. The 23,000 eggs were placed in a small brook emptying into the Sandy and left to hatch.

SIUSLAW RIVER.

The hatchery on the Siuslaw River is located at Seaton, 25 miles above the mouth of the river, and is well furnished with troughs and everything necessary for carrying on salmon work, being supplied with excellent water from a brook near by. In July arrangements were made for the construction of a rack across the river about a mile above the hatchery. This was completed on July 24 and the station placed in charge of S. S. Bass, assisted by George H. Tolbert. About the middle of August salmon appeared in the river in fairly large numbers, but very few of them succeeded in getting up as far as the station, as the fishermen set their nets below, clear across the stream. No eggs were taken, and operations were abandoned about the middle of September, as the run of quinnat salmon was over.

1896

In July cars Nos. 1 and 2 were repaired, repainted, and given over to the Board of Railroad Commissioners of the State. In December cars Nos. 3, 4, and 5 were repaired, painted, and given over to the Board of Railroad Commissioners of the State. In December car No. 6 was repaired, painted, and given over to the Board of Railroad Commissioners of the State. In December car No. 7 was repaired, painted, and given over to the Board of Railroad Commissioners of the State. In December car No. 8 was repaired, painted, and given over to the Board of Railroad Commissioners of the State. In December car No. 9 was repaired, painted, and given over to the Board of Railroad Commissioners of the State. In December car No. 10 was repaired, painted, and given over to the Board of Railroad Commissioners of the State. In December car No. 11 was repaired, painted, and given over to the Board of Railroad Commissioners of the State. 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In December car No. 100 was repaired, painted, and given over to the Board of Railroad Commissioners of the State.

Trout, salmon, etc.
 from last year of the Station. This was a total of 1,100 miles and a distribution at Gree on November 16, to landlocked salmon. traveling 5,318 miles number of salmon 9: commencing October made five trips, traveling 53,424 and the total trip was 16,000. The December 11 and 12 being 63,190, on which made was ten and ten.

Considerable difficulty was experienced in rearing rainbow trout. Various causes were attributed to this trouble, but with the best of care it was found to be due to the fact that the temperature of the water was too high. It was found that the best temperature for rearing rainbow trout was between 50 and 60 degrees Fahrenheit. The loss on car No. 1 was better, apparently, than on car No. 2. The difference in loss, however, was due to the fact that the temperature of the water was lower on car No. 1. Theories have been advanced to account for the loss on car No. 2, but they are not sufficient to account for the loss.

The trout distribution on cars Nos. 1 and 4, and 10, was better than on cars 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100. Between March 1 and March 31, 1896, 9,026 trout were distributed.

4/10

59355
Corn

U. S. COMMISSION OF FISH AND FISHERIES,
JOHN J. BRICE, Commissioner.

PART XXIII.

REPORT

OF

THE COMMISSIONER

FOR

THE YEAR ENDING JUNE 30, 1897.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1898.

r 14, a total of 2,179,000 being secured from
 During the season the salmon appeared in
 w the rack that the Indians often captured
 of the spear; many were also observed above
 before it was constructed.

the work of construction at this point was
 ptember 15, when the spawning season had
 results secured were considered excellent.
 tablished earlier in the season, there seems
 n or eight million eggs might have been col-
 ich the station is located are owned by an
 steps are now being taken by the Govern-
 al cost of operating at this point, including
 and outbuildings, amounted to \$2,288.27.
 a wooden structure without a floor, lighted by
 azed windows in the sides and ends. It was
 s, and the water supply was obtained from a
 ay. The other buildings consisted of sleep-
 ouse for the employees. At the close of the
 ough room was found to be insufficient, and
 irected outside for holding the fry.

on November 15, the water in the brook from
 ined became so muddy that it was necessary
 d to take the supply from the lumber com-
 s time the men were obliged to work night and
 pen and a supply of water flowing through
 enced falling early in November, and by the
 fallen to 13° above zero.

hed from the station on January 18 and J. A.
 The fry were all liberated between January 7
 Little White Salmon near Chenowith, Wash.
 the apparatus was stored in the bunk-house,
 hich the station is located are liable to floods,
 d down with stone and placed in charge of a
 ditted to occupy the mess-house.

