REPORT

OF THE

UNITED STATES COMMISSIONER OF FISH AND FISHERIES

FOR THE

FISCAL YEARS 1889-90 AND 1890-91.

In accordance with the resolution of Congress, the accompanying report presents the work of the Commission for the period commencing July 1, 1889, and ending June 30, 1891.

The appropriations for the current expenses of the work of the Commission during the two fiscal years covered by this report were as follows:

Appropriation.	1889-90.	1890-91.
Compensation of Commissioner	$5,000	$5,000
Propagation of food-fishes	150,000	150,000
Distribution of food-fishes	35,000	50,000
Maintenance of vessels	53,900	53,900
Inquiry respecting food-fishes	20,000	20,000
Statistical inquiry	10,000	20,000
Maintenance of Neosho Station, Missouri	5,000	.....
Total	278,900	298,900

As required by law, detailed reports of the expenditures under these appropriations were presented to Congress December 1, 1890 (Mis. Doc. No. 5, House of Representatives, Fifty-first Congress, second session) and December 1, 1891 (Mis. Doc. No. 16, Senate, Fifty-second Congress, first session). These reports exhibit the expenditures for the conduct of each of the Commission's stations, and also for the special lines of inquiry conducted by the Commission.

INQUIRY RESPECTING FOOD-FISHES AND THE FISHING-GROUNDS.

A full account of the operations of the division conducting these investigations will be found in the accompanying report of Mr. Richard Rathbun, assistant in charge (pages 97 to 171).

My last report contains an outline of the preliminary investigations respecting the fishing-grounds of the North Pacific region, begun by the steamer *Albatross* in the summer of 1888, and which it was proposed to extend to all the waters adjacent to the territory of the United States on the western coast. During the past two years these surveys have been completed between the Straits of Juan de Fuca and the Mexican boundary line, or off the coasts of Washington, Oregon, and California, and a partial examination has been made of the shallow-water area composing the eastern part of Bering Sea.

Lieut. Commander Z. L. Tanner, U. S. Navy, who has commanded the *Albatross* ever since she was placed in commission at the beginning of 1884, has been in direct charge of the conduct of these inquiries, and it is a pleasing duty to make official record of the uniformly capable and efficient services rendered by him in this connection. As commanding officer he has displayed rare seamanship, and at the same time such tact and discretion under difficult and often perplexing conditions of administration as to merit the strongest commendation.

During July, 1889, the *Albatross* was placed at the disposal of the U. S. Senate Committee on Indian Affairs, and was used in visiting the principal Indian settlements in the southeastern part of Alaska. Subsequently the fishery investigations were resumed to the south of Cape Flattery and were carried southward as far as Cape Mendocino. During the following winter the region between Point Arena and Point Conception was examined, and in the autumn of 1890 the remaining section of the coast from Cape Mendocino to Point Arena.

The summer of 1890, beginning in May, was spent entirely in Bering Sea, where it was found that the principal banks frequented by the cod are located off the northern side of the Alaska Peninsula, commencing at Unimak Pass and extending, with only a single break, parallel with the coast to near the head of Bristol Bay. Kulukak Bay also furnishes several smaller grounds. Only two banks are recognized in the southern part of Bristol Bay, both of which afford excellent fishing in moderate depths of water. The most western one, called Slime Bank, is peculiarly infested during the summer season with immense numbers of a large jelly-fish, which are said to remain near the bottom and to greatly interfere with fishing operations during that period. Baird Bank, which lies to the eastward of, and nearly adjoins, Slime Bank, is the largest fishing-ground which has yet been discovered in Alaskan waters, its size being slightly greater than that of

Georges Bank, in the Northern Atlantic. The best fishing-spots occur in the region adjacent to Port Moller and Herendeen Bay, two important inlets for shelter during stormy weather, of which the entrance to the former and the channel through the latter were surveyed and mapped. A coal mine had been opened near the head of Herendeen Bay just previous to the visit of the *Albatross*, which took the first output of coal and found the same of good quality for steaming purposes. The starting of this new enterprise marks a decisive step toward the development of this region, and should it result in the establishment of a permanent settlement it can not fail to advance materially the interests of the neighboring fisheries.

The season proved too short to complete the investigations in Bering Sea as originally planned, outside of the fishing-ground above referred to, and it will be necessary to resume the work at some future time. The position of the western margin of the continental platform was defined, however, for a considerable distance, and a good beginning has been made toward a knowledge of those physical and biological features of the sea which relate to the habits and distribution of the fur seal and other aquatic mammals.

By the surveys of the coasts of Washington, Oregon, and California, the contour of the continental border has been developed from the shore line into depths of 200 fathoms as far south as Point Conception, the region between the latter place and San Diego having been previously explored. A great wealth of hydrographic information of value to navigation has thereby been obtained, in addition to a very fair knowledge of the fishery resources. Very few defined fishing-banks were discovered, but food-fishes of many species, and of good quality, were generally distributed along the coast. Halibut were taken as far south as Heceta Bank, off the coast of Oregon, but they are apparently nowhere sufficiently abundant south of Cape Flattery to induce the sending out of vessels equipped solely for their capture. Several kinds of flounders and of rock-cod are very plentiful, however, and only the lack of suitable markets stands in the way of the organization of an extensive fishery almost anywhere northward of the region tributary to San Francisco, where much activity has now prevailed for a number of years.

A very careful series of temperature and density as well as biological observations in different parts of San Francisco Bay, by Mr. C. H. Townsend, the naturalist of the steamer *Albatross*, seems to indicate that the waters of that region are not, as has hitherto been supposed, unsuited to the breeding of the Atlantic coast oysters, and further investigations regarding this matter are awaited with much interest. Should the establishment of self-sustaining beds of the larger and better quality of oyster prove possible in this bay, it would certainly tend to stimulate the development of an important industry.

Under authority from the President of the United States, the Commissioner has been gratified to assign the steamer *Albatross* to a special scientific investigation of the waters lying off the western coast of America, between Cape San Francisco and the Galapagos Islands, on the south, and the Gulf of California, on the north. This inquiry, which took place during the early part of 1891, was planned and personally directed by Prof. Alexander Agassiz, director of the Museum of Comparative Zoölogy at Harvard University, who also paid a large proportion of the running expenses of the cruise. Scarcely anything had previously been learned regarding the physical or natural-history characteristics of the region, and the expedition proved entirely successful, promising results of an important character. The materials and observations obtained have been placed in Prof. Agassiz's charge for elaboration, and three reports bearing upon the same have already been published.

The most extensive and important operations on the Atlantic coast have been conducted in the interest of the oyster industry. A complete survey has been made of the coast waters of South Carolina, which, it is expected, will direct attention to the abundant resources contained within the boundaries of this State. The oysters are almost exclusively of the raccoon type, seldom growing upon the bottom, but forming narrow ledges or flats along the borders of the bays and of the numerous winding tidal channels, between the levels of high and low tide, wherever the conditions are favorable for their existence. The cause of this surface distribution has not yet been entirely explained, but the observations so far made suggest that possibly the relatively high specific gravity of the water prevents the spat from sinking below the surface. Should this prove to be the case, the establishment of self-sustaining beds below the level of low tide may be impossible, but further investigations are required before passing finally upon this question. In any event an important industry is insured in the use of the raccoon oysters as seed, which, when planted in suitable localities, grow to a good shape, and improve greatly in flavor and consistency. This method of oyster farming is already practiced successfully in two or three places, but only on a very limited scale, and the business is susceptible of extensive development.

The States of Maryland and Virginia have both become greatly concerned regarding the future prosperity of their oyster fisheries. The fact that the oyster beds of Chesapeake Bay have apparently been deteriorating for a number of years has led to the very general conviction that some radical changes in the management of the industry are necessary in order to prevent a very serious depletion. In the spring of 1891 the steamer *Fish Hawk* began an investigation of this region, the principal object of which was to obtain as much accurate information as possible respecting the present condition of the beds, and the

practicability of extending the area of production by artificial plantings, as has been done in Long Island Sound. The survey was first taken up in Tangier Sound, where a similar inquiry had been conducted by the Coast Survey about twelve years before, in the expectation that the results obtained would afford the data for a very instructive comparison. By July 1, 1891, the delineation of the beds had been about completed, and the dredging work was soon to be commenced.

During both summers the oyster beds of Long Island Sound have been subjected to extensive investigations, and much information has been secured regarding the natural features of the region, the habits of starfishes and of other enemies of the oyster, and the conditions of spatting during the two seasons. The summer of 1890 was chiefly spent in making a physical and chemical examination of the waters of the sound, the former inquiry being undertaken with the coöperation of the Superintendent of the Coast Survey. This had for its object to ascertain, by a series of careful current observations, the extent of the movement of water through the sound and the adequacy of the flow to prevent stagnation and consequent harm to the oyster beds. The chemical studies consisted in making tests of the waters in all parts of this area, both in inclosed and exposed positions, to determine its sanitary condition. The result of these researches proves very conclusively that no damage need be apprehended from the present condition of the waters, and that a sufficient flow takes place to insure, under existing circumstances, the prompt removal of polluting matters; but it is not to be denied that the sewage and other sources of contamination might be so increased as greatly to endanger the welfare of the oyster-grounds.

Dr. Bashford Dean, of Columbia College, New York, an expert on the subject of oyster-grounds, who left this country near the close of the last fiscal year for an extended visit in Europe, has been commissioned to study the methods of oyster-culture now practiced in European countries, and to prepare an illustrated series of reports regarding those matters, which, it is expected, will be at least suggestive to American oyster-growers.

