



SPEARFISH STATION, SOUTH DAKOTA—SHOWING HATCHERY, ICE-HOUSE, AND REARING-PONDS.

REPORT
OF THE
UNITED STATES COMMISSIONER OF FISH AND FISHERIES
FOR THE
FISCAL YEAR ENDING JUNE 30, 1899.

I have the honor to submit herewith a report of the operations of the United States Commission of Fish and Fisheries for the fiscal year ending June 30, 1899, with appendices describing its special investigations and researches. Attention may be briefly drawn to the more salient features of the work of the year, detailed descriptions of which may be found in the accompanying reports of the different divisions of the Commission. First, however, a summary review of the status of the most important branches of the fisheries will be given.

GENERAL CONDITION OF THE FISHING INDUSTRY.

Through its agents and correspondents in every part of the United States, the Commission keeps in touch with the leading commercial fishing interests of the coast and interior; and inasmuch as its principal work is directed to the maintenance and improvement of these fisheries, by artificial propagation, by the publication of information showing the status and trend of the fisheries, by indicating to the fishing interests the means of developing the industry through improved apparatus and methods, and by pointing out the necessary measures for conserving the fishery resources, it is proper that the condition of the leading branches of the industry during the year 1899 be noticed in this report of the Commission's operations.

The approximate value of the commercial fisheries of the United States in 1899 was \$40,000,000, of which the great ocean and coastal fisheries yielded \$27,400,000, the river fisheries \$8,600,000, and the Great Lakes and other interior fisheries \$4,000,000. The fisheries for those species the supply of which the Commission is increasing by artificial means have a value of about \$11,600,000. Owing to the recent decline in certain of the ocean and shore fisheries, more especially the fur-seal, whale, mackerel, and lobster, the aggregate value of our fisheries is about 10 or 11 per cent less than during the later years of the last decade and the early part of the present decade, when the maximum seems to have been attained.

Our leading fishery product, the oyster, worth about \$14,000,000 annually, is readily susceptible of increase by methods of cultivation, and each season shows a larger proportion of the marketable output taken from planted grounds, thus insuring a permanent and increasing supply. Some of the States which have vital interests at stake are

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neglecting methods known to be beneficial and continue to depend largely on the natural supply, which is surely becoming exhausted, while other States are reaping important pecuniary returns from more advanced cultural methods. Without implying any criticism of the policy of particular States, attention may profitably be directed to a comparison of the present and past conditions of the oyster industry in the two principal oyster-producing areas, Chesapeake Bay and Long Island Sound. This comparison virtually covers the States of Maryland and Virginia, New York and Connecticut, whose oyster interests outside of those waters are relatively unimportant. Here the line between the different policies adopted in dealing with the oyster question is sharply drawn. In the Chesapeake region reliance now, as in the past, is placed on natural beds and restrictive measures, with little attention given to cultivation, while in Long Island Sound active and direct methods are practiced for increasing the supply and the natural beds are but a small factor.

The following suggestive table shows the oyster output of the four States named, in 1880, when all conducted the oyster industry on practically the same basis, and in recent years when the two regions had widely diverged in their methods. When one considers that the natural advantages possessed by Maryland and Virginia are greatly superior to those of New York and Connecticut, and that in the former States there are 40,000 oyster fishermen and in the latter less than 4,000, the significance of the comparison is accentuated.

States.	1880.		1897.		Percentage of increase or decrease.	
	Bushels.	Value.	Bushels.	Value.	Bushels.	Value.
Maryland.....	10,600,000	\$4,730,476	7,254,934	\$2,885,202	- 31.6	- 39.2
Virginia.....	6,837,240	2,218,376	7,023,848	2,041,683	+ 2.7	- 7.9
Total.....	17,437,240	6,948,852	14,278,782	4,926,885	- 18.1	- 29.1
Connecticut.....	386,450	386,450	2,093,909	1,255,741	+ 522.3	+ 224.9
New York.....	1,043,300	1,577,050	2,215,020	2,141,203	+ 112.3	+ 35.8
Total.....	1,879,750	1,963,500	4,308,929	3,396,944	+ 212.8	+ 73.0

NOTE.—An estimate for 1899, furnished by the New York shell-fish commissioner, shows a crop of nearly 4,000,000 bushels for that State.

The great ocean fisheries for cod, haddock, hake, and halibut, prosecuted on grounds adjacent to the New England coast and on banks lying to the eastward, are in a very satisfactory condition, the year 1899 being in some respects the most remarkable in their entire history. Perhaps the most noteworthy feature of these fisheries is the greatly increased quantity of cod landed in a fresh condition, from both the eastern banks and the grounds off the New England shore. Up to 1896 the salt cod was always in excess of the fresh cod; but since that year the reverse has been the case, and in 1899 the fresh fish exceeded the salt fish by 30 per cent, and the yield was more than double that of six years before. As shown in a statistical bulletin issued by the Commission, the quantity of so-called "ground fish" (i. e., cod, haddock, hake, cusk, pollock, and halibut) landed at Boston and Gloucester in

1899 by American fishing vessels was 155,367,808 pounds of fresh and salted fish, valued at \$3,525,268, against 128,088,295 pounds, valued at \$2,585,010, in the previous year.

There is unmistakable evidence of an increased abundance of cod in the inshore waters along the entire coast from Maine to New Jersey. This may, without hesitation, be attributed principally to the work of artificial propagation centering at the stations of the Commission at Gloucester and Woods Hole. A comparison of the yield of the shore cod fishery in the seven States of the North Atlantic seaboard in which this fishery is carried on shows a marked advance in Maine, Massachusetts, Rhode Island, and New Jersey between 1888 and 1898, and a general increase for the region from 28,450,000 pounds, valued at \$665,000, in 1888 to over 43,000,000 pounds, worth \$934,000, in 1898—50 per cent in quantity and 41 per cent in value.

The period of unprecedented scarcity of mackerel which began in 1886 has continued without intermission to the present time. The catch in 1899 was slightly larger than in the two preceding years, but less than in any other season since 1890. The leading feature of the fishery was the appearance of a large body of mackerel near Cape Cod late in the season, when some good fares were landed.

The decline in the lobster fishery continues in the centers of greatest production, and has been a subject of much solicitude on the part of the Commission, whose measures taken for increasing the supply are elsewhere referred to. Comparing the present output with the catch in 1880 (the earliest year for which authentic statistics are available), it appears that the yield has decreased 5,500,000 pounds, or 28 per cent. The height of this fishery seems to have been attained about 1889, when the catch was nearly 31,000,000 pounds, valued at \$860,000. In 1899 the output was under 15,000,000 pounds, but the value was over \$1,000,000. It is very important that the work done by the Fish Commission in increasing the lobster supply by artificial propagation be supplemented by the State authorities. While the lobster laws of the various States are commendable in principle, greater uniformity is desired and their more rigid enforcement is urgently demanded. During the past five years over 500,000,000 young lobsters have been artificially hatched by the Commission and planted on the east coast. As practically all the eggs from which these were produced would have been destroyed had not the Commission purchased the egg-bearing adults from the fishermen, it can hardly be doubted that these operations have had a decided influence on the supply, but they have not as yet seemed to arrest the decline, in the face of over-fishing and the destruction of short lobsters and brood lobsters carrying eggs.

Among the anadromous fishes, the shad and alewives have continued to be abundant along the entire east coast, notwithstanding that the fisheries are making larger and larger inroads each year. The supply of sturgeons is becoming less each season, and in some waters in which the fish formerly abounded practical extermination has occurred. The

only stream in which a noteworthy run now exists is the Delaware. The protection and increase of these valuable fishes demand the most serious attention on the part of the State authorities, and their artificial propagation is being considered by the Commission. The supply has become so reduced that the collection of even a small number of eggs is difficult. The runs of striped bass, white perch, and yellow perch present no special features, although in the Potomac and some other rivers excessive fishing is beginning to have its effect on the perches. The increasing abundance of the striped bass in the waters of California may be noted.

The season of 1899 was one of the most noteworthy in the history of the Pacific salmon fishery. The pack of canned fish in the Columbia River was the smallest since 1873, with the single exception of 1889. The fall run of fish in the Sacramento was a failure. The catch in the shorter rivers of Oregon and Washington was, perhaps, an average one. In Puget Sound, on the other hand, all records were broken; nearly 900,000 cases of canned salmon were prepared (against 320,000 in the Columbia); and this region now ranks next to Alaska among the salmon-producing sections. In Alaska, also, the pack exceeded that of any previous year, aggregating considerably over a million cases. The total quantity of salmon canned in the United States waters of the Pacific coast was about 2,450,000 cases of 48 one-pound cans each (against 700,000 cases in British Columbia). The quantity of fresh fish represented by this pack, together with the catch salted or sold fresh, was not less than 175,000,000 pounds.

The important fisheries for white-fish, lake herring, lake trout, and pike perch in the Great Lakes are in a generally satisfactory condition. While unfavorable weather, and a close season, during a time when the largest catches are usually made, reduced the output from Michigan waters in 1899, the supply of white-fish in Lake Erie and the Detroit River was very large, and the catch was much in excess of that of any of the preceding ten or twelve years.

The fishery products imported by the United States annually are valued at upwards of \$6,000,000. It is an interesting fact that a large part of this sum represents articles which are similar to or identical with products of our own waters, and which might just as well be purchased in the home markets. This does not refer to products which our fisheries do not yield in sufficient quantities to meet the demand, but to those of which our waters contain an abundance. The reason for seeking such products abroad is not difficult to determine. They are prepared by methods different from those in use in the United States, and are either superior in quality to the average home goods or have certain qualities which commend them to some of our people. The canned sardines of France, the pickled herring of Holland and Norway, and the cod-liver oil of Norway are well-known examples of these goods. Whatever excellence these may have is not due to any inherent property of the fish themselves but solely to the methods of

preparation. It is certainly important that the United States fishermen and manufacturers adopt the best processes, and it would appear to be proper for the Government, as represented by this Commission, to undertake the necessary expert investigations with a view to inform our manufacturers as to the approved fishery methods of other countries.

The acquisition of new island territory having large fish-eating populations opens up important trade opportunities for the manufacturers of salted, smoked, and canned fish. Attention may be especially directed to Puerto Rico, where a recent examination of the Spanish customs records by agents of the Commission has shown that the value of the imports of fishery products during the last years of the Spanish régime was about \$2,000,000 annually, of which less than \$300,000 represented products from the United States and over \$1,500,000 salt fish, chiefly cod, from the British North American provinces. Under proper regulations, there seems no reason why the trade may not be largely increased and pass under the control of our own people.

PROPAGATION OF FOOD-FISHES.

The increase in the appropriation by Congress for the propagation of food-fishes has resulted in an extension of the work, and the output for the fiscal year is greater than that of the previous season by about 198,000,000 fish. The total number distributed was 1,056,371,898, representing the important commercial fishes, such as cod, shad, white-fish, quinnat salmon, pike perch, lake trout, and lobsters.