ATION, OREGON. (L. E. BEAN IN CHARGE).

tion of Dr. S. E. Meek, who was engaged in
 streams in western Oregon, the Commissioner
 of the hatchery on the Siuslaw River at
 . The owner tendered its use to the Commis-
 he fishermen agreed to furnish the necessary
 ng-grounds, about 26 miles below Mapleton,
 rt had been made to operate this station in
 secured, as the fish were all captured several
 seines and gill nets. This season it was deter-

mined to transfer a stock of brood fish in live-boxes from the seining-
 grounds and hold them at the hatchery until they ripened. Several
 hundred salmon were collected at the seines and floated up to the sta-
 tion in this way, and from them 44 ripe females and 42 ripe males were
 saved. Between October 26 and November 16, 217,000 eggs were
 secured from these fish, and during the month of February plants of
 fry aggregating 180,000 were made on the spawning-grounds in the
 immediate vicinity of the station. The fry were observed from time to
 time during the spring by Mr. Bean, and numbers of small schools
 could be seen in the creeks where the deposits had been made as late
 as May. They appeared to be from 1 to 1½ inches long—not quite as
 large as a few which had been retained at the hatchery and fed. Obser-
 vations were continued throughout the spring, but in June all of the
 fry disappeared from the upper parts of the creeks, and were apparently
 moving toward the mouth of the river.

FORT GASTON STATION, CALIFORNIA (CAPT. W. E. DOUGHERTY, SUPERINTENDENT).

This station was operated, as usual, for the collection of eggs of the
 chinook and silver salmon and the steelhead trout. A rack was con-
 structed in Redwood Creek, and the first eggs were obtained on Decem-
 ber 17. As a result of the season's work, 406,000 eggs of the chinook
 and silver salmon were secured, from which 405,000 fry were hatched
 and liberated in Redwood Creek during April and May. The spawning
 season of the steelhead trout commenced on February 7 and continued
 until April, 805,000 eggs having been secured from 179 brood fish.
 Of these, shipments aggregating 550,000 were sent to Bozeman, Craig
 Brook, Cape Vincent, St. Johnsbury, Northville, and Duluth stations,
 and one consignment of 50,000 was furnished to the New York Fish
 Commission. From the remainder of the collection 202,000 fry were
 hatched and liberated in Redwood Creek in June.

Owing to the increased demand for steelhead trout eggs in the East,
 the Korbel Station, which had been closed the preceding year, was
 reopened. The results attained at this point were very unsatisfactory,
 as work was seriously interfered with at the very height of the spawn-
 ing season by high water, which did considerable damage to dams and
 racks. From the eggs collected 337,600 salmon and 55,640 steelhead
 trout fry were hatched and liberated in the Mad River during the
 month of June.

wonderful of the natural attractions of America. It is approximately circular in shape and about 5 miles in diameter. It lies in the top of Mount Mazama, and is completely encircled by a bold escarpment rising from 500 to 2,000 feet almost vertically from the water's edge. So steep are the walls that in only a few places is it possible to descend to the lake. Crater Lake is the deepest American lake, and one of the deepest in the world. The greatest ascertained depth is 2,000 feet, a large part of the bottom being practically a level floor of this depth. With a few limited exceptions there is practically no shore and scarcely any shallow water, the surrounding walls extending vertically beneath the water to a depth of several hundred feet. In Eagle Cove on the south side of the lake, in Cleatwood Cove on the north side, and about Wizard Island are found the only considerable areas of shallow water, the depth ranging from 2 to 100 feet; and, in the absence of streams flowing into the lake, the best conditions required for spawning-beds would probably be furnished at these places.

The water was ascertained to be sufficiently pure and of proper temperature for trout, and to contain a fairly abundant supply of fish-food, consisting chiefly of small crustaceans, insect larvæ, and mollusks. While the conditions do not seem favorable for the existence of an abundant fish life in this lake, it is probable that a limited number of trout would be able to maintain themselves in it, especially the species of black-spotted trout found in Lake Tahoe (*Salmo mykiss henshawi*).