The physical inquiries in the mackerel region off the southern New England coast under the direction of Prof. William Libbey, jr., referred to in the last annual report, were conducted during a part of July and August, 1889, and again during the summer of 1890. The former season the work was performed by means of the schooner *Grampus* alone, but during the latter the Coast Survey steamer *Blake* was detailed to act in coöperation with the *Grampus*, and, through the courtesy of the Light-House Board, a party of observers was also stationed on the Nantucket New South Shoal light-ship. Parallel lines of observing stations were carried seaward from the coast for distances of 130 to 150 miles, the lines being 10 minutes of longitude apart and the stations 10

miles apart. At each of these stations, which numbered several hundred in the course of the two seasons, the temperature of the water was taken at regular intervals between the surface and bottom, or down to depths of 300 to 500 fathoms, where the depth of water exceeded that amount, and at the same time a full set of meteorological observations was recorded. The result has been to furnish a large series of vertical temperature sections through the water which show very clearly the relations of the Gulf Stream with the colder waters of the Arctic current, and the surface variations are accompanied by very complete meteorological data, with which, it is hoped, a correlation may ultimately be rendered possible. These observations will undoubtedly throw much light upon the habits of several species of pelagic fishes, of which the mackerel is most conspicuous, and even the movements of such bottom fishes as the tile-fish will probably find their explanation in a knowledge of these physical characteristics.

Dr. H. V. Wilson, a graduate of Johns Hopkins University, was appointed resident naturalist at the Woods Holl Station in the spring of 1889, and has served in that capacity during the past two years. The laboratory at this place has, therefore, been kept constantly open during this entire period, and in the summer months a large number of biologists have been present, as in former years. Dr. Wilson's studies have been directed toward the practical needs of the fish-cultural operations, and have related chiefly to the sea bass, the cod, and the Atlantic salmon. A comprehensive study of the life history of the lobster has also been taken up for the Fish Commission by Prof. F. H. Herrick. Important observations regarding the natural history of many fishes and experiments relating to the artificial propagation of several of these have been made by Mr. V. N. Edwards. His investigations, moreover, have furnished conclusive proof that the hatching work of the Fish Commission has been exceptionally successful in increasing the supply of cod on the southern New England coast, and show that the larger fish resulting from these plantings will to some extent enter more shallow waters than are generally frequented by the cod, schools of this species now often making their appearance in places where they were never seen before. Experiments relative to the propagation of the Spanish mackerel and inquiries regarding its embryology were in progress in the lower Chesapeake Bay during the latter part of June, 1891, being conducted by a party on board the steamer *Fish Hawk*.

The investigations respecting the interior waters of the country have been conducted upon a very extensive scale and with important practical results, having reference mainly to the fish-cultural needs of the regions which have been examined. They have covered, to a greater or less extent, twelve different States and Territories, as follows: The Yellowstone National Park, in Wyoming; Colorado, Utah, Missouri, Arkansas, Iowa, Wisconsin, Indiana, Ohio, Kentucky, Florida, and

Alaska. The Alaskan survey, the preparations for which were described in my last report, was specially authorized by Congress and was executed during the summer of 1889, the work being in charge of Dr. Tarleton H. Bean, the ichthyologist of the Commission. The objects of the inquiry were to study the natural history of the salmon and the physical characteristics of their environment, to obtain information regarding the methods, statistics, and conditions of the fishery, and to ascertain the necessities and advantages of Alaskan waters for the artificial propagation of these species. Owing to the difficulties in the way of reaching their working grounds, the party did not arrive at Kadiak until the last of July, and was thereby prevented from extending its observations beyond that island and Afognak. Considering, however, that Karluk River, on Kadiak Island, furnished at that time about one-half the entire yield of the territory in canned salmon, and that ample opportunities were afforded there for making a very thorough study of the subject, the expedition was entirely successful in its mission. The results were reported to Congress during the winter of 1889–90, and in that connection the Commissioner recommended that action be taken to prohibit obstructions impeding or preventing the ascent of salmon in the Alaskan rivers to their spawning-grounds and to prevent destructive methods of fishing, or that a system of leasing fishery privileges under fixed regulations be inaugurated. It was also suggested that additional legislation might provide for an increased production of salmon by fish-cultural methods, thus avoiding the enormous waste of eggs and young fish under their natural conditions, and repairing to some extent the injury caused by overfishing.

In the majority of the other inland investigations the Commissioner has had the advice and coöperation of Dr. David S. Jordan, president of the Indiana University, who has also participated personally in the explorations of Colorado, Utah, and the Yellowstone National Park during the summer of 1889. During the next summer Prof. S. A. Forbes, director of the laboratory of natural history of the State of Illinois, and Prof. Edwin Linton, of Washington and Jefferson College, Pennsylvania, undertook for the Fish Commission a very detailed investigation of the invertebrate fauna of the Yellowstone National Park from the standpoint of the natural food supply for fishes. It was considered that the planting of fishes in this region would be largely dependent for its success upon the abundance of these lower organisms, and it is very gratifying to be able to announce that the observations in this respect were attended with entirely satisfactory results.

METHODS AND STATISTICS OF THE FISHERIES.

The conduct of this division has continued under the direction of Mr. J. W. Collins, assistant in charge, but since his designation, in August, 1890, as the representative of the Commission on the Government Board of Control and Management of the World's Columbian Exposition, much of the supervision of the work has devolved upon Dr. Hugh M. Smith, the principal assistant in the division, to whose accompanying report (pages 173–204) reference is made for a detailed account of the nature, scope, purposes, and results of the work during the period under consideration.

The inquiries have been mainly confined to the collection and compilation of the statistics of the fisheries of the United States, giving the quantity and value of the products, the capital invested, the number and nationalities of persons employed, and to the study of the methods and relations of the fisheries with a view to their improvement.

The limited appropriation and the consequent small force available for this work preclude the possibility of an annual investigation of the fisheries of the entire coast and inland waters of the country; even if this should be attempted, it is open to question whether the variations in the fisheries from year to year are generally sufficiently marked, or whether at this time the results would be of sufficient importance to warrant the largely increased expenditures that would be required to properly conduct the work. Comparative statistics are more valuable when they relate to definite intervals of time than when they cover successive years. The researches of the Commission, which have been addressed to every section of the coast, furnish data for the comparison of conditions at intervals of three or four years and the determination of the influences of the methods and means employed upon the prosperity of the fisheries. Thus pursued, they furnish important material which has been or may be useful as the basis for the regulation, protection, maintenance, and improvement of the fisheries, and for advancing the physical and financial conditions of the fishermen.

The investigations undertaken during the two years covered by this report were more extensive than had previously been carried on. Field work was done in twenty-two States; complete studies of the coast fisheries were made in Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas; inquiries begun during the previous year were brought to a close in New York and California; and special investigations were made in Maryland, Virginia, Pennsylvania, Oregon, Washington, and elsewhere.

The inquiry on the Pacific coast placed the office in possession of definite information concerning the results which have attended the introduction of shad and striped bass to that region and disclosed a very satisfactory outlook for the establishment of important fisheries for these species. Shad are now found along the entire coast from Monterey Bay to Puget Sound, and are caught for market in each State. In 1888, without the use of special apparatus, over 100,000 pounds of shad were taken, and the following year the catch was considerably larger. Recent advices show that the shad is annually increasing in abundance, and in places has already become one of the most important food-fishes. The striped bass is more restricted in its distribution than the shad, and seems to be found chiefly in San Francisco Bay; it has not yet reached the commercial prominence of the shad.

The important fisheries of the New England States were carefully canvassed in the early part of the fiscal year 1890. No other investigation of this region had been made since 1880; and in view of the changes that had taken place in the extent and methods of the fisheries it was considered desirable to secure full and precise information regarding them, because of the international questions in relation thereto then pending or likely to arise. The inquiry covered the ocean, shore, and river fisheries of the region and the shore industries related to or dependent on the fisheries. Special studies were made of the more important branches, as the sardine industry, smoked-herring trade, lobster-canning business, etc., and at Boston and Gloucester a comprehensive canvass was conducted regarding the extent and methods of the wholesale trades in fresh, salted, and smoked fish, lobsters, and oysters. The decrease in the fishing industry of this section which has occurred since 1880 has been largely in the whale and mackerel fisheries, while the general branches are fully as successful as formerly.

The researches in the South Atlantic and Gulf States indicate a very marked development of the fisheries since the last general investigations were made, the advance in certain lines being phenomenally large. The resources of both these regions are only partly utilized, and the fisheries are no doubt destined to undergo still further improvement in the near future. Especially worthy of notice are the recent increase in the shad and oyster fisheries and the attention which the subject of oyster cultivation is receiving in every State.

A number of important papers relating to the fisheries were published during the year, an analysis of which will be found in the report of the division, which also contains remarks on certain important features of the fisheries during 1889 and 1890, as well as an account of the miscellaneous relations and work of the office.

FISH-CULTURE.

The work of this division has continued under the immediate direction of the Commissioner. During the year ending June 30, 1890, the stations operated were:

1. Schoodic Station, Me.
2. Craig Brook Station, Me.
3. Green Lake Station, Me.
4. Gloucester Station, Mass.
5. Woods Holl Station, Mass.
6. Cold Spring Harbor Station, N. Y
7. Gloucester City Station, N. J.
8. Battery Island Station, Md.
9. Fort Washington Station, Md.
10. Central Station, Washington, D. C.
11. Fish Ponds, Washington, D. C.
12. Wytheville Station, Va.
13. Sandusky Station, Ohio.
14. Northville Station, Mich.
15. Alpena Station, Mich.
16. Duluth Station, Minn.
17. Quincy Station, Ill.
18. Neosho Station, Mo.
19. Leadville Station, Colo.
20. Baird Station, Cal.
21. Fort Gaston Station, Cal.
22. Clackamas Station, Oregon.