On the Pacific coast collections of quinnat-salmon eggs were made as usual at Baird and Battle Creek, in the Sacramento River Valley, and on the Clackamas, Salmon, and Little White Salmon rivers, in the Columbia River basin. The experience this season varied from that of the past in the number of eggs secured in the different regions. At Baird runs of salmon were unusually good, and 16,568,600 eggs were taken, while at Battle Creek, where 48,000,000 eggs had been obtained the previous year, only 20,000,000 were secured this season, very few salmon entering Battle Creek on account of the low water. In the Columbia River basin the season was not as satisfactory as had been expected; but few salmon ascended the Little White Salmon or Clackamas rivers, consequently the take of eggs at these stations was below the normal, as will be seen by referring to the accompanying reports of the different stations. Notwithstanding the falling off in the number of eggs taken at some points, about 29,000,000 salmon fry were liberated in the valley of the Sacramento during the fall and winter, and over 12,800,000 in the basin of the Columbia.

The discontinuance of the Fort Gaston Station, from which the supply of steelhead-trout eggs had heretofore been obtained, necessitated the collection of these eggs from some other source, as the demand for this species has increased, owing largely to its successful introduction into the Great Lakes. A substation was accordingly established on the Willamette River, near Oregon City, where several hundred thousand eggs were obtained.

On the Great Lakes the collection of white-fish eggs from commercial fishermen was hampered by the operation of State laws, which prohibit the capture of white-fish during the spawning season in Lakes Michigan and Huron. A few million were taken in Lake Superior, but the conditions under which fishing is conducted in this lake are such that it is not possible to obtain many eggs, and the work was practically restricted to the station at Put-in Bay, Lake Erie. The experiments mentioned in the last report having demonstrated the practicability of holding adult white-fish in pens for spawning purposes, 12,785 fish were thus confined, and from them 102,051,000 eggs were obtained, which, with 83,403,000 secured from fishermen, made a total of 185,454,000, as against 112,842,000 for the previous year. From the success in obtaining eggs from penned fish this year it would seem that in the future the necessary supply can be readily obtained by impounding a sufficient number of white-fish early in each season. Most of these eggs were hatched as usual at Put-in Bay and liberated in Lake Erie, though the hatchery at Alpena, Mich., was filled and some millions were sent to the hatcheries at Duluth, Minn., and Cape Vincent, N. Y.

The lake-trout work in Lakes Superior, Michigan, and Huron was continued on the same lines as heretofore, but owing to the fact that the spawning fish did not appear on the spawning-grounds in Lakes Michigan and Huron until near the 1st of November, just before the close season commenced, the egg collections were much less than formerly. In Lake Superior efforts were more successful, 6,300,000 being obtained from the American and Canadian shore fisheries. As a result of the season's work over 9,500,000 fry were liberated.

The resumption of the propagation of pike perch the previous season met with such hearty commendation from all parts of the Great Lakes region that it was decided not only to increase the work on Lake Erie, but to undertake the collection of eggs in Michigan waters for filling the Alpena hatchery, and in Vermont and New York waters for the station at Cape Vincent. The experience gained in Saginaw Bay and on the Missisquoi River in Vermont has shown that several hundred million pike-perch eggs may be collected in these localities under more favorable conditions. In Lake Erie the number of eggs collected aggregated over 493,000,000. Of these, 87,862,090 were taken from fish which had been penned at Monroe Piers, Mich., and Put-in Bay. The application of this method did not prove as satisfactory with the pike perch as with the white-fish, as the conditions differed in many respects. The pike perch did not stand transportation as well, and unless stripped within 72 hours after being penned the eggs were usually valueless. The higher temperature of water in the spring, when the pike perch are penned, may be the reason for the smaller measure of success.

Work at the marine stations on the coast of Massachusetts was begun in the fall, the schooner *Grampus* being utilized during the months of October and November in collecting brood cod for the Woods Hole station. Field stations were established at Plymouth, Mass., and



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Kittery Point, Me., in November for the purpose of collecting cod eggs from the fishing vessels sailing from those ports. A total of 322,905,000 eggs was obtained, which produced 208,000,000 fry, which were planted on natural spawning-grounds along the coasts of Massachusetts, New Hampshire, and Maine.

On account of the meager number of eggs of the pollock taken in the past few years, but little attention was paid to the propagation of this species, though a few eggs were collected at Gloucester and hatched.

It had been determined to largely increase the output of flat-fish, but these plans were hampered by the lateness of the season, ice remaining in the harbors until late in February. As soon as the ice disappeared satisfactory collections of eggs were made in the vicinity of Woods Hole and East Greenwich, R. I., but from unexplained causes it was difficult to fertilize those first taken. Subsequently the method of fertilization was changed. As a result of the season's work, 52,441,000 fry were liberated in suitable waters in the vicinities from which the eggs were collected.

Early in March steps were taken to prepare for the lobster work along the coast of Maine. All of the dealers as far east as Rockland were visited, and arrangements were made with Mr. A. R. Nickerson, commissioner of sea and shore fisheries of the State of Maine, for the cooperation of the State officials in securing all egg-bearing lobsters captured during the spring. In the past considerable difficulty has been experienced in making the fishermen understand that they would be permitted to hold egg-bearing lobsters in live-cars, for the United States Fish Commission, as the State law provides that any person having in his possession egg lobsters would be subject to fine. Notices signed by the United States Fish Commissioner and State Commissioner Nickerson, advising the fishermen that they were authorized to hold live lobsters for this Commission, were distributed all along the coast, and the State deputy wardens were instructed not to molest anyone found with live female lobsters held for propagation. An effort was also made to secure a suitable site for the construction of a pound where a million or more young lobsters could be held until their fourth molting. A cove was needed covering several acres, and which could be so inclosed that the tide would ebb and flow daily through it, thus affording an abundance of natural food. After carefully considering many places, a location was selected in the vicinity of Vineyard Haven, but further investigation showed that the expense involved in proper equipment was more than could be met from the funds available, and accordingly the attempt had to be abandoned at that time.

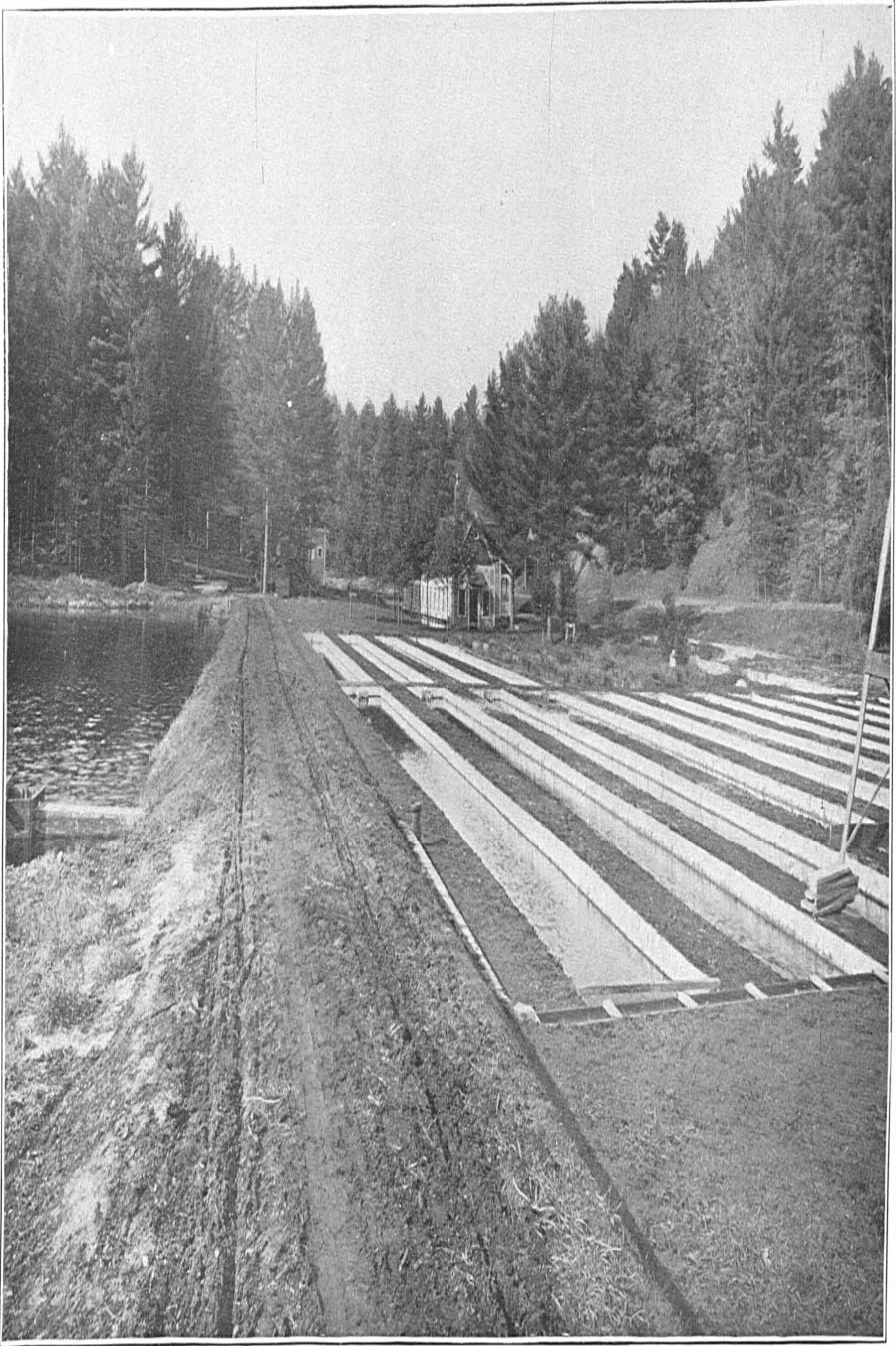
The work of collecting egg lobsters commenced in April and continued until June 30 at Woods Hole, and until July 10 north of Cape Cod. All of the important fishing centers between Rockland, Me., and Newport, R. I., were visited at least once or twice a week by agents of the Commission, and 121,878,000 eggs were secured. These were hatched at Woods Hole and Gloucester and yielded 110,491,000 fry,

36,925,000 of which were planted along the coast of Maine at various localities selected by the commissioner of sea and shore fisheries, 33,685,000 above Cape Cod along the coast of Massachusetts, and the balance along the coast below the cape, as far south as Long Island Sound, Connecticut and Rhode Island. Although the plants already made have apparently had no appreciable effect upon the fishery, correspondents at various points report large numbers of young lobsters, varying from 2 to 4 inches in length, captured in traps or carried up on the beach in grass during heavy seas. Mr. W. D. Monroe writes that while at his home in Marblehead, immediately after a severe November storm, he observed hundreds of small lobsters on the beach in eelgrass; and that, although he had lived there for many years, he had never before seen such numbers of young lobsters in the vicinity, and thinks they are the product of the hatchery at Gloucester.