COAST RIVERS OF CALIFORNIA.

In May, 1897, Dr. Charles H. Gilbert, with four assistants from Leland Stanford Junior University, was engaged to make an ichthyological canvass of the coastal streams of California, and at the close of the year the inquiry was still in progress. The object of the investigation was to study the fishes of the different streams with reference to their distribution, abundance, spawning habits and grounds, etc., particular attention being paid to the species of economic value.

FLORIDA.

In October and November, 1896, certain investigations were carried on in the coastal waters of Florida in response to a resolution of the United States Senate, dated February 15, 1895, requiring the Commissioner to make an inquiry as to the extent, methods, and present condition of the coast fisheries of the State, especially the sponge and oyster fisheries. Prof. B. W. Evermann and Dr. W. C. Kendall represented this division in the party sent by the Commissioner to make the necessary examinations. Special inquiries were made at Key West, Biscayne Bay, Tampa, Tarpon Springs, and other places, having for their object a study of the natural history of the various species of commercial sponges with reference to the causes of the decrease in their abundance and the possibilities of artificial propagation; also a deter-

mination of the abundance, size, spawning, and habits of salt-water fishes.

The sponge industry received much attention that the methods employed are seriously affected and that important modifications in this fishery are much needed. The inquiry into the lawful minimum size of sponges should be enforced and the sale of undersized sponges should be entirely brought about by which any given grower should only once in any period of two years, and provide the protection of those desiring to undertake the production of sponges, a new field that gives promise of great importance.

The number of species of salt-water food-fishes is larger than in any other State. The fishes of this part of the State, regarding both individuals and species, among which are species handled for food at Key West exceed in much commercial importance. If to these a value be added, the total number of fishes inhabiting the State is found to be about 225. The investigation has been no noteworthy diminution in the abundance of fishes of this part of the State. The present inquiry is such as will conserve the fisheries to the future. The information was obtained regarding the fishes of this part of the State to be learned. The fishermen are, as a rule, ignorant of the habits and spawning of even the common species and can not be relied on. The most satisfactory method of the life-histories of these fishes is to station an observer, who will continue his observations during the seasons.

Large and important collections of fishes were made in places visited. These are now being studied and compared with other collections from Florida, serve as a basis for a comprehensive report on the fishes of the State. The material collected was utilized in a report submitted to the Commissioner in January, 1897.

MISSISSIPPI.

At the request of prominent citizens of New Orleans a study of certain waters about the mouth of the Mississippi was made in April, 1897, for the purpose of determining the best means to be done to increase the abundance of game and fish. The locality is an important resort for New Orleans and it is desirable that additional species of game fishes should be introduced. The examination was conducted by Messrs. B. W. Evermann, H. R. Center, and

U. S. COMMISSION OF FISH AND FISHERIES,
JOHN J. BRICE, Commissioner.

PART XXII.

REPORT

OF
THE COMMISSIONER

FOR

THE YEAR ENDING JUNE 30, 1896.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1898.

IVINGSTON STONE, SUPERINTENDENT).

Table of temperatures at Baird Station.

rack was constructed across McCloud salmon. Several additional piers were put and widening of the river. After the wornout flatboats supporting the current two substantial piers were erected in piers for the summer run of salmon were first eggs were collected the following year, and the results attained were unaccounting to 7,747,600. Operations were the fall run of salmon appeared, but very few fish were captured, and only making a total of 9,663,000 for the season. the season's collection was transferred permission, to be hatched at the Sisson public waters of the State. Of the stock referred to Clackamas Station; 10,000 were sent to Atlanta for hatching in the exhibit. In addition to these shipments sent to applicants in foreign countries:

Month.	Air.			Water.			Month.	Air.			Water.		
	Min.	Max.	Mean.	Min.	Max.	Mean.		Min.	Max.	Mean.	Min.	Max.	Mean.
1895.						1896.							
July	69	94	85	56	58	57	January	44	72	56	42	49	46
August	78	99	87	58	60	58	February	49	78	63	45	50	47
September	90	90	75	49	57	51	March	34	78	70	41	52	48
October	67	90	79	49	54	52	April	42	72	55	45	52	49
November	42	87	65	41	50	45	May	46	92	67	48	56	51
December	36	70	51	39	47	43	June	58	92	82	52	58	56

Table showing the catch of salmon and number of eggs collected at Baird Station.