During the following year the same stations were continued with the exception of that at Sandusky, the work conducted there being transferred to the Commission's new station on the island of Put-in Bay, Ohio. The fish-cultural work of the Commission during these years was increased over that prosecuted during the year 1889 by the operation of stations at Green Lake, Me., Gloucester City, N. J., Neosho, Mo., Leadville, Colo., and Fort Gaston, Cal.

The following tables show the work done at the respective stations during the two fiscal years:

Summary of production by stations.

Species and source of supply.	1889-90.			1890-91.		
	Eggs.	Fry.	Adults and yearlings.	Eggs.	Fry.	Adults and yearlings.
Schoodic, Me.:						
Landlocked salmon	635,000	214,000	.....	456,000	113,000	.....
Craig Brook, Me.:						
Landlocked salmon	.....	.....	17,380	.....	5,289	7,367
Atlantic salmon	890,000	.....	91,395	.....	.....	123,835
Von Behr trout	.....	.....	.....	.....	.....	3,580
Rainbow trout	.....	.....	747	.....	.....	.....
Loch Leven trout	.....	.....	.....	.....	.....	11,297
Brook trout	.....	.....	1,022	.....	4,251	.....
Green Lake, Me.:						
Landlocked salmon	10,000	150,000	.....	.....	3,000	.....
Gloucester, Mass.:						
Cod	.....	14,957,500	.....	.....	18,968,000	.....
Pollock	.....	14,899,000	.....	.....	14,827,500	.....
Haddock	.....	5,192,000	.....	.....	78,500	.....
Woods Holl, Mass.:						
Sea bass	.....	3,893,500	.....	.....	.....	.....
Scup	.....	396,000	.....	.....	.....	.....
Squeteague	.....	227,500	.....	.....	.....	.....
Mackerel	.....	688,500	.....	.....	.....	.....
Tautog	.....	732,500	.....	.....	.....	.....
Cod	.....	6,826,000	.....	.....	36,416,000	.....
Haddock	.....	528,000	.....	.....	.....	.....
Flatfish	.....	4,086,500	.....	.....	3,350,500	.....
Lobster	250,000	4,511,000	.....	.....	3,533,500	.....

Summary of production by stations—Continued.

Species and source of supply.	1889–90.			1890–91.		
	Eggs.	Fry.	Adults and yearlings.	Eggs.	Fry.	Adults and yearlings.
Cold Spring Harbor, N. Y.:						
Atlantic salmon		506,400				
Landlocked salmon		80,000				
Lake trout		470,000			482,622	
Loch Leven trout					18,015	
Gloucester City, N. J.:						
Shad		6,204,000			6,155,000	
Battery Island, Md.:						
Shad	12,637,000	12,248,000		8,250,000	37,747,000	
Fort Washington, Md.:						
Shad	34,446,000	356,000		32,361,000	170,000	
Central Station, Washington, D. C.:						
Shad		23,493,000		8,140,000	14,972,000	
Rainbow trout					11,981	
Brook trout		30,500			20,744	
Lake trout					87,588	
Von Behr trout					16,467	
Landlocked salmon		18,200			25,274	
Whitefish		4,300,000			3,600,000	
Smelt					400,000	
Yellow perch		754,000				
Fish Ponds, Washington, D. C.:						
Shad						800,000
Carp			28,700			337,040
Goldfish			15,972			23,029
Tench			24			1,650
Wytheville, Va.:						
Rainbow trout	158,000		39,276	195,000		37,990
Von Behr trout			237			
Brook trout			1,145			
Carp			2,330			6,931
Goldfish			1,535			1,911
Black bass						810
Rock bass			3,484			4,427
Sandusky, Ohio:						
Whitefish	22,000,000	30,628,000				
Pike perch	19,000,000	36,200,000				
Put-in Bay, Ohio:						
Whitefish				71,625,000	10,000,000	
Pike perch				58,000,000	60,000,000	
Lake trout					192,000	
Northville, Mich.:						
Whitefish	28,460,000					
Lake trout	2,600,000		13,132	2,285,000	600,000	187,805
Rainbow trout	12,500		19,143			4,053
Von Behr trout	58,000		6,175	226,000		18,655
Loch Leven trout	162,000		10,000	80,000		14,775
Brook trout	265,000	10,000	7,800	110,000		16,795
Alpena, Mich.:						
Whitefish		33,600,000		20,500,000	24,060,000	
Duluth, Minn.:						
Landlocked salmon					20,000	
Lake trout		935,000			358,000	235,000
Von Behr trout					15,000	
Brook trout		28,000				100
Whitefish		24,850,000			11,330,000	
Pike perch		580,000		12,000,000	10,100,000	
Quincy, Ill.:						
Catfish			11,116			
Brook pike			70			
Buffalo			2,215			
Yellow perch			16,323			9,958
Pike perch			1,000			
White bass			10,604			
Fresh-water drum			200			
Black bass			63,145			44,405
Crappie			18,575			21,901
Rock bass			2,854			10,802
Sunfish			6,973			2,435
Neosho, Mo.:						
Rainbow trout						21,039
Von Behr trout						11,925
Lake trout						500
Carp						1,782
Tench						9,907
Goldfish						17,007
Rock bass						1,308

Summary of production by stations—Continued.

Species and source of supply.	1889-90.			1890-91.		
	Eggs.	Fry.	Adults and yearlings.	Eggs.	Fry.	Adults and yearlings.
Leadville, Colo.:						
Brook trout	75,000	126,881		5,060		59,000
Baird, Cal.:						
Quinnat salmon	1,554,000	84,000		2,988,000	722,000	
Fort Gaston, Cal.:						
Quinnat salmon					55,000	
Clackamas, Oregon:						
Quinnat salmon	1,000,000	2,776,475		700,000	4,901,525	
Connecticut River, car No. 3:						
Shad		705,000				
Steamer Fish Hawk:						
Shad	3,669,000	20,596,000				
Spanish mackerel					776,000	
Collections in Idaho:						
Black-spotted trout			1,000			
Collections in Montana:						
Whitefish			3,000			
Germany, gift of Herr von dem Borne:						
Von Behr trout	84,000					
Saibling	13,000					
Loch Leven trout	15,000					
Germany, gift of Herr von Behr:						
Von Behr trout	56,000			29,750		
New York Fish Commission:						
Brook trout				20,000		
Von Behr trout				100,000		

DISTRIBUTION OF FOOD-FISHES.

The results obtained by stocking public waters with species of fish which are indigenous to them have been difficult of exact determination; that good has followed is shown by the continued increase in the value of the fisheries, demonstrated by carefully collected statistics. In those waters where species not indigenous were placed it is clearly shown what is possible of accomplishment. For information relative to the acclimation of the shad and striped bass on the Pacific Coast reference is made to page 175 of this report. Many of the streams and lakes of the Yellowstone National Park, formerly barren of food-fish, are also now furnishing an abundance of trout and whitefish, the result of plantings of former years.

The following table summarizes the work of distribution of various species of food-fishes during the two years covered by this report. The large increase over former years in the number of adult and yearling fishes distributed is the result of systematic efforts in rearing. This feature will continue to receive attention, it being applicable to fresh-water, marine, and anadromous species. The advantage of stocking waters with fish of a size large enough to protect themselves or to escape from their enemies will be very readily appreciated. The details of distribution will be found in Tables A and B, pages 75 to 96 of this report.

Summary of distribution.

Species.	Year ending June 30, 1890.				Year ending June 30, 1891.			
	Eggs.	Fry.	Adults and yearlings.	Total.	Eggs.	Fry.	Adults and yearlings.	Total.
Catfish			11,068	11,068				
Carp			26,316	26,316			338,809	338,809
Tench							11,385	11,385
Goldfish			16,005	16,005			36,561	36,561
Buffalo			2,195	2,195				
Shad	2,264,000	*68,401,000		70,665,000	837,000	†67,035,000	800,000	68,672,000
Quinnat salmon	2,454,000	2,940,475		5,394,475	3,677,900	5,678,525		9,356,425
Atlantic salmon	100,000	503,150	91,395	784,545			113,835	113,835
Landlocked salmon	345,000	462,100	17,380	824,480	325,000	166,289	7,367	498,656
Loch Leven trout	85,000		9,989	94,989	40,000	18,000	25,772	83,772
Rainbow trout	145,500		57,635	203,135	150,000	11,981	56,380	218,361
Von Behr trout	76,000		6,279	82,279	139,750	31,400	33,760	204,910
Black-spotted trout			1,000	1,000				
Brook trout	177,500	195,381	9,866	382,747	50,000	24,831	74,153	148,984
Lake trout	1,075,000	1,405,000	13,001	2,493,001	985,000	1,658,641	416,611	3,060,252
Saibling	8,000			8,000				
Whitefish	18,210,000	93,378,000	3,000	111,591,000	75,925,000	48,702,000	10,000	124,637,000
Smelt						400,000		400,000
Brook pike			70	70				
Yellow perch		754,000	15,402	769,402			9,568	9,568
Pike perch	19,000,000	36,730,000	1,000	55,731,000	70,000,000	62,400,000		132,400,000
Sea bass		3,893,500		3,893,500				
White bass			10,004	10,004				
Black bass			62,157	62,157			43,731	43,731
Crappie			18,068	18,068			20,454	20,454
Rock bass			5,097	5,097			15,504	15,504
Sunfish			6,815	6,815			2,262	2,262
Scup		396,000		396,000				
Fresh-water drum			200	200				
Squeteague		227,500		227,500				
Mackerel		688,500		688,500				
Spanish mackerel						776,000		776,000
Tautog		732,000		732,000				
Cod		21,783,500		21,783,500		55,384,000		55,384,000
Pollock		14,899,000		14,899,000		14,827,500		14,827,500
Haddock		5,720,000		5,720,000		78,500		78,500
Flatfish		4,086,500		4,086,500		3,350,500		3,350,500
Lobsters	250,000	4,511,000		4,761,000		3,533,500		3,533,500
Total	44,280,000	261,706,606	383,942	306,370,548	152,129,650	264,076,667	2,016,152	418,222,469

* In addition to these 2,144,000 were deposited for rearing in the fish ponds, Washington, D. C.
† Besides these 2,954,000 were deposited for rearing in the fish ponds, Washington, D. C.