The season's shad operations were begun, as in former years, in Albemarle Sound, with the steamer *Fish Hawk* as a floating hatchery. Though this vessel was available for duty earlier than usual, owing to unfavorable weather it was the 5th of April before any ripe fish were secured. Egg-collecting was pushed vigorously until April 30, when the vessel proceeded to the Delaware River. During the month 21,000,000 eggs were hatched and the fry planted in North Carolina waters. Early in April shad-hatching commenced at Bryan Point on the Maryland shore of the Potomac River and at Havre de Grace on the Susquehanna, and on May 11 the *Fish Hawk* arrived in the Delaware, opposite Gloucester, N. J., and took up the work there. The results from all of these stations this season were satisfactory, enabling the Commission to plant over 235,000,000 fry, an increase over the previous year of more than 7,000,000. The importance of artificial propagation is fully realized by shad fishermen, and its effect on the fishery is the best illustration of the value of fish-culture. The catch of fish increases yearly, notwithstanding fewer fish ascend to their natural spawning-grounds at the headwaters of the various rivers, owing to the greater number of pound and gill nets.

At the inland stations there has been a steady increase in the output of brook trout, landlocked salmon, and the large-mouth black bass, which is particularly gratifying in view of the growing demand for these species throughout the country. As an instance of the success achieved in artificially extending the range of brook trout, it may be mentioned that at the Leadville Station, in Colorado, over 3,656,000 brook-trout eggs were collected during the fall from streams and lakes which had been stocked comparatively few years ago, this fish not being a native of this section of the United States.

The propagation of the grayling, which was undertaken the previous season at Red Rock Lake, Montana, was continued under better conditions, and 5,300,000 eggs were collected. Consignments of these were sent to Wyoming, Minnesota, Michigan, Rhode Island, and Vermont, in waters where it is hoped this fine food and game fish may be established.



NASHUA STATION, NEW HAMPSHIRE—REARING-PONDS.

The following tables show the output of the various stations and the number of fish and eggs furnished to the States and Territories:

Statement of fish and eggs furnished for distribution by the stations of the United States Commission of Fish and Fisheries during the fiscal year ending June 30, 1899.

Source of supply.	Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Green Lake, Me.	Golden trout		3,074	
	Brook trout		190,000	8,800
	Lake trout	500,000	399,317	
	Black-spotted trout		8,386	
Craig Brook, Me.	Steelhead trout			3,767
	Landlocked salmon	82,500		333,157
	Atlantic salmon	650,000	450,000	302,280
	Landlocked salmon	110,000	141,875	159,250
	Rainbow trout			23,765
	Brook trout			1,500
St. Johnsbury, Vt.	Steelhead trout			26,482
	Scotch sea trout			704
	Brook trout	230,000	440,000	4,025
	Steelhead trout			3,620
	Lake trout		15,000	
Gloucester, Mass.	Quinnat salmon			147
	Landlocked salmon			6,205
	Pike perch		250,000	
	Cod	9,069,000	100,445,000	
Woods Hole, Mass.	Pollock		834,000	
	Lobster		70,610,000	
	Cod		92,143,000	
Cape Vincent, N. Y.	Flat-fish		52,441,000	
	Lobster		37,853,000	
	Brook trout		200,000	
	Lake trout		425,000	
	White-fish		5,000,000	
Steamer Fish Hawk	Pike perch		9,050,000	
	Shad	65,965,000	45,023,000	
Battery Station, Md.	Shad	16,430,000	125,596,000	
Fish Lakes, D. C.	Black bass, large-mouth			44,465
	Black bass, small-mouth			150
	Crapple			3,662
	Shad			3,000,000
	Rainbow trout		8,143	d 112
	Brook trout		8,000	d 10
	Lake trout		11,128	
	Scotch sea trout			d 50
	Quinnat salmon			d 12
	Landlocked salmon			d 100
Central Station, D. C.	Atlantic salmon		4,225	d 95
	Yellow perch		30,000	
	Shad		c 800,000	
	Shad	f 2,401,000	37,381,000	
	Rainbow trout	g 140,000		460
Bryan Point, Md.	Quinnat salmon			1,230
	Black bass			974
	Black bass			1,460
Wytheville, Va.	Rainbow trout			44,800
	Brook trout			6,700
Erwin, Tenn.	White-fish	216,000	104,930,000	
	Pike perch		108,540,000	
Put-in Bay, Ohio.	Lake trout		2,800,000	190,000
	Brook trout		609,000	8,600
	Loch Leven trout	8,500		2,000
	Steelhead trout			2,500
	Rainbow trout		10,000	
Northville, Mich. h.	Grayling		50,000	
	White-fish	500,000	28,000,000	
	Pike perch		25,000,000	
Alpena, Mich.	Lake trout	050,000	4,335,000	
	Brook trout		87,308	
	White-fish		i 15,300,000	
	White-fish			

a 2,028,000 eggs were also delivered to the laboratory at the station for experimental rearing.
 b 1,710,000 eggs were also transferred to Battery Station, Md.
 c 2,800,000 eggs were also transferred to Washington, D. C.
 d These fish were taken from the aquaria of Central Station.
 e 2,700,000 shad fry transferred to Fish Lakes rearing-ponds are not included in tabulation.
 f Of these, 500,000 were lost on car No. 1, on trip to Atlanta, Ga.; 1,661,000 shad eggs were also transferred to Central Station for hatching.
 g There were also transferred to U. S. Fish Commission stations 88,500 rainbow-trout eggs for hatching, and 1,500 to the Johns Hopkins University, Baltimore, Md.
 h The Northville Station also shipped to Prof. Loey, at Chicago, for scientific purposes, 4,000 lake-trout eggs, 4,000 brook-trout eggs, and 3,000 Loch Leven trout eggs. There were also shipped to the Omaha Exposition 4,000 lake-trout yearlings, 600 brook-trout yearlings, 1,000 Loch Leven and 100 rainbow trout yearlings; also, 25 small-mouthed black bass.
 i 500 white-fish eggs were shipped to the University of Chicago, for scientific purposes.

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Statement of fish and eggs furnished for distribution—Continued.

Source of supply.	Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Quincy, Ill	Black bass			68,452
	Crappie			9,270
	Cat-fish			1,250
Manchester, Iowa	Brook trout	3,000	187,000	59,000
	Rainbow trout		15,000	18,000
	Lake trout		180,000	400
	Grayling		22,000	
	Black bass, large-mouth			685
	Black bass, small-mouth			28
	Rock bass			1,183
Neosho, Mo.	Rainbow trout	35,000		83,964
	Black bass			16,750
	Strawberry bass			810
	Rock bass			81,518
San Marcos, Tex.	Black bass			87,975
	Crappie			1,080
	Rock bass			3,065
Leadville, Colo. b	Brook trout	105,000	577,000	293,300
	Black-spotted trout	10,000		78,000
	Loch Leven trout		7,000	17,000
	Grayling		20,000	
	Lake trout		10,000	
Bozeman, Mont.	Brook trout			19,000
	Steelhead trout			20,000
	Black-spotted trout	25,000	106,325	58,000
	Grayling	75,000	4,475,000	
Baird, Cal	Quinnat salmon	11,440,500	3,275,110	
Battle Creek, Cal	Quinnat salmon	16,180,500		
Clackamas, Oreg	Quinnat salmon		7,497,831	
	Steelhead trout	21,000	8,625	
Upper Clackamas, Oreg.	Quinnat salmon		2,930,000	
Salmon River, Oreg.	Quinnat salmon		650,355	
Little White Salmon, Wash.	Quinnat salmon		1,791,056	

a 90,800 rainbow-trout eggs also transferred to U. S. Fish Commission stations for hatching.

b This station also transferred 380,000 brook-trout eggs and 10,000 rainbow-trout eggs to U. S. Fish Commission stations. There were transferred to Bozeman Station, 200,000 brook-trout fry and 780 2-year-old brook trout. 16,000 eggs of the black-spotted trout, and some few adult and yearlings of black-spotted, rainbow, and brook trout, were transferred to the Omaha Exposition.

c 305,000 grayling eggs transferred to U. S. Fish Commission stations. 10,000 black-spotted-trout eggs and 10,000 grayling eggs sent to Omaha Exposition are not included in tabulation.

d 35,000 quinnat salmon eggs sent to Omaha Exposition not accounted for in tabulation.

e 2,000,000 quinnat salmon eggs were transferred to Clackamas Station and 180,000 were delivered to Mr. Kutter for experimental purposes.

f 138,000 steelhead eggs were transferred to U. S. Fish Commission stations.

Summary of distribution.

Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.	Total.
Shad	24,290,000	208,311,740	3,000,000	235,607,740
Quinnat salmon	27,030,000	16,144,352	1,389	43,775,741
Atlantic salmon	650,000	440,225	302,352	1,491,577
Landlocked salmon	192,500	141,875	497,871	632,346
Steelhead trout	21,000	8,625	50,310	85,935
Loch Leven trout	8,500	7,000	19,000	34,500
Rainbow trout	175,000	83,143	158,831	300,974
Black-spotted trout	35,000	114,711	135,441	285,152
Brook trout	338,000	2,354,200	388,583	3,080,783
Lake trout	1,150,000	8,235,045	190,400	9,575,445
Scotch sea trout			814	814
Golden trout		3,074		3,074
Grayling	75,000	4,567,000		4,642,000
White-fish	710,000	152,755,000		153,471,000
Pike perch		232,840,000		232,840,000
Yellow perch		30,000		30,000
Cat-fish			1,250	1,250
Black bass (large-mouth)			208,938	208,938
Black bass (small-mouth)			186	186
Crappie			13,941	13,941
Rock bass			29,192	29,192
Strawberry bass			810	810
Cod	9,609,000	198,588,000		208,257,000
Pollock		834,000		834,000
Flat-fish		52,441,000		52,441,000
Lobster		108,463,000		108,463,000
Total	64,956,000	986,320,990	5,094,908	1,056,371,898

REPORT OF COMMISSIONER OF FISH AND FISHERIES. XVII

Résumé, by States and Territories, of the distribution and assignment of fish and eggs.