Signee.	Number assigned.
.....	25,000
.....	20,000
.....	50,000

Date.	Salmon caught.			Eggs collected.	Date.	Salmon caught.			Eggs collected.
	Male.	Fem.	Ripe.			Male.	Fem.	Ripe.	
1896.				1896.					
Aug. 26	343	171	19	.....	Oct. 21	13	13	9	.....
27	610	288	19	79,000	22	8	4	4	.....
28	303	270	16	65,500	23	7	2	2	.....
29	201	151	12	93,600	28	23	31	16	.....
30	283	171	21	57,500	29	35	24	34	.....
31	310	139	28	83,400	30	15	9	7	178,500
Sept. 1	97	63	15	137,000	31	33	27	10	.....
2	433	240	56	221,000	Nov. 1	33	29	11	189,100
3	308	181	56	283,800	2	22	39	21	.....
4	403	178	66	278,800	3	29	31	19	.....
5	270	143	50	277,900	4	27	20	12	148,200
6	380	153	47	294,100	5	22	14	10	.....
7	368	196	82	285,500	6	25	27	15	95,200
8	329	169	63	335,700	7	6	6	3	.....
9	357	154	84	517,000	8	46	37	14	.....
10	695	357	113	345,800	9	51	41	23	188,900
11	565	364	86	542,000	10	22	25	19	120,700
12	270	122	38	.....	11	14	21	10	.....
13	362	311	64	709,800	12	12	22	12	192,100
14	487	243	57	308,500	13	.....	.....	.....	125,800
15	395	183	116	657,000	14	.....	.....	.....	128,600
16	188	105	65	.....	15	.....	.....	.....	54,400
17	89	45	26	503,800	16	2	5	5	.....
18	115	87	57	.....	17	2	3	2	.....
19	157	105	79	545,400	18	7	5	4	.....
20	56	40	22	240,800	19	36	39	28	68,800
21	44	29	23	.....	20	8	9	6	91,800
22	46	57	47	329,400	21	8	19	12	85,000
23	25	44	36	.....	22	3	6	4	.....
24	15	36	28	307,600	23	6	5	5	.....
25	77	24	20	200,000	24	16	8	7	.....
26	2	2	2	.....	25	4	4	4	131,400
27	3	4	2	66,800	26	2	.....	.....	.....
28	11	13	10	.....	27	.....	.....	.....	.....
29	17	14	8	.....	28	.....	.....	.....	.....
30	13	11	9	.....	29	.....	.....	.....	.....
Oct. 1	.....	.....	.....	.....	30	.....	.....	.....	.....
2	.....	.....	.....	.....	Dec. 1	.....	.....	.....	.....
3	.....	.....	.....	.....	2	.....	.....	.....	.....
4	.....	.....	.....	.....	3	.....	.....	.....	.....
5	.....	.....	.....	.....	4	.....	.....	.....	.....
6	.....	.....	.....	.....	5	.....	.....	.....	.....
7	.....	.....	.....	.....	6	.....	.....	.....	.....
8	.....	.....	.....	.....	7	.....	.....	.....	.....
9	.....	.....	.....	.....	8	.....	.....	.....	.....
10	.....	.....	.....	.....	9	.....	.....	.....	.....
11	.....	.....	.....	.....	10	.....	.....	.....	.....
12	.....	.....	.....	.....	11	.....	.....	.....	.....
13	.....	.....	.....	.....	12	.....	.....	.....	.....
14	.....	.....	.....	.....	13	.....	.....	.....	.....
15	.....	.....	.....	.....	14	.....	.....	.....	.....
16	.....	.....	.....	.....	15	.....	.....	.....	.....
17	.....	.....	.....	.....	16	.....	.....	.....	.....
18	.....	.....	.....	.....	17	.....	.....	.....	.....
19	.....	.....	.....	.....	18	.....	.....	.....	.....
20	.....	.....	.....	.....	19	.....	.....	.....	.....
21	.....	.....	.....	.....	20	.....	.....	.....	.....
22	.....	.....	.....	.....	Total	9,320	5,512	1,951	9,663,000