In addition to the foregoing there were furnished for distribution, but lost in transit, during the two years:

In 1889–90:

6,731,000 shad fry, 50,000 pike perch fry, and the following adults and yearling fish: 48 catfish, 810 carp, 20 buffalo, 3,250 Atlantic salmon, 100 landlocked salmon, 11 Loch Leven trout, 1,531 rainbow trout, 133 Von Behr trout, 101 brook trout, 131 lake trout, 921 yellow perch, 560 white bass, 988 black bass, 507 crappie, 1,241 rock bass, and 158 sunfish; a total of 6,791,510.

In 1890–91:

5,508,000 shad fry, 7,700,000 pike perch fry, 288,000 whitefish fry, 61,569 lake trout fry, and the following adults and yearling fish: 6,944 carp, 5,386 goldfish, 172 tench, 10,000 Atlantic salmon, 300 Loch Leven trout, 6,702 rainbow trout, 400 Von Behr trout, 1,742 brook trout, 6,694 lake trout, 325 perch, 1,415 black bass, 1,440 crappie, 173 sunfish, 328 rock bass; a total of 13,599,590.

STATION REPORTS.

SCHOODIC STATION, MAINE (CHARLES G. ATKINS, SUPERINTENDENT).

1889-90.

This station was conducted jointly by the United States and Maine and New Hampshire. Operations were begun September 1, 1889, and 871 landlocked salmon were caught and impounded. Of these, 557 were females, from which 1,215,455 eggs were obtained by November 24. The losses were 163,005, there remaining in February, 1890, 1,052,450 good eggs, of which the State of Maine received 48,000, New Hampshire 73,000, and the United States 931,450. Of those belonging to the United States, 635,000 were distributed to various State fish commissions and other hatcheries, as mentioned in the details of distribution (pages 75 to 96). One shipment of 20,000, sent to Fort Gaston Station, California, was a total loss, as a result of detention while en route, the losses on the other twenty shipments amounting to but 4,246 eggs. The 296,450 eggs retained produced 214,000 fry, which were able to take food at the time of their release in local waters, in June, 1890.

Table of spawning operations at Schoodic Station, Maine, 1889-90.

Date.	Temperature, 7 a. m.		Fish at first handling.							Females spawned.			Eggs taken.	
					Females.									
	Air.	Water.	Total.	Males.	Total.	Ripe.	Unripe.	Spent.	Diseased.	First time.	Second time.	With some bad eggs.	Weight.	Number.
1889.	°F.	°F.											*Lb.* *Oz.*	
Oct. 27	47	47	18	13	5	2	3	....	....	2	.....	1	0 2	1,932
28	50	51	19	14	5	.....	5	....	....	.....	2	.....	0 8	1,288
29	40	47	28	19	9	1	7	1	1	1	.....	1	0 11	1,771
30	38	47	96	41	55	1	54	....	....	2	2	.....	0 12	1,932
31	38	44	44	21	23	2	21	....	1	2	.....	.....	1 15	4,903
Nov. 1	38	44	15	9	6	1	4	1	....	4	2	.....	3 12	9,606
2	35	45	34	23	11	3	8	....	....	9	5	.....	6 1	15,629
3	50	48	14	7	7	3	4	....	....	3	8	.....	4 0	10,312
4	40	47	31	19	12	1	11	....	....	10	4	2	8 0	20,624
5	42	46	23	13	10	4	6	....	....	6	10	1	4 4	10,956
6	35	45	20	10	10	4	6	....	....	19	6	3	12 12	32,868
7	36	44	13	8	5	3	2	....	....	21	17	7	14 7	37,219
8	39	44	37	15	22	12	10	....	1	33	21	2	27 13	71,699
9	40	42	39	14	25	14	11	....	....	25	34	9	26 5	67,833
10	33	42	66	12	54	23	26	5	1	37	26	8	29 9	76,211
11	34	42	30	6	24	14	10	....	....	34	34	2	28 6	73,150
12	40	43	39	6	33	13	18	2	....	24	35	4	21 9	55,587
13	46	44	38	9	29	12	13	4	....	38	24	9	32 3	82,979
14	44	44	66	8	58	16	33	9	....	40	37	7	31 14	82,169
15	32	43	51	4	47	18	26	3	....	40	40	11	35 7	91,357
16	21	37	63	4	59	23	31	5	3	49	37	2	39 7	101,607
17	24	37	6	1	5	1	1	3	....	17	51	4	20 15	53,975
18	33	38	4	1	3	2	1	....	....	30	21	3	22 6	57,682
19	31	38	3	.....	3	.....	.....	3	....	6	33	2	10 14	28,034
20	39	30	8	1	7	1	4	2	....	8	6	.....	8 10	22,234
21	46	41	5	.....	5	3	1	1	....	19	7	.....	12 6	31,902
22	38	40	6	1	5	3	.....	2	....	21	22	2	17 6	44,792
23	38	41	5	1	4	1	1	2	....	6	21	.....	38 14	100,218
24	36	40	.....	.....	.....	.....	.....	.....	.....	11	6	.....	9 7	24,774
			821	280	541	181	317	43	7	517	512	80	471 5	1,215,455

The weighing and measuring of 825 mature salmon (312 males and 513 females) gives the following:

Average weight of males..pounds.	3.98	Average length of males..inches.	21.30
Average weight of females..do...	3.91	Average length of females..do...	20.60
Weight of heaviest male....do...	6.00	Length of longest male.....do...	26.00
Weight of heaviest female..do...	5.50	Length of longest female....do...	24.00
Weight of lightest male.....do...	1.91	Length of shortest male ....do...	16.00
Weight of lightest female...do...	2.00	Length of shortest female...do...	17.00

At the close of the fishing season in November, 1889, a new departure was made, being the restripping of the fish prior to their liberation from the inclosures. Most of the females were found to contain eggs, the aggregate amounting to 33 pounds, or about 75,000 in number. In development these eggs proved to be quite as good as those taken previously.

1890-91.

Active work was begun October 29, 1890, and between that date and November 18, 510 landlocked salmon were captured. Of this number 371 were females, which yielded 778,796 eggs. In March, 1891, there remained 649,906 good eggs, of which 163,000 were retained for hatching and liberation in local waters, and 29,000 turned over to the Maine fish commissioners. The remainder, 456,900 eggs, were mainly consigned to various fish-hatcheries, national, State, and private, enumerated in the details of distribution; the eggs reserved were hatched, and in June the fry were released in local waters, with the exception of 50,000, which were held in rearing troughs beyond the present year. Two thousand of the fry retained were derived from eggs taken at the final stripping of the brood salmon prior to their release in November, 1890, and were placed apart for purposes of observation. They were discovered to suffer a less mortality during June than the others; the death rate during that month among the larger number being 15 to each 2,000, while the loss of these 2,000 fish obtained from the late eggs was but 3. A portion of the eggs which produced the fry under consideration must have remained in the parent fish nearly a month subsequent to the dates when the brood fish were first relieved of their spawn.

CRAIG BROOK STATION, MAINE (CHARLES G. ATKINS, SUPERINTENDENT).

In the report for 1889 reference was made to the intention to establish a permanent station at this point and to purchase the property then under lease. Congress by act approved March 2, 1889, having appropriated $11,000 "for the purchase of ground, construction of buildings and ponds, and purchase of equipment of fish-hatchery and rearing stations near Craig Brook, Reed Pond, and Branch Pond, Maine;" and the agreement of the owner of the Craig Brook property to sell the same to the United States having been obtained, the Attorney-General was requested to have the title examined and the proper transfer made.

This was done, and the site became vested in the United States by deed of Thomas Partridge, dated September 4, 1889.

Active operations in construction were immediately commenced. During the year ending June 30, 1890, the principal items were, a one-story building 24 feet by 50 feet for the rearing of live food (maggots) for the young fish; for use in connection therewith, an ice-house 11 feet by 13 feet; a storage-house 12 feet by 20 feet; a cellar 20 feet by 20 feet for the wintering of the live food; two small buildings 15 feet by 31 feet, and 15 feet by 20 feet, one for use as a mess-house for the employés of the station and the other as an office and quarters for the station's foreman; a shed 20 feet by 50 feet, with cellar, and fitted with hogshead tanks for the wintering of fish; a timber dam at Craig Pond, with penstock running 60 feet into the pond, permitting the water to be drawn from the pond at a depth of 4 feet below the surface; a stone dam across the brook, above the hatchery, to which the water was led by an 8-inch aqueduct about 425 feet long; a stand of 100 outdoor rearing troughs; a stone foundation for superintendent's dwelling; a number of ponds, grading, etc.