State or Territory.	Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Alabama.....	Rainbow trout.....			2,400
	Black bass.....			3,730
Arizona.....	Rock bass.....			365
	Black bass.....			150
Arkansas.....	Rock bass.....			850
	Rainbow trout.....			25,155
California.....	Black bass.....			1,630
	Rock bass.....			100
	Quinnat salmon.....	24,978,000	3,275,110	
	Landlocked salmon.....	20,000		
Colorado.....	Lake trout.....	50,000		
	Loch Leven trout.....		7,000	17,000
	Brook trout.....		500,000	216,300
	Black-spotted trout.....			63,000
	Lake trout.....		10,000	
Connecticut.....	Grayling.....		20,000	
	Black bass.....			550
	Shad.....		9,700,000	
	Atlantic salmon.....	200,000		
	Landlocked salmon.....	25,000		2,000
	Steelhead trout.....	21,000		
	Loch Leven trout.....	2,500		
	Rainbow trout.....	20,000		
	Brook trout.....	25,000	47,975	1,500
	Lake trout.....	200,000		
Delaware.....	Black bass.....			950
	Crappie.....			100
	Lobster.....		5,717,000	
	Shad.....		22,920,000	
District of Columbia.....	Rainbow trout.....			500
	Black bass.....			600
	Crappie.....			300
Georgia.....	Shad.....			3,000,000
	Rainbow trout.....		3,000	
	Yellow perch.....		30,000	
	Shad.....	1,901,000	882,433	
Idaho.....	Rainbow trout.....			2,800
	Brook trout.....		4,000	
	Black bass.....			5,250
	Crappie.....			1,947
Illinois.....	Rainbow trout.....	10,000		
	Black-spotted trout.....		50,000	
	Brook trout.....	20,000	22,500	25,000
	Black bass.....			564
Indiana.....	Brook trout.....			200
	Cat-fish.....			1,250
	Black bass.....			3,080
	Crappie.....			2,400
Indian Territory.....	Brook trout.....		24,500	
	Lake trout.....		20,000	
	Pike perch.....		6,500,000	
	Black bass.....			6,515
	Crappie.....			1,850
Iowa.....	Rock bass.....			200
	Rainbow trout.....			3,175
	Black bass.....			585
	Rock bass.....			500
Kansas.....	Rainbow trout.....		15,000	9,000
	Brook trout.....		108,030	53,300
	Lake trout.....		180,600	400
	Grayling.....		22,000	
	Black bass, large-mouth.....			10,720
	Black bass, small-mouth.....			26
	Rock bass.....			800
Kentucky.....	Rainbow trout.....			1,945
	Black bass.....			1,711
	Rock bass.....			9,000
	Black bass.....			3,065
Louisiana.....	Crappie.....			1,300
	Rock bass.....			275
	Black bass.....			4,242
	Rock bass.....			1,800
Maine.....	Rock bass.....			4,242
	Atlantic salmon.....		445,000	392,257
	Landlocked salmon.....	62,500	141,875	451,682
	Steelhead trout.....			80,195
	Rainbow trout.....			17,257
	Black-spotted trout.....			8,880
	Brook trout.....			196,000
Maryland.....	Lake trout.....	500,000	379,317	8,800
	Scotch sea trout.....			764
	Goemon trout.....			3,074
	Lobster.....		33,825,000	
.....	Shad.....	10,930,000	80,100,000	
	Atlantic salmon.....			4,225
	Rainbow trout.....	25,000	5,143	5,700

XVIII REPORT OF COMMISSIONER OF FISH AND FISHERIES.

Résumé of the distribution and assignment of fish and eggs—Continued.

State or Territory.	Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Maryland.....	Brook trout.....		4,000	1,100
	Lake trout.....		11,128	
	Black bass, large-mouth.....			2,710
	Black bass, small-mouth.....			10
Massachusetts.....	Crappie.....			900
	Shad.....		870,000	
	Landlocked salmon.....	20,000		3,000
	Rainbow trout.....			2,000
	Brook trout.....		41,968	
	Lake trout.....		19,000	
	Black bass.....			1,250
	Cod.....	9,669,000	198,588,000	
	Pollock.....		834,000	
	Flat-fish.....		48,220,000	
Michigan.....	Lobster.....		62,004,000	
	Steelhead trout.....			2,500
	Loch Leven trout.....			2,000
	Rainbow trout.....		7,000	
	Brook trout.....		572,077	3,600
	Lake trout.....		4,660,000	175,000
	Grayling.....		50,000	
	White-fish.....		53,270,000	
	Pike perch.....		88,200,000	
	Black bass.....			2,200
Minnesota.....	Rock bass.....			750
	Brook trout.....		93,710	5,000
	Lake trout.....		1,470,000	
	Black bass.....			800
Mississippi.....	Black bass.....			4,470
	Crappie.....			200
	Rock bass.....			1,305
	Black bass.....			35,124
Missouri.....	Rainbow trout.....			
	Brook trout.....	3,000		
	Black bass.....			6,850
	Crappie.....			100
	Rock bass.....			940
	Strawberry bass.....			310
	Steelhead trout.....			19,995
	Black-spotted trout.....		56,325	59,941
	Brook trout.....	5,000		18,899
	Grayling.....		4,475,000	
Nebraska.....	Rainbow trout.....			10,000
	Brook trout.....		2,000	500
	Black bass.....			350
	Black bass.....			
New Hampshire.....	Atlantic salmon.....	200,000		
	Landlocked salmon.....			7,000
	Rainbow trout.....	30,000		500
	Brook trout.....	25,000	8,000	225
	White-fish.....	216,000		
New Jersey.....	Lobster.....		3,600,000	
	Shad.....	2,200,000	21,911,000	
	Landlocked salmon.....	5,000		
	Rainbow trout.....			1,300
	Brook trout.....	20,000		1,900
New Mexico.....	Black bass.....			2,250
	Rainbow trout.....			3,800
	Black bass.....			600
	Rock bass.....			200
	Black bass.....			
New York.....	Shad.....		11,470,000	
	Landlocked salmon.....	25,000		14,000
	Rainbow trout.....			500
	Brook trout.....	45,000	195,000	
	Lake trout.....	100,000	425,000	
	White-fish.....		5,000,000	
	Pike perch.....		7,000,000	
	Black bass.....			1,380
North Carolina.....	Shad.....		10,170,140	
	Rainbow trout.....			0,384
	Brook trout.....	20,000		
	Black bass.....			3,375
	Black bass.....			
North Dakota.....	Brook trout.....		15,000	
	Lake trout.....		27,000	
	Black bass.....			
Ohio.....	Rainbow trout.....		3,000	
	Brook trout.....		79,000	
	White-fish.....		86,860,000	
	Pike perch.....		178,840,000	
	Black bass.....			5,625
	Rock bass.....			200
Oklahoma.....	Rainbow trout.....			2,220
	Black bass.....			1,200
	Rock bass.....			900
Oregon.....	Quinnat salmon.....	2,002,000	11,078,186	
	Steelhead trout.....		8,625	
	Brook trout.....			11,000

REPORT OF COMMISSIONER OF FISH AND FISHERIES.

XIX

Résumé of the distribution and assignment of fish and eggs—Continued.

State or Territory.	Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Pennsylvania.....	Shad.....	9,285,000	21,750,000	.....
	Atlantic salmon.....	250,000	.....	.....
	Rainbow trout.....	.....	.....	1,788
	Brook trout.....	10,000	.....	1,299
	Black bass.....	.....	.....	2,675
Rhode Island.....	Crappie.....	.....	.....	2,100
	Rock bass.....	.....	.....	1,200
	Landlocked salmon.....	20,000	.....	.....
	Grayling.....	50,000	.....	500
	Black bass.....	.....	4,212,000	.....
South Carolina.....	Flat-fish.....	.....	3,817,000	.....
	Lobster.....	.....	1,974,167	.....
	Shad.....	.....	.....	800
	Rainbow trout.....	.....	.....	1,775
	Black bass.....	.....	50,000	17,250
South Dakota.....	Brook trout.....	.....	58,000	.....
	Lake trout.....	.....	125,000	.....
	White-fish.....	.....	.....	9,500
	Black bass.....	.....	.....	25
	Rock bass.....	.....	.....	11,501
Tennessee.....	Rainbow trout.....	.....	.....	1,000
	Brook trout.....	.....	.....	6,575
	Black bass.....	.....	.....	260
	Crappie.....	.....	.....	1,238
	Rock bass.....	.....	.....	940
Texas.....	Rainbow trout.....	.....	.....	87,045
	Black bass.....	.....	.....	1,024
	Crappie.....	.....	.....	8,484
	Rock bass.....	.....	.....	.....
	Landlocked salmon.....	5,000	.....	11,000
Utah.....	Black-spotted trout.....	.....	11,000	.....
	Brook trout.....	80,000	.....	.....
	Black bass.....	.....	.....	100
	Quinnat salmon.....	.....	.....	147
	Landlocked salmon.....	10,000	.....	20,189
Vermont.....	Steelhead trout.....	.....	.....	3,620
	Rainbow trout.....	.....	.....	3,000
	Brook trout.....	25,000	341,872	3,800
	Lake trout.....	300,000	15,000	.....
	Pike perch.....	.....	2,300,000	.....
Virginia.....	Black bass.....	.....	.....	500
	Shad.....	.....	14,555,000	.....
	Quinnat salmon.....	.....	.....	1,242
	Atlantic salmon.....	.....	.....	95
	Landlocked salmon.....	.....	.....	100
Washington.....	Rainbow trout.....	.....	.....	1,772
	Brook trout.....	.....	.....	10
	Scotch sea trout.....	.....	.....	50
	Black bass.....	.....	.....	10,825
	Crappie.....	.....	.....	250
West Virginia.....	Quinnat salmon.....	500,000	1,791,050	.....
	Black-spotted trout.....	.....	.....	1,500
	Brook trout.....	.....	.....	17,000
	Black bass.....	.....	.....	975
	Rainbow trout.....	.....	.....	5,700
Wisconsin.....	Brook trout.....	20,000	.....	900
	Black bass, large-mouth.....	.....	.....	6,850
	Black bass, small-mouth.....	.....	.....	150
	Crappie.....	.....	.....	1,150
	Rainbow trout.....	.....	.....	3,500
Wyoming.....	Brook trout.....	.....	36,068	.....
	Lake trout.....	.....	720,000	15,000
	White-fish.....	.....	6,000,000	.....
	Black bass.....	.....	.....	85
	Rainbow trout.....	25,000	.....	.....
Foreign Countries:	Black-spotted trout.....	25,000	.....	.....
	Brook trout.....	50,000	.....	.....
	Grayling.....	25,000	.....	.....
	Black bass.....	.....	.....	125
	Quinnat salmon.....	100,000	.....	.....
Japan.....	Quinnat salmon.....	25,000	.....	.....
France.....	Rainbow trout.....	25,000	.....	.....
New Zealand.....	Quinnat salmon.....	25,000	.....	.....
	White-fish.....	500,000	.....	.....
Ireland.....	Rainbow trout.....	10,000	.....	.....
	Brook trout.....	20,000	.....	.....
Portugal.....	Rainbow trout.....	10,000	.....	.....
England.....	Rainbow trout.....	10,000	.....	.....
	Brook trout.....	20,000	.....	.....
Germany.....	Rainbow trout.....	10,000	.....	.....
	Black-spotted trout.....	10,000	.....	.....
Canada.....	Lake trout.....	.....	240,000	.....
	White-fish.....	.....	1,500,000	.....

During the year over 100,000,000 fish were handled on the four cars of the Commission, with a loss of a little over 1,250,000, or about 1.28 per cent. The cars traveled 95,374 miles in making this distribution. The remaining fish propagated were distributed by detached messengers and employees of the stations, who traveled 138,847 miles.