amounting to 768,200, were retained at the hatching from them 400,000 were deposited in March. The remaining 250,000 were being fed on chopped liver, venison, could be secured. When they were liberated on May 12, they were strong, healthy fish, inches. These fish were kept during the cost of the food, as the water used from the aqueduct from Wiley Creek, which was used. The hatching apparatus used was Stone salmon basket, a full description for 1895.

FORT GASTON AND SUBSTATIONS (CAPT. W. E. DOUGHERTY IN CHARGE).

Superintendent visited Battle Creek and made either acquiring the salmon-hatching apparatus by the California Fish Commission, in connection with Baird, since the Commission indicated that immense numbers of eggs the California Commission having taken of less than one month.

The allotment for the fiscal year being only \$1,000 it was decided to close the substation at Korb and confine operations to the collection of steelhead-trout and quinnat-salmon eggs at the substation on Redwood Creek, and of Von Behr and rainbow trout eggs at Fort Gaston. The difficulty experienced heretofore in constructing a rack that would withstand the force of the water during a freshet was overcome this year by a plan devised by Mr. Dayton Barnhardt. The bed of the river, 135 feet wide, was paved with heavy timbers 30 feet long. Timber piers were then constructed 30 feet apart, which extended up through

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the platform to high water, and the rack was built across the river 5 feet high, so as to permit the water at its highest stages to pass over the top.

During the months of December and January 73,000 quinnat-salmon eggs were taken from the 49 females captured. These eggs were hatched at the station and the 65,700 fry resulting from them were liberated in adjacent streams. Only about 50 per cent of the steelhead trout below the rack were used, as the means for impounding them were inadequate, but 795,000 eggs were secured from the 257 females stripped. The bulk of these eggs were shipped, as shown by the accompanying table, but from those retained at the station 107,808 fry were deposited in waters in the immediate vicinity.

Shipments of steelhead-trout eggs.

Consignee.	Number.
New York Fish Commission, Caledonia, N. Y.....	75,000
U. S. F. C. Station, Northville, Mich.....	100,000
U. S. F. C. Station, Duluth, Minn.....	150,000
U. S. F. C. Station, Cape Vincent, N. Y.....	50,000
U. S. F. C. Station, East Orland, Me.....	100,000
Japanese Minister of Agriculture and Commerce, Niigata Ken, Japan.....	75,000
New York Fish Commission, Cold Spring Harbor, N. Y.....	25,000
Total.....	635,000

From brood fish at Fort Gaston 17,000 Von Behr and 87,000 rainbow-trout eggs were taken; 10,000 Von Behr eggs were consigned to the California Fish Commission and 30,000 of the rainbows to the Country Club, Marin County, Cal. The balance were hatched at the station. At the close of the fiscal year the stock on hand was as follows:

Species.	Calendar year in which hatched.		
	1896.	1895.	1894.
Rainbow trout.....	40,000	3,000	100
Von Behr trout.....	1,500	200	.....
Brook trout.....	.....	300	.....

In view of the increased run of salmon in Redwood Creek and Mad River, due to plants made in previous years, it is recommended by the superintendent that both of the substations be operated to their fullest capacity during the next fiscal year. The hatchery at Redwood is located in a building 18 by 42 feet, and is equipped with 14 troughs, fitted with trays and salmon baskets. The water supply is taken from Minor Creek, 650 feet distant, and is conducted to the hatchery through an open ditch and flume. The Fort Gaston hatchery is 30 by 38 feet, and is equipped with 36 troughs 12 feet long, 12 inches wide, and 5 inches deep, fitted with trays 10 by 22 inches. The water for the hatchery is obtained from two sources, Supply Creek and Hospital Creek.