During the year ending June 30, 1891, plans and specifications were prepared for the superstructure of the superintendent's dwelling and office and a stable, and a call for proposals for the construction of the same was duly advertised on September 16, 1890, but no response thereto was received at the date fixed for their opening, October 15. Owing to the lateness of the season readvertisement was deferred till January 13, 1891. In answer to this three bids were received. The lowest bid was that of Carlton McGown, of Ellsworth, Me., at $3,970 for the dwelling and $995 for the stable. In view of the limited funds for this work the building of the stable was deferred and contract was made, under date of March 5, 1891, for the dwelling only. The plans called for a neat two-story cottage of ten rooms, with woodshed, etc., in the rear. Work on the same was promptly begun. The farmhouse on the property when purchased has received some repairs and is available for quarters for the employés. The series of rearing ponds on the slope of the south bank of the brook, commenced in the fall of 1890, was completed. They are about 15 feet by 50 feet in size and nineteen in number, and receive their water supply from the brook through a pipe conduit. A road from the station to the town road was constructed and other improvements tending to the development of the station were made.

An additional appropriation of $14,000 was made for these special constructions at Craig Brook and Green Lake by the act approved August 30, 1890.

The active fish-cultural work of the station during the period covered by this report follows.

1889-90.

During this year the fish-cultural work embraced the propagation of the Atlantic and landlocked salmons and the brook and rainbow trouts, the Swiss lake trout, the saibling, and the Loch Leven trout. The adult Atlantic salmon, purchased jointly by the United States and the State of Maine in the summer of 1889, 410 in number, were inclosed at Dead Brook, and in the following October, the commencement of the spawning season, 292 were recovered. Of these, 186 were females, which produced 1,904,000 eggs. In February, 1890, there remained 1,733,675 good eggs, which were divided between the subscribers, Maine receiving 600,000 and the United States 1,137,159. Of these latter, 890,000 were consigned to various State and other hatcheries, and 247,159 retained for hatching and subsequent liberation in local waters.

Besides the Atlantic salmon eggs produced there were received and developed eggs as follows: 3,500 of the saibling and 7,400 of the Swiss lake trout, presented by Herr Max von dem Borne, of Germany; 18,300 of the Loch Leven trout, transferred from the Northville Station, Michigan, and 56,300 of the landlocked salmon from the Schoodic Station, which were hatched and reared for the stations at Green Lake and Craig Brook. To accommodate the fry anticipated from this large number of eggs from June till October, 1890, 100 new troughs were built, increasing their total to 163. These troughs were 8 inches deep, 12¾ inches wide, and 10 feet long, with a capacity of 2,000 fry. Only 11 of the troughs were under shelter, but those in the open air were provided with double lids, which form a peak when closed.

The incubation of the eggs was without event until the yolk stage was reached, May, 1890, when they were attacked by a disease hitherto unknown here and by which 30 per cent of the stock was destroyed in sixty days. The epidemic first appeared among the Atlantic salmon, but ultimately affected, and with greater fatality, the landlocked salmon, saibling, and Swiss lake trout. Prior to the appearance of the disease the fry had been counted and set apart in lots of 1,000 to 4,000, and while some lots were wholly destroyed, others were but partially, and still others escaped entirely.

The rearing operations were successful. Of the original stock of 144,256 fish, chiefly of the previous year's hatching, 113,139 were on hand October and November, 1889, when most of them were liberated in local waters. The percentages saved are shown below:

Kind.	Age at start.	Number at start.	Number at close.	Per cent saved.
Atlantic salmon	One year	1,520	1,350	89
Do	In the egg	109,965	91,856	83
Landlocked salmon	One year	80	78	97
Do	In the egg	26,191	17,630	68
Rainbow trout	do	2,500	947	38
Brook trout	do	4,000	1,272	32
Total		144,256	113,139	78

The heaviest losses having occurred among the species derived from eggs received from a distance, viz, the rainbow and brook trout, it is inferred that packing and transportation were factors in the greater mortalities shown, especially since the smallest loss occurred among the Atlantic salmon, which were produced from eggs taken at the station.

When liberated, the Atlantic salmon were deposited in neighboring brooks. The landlocked salmon, with the exception of a few hundred, were taken across the country and placed in Green Lake. Of the 113,139 reared fish, 14,139 were still further retained for winter feeding, among them some of each kind and age. These were placed in special tanks, with the exception of a few which were kept in the open-air troughs till late in the winter. The mortality during this period was small.

1890-91.

The collection of Atlantic salmon eggs was conducted with the coöperation of the States of Maine and Massachusetts. It having been determined to devote more attention to the rearing feature, it was decided to reduce the egg-collecting to a scale commensurate with the capacity of the station, but a smaller number of eggs was obtained than was desired, owing to the scarcity of adult salmon, only 133 being secured. At the spawning time, October 1890, 77 of these remained alive in the inclosures, of which 52 were females, yielding 553,400 eggs. The good eggs remaining in January were divided, Maine receiving 264,000, Massachusetts 133,000, and the United States 134,218. The share of the United States was increased by the Maine commissioners, who contributed 183,000 for purposes of hatching and rearing.

In addition to the salmon eggs, there were also produced 23,146 of the brook trout from fish artificially reared. These and other eggs received at the station are noted in the list below:

Kind.	Source.	Original number of eggs.	Number hatched.
Atlantic salmon	Produced at station	317,218	316,308
Landlocked salmon	Grand Lake Stream Station	21,906	21,824
Brook trout	Produced at station	23,146	14,524
Loch Leven trout	Northville Station	16,583	16,457
Von Behr trout	Germany	15,119	13,824
Scottish sea trout	Scotland	12,374	9,367
Total		406,346	392,304

Both the Von Behr and Loch Leven trout eggs arrived in poor condition, having already commenced hatching, and gave practically no results. All other eggs were good, and the epidemic usually incident to the months of May and June of former years did not occur. About 150,000 fish of the hatching of 1890 were cared for in rearing troughs till the present fiscal year, all being liberated in October, 1890, except

14,736 Atlantic salmon, 490 landlocked salmon, 31 saibling, 490 Swiss lake trout, and 490 Loch Leven trout, which were further held for observation during the winter months. Their history while subjected to rearing methods, from June to October, 1890, is shown below:

Kind.	Stock July 1.	Stock October 1.	Per cent saved.
Atlantic salmon	247,159	124,267	50
Landlocked salmon	56,363	7,849	14
Saibling	2,635	41	2
Swiss lake trout	6,821	3,916	57
Loch Leven trout	17,889	11,797	66
Total	330,867	147,870	45

In addition, there were brought over from the last fiscal year 1,471 fish, 1 and 2 years old, which are included in the following statement:

Kind of fish.	Original number.	Locally distributed.	Transferred.	Reserved and on hand July 1, 1891.
Atlantic salmon of 1888	73	.....	.....	66
1889	713	675	.....	.....
1890	124,267	103,226	20,329	100
1891	316,308	.....	.....	289,249
Landlocked salmon of 1888	78	.....	.....	68
1889	180	.....	.....	126
1890	7,849	7,397	10	429
1891	21,824	.....	5,289	12,106
Rainbow trout of 1889	180	.....	.....	176
Brook trout of 1889	240	.....	.....	218
1891	14,524	.....	4,251	1,381
Saibling of 1890	41	.....	10	19
Swiss lake trout of 1890	3,916	3,580	.....	179
Loch Leven trout of 1890	11,797	11,297	10	480
1891	16,457	.....	.....	10,862
Von Behr trout of 1891	13,824	.....	.....	1,085
Scottish sea trout of 1891	9,367	.....	.....	97
Total	541,645	125,780	29,869	316,701

In July, 1890, the water temperature rose to a maximum of 72° F. in rearing troughs fed from Craig Brook. In conduits supplied in part by spring water the temperature was 69°, and after passing through four rearing troughs in succession it was 72°. In August the water in the hatchery was 58° to 76°; in open-air troughs, 59° to 75°; and in the ponds 58° to 74½°. Experimental lots of salmon fry were kept in two neighboring streams, and in one of them, at East Orland Bridge, the water rose August 4 to 82° without injuring them. The September temperature was 69° to 53°; October, 63° to 46°; November, as low as 37°, from 24th to 29th; January, 32½° to 35°, with nearly all the fish remaining in the open-air troughs; February, 32½° to 36°, with weather comparatively mild and the ice on Alamoosook Lake 29½ inches thick.

GREEN LAKE STATION, MAINE (C. G. ATKINS AND H. H. BUCK, SUPERINTENDENTS).

By act approved March 2, 1889, to which reference has been made under Craig Brook Station, Congress directed the establishment of a fish-hatchery near Reed Pond or Branch Pond, Maine. On August 22, 1889, Mr. Charles G. Atkins, superintendent of Craig Brook Station, was instructed to proceed to the localities mentioned, with a view to their examination and the submitting of a report, with recommendations as to the site desirable to be acquired. Reed Pond, or Green Lake, was reported as being the best location, and one to which landlocked salmon are native. The stream in which they spawn (Great Brook) is one of the finest in that region. Branch Pond failed to furnish the necessary requirements for fish-cultural work, and its further consideration was waived. Mr. Atkins recommended, therefore, that the location of the permanent station be in the vicinity of Green Lake, calling attention to sites at Great Brook, the spawning-ground of the landlocked salmon, about the center of the lake, and at Mann Brook, near the station on the Maine Central Railroad, at its extreme northwestern end.