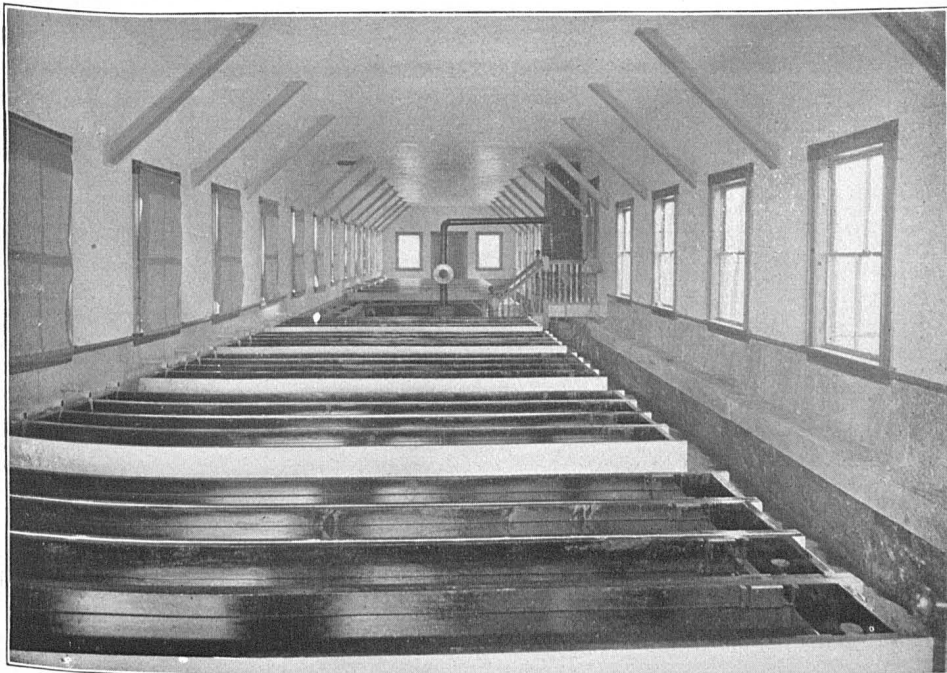
The railroads shown by the following list assisted the Commission very greatly by furnishing free transportation, without which the work would have necessarily been curtailed:

Table showing the amount of free transportation furnished by the railroads named during the fiscal year ending June 30, 1899.

Name of railroad.	Cars.	Messen- gers.	Name of railroad.	Cars.	Messen- gers.
	<i>Miles.</i>	<i>Miles.</i>		<i>Miles.</i>	<i>Miles.</i>
Atchison, Topeka and Santa Fe Rwy	3, 178	1, 274	Hoosac Tunnel and Wilmington R. R.		48
Austin and Northwestern R. R.		200	Houston and Texas Central R. R.	592	166
Baltimore and Ohio R. R.	358		Illinois Central R. R.	82	
Bangor and Aroostook R. R.	152	351	International and Great North- ern R. R.	853	728
Bennington and Rutland Rwy		52	Kansas City, Fort Scott and Memphis R. R.	452	31
Boston and Maine R. R.		2, 420	Kansas City, Pittsburg and Gulf R. R.		480
Burlington and Missouri River R. R. in Nebraska.	1, 303		Maine Central R. R.	2, 488	44
Burlington, Cedar Rapids and Northern Rwy	3, 285	1, 353	Maniatique Rwy	128	
Central Vermont Rwy		620	Mattoon Rwy	18	
Chesapeake and Ohio Rwy	599		Michigan Central R. R.	8, 170	410
Chicago and North western Rwy.	784	546	Minneapolis, St. Paul and Sault Ste. Marie Rwy	252	
Chicago and West Michigan Rwy	1, 701	42	Missouri, Kansas and Texas Rwy		803
Chicago, Burlington and Quincy R. R.	2, 466		Mobile and Ohio R. R.	1, 802	
Chicago, Milwaukee and St. Paul Rwy	452		Montana R. R.		240
Chicago, St. Paul, Minneapolis and Omaha Rwy	302		Montpelier and Wells River R. R.		168
Cincinnati Northern R. R.		42	Northern Pacific Rwy	1, 579	243
Cleveland, Cincinnati, Chicago and St. Louis Rwy	2, 370		Ohio River R. R.	121	
Colorado Midland Rwy	1, 176	83	Oregon Railroad and Navigation Co	1, 279	
Colorado and Southern Rwy	364	1, 832	Oregon Short Line R. R.	2, 385	805
Delaware and Hudson R. R.	475		Portland and Rumford Falls Rwy		114
Denver and Rio Grande R. R.	1, 488	4, 578	Rio Grande Western Rwy	1, 498	
Denver, Leadville and Gunnison Rwy		929	Rumford Falls and Rangeley Lakes R. R.	56	
Detroit and Mackinac Rwy	3, 004	524	Rutland R. R.		270
Detroit, Grand Rapids and West- ern R. R.	1, 049		St. Louis Southwestern Rwy	418	750
Detroit, Toledo and Milwaukee R. R.	140		San Antonio and Aransas Pass Rwy	415	426
Duluth, South Shore and Atlan- tic Rwy	2, 285		Sandy River R. R.		22
Erie R. R.		394	Southern Pacific Co.		326
Fitchburg R. R.		174	St. Johnsbury and Lake Cham- plain R. R.		775
Flint and Pere Marquette R. R.	4, 452	1, 406	St. Louis and San Francisco R. R.	784	620
Franklin and Megantic Rwy		50	Texas and Pacific Rwy	2, 519	3, 404
Fort Worth and Rio Grande Rwy		284	Union Pacific R. R.	1, 420	
Galveston, La Porte and Hous- ton Rwy		14	Union Pacific, Denver and Gulf Rwy	597	192
Grand Rapids and Indiana Rwy.	680	157	Wabash R. R.	2, 106	96
Grand Trunk Rwy	68		Wilmington and Northern R. R.		56
Great Northern Rwy	985	633	Wisconsin Central R. R.	92	
Green Bay and Western R. R.	132				
Gulf, Colorado and Santa Fe Rwy	736	102	Total	59, 797	29, 439



NASHUA STATION, NEW HAMPSHIRE—HATCHERY EXTERIOR.



NASHUA STATION, NEW HAMPSHIRE—HATCHERY INTERIOR.

BIOLOGICAL INQUIRIES.

The work of the division of scientific inquiry has been of more than usual interest during the past year. Several important investigations have been inaugurated, and those already in progress have been completed or continued.

In July, 1898, a systematic survey of the biological and physical conditions of Lake Erie was begun and has been carried on with gratifying success. The commercial value of the fisheries of the Great Lakes and the magnitude of the fish-cultural operations necessary to maintain the supply of food-fishes make it important that all of the conditions which affect fish life be carefully studied, especially that future fish-cultural efforts may obtain the best results. The investigation was begun in Lake Erie, with headquarters at the station of the Commission at Put-in Bay, where the hatchery building could be used as a laboratory and the other facilities of the station, including a steam launch, could be utilized; furthermore, the region affords excellent natural advantages for pursuing the studies indicated. Prof. Jacob Reighard, of the University of Michigan, was placed in direct charge of the work, and was assisted by a corps of specialists, consisting of representatives from various institutions of learning and from the staff of the Commission. The summer was devoted to a study of the fishes and of the minute animals and plants which influence the movements and distribution of fishes, and the results were of such value that the investigation will be continued and its scope enlarged as much as possible.

The biological surveys of the interior waters of the Northwest have been continued under the direction of Dr. B. W. Evermann. The investigations during the season of 1898 chiefly concerned lakes Chelan, Kootenay, and Cœur d'Alene, and were, in a measure, preliminary to determining the advisability of more exhaustive inquiries in future. Lake Chelan, in the State of Washington, one of the largest bodies of fresh water west of the Mississippi, and Lake Kootenay, in British Columbia, are two important sources of the Columbia River. The investigations regarding them embraced a study of their general fish fauna, and were also for the purpose of determining the presence in their waters of the blueback salmon or red-fish in connection with the studies of the salmon in the Columbia River basin, which have been carried on for some years by the Commission. The fishes of Lake Chelan have never been studied, and, though it is known to contain 8 or 10 species, the red-fish probably does not occur in it. No satisfactory evidence could be found of the presence of the large red-fish in Lake Kootenay, but the small variety occurs in considerable numbers in the Kootenay system, and it is reported as spawning in streams in that region tributary to the Columbia. In Lake Cœur d'Alene, Idaho, it was desired to ascertain the results of plants of white-fish made by the Commission. No positive information was obtained, but the fishery resources of the lake are such as to warrant a further comprehensive study of its conditions.

In accordance with the policy of the Commission of making a study of the biological and physical conditions of important inland waters, an examination of the lake systems of Maine was begun by an inquiry embracing the Sebago Lake basin. The inland fisheries of this State are valuable and carefully fostered, and among its lakes Sebago, with its tributaries, holds an important place, both on account of its size and the considerable fish-cultural operations which have been carried on in its waters. The inquiry at this time appeared the more desirable on account of the apparent decrease of fish life, notwithstanding the extensive efforts made to maintain the supply. Several species of food and game fishes inhabit the lake, the most important being the land-locked salmon, and although this was the primary object of the inquiry, the other species received due attention. Interesting data in regard to the apparent decrease of the fish supply and bearing on the relation between the landlocked salmon (*Salmo salar sebago*) and the Atlantic salmon (*Salmo salar*) have been collected. The investigation was carried on by Dr. W. C. Kendall during July and August, 1898, and continued in May, 1899, and at the close of the fiscal year was still in progress. Besides Sebago Lake several smaller lakes and other waters in its extensive basin were examined.

For some time it has been held by citizens of Utah that certain useful marine animals might be advantageously acclimated in the waters of Great Salt Lake. While the salinity of the waters of the open lake was acknowledged to be too great for success in this direction, it was thought that in some of its bays, where rivers discharge, the density might be sufficiently low to permit the survival and growth of oysters, clams, crabs, and even fish. Accordingly, at the request of those interested, the Commission decided to undertake a study of the physical conditions of the lake in order to decide as to the feasibility of the project. The investigation was made by Dr. H. F. Moore, in September, 1898, and as shown in his comprehensive paper published as an appendix to this report (pp. 229-250) the question may be regarded as settled. It was found that while there is an ample food supply, yet owing to the limited and irregular character of the zone of mixed water, even at the mouths of rivers and streams, the attempt to stock the lake with any marine species would be useless, and any efforts to introduce shad or other anadromous fishes in the rivers would be equally unavailing.

An interesting inquiry into the utilization of the shells of fresh-water mussels in the manufacture of buttons has been made and a report on the subject published. While this industry has grown up within the last ten years, it has rapidly increased in value and importance, and if proper steps are taken to prevent needless depletion of the mussel beds it might well grow to larger proportions. The fishery has been exceedingly active and is carried on along about 200 miles of the Mississippi River in Iowa and Illinois, where the shoalness of the river makes nearly every part easily accessible, and the exhaustion of these beds, if present methods are continued, is a question of but a short time. In

various streams other species of mussels than those now sought are known to exist, and these will probably be resorted to in the future. The industry has attained such proportions in the way of capital invested and labor employed that its destruction would be a calamity in many communities. It would seem very desirable, therefore, that the States interested enact legislation forbidding the gathering of small mussels, providing for a close season during spawning time, and preventing damage to the beds by sewage and factory refuse.

The experiments in fattening oysters have been continued at Lynn-haven River with interesting results. As it was found after a year's trial that oysters which had been planted in an inclosed pool did not fatten and were inferior to those growing on beds in the open rivers, an attempt was made to increase artificially the fertility of the water. The effort was encouraging, and it is believed that a continuation of the experiments will result in valuable improvements in oyster-culture.

An investigation, referred to elsewhere, of the waters of Narragansett Bay, was made with the steamer *Fish Hawk* in October and November, 1898, to study the distribution of star-fish in that body of water. It was found that this enemy of the oyster multiplies with great rapidity in certain localities, and from these breeding-grounds the young are distributed to the oyster-beds. It appears that these nurseries might be destroyed at small expense and that the oyster-grounds are probably free from invasion from beyond the limits of the bay. Supplemental to this work, observations were made of the general biological conditions prevailing in the bay and in Block Island Sound.