U. S. COMMISSION OF FISH AND FISHERIES,
GEORGE M. BOWERS, Commissioner.

PART XXIV.

REPORT

OF

THE COMMISSIONER

FOR

THE YEAR ENDING JUNE 30, 1898.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1899.

OF FISH AND FISHERIES.

iddle of December, at which time
reek. Only the ripe females and
fish fertilization were transferred
fish being returned to the creek.
s used, as they were always in
ere thrown on the banks to die
om them, but the males were
ulated each day until exhausted.
ood were given to those applying
ed fish during the season, some
away.

er 22, the collections to the close
e smallest take in one day was
age was 1,250,000 per day. The
4. The total loss of eggs in the
handled weighed from 2½ to 40
out 22 pounds.

y catch of ripe females, eggs col-
temperature of water:

Date.	Number of fish taken.		Number spawned.	Number of eggs taken.	Daily loss of eggs in hatchery.	Water temp. in hatchery a. m.	
	6 a. m. to 6 p. m.	6 p. m. to 6 a. m.				hatchery a. m.	hatchery p. m.
v. 30	138	96	150	880,000	50,000	o	o
o. 1	85	55	228	1,360,000	52,500	51	52
2	41	38	143	800,000	57,500	46	50
3	26	20	75	400,000	55,000	44	48
4	44	...	45	240,000	62,500	44	48
5	...	74	...	67,500	62,500	48	49
6	90	30	118	720,000	62,500	50	52
7	58	...	127	760,000	55,000	50	51
8	40	28	58	360,000	65,000	50	51
9	5	...	07	360,000	62,500	48	49
10	...	...	17	85,000	57,500	50	51
11	...	...	...	...	67,500	51	51
12	...	...	...	...	50,000	50	52
13	41	...	...	...	62,500	49	50
14	...	...	41	247,500	70,000	48	50
15	...	...	...	...	55,000	47	48
16	...	...	...	...	65,000	45	48
17	...	...	...	...	70,000	44	47
18	...	...	...	...	52,500	45	47
19	...	...	...	...	65,000	43	46
20	...	...	...	...	60,000	43	46
21	...	...	...	...	65,000	43	46
22	...	...	...	...	60,000	43	46
23	...	...	...	...	62,500	44	46
24	...	...	...	...	65,000	45	48
25	...	...	...	...	25,000	46	49
26	...	...	...	...	15,000	48	52
27	...	...	...	...	20,000	49	51
28	...	...	...	...	15,000	48	50
29	...	...	...	...	17,500	46	48
30	...	...	...	...	12,500	48	51
31	...	...	...	...	7,500	46	50
ii. 1	...	...	...	...	12,500	46	50
2	...	...	...	...	17,500	47	50
3	...	...	...	...	7,500	47	50
4	...	...	...	...	5,000	47	51
5	10,000	48	50
6	15,000	50	51
7	12,500	46	48
Total.	5,710	3,065	8,784	48,527,000	3,395,000

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As soon as the eggs had been fertilized they were hauled in wagons from the fishing-grounds to the hatchery (about two-thirds of a mile), where they were placed in baskets until eyed and ready for shipment. The first consignment was forwarded to Sisson on November 16, and shipments continued from that time until January. Of the total number collected 24,000,000 were turned over to the California Commission, to be hatched on the Sacramento and Eel rivers; 4,000,000 were sent to Baird; 6,000,000 were sent east on car No. 3; 2,000,000 were transferred to Bear Valley Station and 3,000,000 to Clackamas, Oreg.

The remaining 6,000,000 yielded 5,885,500 fry, which were liberated in Battle Creek between December 16 and February 28, on which date the station was closed and placed in charge of a watchman. The total loss of eggs during incubation was 3,395,000.

In December Mr. Cloudsley Rutter was detached from Battle Creek and ordered to Olema, Bear Valley, Cal., to hatch and liberate the 2,000,000 eggs transferred to that point. The loss during incubation was small, 1,970,000 fry being hatched, but owing to limited facilities for holding them in the hatchery it was found necessary to liberate them a few days after the bursting of the shell, in Olema Creek, Papermill Creek, Hatchery Pond, Hatchery Creek, and a brook near Inverness.