After due consideration of the recommendations, the Commissioner determined upon the site at Great Brook, and on December 6 directed that negotiations be opened for the purchase of the necessary land and water privileges. The site selected takes in the whole of the stream of Great Brook on both sides, running from Rocky Pond to Green Lake, securing the outlet to Rocky Pond, with all privileges of damming, etc., and embracing a territory of about 820 acres. Definite proposal to sell was received on April 25, 1890, and on the 20th of the following month the papers were referred to the Attorney-General, with the request that the title to the property be examined and arrangements made for the transfer of the same to the United States. In accordance with agreement with the owners, a survey of the property for the determination and establishment of its bounds was made in August, 1890. The examination of the title was completed in May, 1891, and the purchase money passed. Plans and specifications were prepared for the construction of the dwelling house, stable, and box flume to bring the necessary supply of water from Rocky Pond to the hatchery. Advertisements calling for proposals, to be opened on May 21, 1891, were published, commencing April 23. The lowest bids received were those from Mr. Carlton McGown, for the construction of the flume, at 97¾ cents per running foot, and from Mr. Austin M. Foster, for the hatchery, dwelling house, stable, etc., both of these gentlemen doing business in Ellsworth, Me. Mr. McGown, however, owing to ill health, declined to execute the contract for the flume, and one was entered into with Mr. Foster, at the rate given in the bid of Mr. McGown, who made good to Mr. Foster the difference between their bids. On account of this declination to execute the contract some delay was caused, but

on the 20th of June it was duly signed by Mr. Foster. For the hatchery the price was $4,174.80; for the dwelling house, $3,007; and for the stable and tool-house, $1,317, contract for which was made June 13, 1891. The flume, which will have a length of nearly 7,050 feet, will aggregate a cost of about $6,800.

1889–90.

Pending the acquirement of a site, it was decided to begin fish-cultural operations at Green Lake in the fall of 1889. A camp was established on the lower part of Great Brook for the collection of eggs, arrangements being made by erecting barriers to prevent the further ascent of the salmon and an inclosure for their retention till ready to spawn. For the development of the eggs secured a cheap structure containing the necessary trough space was put at Mann Brook.

Operations in spawn-taking were begun November 4, and in eleven days 294,700 eggs were produced from 75 females, the catch of males being 50. The eggs developed slowly, the water being very cold. On April 8, 1890, 10,000 eggs were forwarded to Cold Spring Harbor, N. Y., and from those remaining there were produced 150,000 fry, which were liberated in Green Lake, in June. In October, 1889, a consignment of landlocked salmon and rainbow trout, which had been held at Craig Brook Station till 7 months old, was received and liberated in Green Lake and tributaries.

Upon weighing and measuring the Green Lake salmon it was found that they were twice the size of those of Grand Lake Stream, 69 full-roed females averaging 7.8 pounds in weight and 25.5 inches in length; the average weight of 50 males being 5.01 pounds, and their length 22.3 inches. One female weighed 11 pounds 9 ounces and measured 30 inches; another, 11 pounds 6 ounces in weight, was 30½ inches long; one male reached 13 pounds 8 ounces in weight and was 31 inches long.

1890–91.

The production of landlocked salmon eggs between October 31 and November 21, 1890, was 185,000. The fry from these, with the exception of 3,000 released June 10, 1891, on account of fungus, were kept in rearing troughs beyond the termination of the present fiscal year. The adult fish captured, 46 females and 21 males, were again found to be of large size, the former averaging 7 pounds in weight and 25.2 inches in length, and the latter 6 pounds 9 ounces in weight and 25.1 inches in length, while 3 females and 4 males were in excess of 10 pounds weight each. At the close of spawn-taking, in November, the barriers were removed and these brood fish set free in the lake. Another consignment of reared fish, 7 months old, consisting of Swiss lake trout, landlocked salmon, and Loch Leven trout, was received in October, 1890, from Craig Brook Station and placed in Green Lake and its tributaries.

The station remained under the superintendency of Mr. Atkins till January, 1891, when, the other work intrusted to his charge requiring more of his time, it was placed under the conduct of Mr. Buck.

GLOUCESTER, MASS., STATION (A. C. ADAMS, COMMANDING SCHOONER GRAMPUS, IN CHARGE).

1889-90.

In the conduct of operations at this station the work of collecting eggs devolved upon the officers and crew of the schooner *Grampus* and covered the period from September, 1889, to May, 1890. The fishing-grounds were visited by the *Grampus*, and the brood fish obtained by hand lines and held in the ship's well, being afterwards transferred to live-cars at the station. The supply of eggs from this source being inadequate, owing to the limited catch, hand-line fishing was discontinued and arrangements were made to secure the eggs from the vessels of net fishermen, the *Grampus* each morning visiting the fishing-grounds situated 8 miles S. by W. of Eastern Point Light, where the greater part of the crew were distributed among the fishing vessels for spawn-taking, due compensation being made the fishermen for eggs and accommodations. Between October 18 and January 3, 42 such trips were made with the *Grampus*. By January 1 it was found desirable to utilize a larger proportion of the *Grampus* crew as spawn-takers, and after that date the vessel anchored near the station and each morning the spawn-takers were put aboard the fishing vessels as they were about to sail out of the harbor.

Pollock.—Eggs were first taken October 18, 1889. By December 20 181 ripe fish had been handled, from which 40,166,300 eggs were obtained, and fry produced to the number of 14,899,000.

Cod.—The collection of cod eggs extended from October 23, 1889, to May 5, 1890, during which time 14,957,000 fry were produced from 47,556,000 eggs, derived from 242 fish. The period of greatest success in hatching was during the month of January, when 60 per cent of fry were produced from all eggs taken. During a short period in February the proportion of spawning fish was greatest. Eggs were transferred to Woods Holl Station, February 2 to 9, to the number of 3,198,700, and on April 4 a further consignment of 687,400 to the same place was made.

Haddock.—Spawning fish were obtained from February 13 to May 7, 240 females producing 30,322,000 eggs, from which 5,192,000 fry were hatched. In the manipulation of all of these species difficulty was experienced from sediment, which caused many eggs to sink, more especially of the cod and pollock. After the cessation of storms many eggs which had sunk were cleaned and restored to the surface by means of increased circulation of water. Great interest in this work was manifested by the fishermen, who extended many courtesies to the Commission's spawn-takers.

On May 15 the hatchery was closed.

The egg-collections were again made by the officers and crew of the schooner *Grampus*. From December 9, 1890, to January 20, 1891, the second mate and three seamen were stationed at Kittery Point, Maine, to collect eggs from Ipswich Bay and forward them by rail to Gloucester. The remainder of the spawn-takers were engaged collecting from the nets of fishermen from Gloucester.

Pollock.—Eggs were first taken October 31, 1890, and in the twenty-nine days following 38,054,700 were delivered for hatching. The spawning fish were principally taken in nets near Baker Island, a few being taken on hand lines to the southward of Thatcher Island.

Haddock.—But few haddock eggs were obtained prior to the close of the station, April 1, the appearance of the schools of fish on the grounds being later than usual. On April 5 schools of haddock in fine condition made their appearance and remained accessible, along with a smaller proportion of cod, till after June 1. The production of eggs was 1,154,100, which were obtained off Thatcher Island and Gloucester, the adult fish being associated with codfish, though often found 5 to 10 miles farther offshore.

Cod.—Beginning November 26, 1890, eggs were obtained to the number of 110,112,300. Early in December two trips were made with the *Grampus* to Ipswich Bay, resulting in the collection of nearly 10,000,000 eggs. After this time such large quantities were secured from the two sources that the hatchery was twice overrun, the receipts December 1 to 15 being nearly 19,000,000, while from January 6 to 21 the numbers brought in ran from 1,000,000 to 10,000,000 per day. About 16,000,000 were received overland from Kittery Point, Maine, a journey of five hours by railroad.

More than 43,000,000 cod eggs were sent to the Woods Holl Station during the season, but they produced only 150,200 fry. Nearly 15,000,000 eggs gathered at Ipswich Bay, and shipped from Kittery Point, Maine, to Gloucester, an equal journey by rail, developed at the Gloucester Station over 20 per cent of fry. About 30,000,000 eggs collected at Gloucester and hatched there, and hence not subjected to transportation by railroad, produced 25.5 per cent of fry. Of the eggs shipped to Woods Holl, over 11,000,000 were from Ipswich Bay and were reshipped from Gloucester. The Cape Ann eggs sent to Woods Holl were but 15 minutes longer on the road than were the Ipswich Bay eggs shipped to Gloucester. When the season was far advanced, February 20, 1891, at the suggestion of W. P. Sauerhoff, fish-culturist, an experimental shipment of a half million cod eggs was made from Kittery Point to Gloucester in two air-tight fruit jars, of 2½ quarts capacity each, which resulted in the hatching of 71 per cent, the fry being healthy. The jars were filled with sea water and packed in snow, thereby lowering the temperature two or three degrees, or to 33° F. These eggs were not dissimilar to those previously forwarded from

Kittery Point. After storms the turbid water caused the sinking of many eggs, which were discharged overboard; but upon testing a lot of eggs which were too heavy to float at the time of their receipt, it was found that with care they hatched with good results. The question of impregnation was usually determined by the use of the microscope when the eggs were first received.