The study of salmon in the Sacramento River has been continued in a systematic manner, all portions of the river and the lakes at its source having been visited, seining stations established at regular intervals, and traps built. Thus the stream was kept under close observation and many facts ascertained regarding the natural history of salmon in this river. A full report on this work is being prepared and will soon be ready for publication.

An investigation has been undertaken looking to a better understanding of the natural history of the herring, particularly as to their migrations and spawning habits, a thorough knowledge of which is important from the value of the herring fisheries on the Maine coast.

Minor investigations have been made in the Wabash basin, in the San Pedro River, Arizona, and in the District of Columbia, together with interesting studies of the shad and mackerel.

A noteworthy event was the rediscovery of the tile-fish in considerable quantities and the definite location of its range. Since its apparent extinction in 1882, it has only been taken occasionally, but as the result of systematic cruising by the *Grampus*, in the summer of 1898, on the edge of the continental plateau south of southern New England and Long Island the fish was found in abundance and evidently breeding. As its range is close to the markets of the Atlantic coast it is not unlikely that a new marine fishery may yet be developed.

The laboratory of the Commission at Woods Hole, Mass., has been kept open during the entire year under the direction of Dr. H. C. Bumpus, of Brown University, and a large number of voluntary investigators have taken advantage of the opportunities offered. The equipment of the laboratory has been increased, collecting and other apparatus supplemented, a library established, and vessels and boats of the Commission have been utilized. While no restriction is placed on the lines of study pursued, in a majority of cases they bear, directly or indirectly, on economic problems related to the fisheries, and it is felt that the work carried on there has been not only of scientific interest and importance, but will also be of great practical value. Among the more important researches were a continuation of the experiments looking to the rearing of young lobsters, studies of fish parasites, and the habits of the star-fish, the ravages of which cause such loss to the oyster-beds. Observations were also made on the preservation of fish for market without the use of ice. Data were collected preliminary to undertaking the artificial propagation of the clam on a somewhat extensive scale, as it is believed that this very important shore fishery may thus be benefited.

It has been felt that a more complete knowledge of the habits, distribution, and abundance of the marine food-fishes in the coastal waters of the South Atlantic States and of the non-economic fishes and other animals related to the food-fishes, as food, enemies, etc., is highly desirable from scientific, economic, and fish-cultural standpoints. It was therefore decided to establish a biological station and laboratory at some point where work could be carried on by volunteer investigators, as at Woods Hole. The plan met with the indorsement and encouragement of those interested in the development of the fisheries of the South, and after due consideration Beaufort, N. C., was selected as the most available place, the advantages of the locality having been shown by experience. The waters are full of animal life and the region is favorable for a study of the biological conditions of the southern coast in general. Accordingly, a building was rented, equipment provided, and on June 1, 1899, the laboratory was opened under the direction of Dr. H. V. Wilson, of the University of North Carolina.

STATISTICS OF THE FISHERIES.

A canvass of the fisheries of the coast and tide waters of the Middle Atlantic States has been completed, covering the statistics for the calendar year 1897, the details of which are shown hereafter in the division report. It was found that the fisheries of these States have decreased in aggregate value \$4,701,051 since the last canvass was made in 1891, chiefly owing to the falling off in the oyster industry in Maryland and Virginia, although this fishery is still by far the most important of the region, being worth \$8,877,824 while the total shad fishery, which ranks next, is valued at \$980,977. The fisheries for alewives, menhaden, and crabs vary in value from \$229,000 to \$471,000,

and the blue-fish fishery is worth over \$580,000. The total fisheries of these States were worth, respectively: New York, \$3,401,190; New Jersey, \$3,614,434; Pennsylvania, \$269,507; Delaware, \$252,123; Maryland, \$3,617,306; Virginia, \$3,167,863. They represent an investment of \$15,188,614, and employ 95,316 persons.

Monthly statistics of the yield and value of the more important fisheries which find a market at the port of San Francisco have been collected, and for the calendar year 1898 they have aggregated more than 39,500,000 pounds, valued at over \$7,330,000. This includes the whale fishery and most of the Alaskan salmon fisheries, as well as certain ones of Oregon and Washington. The item of greatest importance is the salmon fishery, valued at nearly \$5,250,000. The growth of the oyster industry of San Francisco Bay, based on transplanted eastern oysters, is of interest, the quantity marketed in 1898 being valued at \$482,000. It was found that the sea-otter fishery, prosecuted off the coast of Alaska, is rapidly declining, only 154 skins having been entered at the custom-house during the year. It may be noted that the whale fishery experienced a revival in 1898, the value of its products being materially increased by an unusual capture of bowhead whales in the Arctic Ocean by the Pacific whaling fleet.

The total quantity of fishery products landed at the ports of Boston and Gloucester in 1898 was 143,403,740 pounds, valued at \$2,989,088, an increase over the preceding year of 16,538,142 pounds, worth \$110,453. This increase must be entirely credited to Gloucester, the receipts at Boston showing a decrease, as compared with 1897, of 8,224,000 pounds. Interesting tables, illustrating in detail the fisheries conducted from these two ports, are published hereafter.

An agent of the division accompanied the *Fish Hawk* to Puerto Rico, where his investigations developed interesting information regarding the commercial aspects of the fisheries in that island, as mentioned in the paragraph relating to that expedition.

An inspection of the Pribilof seal rookeries was made by Mr. Charles H. Townsend during July and August, 1898, in order to report to the Treasury Department, as required by law, on the condition of the fur-seal herd. It was found that the herd had decreased some 22 per cent since the count of 1897. During the year the number of surplus male seals killed on the islands, under the supervision of the United States Government, was 18,032, and the pelagic catch made by 35 Canadian vessels from the American herd was 28,142.

THE STEAMER FISH HAWK.

This vessel was returned to the Commission by the Navy Department September 15, 1898, and on September 29 Lieut. Commander Richard G. Davenport, U. S. N., under orders from the Navy Department, assumed command. Some alteration and refitting were necessary after her use as a gunboat, and October 18 she was again ready for Fish Commission work. Soon after a special investigation of Narragansett Bay, mentioned elsewhere, was undertaken at the request of the Rhode Island commissioners

of inland fisheries, and was completed November 17. Shortly thereafter preparations were begun to fit the vessel for a scientific expedition to Puerto Rico. When this island became a possession of the United States little was actually known of the animal life in its waters; but it was believed that many species of food-fishes and other edible aquatic animals existed there, and it was felt that a knowledge of these, of the commercial fisheries, and the fish trade would prove of both scientific interest and economic value. The establishment of new business and social relations between Puerto Rico and the United States and the consequent changes in the industries of the island made it desirable that the conditions be studied before considerable modifications should take place. It was therefore decided to send the *Fish Hawk* to Puerto Rico with a party to study the subject.

The scientific investigations were under the immediate direction of Dr. Barton W. Evermann, of the division of scientific inquiry, who had the aid of a full corps of assistants. The vessel sailed from Norfolk on December 17 and arrived at San Juan January 2. The investigations were immediately begun at this port and extended entirely around the island, stops being made at the principal places. Though the shortness of the time during which the *Fish Hawk* could be retained on this work prevented the investigation from being complete and thorough, extensive collections were made and valuable information obtained. A general report embodying the results of the expedition will be issued, as soon as practicable, in the Bulletin of the Commission for 1900.

The results of the commercial inquiries have already been published as an appendix to this report, pages 1-34. Many species of edible fishes are found and fishing for local consumption is conducted about most parts of the island, though not very actively, most of the fish used being brought from Nova Scotia and Newfoundland. 34,156,000 pounds, valued at about \$2,124,000, were imported in 1897, of which over 28,000,000 pounds came from the British possessions and less than 5,000,000 pounds from the United States. Most of these fish were either dried, pickled, or canned. With improved methods of transportation and refrigeration it is thought that the local fisheries might be greatly increased in quantity and value.

The work of the party was aided by the military and naval authorities in the island, the governor-general, Maj. Gen. Guy V. Henry, directing that every facility be granted to Lieut. Commander Davenport and Dr. Evermann.

In order to take up the usual shad-hatching work in Albemarle Sound, the *Fish Hawk* left Puerto Rico February 22, arrived at Norfolk, Va., on March 8, and at Edenton, N. C., on March 15. From this date till June 12 the vessel was engaged in shad operations in Albemarle Sound and the Delaware River, when it proceeded to Woods Hole, Mass., and there remained until the close of the fiscal year, in connection with the scientific work carried on at that station. During the year this vessel was more extensively engaged at sea than usual, having steamed



SPEARFISH STATION, SOUTH DAKOTA—HATCHERY INTERIOR.

over 7,000 miles. While engaged in scientific work her deep-sea dredges, trawls, and other appliances were almost constantly in use.

On March 18 Lieutenant-Commander Davenport was detached from the vessel at his own request, and though he had only been in command five months it is felt that the Commission has lost the services of a faithful and efficient officer. On the same date he was succeeded by Mate James A. Smith, U. S. N.

REPAIRS TO STEAMER ALBATROSS.

The *Albatross* was detailed by the President to the Navy Department April 13, 1898, as an auxiliary cruiser during the war with Spain and was returned to the Commission August 25, 1898. This vessel had been in commission since 1883 and was in need of considerable repairs and alterations besides new boilers, her present ones being nearly worn out and unserviceable. Accordingly, under authority of an act of Congress approved July 1, 1898, plans for the boilers were prepared, contracts let, and the work of repairing was taken up as soon as possible, but owing to delays in the completion of the boilers, the ship was not ready for sea till the close of the fiscal year. The boilers are of the Scotch marine type 10½ feet long by 12 feet greatest diameter. The principal alterations were raising the pilot house, thereby permitting the construction of two new staterooms underneath and an upper bridge on top, and the enlargement of the coal-bunkers to provide additional storage for 70 tons of coal. A new dynamo and engine were provided, the main engines and the machinery overhauled and repaired, the quarters of officers and crew refitted, the hull of the vessel inspected and scaled wherever necessary, and many other minor but essential improvements made. This work has been done under the immediate supervision of the commanding officer, Commander Jeff. F. Moser, U. S. N., and he reports that the hull and appurtenances of the vessel are now in first-class condition and that her general efficiency is greatly increased. By the addition to the coal-bunkers her steaming radius is extended 1,300 or 1,400 miles, and with the new staterooms the scientific parties carried can be more comfortably accommodated.

NEW STATIONS.

The new stations at Spearfish, S. Dak., and Nashua, N. H., for which sites were acquired during the past fiscal year, and at Erwin, Tenn., where construction work was in progress, are designed primarily for the propagation of the salmonidæ, though the basses also are to receive attention at Erwin. At Spearfish a frame hatchery 32½ by 65½ feet has been erected. The building is on a stone foundation, is heated by steam, and contains a hatching-room, office, reception-hall, and boiler-room, with two bed-rooms in the upper story. The hatching-room contains 32 troughs, 13 feet by 12¾ inches, fitted with the usual trays, which afford facilities for handling about 1,000,000 eggs. The water supply is obtained from springs, and is conducted into the building by gravity. 12 rearing-ponds 100 by 8 feet, 3 spawning-ponds 120 by 20 feet, 2

spawning-ponds 84 by 20 feet, all 3 feet deep, have been completed, besides 3 stock-ponds, aggregating 15,000 square feet. To protect these ponds from floods it was necessary to excavate an 800-foot channel, 10 feet wide and 6 feet deep, to carry off water from a gulch located above them. An ice-house, 20 feet by 14 feet, has been built, and the necessary walks and roadways have been completed and the property fenced with wire.