In depositing the fry, shoals or riffles were selected as the most suitable places. When the fry were first planted the creeks were very low, which enabled Mr. Rutter and his assistant to observe their movements closely. During the first nine days they moved neither up nor down stream, but collected in groups in shallow places. At one spot from 4,000 to 5,000 were found in an eddy behind a rock. After the heavy rain of February 1, however, no further traces of them could be seen. On February 26 the station was closed and observations were discontinued, owing to lack of funds. The grounds upon which the plants had been made were examined again on April 10 and very few fry were found in the creek, though enough had been planted to give 2 to every square foot of surface from the mouth to the highest point at which deposits were made.

FORT GASTON STATION, CALIFORNIA (W. E. DOUGHERTY IN CHARGE).

Owing to lack of rains during the summer and fall, very few salmon and no steelheads reached the traps in the spring; consequently no work was done at Fort Gaston. At Redwood large numbers of salmon were taken below the rack, but owing to lack of facilities only about half of them were used. During the year 1,410,000 steelhead eggs, 1,283,450 eggs of the chinook and nerka salmon, and 41,000 rainbow-trout eggs were collected; 710,000 steelhead eggs were shipped to eastern stations; the balance were hatched, and the fry resulting from the steelheads and the salmon were liberated in Redwood Creek. The rainbow-trout fry (35,950) were deposited in Mill, Pine, and Fish Tangatang creeks.

As these stations are practically inaccessible, it being necessary to pack on mules all material carried in and out, and as better results can

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be secured more economically at other points, they were abandoned at the close of the year.

CLACKAMAS STATION, OREGON (W. F. HUBBARD, SUPERINTENDENT).

Arrangements were made to operate (in connection with Clackamas Station) substations on the Salmon and Little White Salmon rivers; also a hatchery belonging to the Columbia River Packers' Propagating Company on the headwaters of Clackamas River; and with Mr. R. D. Hume on Rogue River.

The rack across the Clackamas was finished early in July. Heretofore it had been constructed on a shallow riffle a short distance above the station, but this season the property-owners controlling the shores objected, and it became necessary to locate it directly opposite the station in much deeper water. During the summer the hatchery was overhauled and placed in thorough repair, new foundations, sills, and flooring being laid; many old troughs, which had been used since the establishment of the station, were replaced by new ones. The hatchery was further improved by putting in new skylights. The water supply, which had been very unsatisfactory in the past, was increased.

Early in September, all repairs and preparatory work having been completed, operations were commenced, but no ripe fish were taken until September 15. The fishing below the rack was continued every night, but very few fish were taken and only 386,650 eggs were collected in September. As the prospects for large collections in the vicinity of the station were poor, arrangements were made early in October, with Mr. G. H. Oldenburg, for collecting eggs at a point about 4 miles below the station, at the rate of 40 cents per 1,000, eyed; and 824,800 were secured from this source between October 20 and December 3, the eggs being delivered in good condition.

Fishing operations continued until October 24, when the water in the river rose so high that the men were compelled to stop work. They resumed on November 7, but by this time all the salmon in the vicinity of the rack had spawned. As a result of the season's work, 1,672,275 eggs were taken from the Clackamas River.

During September 1,066,600 eggs were received from Salmon River, and commenced hatching on the 16th. The fry from the first lot were not as strong as usual, which was attributed to the fact that the water at Clackamas Station, taken from Clear Creek, is between 10° and 15° warmer than that of Salmon River. As soon as the temperature fell there was no difference between the fry hatched from eggs collected on the Salmon and those on the Clackamas. Between October 19th and November 16th, 4,000,000 eggs were transferred from the Little White Salmon in four shipments, and on January 18 another consignment of 3,000,000 arrived from Battle Creek. These were in excellent condition, only 2,200 being lost in transit. Plants of fry were made from time to time, commencing October 7, in Clackamas River and Clear Creek, the last plant being made on April 28. As a result of the eggs collected at