The surface temperature on the collecting grounds, about 45° F. at the commencement of the season, gradually fell to 33° by December 25, from which time till March it ranged from 34° to 37°.

During the whole period of operations copepods were abundant in the water used for developing the eggs and were considered injurious.

Below is a condensed statement of operations:

Kind.	Period of operations.	No. of females spawned.	No. of eggs taken.	No. of fry released in local waters.	No. of eggs shipped to Woods Holl Station.	No. of eggs put overboard.
Cod	Nov. 26-Mar. 18	228	110,112,300	18,968,100	43,514,300	1,785,200
Haddock	Jan. 29-Mar. 9	16	1,154,100	78,600	.....	85,100
Pollock	Oct. 31-Dec. 2	151	38,546,200	14,827,900	.....	.....
Total	.....	395	149,811,600	33,874,600	43,514,300	1,870,300

WOODS HOLL STATION, MASSACHUSETTS (JOHN MAXWELL, SUPERINTENDENT).

1889-90.

The fish-cultural work of this station covers a period of eight months, and was conducted chiefly by the resident employés of the station. In the propagation of cod the force was increased by the assignment of Mr. Richard Dana, who was placed in charge, the period of active work being from October 14, 1889, to April 4, 1890.

Cod.—As a source of egg supply, 3,403 adult codfish were obtained from fishermen October 22 to November 19, 1889, and placed in live-cars and in one of the tidal basins. Here, under as natural conditions as practicable, the brood fish were held to await maturity, when they were stripped of their eggs every two or three days until the supply was exhausted. Many of the adult fish died immediately after being placed in the inclosures, the temperature being then 55° F., and some died each day until the water temperature fell to 46°. A great many became blind, and it was supposed to be caused by the glare of the sunlight, the water being shallow.

In the two months following 91 fish yielded 8,545,700 eggs, and from these there were hatched and liberated in local waters, when from three to six days old, 5,861,100 fry. At the termination of the spawning season there were remaining on hand 1,000 of the brood fish, which were retained in one of the tidal basins to determine their value as spawn-producers the succeeding fall. On February 11, 1890, 2,374,200 eggs received from Gloucester Station were put in process of hatching, with the result of 584,700 fry, and a second consignment, April 14, of 621,500 eggs, from the same source, produced 416,300 fry.

Haddock.—A consignment of 1,138,200 haddock eggs from Gloucester, Mass., April 14, produced 528,000 fry.

Flatfish.—The eggs of the flatfish were secured after February 3, 1890, 87 ripe females being taken in fyke nets in the harbor near the station. The yield of eggs was 5,841,100, and the fry produced and liberated in local waters, 4,086,700. The adult fish were obtainable in abundance, except when driven into deeper water by cold weather.

Lobsters.—Brood lobsters were collected from the pots of local fishermen, November to May, and placed in inclosures to await maturity, some, however, being marked and released after their eggs had been stripped, in order to determine, if possible, the frequency of spawning under natural conditions. The eggs were taken subsequent to April 16 from 723 adults, the yield being 8,317,600 and the production of fry 4,511,106, or 54 per cent. The fry were released in local waters when 2 to 4 days old, except a few which were experimentally held in the jars six weeks and afterwards transferred to the aquaria. The hatching was conducted in the Chester tidal jar, the improved McDonald tidal box, and in the universal hatching jar. Eggs taken April 22 (water temperature 45°) hatched June 4 (water temperature 59°), a period of 42 days. A lot of eggs brought in by a local fisherman and thought to be on the eve of hatching, remained in process of development 99 days. When they were received the embryos were well developed and the water temperature 36°, but no further growth was observed till the temperature rose to 54°, May 18, when the eggs hatched.

For consignment to Galveston Harbor, Texas, 745 healthy lobsters, 7 to 10 inches long, were collected and packed in sea moss in 105 wooden crates, prepared at the station. Among them were 385 females, of which 37 bore impregnated eggs, estimated at 250,000 in number. The adult lobsters all died before reaching their destination, but the eggs were planted on the Gulf side of Galveston Harbor breakwater, about 4 miles from the shore.

Other fish.—After May 23, sea bass, mackerel, squeteague, tautog, and scup eggs were successfully handled to the extent of several millions, all of them being of the floating character and collected from the pound nets of local fishermen.

The following table exhibits the fish-cultural work of the station during the year:

Kind.	Spawning period.	No. of eggs taken.	No. of fry produced.	Average No. hours hatching.	Temperature.
Cod	Nov. 18–Jan. 18	8,545,700	5,861,100	351	47° to 35°
Do		*621,588	416,300		
Do	Feb. 2–11	*3,201,400	548,700		37° 39°
Haddock		*1,338,200	528,100		
Flatfish	Feb. 3–Apr. 24	5,848,100	4,086,700		27° 46°
Lobster	Apr. 16–June 13	8,317,600	4,511,100	573	50° 62½°
Scup	June 14–20	443,000	396,300	83	61½° 62½°
Sea bass	May 23–June 20	4,271,200	3,893,700	104	56° 64°
Mackerel	June 2–11	2,915,000	688,700	90	59° 61°
Squeteague	June 6	237,600	227,600	65	60°
Tautog	May 21–June 24	807,600	732,200	87	56° 64°

* From Gloucester Station.

Experiments were made by Mr. Vinal N. Edwards for the purpose of determining the times of spawning of different fishes, and the period of incubation and character of their eggs, etc., the results of which are shown in the following table:

Kind of fish.	Date.			Eggs.			Temperature when eggs were taken.	Temperature when eggs were hatched.
	When eggs were taken.	When eggs were hatched.	No. of days hatching.	Number handled.	Character.	Number to linear inch.		
							°	°
Flatfish	Apr. 12	Apr. 29	17	192,000	Adhesive, sinking.	22	38	46
4-spotted flounder	May 12	May 20	8	50,000	Floating	26	51	56
Sand dab	do	do	8	100,000	do	24	51	56
Tautog	May 21	May 26	5	221,000	do	26	56	56
Sea bass	June 4	June 9	5	412,000	do	26	59	60
Squeteague	June 6	June 8	2	297,000	do	28	60	60
Mackerel	do	June 9	3	159,000	do	24	60	60
Squid	May 13	June 10	26	3,000	Sinking		51	61
Cunner	May 22	May 27	5	100,000	Floating	26	56	56
Toadfish	May 28	June 28	31	200	Sinking	5	56	65
Scup	June 14	June 18	4	158,000	Floating	26	61	63
Lamprey eel	June 2	June 17	15	300	Sinking		*70	70
Skate	June 23	Sept. 27	96	1	do		64	66
Codfish					Floating	18		
Bonito					do	20		
Lobster					Sinking	15		

* Hatched in fresh water.

The mean of the salt-water temperatures and densities during the period of egg development is given by months below:

Month.	Temperature.	Density.
December	43.1	1.0255
January	39.3	1.0256
February	36.4	1.0255
March	36.1	1.0255
April	43.3	1.0255
May	53.4	1.0255
June	62	1.0255

Collections of specimens of marine plants and animals were made throughout the cooler months and forwarded by express to the aquaria at Central Station, Washington, D. C., one consignment transferred by the steamer *Fish Hawk* comprising 600 fishes, crustaceans, etc., representing forty species.

1890–91.

Mr. Alexander Jones was in immediate charge of hatching the cod and flatfish, but being temporarily detached before the lobster season opened, the manipulation of that species was directed by the superintendent.

Cod.—Through the agency of Mr. I. Spindel, 3,000 selected brood cod were procured, principally from Nantucket Shoals, and, as in previous years, held in inclosures till the spawning season. They suffered less mortality than those impounded the preceding season, but on January

8, 1891, 300 died from the effects of slush ice, which formed inside the live-cars from snow that fell between the wooden slats. Besides having their gills choked up, many were found to contain in their stomachs lumps of ice as large as walnuts. Less blindness occurred, probably on account of greater care in handling the fish at the time of their capture, a feature being the avoidance of the usual custom of thrusting a finger into the eye socket of the fish when removing the hook.

Of the brood fish only 587 yielded eggs, these being 67,399,000 in number and producing 36,266,100 fry. Eggs were stripped about every other day, from November 17 to February 7.

Consignments of eggs, by rail, were received from Gloucester Station to the number of 43,168,500, from December 16 to January 19, but of these only 16,332,000 were thought to be good twelve hours subsequent to arrival, and their total production was but 150,000 fry.

Observations during hatching this year led to the conclusion that those eggs which sink within five or six days after being taken are defective in their fertilization. The results of attempts made at impregnation by the dry method, though not conclusive, were unsatisfactory. The eggs that sunk were transferred from jars to boxes, and *vice versa*, and close attention given them. Those placed in jars would in a short time become milky and glutinous and so foul that cleansing by washing was impracticable; while those in boxes, without turning milky, would adhere together and to the hatching vessels, finally perishing.

The profuse abundance of copepods in the hatching vessels throughout the season was thought to be injurious to the eggs and fry, since they were seen densely congregated about dead eggs and the weaker fry, and were in constant friction with the live eggs and fry in their crowded condition. Attempts to exclude them by means of cheese-cloth strainers were ineffectual, owing to their minuteness. Another unfavorable element was the employment of hatching boxes which had been used during the summer preceding for the live storage of medusæ and other low forms of animal life which exude slime and poisonous substances. It was found that eggs kept in the boxes which had been used for this purpose were invariably attended with a high death rate, but if early removed to other vessels they immediately recovered. Vigorous efforts to cleanse the infected boxes failed.