At Nashua a hatchery similar in construction to the one at Spearfish has been erected. The building is 100 by 18 feet, and is equipped with 40 troughs $12\frac{1}{2}$ feet by $12\frac{3}{4}$ inches, with a capacity for handling 1,000,000 eggs. Two other buildings have been erected; one a frame structure 34 by 18 feet, on post foundations and containing a carpenter-shop, fuel-room, and refrigerator, the other an ice-house 20 by 14 feet, affording storage for 30 tons of ice. There have been completed 14 rearing-ponds 100 by 8 feet by 2 feet deep, 3 spawning-ponds 64 by 36 feet, and 2 spawning-ponds 70 by 48 feet, all 3 feet deep, and 2 stock-ponds, one about $\frac{1}{2}$ acre and the other $1\frac{1}{2}$ acres in extent.

The hatchery and ponds are supplied with water flowing naturally from springs above them, and these springs can be supplemented in dry weather, if necessary, with ample water from a dozen driven wells on the premises. The grounds have been graded and the necessary roadways and walks completed and the reservation surrounded with a fence.

The development of the Erwin station has been continued, and there have been erected—besides the hatchery and superintendent's dwelling mentioned in the last report—a foreman's house, barn, ice-house, and fuel-house. The hatchery is a frame building 100 by 18 feet, equipped with 34 troughs $12\frac{1}{2}$ feet by $12\frac{3}{4}$ inches, with a capacity for about 1,000,000 eggs. The superintendent's dwelling is a two-story frame cottage 27 by 36 feet, and contains 6 rooms. The foreman's dwelling contains 5 rooms, and is a frame structure 50 by 38 feet. The barn, 20 by 30 feet, has 2 stalls and wagon room; and the ice-house, 20 by 14 feet, has storage capacity for 30 tons of ice. There are now completed 6 spawning-ponds 100 by 10 feet, 5 feet deep; 2 spawning-ponds 100 by 50 feet, and $2\frac{1}{2}$ feet deep; 24 rearing-ponds 50 by 12 feet and 2 feet deep, and 4 stock ponds with an aggregate area of 30,155 square feet. The water supply is derived from a spring, and is led to the hatchery and ponds by gravity. As no railroad station is near, a siding has been built for convenience in handling shipments of fish. The grounds have been surrounded with a substantial wire fence.

An act of Congress approved July 1, 1898, directed the establishment of fish-cultural stations in the States of Georgia and Washington, in both cases providing that the land should be donated to the Government.

In Georgia the location near Bullochville, in Meriwether County, described in the last annual report, being satisfactory, negotiations were entered into with the owners, and on February 14, 1899, 18.97 acres were given to the United States by Messrs. Benjamin F. and Cyprian

Bulloch and Mrs. Sarah J. Bussey, the deed containing a proviso that the land should revert to the owners in case of its abandonment as a fish-cultural station. The preparation of plans was promptly taken up and at the end of the year the development of the station had begun.

The station in the State of Washington being intended for propagating the blueback or sockeye salmon, it has been deemed advisable to locate the hatchery at Baker Lake, where extensive spawning-grounds of this species are known to exist, as noted in the last report. Baker Lake is in what is known as the Washington Forest Reserve and is the head of Baker River, its outlet, about 16 miles above where the latter empties into the Skagit River and about 35 miles by trail north-east from the town of Hamilton. The lake is about $1\frac{1}{2}$ miles long by $1\frac{1}{2}$ miles wide. The point selected for the hatchery is near the center of the south shore of the lake, where a State hatchery has been operated for a number of years. By a proclamation of the President, dated May 10, 1899, the lake and surrounding lands within half a mile of its shore were set apart for the use of this Commission for fish-cultural purposes. The State hatchery and equipment have been purchased, and preparations for operating the station were at once begun.

Battle Creek Station, California, had been operated since the season of 1896 under an arrangement made with the California State Commission, and as it afforded exceptional opportunities for the collection of salmon eggs its acquisition by the Government has been deemed of importance. An act of Congress approved January 28, 1898, authorized the establishment of a permanent station at this point. Owing to difficulty in obtaining a valid title to the land, the purchase was not completed till March 25, 1899. The buildings and equipment of the California Commission have been purchased, and the station is now in condition for continued operation. It is on the east bank of Battle Creek, in Tehama County, about 12 miles east of the town of Anderson. The hatchery buildings are described in the appendix to the report for 1897, page 24.

Edenton Station, North Carolina.—By act of Congress approved July 7, 1898, provision was made for establishing a fish-cultural station in the State of North Carolina. As this station was intended primarily for the propagation of shad, striped bass, black bass, and the perches, it was almost imperative that it should be located on the headwaters of Albemarle Sound, where the large shad and striped-bass fisheries are conducted, and where bass and perch are also abundant.

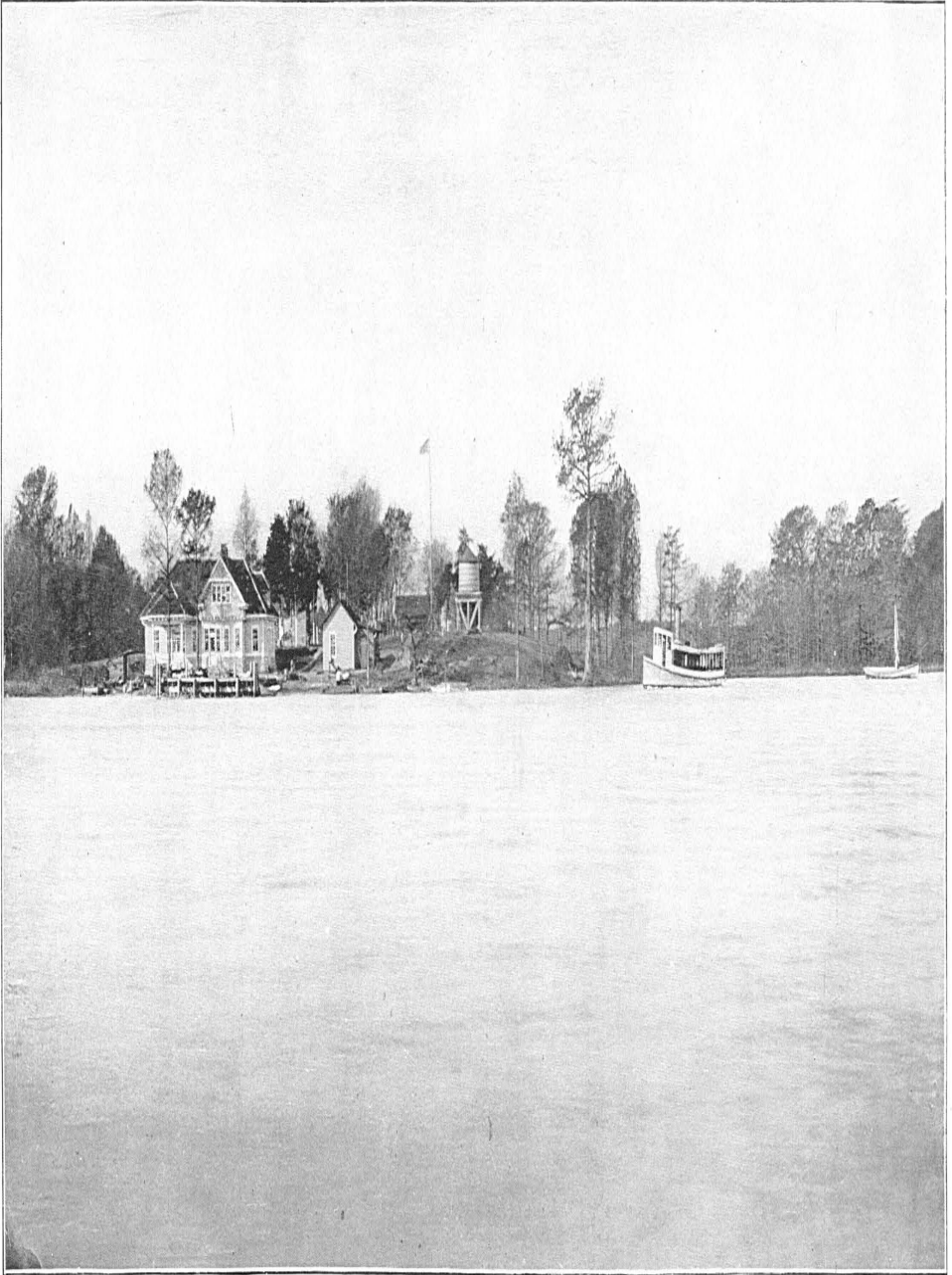
In December, 1898, this locality was examined by Mr. S. G. Worth, who was designated to select a site, his past experience having peculiarly fitted him to judge of the requirements needed for the contemplated station, as he had been in charge of the shad operations of the Commission on the Potomac River for many years, and had also been State fish commissioner of North Carolina. This investigation resulted in the selection of a tract of land comprising 15 acres, about a mile west of the village of Edenton, on the west bank of Pembroke Creek. An

option was secured on the land on February 10, and as the act provided for the completion of the station by June 30, 1899, the Department of Justice was at once asked to secure the necessary titles.

On March 15 a communication was received from a committee appointed by the State Board of Agriculture of North Carolina, asking the Commissioner to meet the committee at Edenton on the 29th of March, or to send a representative, to discuss the eligibility of the site selected and to secure a better location if it could be found. A reply was made to the effect that an option had already been taken on the land, but the assistant in charge of the division of fish-culture was directed to meet the committee and explain fully the causes which led to the selection of the proposed site. At the meeting, which occurred on the date mentioned, certain objections were made to the location, principally that Pembroke Creek was so strongly infected with juniper that it was doubtful whether shad eggs would hatch in its water and that the location was too distant from the egg-producing area, viz, 7 to 15 miles. No evidence was produced to show that the creek was more strongly tainted than any of the other streams in the immediate vicinity except letters from individuals, and letters testifying equally to the contrary were read in rebuttal; besides which a number of reputable citizens testified to the capture of shad in the stream. Steps were at once taken to have this matter thoroughly tested, and under the direction of Capt. James A. Smith, of the steamer *Fish Hawk*, a temporary hatchery was erected on the creek where, during the month of April, 375,000 shad eggs were hatched with a loss of 18 per cent.

The results thus obtained by actual operations would seem to fully justify Mr. Worth's selection, and the purchase was consummated April 11, 1899. This location affords suitable water for the hatchery, and the lay of the land is favorable to the construction of the necessary buildings and ponds. The hatchery has been completed. It is a two-story frame building 70 by 30 feet, designed to accommodate 300 universal hatching-jars placed on eleven tables and on shelves along the sides of the room, this arrangement permitting the hatching of about 30,000,000 shad eggs at a time. The water is obtained from Pembroke Creek, whence it is pumped into a 6,000-gallon tank for distribution through the hatchery. A frame pump-house 30 by 15 feet, with a fuel-house attached, has been completed and a 15-horsepower horizontal Simplex Blake pump with a No. 5 boiler has been installed. It is proposed to furnish water for the bass ponds from artesian wells, several of which will be driven, and during the coming year the ponds will be constructed and other buildings erected. A T-shaped landing-pier 95 feet long has been built and the grounds surrounded with a wire fence.

Plans for the new stations have been prepared by the architect and engineer, Mr. H. von Bayer, who has had the general oversight of the construction work involved, besides the more important alterations at other stations. Plans of these stations and of those completed during the preceding fiscal year are shown after page 6.



EDENTON STATION, NORTH CAROLINA—HATCHERY AND BOILER-HOUSE.

NEW TRANSPORTATION CAR.

The new stations which have been placed in operation during the last two or three years, and the consequent increase in the output of the Commission, have rendered necessary an increase of transportation facilities to distribute the greater quantity of fishes now available. Under the authority of an act of Congress approved March 3, 1899, a contract was made with the Jackson & Sharp Company, of Wilmington, Del., to build a fish-transportation car to replace the old one known as car No. 4. The new car is supplied with all the appliances and conveniences which experience has shown to be essential, and is similar in construction, dimensions, and arrangement to car No. 3, described on page xxxvi of the report for 1898. It is, however, somewhat higher than No. 3, being 14 feet over all. Bolted to the side sills and running the full length of the car is a plating of steel $\frac{1}{2}$ inch thick, 8 $\frac{1}{2}$ inches wide, and 60 feet long. The car is equipped with standard steel platforms and national combination couplers, and Pullman trucks with 38-inch wheels. The car formerly known as No. 4 is simply a baggage car arranged with sleeping quarters and circulating apparatus, and could only be used as an auxiliary, and, on account of its age, lack of facilities, and structural weakness, was not available for long trips.

EXPOSITIONS.

The Trans-Mississippi and International Exposition at Omaha, Nebr., in which this Commission participated, and which was in progress at the close of the fiscal year, terminated November 1, 1898. The exhibit of the Commission was described in the report for 1898, page xxxvii, and was similar in its scope and plan to those shown at the Atlanta and Nashville expositions, reports of which have already been published. The exhibit was in charge of Mr. W. de C. Ravenel, and was designed to illustrate the work of the different branches of the Commission. As at former expositions, the display attracted favorable attention and comment from visitors.

The Commission was awarded five bronze medals and five diplomas for an "interesting and instructive exhibit," for "fish-culture," for "statistics of fisheries," for "live-fish display," and for "scientific inquiry." A medal and diploma were also awarded to each of the following persons for valuable services rendered to the Exposition in connection with the exhibit of the Commission: George M. Bowers, W. de C. Ravenel, Hugh M. Smith, S. P. Bartlett, Frank N. Clark, E. A. Tulian, H. D. Dean, E. F. Locke, G. A. Schneider, R. J. Conway, W. P. Sauerhoff.

Under the authority of an act of Congress approved March 3, 1899, providing for the participation of the Government in the Pan-American Exposition, to be held in Erie or Niagara County, N. Y., in 1901, Mr. Ravenel was appointed, on April 28, 1899, the representative of this Commission on the Government board of managers.

LIBRARY AND PUBLICATIONS.

There were added to the library during the year 441 books and pamphlets bearing on fish-culture, the fisheries, and related subjects, besides various periodicals.

During the fiscal year the bound report for 1898, with appendices, and the bound Bulletin for 1897 were issued. These volumes comprise the following articles, which were also issued separately:

- Proceedings and papers of the National Fishery Congress. Bulletin for 1897, pp. 145-371.
- Proceedings of National Fishery Congress. Bulletin for 1897, pp. 147-168.
- Methods of plankton investigation in their relation to practical problems, by Jacob Reighard. Bulletin for 1897, pp. 169-175.
- The importance of extended scientific investigation, by H. C. Bumpus. Bulletin for 1897, pp. 177-180.
- The utility of a biological station on the Florida coast in its relations to the commercial fisheries, by Seth E. Meek. Bulletin for 1897, pp. 181-183.
- Establishment of a biological station on the Gulf coast, by W. Edgar Taylor. Bulletin for 1897, pp. 185-188.
- Some notes on American shipworms, by C. P. Sigerfoos. Bulletin for 1897, pp. 189-191.
- An economical consideration of fish parasites, by Edwin Linton. Bulletin for 1897, pp. 193-199.
- The fish fauna of Florida, by B. W. Evermann. Bulletin for 1897, pp. 201-208.
- The lampreys of central New York, by H. A. Surface. Bulletin for 1897, pp. 209-215, plates 10 and 11.
- The protection of the lobster fishery, by Francis H. Herrick. Bulletin for 1897, pp. 217-224.
- The Florida commercial sponges, by Hugh M. Smith. Bulletin for 1897, pp. 225-240, plates 12-31.
- On the feasibility of raising sponges from the egg, by H. V. Wilson. Bulletin for 1897, pp. 241-245.
- The Hudson River as a salmon stream, by A. Nelson Cheney. Bulletin for 1897, pp. 247-251.
- A plea for the development and protection of Florida fish and fisheries, by James A. Heushall. Bulletin for 1897, pp. 253-255.
- International protection for the denizens of the sea and waterways, by Bushrod W. James. Bulletin for 1897, pp. 257-263.
- The restricted inland range of shad due to artificial obstructions, and its effect upon natural reproduction, by Charles H. Stevenson. Bulletin for 1897, pp. 265-271.
- The green turtle and the possibilities of its protection and consequent increase on the Florida coast, by Ralph M. Munroe. Bulletin for 1897, pp. 273-274.
- Some factors in the oyster problem, by H. F. Moore. Bulletin for 1897, pp. 275-284.
- The oyster-grounds of the west Florida coast; their extent, condition, and peculiarities, by Franklin Swift. Bulletin for 1897, pp. 285-287.
- The oysters and oyster beds of Florida, by J. G. Ruge. Bulletin for 1897, pp. 289-296.
- The Louisiana oyster industry, by F. C. Zacharie. Bulletin for 1897, pp. 297-304.
- The oyster bars of the west coast of Florida, their depletion and restoration, by H. A. Smeltz. Bulletin for 1897, pp. 305-308.
- Notes on the fishing industry of eastern Florida, by John Y. Detwiler. Bulletin for 1897, pp. 309-312.
- Oysters and oyster-culture in Texas, by I. P. Kibbe. Bulletin for 1897, pp. 313-314.
- The methods, limitations, and results of white-fish culture in Lake Erie, by J. J. Stranahan. Bulletin for 1897, pp. 315-319.
- A brief history of the gathering of fresh-water pearls in the United States, by George F. Kunz. Bulletin for 1897, pp. 321-330.
- The red-snapper fisheries; their past, present, and future, by Andrew F. Warren. Bulletin for 1897, pp. 331-335.
- Some brief reminiscences of the early days of fish-culture in the United States, by Livingston Stone. Bulletin for 1897, pp. 337-343.
- The relations between State fish commissions and commercial fishermen, by W. E. Meehan. Bulletin for 1897, pp. 345-348.
- Possibilities for an increased development of Florida's fishery resources, by John N. Cobb. Bulletin for 1897, pp. 349-351.
- The utility and methods of mackerel propagation, by J. Percy Moore. Bulletin for 1897, pp. 353-361.
- The large-mouth black bass in Utah, by John Sharp. Bulletin for 1897, pp. 363-368.
- Florida fur-farming, by J. M. Willson, jr. Bulletin for 1897, pp. 369-371.

REPORT OF COMMISSIONER OF FISH AND FISHERIES. XXXIII

- The fresh-water pearls and pearl fisheries of the United States, by George F. Kunz. Bulletin for 1897, pp. 373-426, plates 1-xxii.
- Report of the Commissioner for the fiscal year ending June 30, 1898, including the reports on divisions of fish-culture, scientific inquiry, and fisheries, by George M. Bowers. Report for 1898, pp. 1-clxxxvi, plates 1-xxi.
- Report on mackerel investigations in 1897, by J. P. Moore. Report for 1898, pp. 1-22.
- Report on fishes obtained by the steamer *Albatross* in the vicinity of Santa Catalina Island and Monterey Bay, by Charles H. Gilbert. Report for 1898, pp. 23-29, plates 1 and 2.
- Notes on the extent and condition of the alewife fisheries of the United States in 1896, by Hugh M. Smith. Report for 1898, pp. 31-43.
- Report on the oyster-beds of Louisiana, by H. F. Moore. Report for 1898, pp. 45-100, plate 3.
- The shad fisheries of the Atlantic coast of the United States, by Charles H. Stevenson. Report for 1898, pp. 101-269.
- List of fishes collected at the Revillagigedo Archipelago and neighboring islands, by David S. Jordan and R. C. McGregor. Report for 1898, pp. 273-284, plates 4-7.
- Report on investigations by the U. S. Fish Commission in Mississippi, Louisiana, and Texas in 1897, by B. W. Evermann. Report for 1898, pp. 285-310, pls. 8-36.
- List of publications of the U. S. Commission of Fish and Fisheries available for distribution on March 1, 1899. Report for 1898, pp. 311-327.
- Report upon exhibit of the U. S. Fish Commission at the Tennessee Centennial Exposition in 1897, by W. de C. Ravenel. Report for 1898, pp. 329-339, pl. 37.

The continued public interest in the work of the Commission is shown by the requests received for its publications, 3,511 bound and 8,513 pamphlet copies of which have been distributed.

The Museum of Comparative Zoology published in August, 1898, a paper relative to the investigations conducted by the Fish Commission steamer *Albatross* in 1891, entitled:

Preliminary Report on *Branchiocerianthus urceolus*, a new type of Actinian, by E. S. Mark. Bull. Museum of Comparative Zoology, vol. xxxii, pp. 148-154, 3 plates.

The expenditure of the appropriations for the last fiscal year was reported to Congress December 6, 1898 (House Doc. No. 40, Fifty-fifth Congress, third session).

Appropriations for conducting the operations of the Commission for the fiscal year ending June 30, 1899, were made by Congress as follows:

Salaries.....	\$197,900
Miscellaneous expenses:	
Administration.....	9,000
Propagation of food-fishes.....	140,000
Maintenance of vessels.....	30,500
Inquiry respecting food-fishes.....	10,800
Statistical inquiry.....	5,000
For new boilers and general repairs to the steamer <i>Albatross</i>	26,000
For establishment of fish-cultural stations in—	
North Carolina.....	15,000
Georgia.....	15,000
State of Washington.....	10,000
For completion of stations now under construction at—	
Erwin, Tenn.....	6,018
Spearfish, S. Dak.....	5,000
Manchester, Iowa.....	6,000
Bozeman, Mont.....	1,500
Nashua, N. H.....	7,000
For repair and improvement of station at Duluth, Minn.....	1,000
For construction of fish-distribution car.....	8,000

A report showing in detail the expenditure of these amounts will be made to Congress in accordance with law.

GEORGE M. BOWERS,
Commissioner.