Hatching was one to three days earlier in the tidal boxes than in the inverted tidal jars, owing, presumably, to the greater circulation and light afforded the eggs. The fry produced were liberated in neighboring waters when they were 12 to 48 hours old.

Flatfish.—Adult flatfish to the number of 71 were taken with a fyke net in Woods Holl Harbor and yielded 4,689,700 eggs, which produced 3,350,800 fry. The spawning period of the flatfish was between February 3 and March 7.

Lobster.—In the hatching of the lobster greater success than formerly was met, by the substitution of the universal hatching jar for the tidal jar, whereby the clotting of the eggs was greatly diminished. The productive period was from April 28 to June 30, during which time from 482 lobsters were taken 4,353,800 eggs, yielding 3,533,900 fry, or 81 per cent. The eggs were obtained from lobsters captured in pots operated by the employés of the station and from local fishermen, who coöperated in the work, saving all the ripe eggs from among the lobsters handled by them.

The monthly mean temperatures and densities of the salt water used in hatching operations of the station were as follows:

Month.	Temperature.	Density.
December	36.4	1.0252
January	33.1	1.0274
February	34.1	1.0308
March	35.7	1.0274
April	44.3	1.0256
May	52.1	1.0271
June	61.2	1.0259

COLD SPRING HARBOR STATION, NEW YORK (FRED. MATHER, SUPERINTENDENT).

This station has continued in operation as in previous years. Most of the eggs received and consigned as foreign exchanges passed through it, where they were examined and, if necessary, were repacked before they were forwarded to their destination. A considerable number of Atlantic salmon eggs were hatched here for the Hudson River, the production of that and other species for the two years being as follows:

Kind.	Source.	Eggs received.	Fry produced.
1889–90.			
Atlantic salmon	Craig Brook Station	600,000	506,400
Landlocked salmon	Schoodic Station	85,000	80,000
Lake trout	Northville Station	500,000	470,000
1890–91.			
Loch Leven trout	Northville Station	20,000	18,000
Lake trout	....do	500,000	482,600

GLOUCESTER CITY STATION, NEW JERSEY (JOHN GAY, IN CHARGE).

1889–90.

The propagation of shad by the Commission has been confined mainly to its stations on the Susquehanna and Potomac rivers, though some attention has been given to work on the Delaware River through the use of the steamer *Fish Hawk* and one of the distributing cars. In the spring of 1890 Mr. W. J. Thompson, of Gloucester City, who is largely interested in the fisheries of the Delaware River, offered to erect on his

property a hatchery building for the Commission, free of expense, the Commissioner, however, to furnish the necessary equipment. Mr. John Gay, inspector of stations, was directed to examine the location, and on his report and recommendation the offer of Mr. Thompson was accepted. Immediate steps were taken to equip the station, and active operations were inaugurated. On April 22, 1890, the steamer *Fish Hawk* arrived with the necessary materials, and her crew speedily fitted up the building. By May 12 the establishment was ready for the receipt of eggs, the water being derived from the supply of Gloucester City.

The first eggs received were those transferred from the *Fish Hawk*. The spawn-takers commenced taking eggs May 13, visiting the fisheries daily by the launch *Petrel*. Their collections for the season closed May 28, 1890, amounting to 6,396,000 eggs, which were obtained from seines, as follows: Gloucester Point, 30,000; Faunce's, 1,752,000; Rice's, 922,000; and Howell Cove, 3,792,000. These eggs, together with the 3,654,000 transferred from the *Fish Hawk*, made a total of 10,150,000, and produced 6,204,000 fry, which were liberated in Big Timber Creek, New Jersey, a stream near Gloucester City. The water temperature in the hatchery was 58° May 12; 60° May 15 to 23; and 63° May 31.

Further details concerning the operations at Gloucester, N. J., will be found in the account of the operations of the *Fish Hawk*, pages 55 and 56.

1890–91.

In the previous year's work it was found that the water used was of too low a temperature and also contained injurious ingredients. In order to obtain supplies of a more suitable character for the work, a pumping plant was put in with a suction pipe laid to the Delaware River, connection still being maintained with the city supply for cases of emergency. The steam launch *Petrel* was again assigned here. The *Fish Hawk* being needed for other work, the propagation of shad on the Delaware River was conducted by this station only. The collection of eggs began April 30, 1891, and was continued till June 2, resulting in a total of 12,465,000. Fry produced from these eggs amounted to 6,155,000, of which 4,930,000 were turned over to messengers for distribution and 1,225,000 deposited locally in Big Timber Creek. The seines attended for spawn were those at Gloucester Point, Faunce's, and Howell Cove. The largest day's production of eggs, 1,242,000, was on May 1, the Howell Cove seine furnishing 973,000 of these. During the season but one ripe shad was obtained at Gloucester Point, a source of 2,500,000 eggs the year preceding.

The weather was abnormal and the river being low from a drought in the headwaters was made lower by prevailing winds from the north and northwest. There were snow flurries May 6. The catch of shad was within 25 per cent of the usual number, but spawning fish were

very scarce, and ripe bucks of such infrequent occurrence that it was at all times difficult to secure enough milt for purposes of fertilization. A great many shad moved upward to headwaters, many being seen in the vicinity of Egypt Mills, Pike County, Pa., and in New York State, as much as 300 miles above the ocean, higher than known since the building of the dam at Lackawaxen in the year 1823. The headwaters were made accessible to the spawning shad by the construction in 1889 of a fishway at the dam by the joint action of New York and Pennsylvania. Fishing operations ceased June 3, and the station was closed June 6.

BATTERY ISLAND STATION, MARYLAND (W. DE C. RAVENEL, SUPERINTENDENT).

1889–90.

As in previous years, in addition to the operation of the Commission's station on Battery Island, the canning house of Mr. S. J. Seneca, at Havre de Grace, was rented for the season and equipped with 100 hatching jars of a capacity of 8,000,000 eggs. This auxiliary hatchery being located in the proximity of the railroad station proved a valuable adjunct to the work of distribution. The collection of spawn began April 21 and continued till May 20, 1890, the aggregate number of eggs secured by the two establishments being 32,405,000. Of these, 12,637,000 were transferred to the cars for hatching en route; from the remainder 12,248,000 fry were produced, which were also mainly distributed by the messenger service. To procure the eggs, 60,600 fathoms of seine haul and 179,925 fathoms of gill net were attended, the number of seined shad examined being 22,800 and of those from gill nets, 16,700, a total of 39,500, of which 985 were stripped.

Early in May continued heavy rains caused muddy water and backed the run of shad down the bay, so that the seine catch was reduced to one-third of that of the previous year and the gill-net catch to one-half. Of the entire production of eggs, more than three-fourths were obtained prior to the freshet period, commencing May 7. The eggs, though scarce, were of unusually good quality and afforded fry of superior vigor.

1890–91.

Shad hatching was again conducted both at Battery Island and at the auxiliary hatchery at Havre de Grace. On April 17, 1891, twenty spawn-takers began operations, and from that time until June 6 were interrupted by storms but two nights. By the 1st of May 26,370,000 eggs had been secured, and by the end of the season a total of 63,110,000. Of these, 837,000 were turned over to the Delaware Fish Commission and 7,413,000 to the Fish Commission's cars for hatching en route to the places of deposit. From the remainder were produced 37,747,000 fry. The eggs obtained on each of nine days were over a million, on twelve

days over two millions, and on three days over three millions. The water in the vicinity of the station was so extraordinarily clear that seines could be hauled with any advantage at night only; operations were therefore suspended the first week in May, one month earlier than customary, with one-half the usual catch, the catch by gill fishermen being about two-thirds.

The attendance of the spawn-takers was on 49,600 fathoms of seine and 224,700 fathoms of gill net, which afforded 35,200 adult shad for examination, about equally divided between the two classes of nets. The number of fish stripped was 2,013.

The average water temperature during the last fifteen days in April was 60.8° F., during the month of May 62.1°, and the first nine days in June 70.8°.

When fry accumulate in large numbers between deliveries to messengers they are kept in large storage tanks rather than in the collector aquaria, this method having been found so advantageous that its application is general in the station. The tanks are 96 inches long by 18 wide and 16 deep, partitioned midway between the ends to form two separate compartments, which are provided with guard screens at their outlet ends. The water circulation is derived from two one-fourth-inch jet cocks, to which gum tubing is attached, under 10 pounds pressure to a square inch. As many as 300,000 to 400,000 fry are supported in each subcompartment, the variation in number being regulated in accordance with temperature.

An experiment was made of holding shad in standing water, 25,000 fry being placed in a 12-gallon can and one-fourth the water changed every four hours. At the end of twelve days the loss was 4,185, and of these 40 per cent occurred in the first sixty hours. The temperature of the water at the beginning of the experiment was 56°, but gradually rose till on the twelfth day it was 70°; on the following five days it dropped to 52°, when heavy mortality occurred.

The purchase of this station, at the head of Chesapeake Bay, Maryland, which had been occupied under lease by the Commission for a number of years, was provided for in an act approved March 3, 1891. By direction of the United States Attorney-General, an examination of the title to the property was made by the United States district attorney for Maryland, who, on June 26, 1891, reported the same good in Mr. T. B. Ferguson, by whom a deed transferring the same to the United States was duly executed.

FORT WASHINGTON STATION, MARYLAND (S. G. WORTH, SUPERINTENDENT).

1889–90.

This station, lying on the Potomac River, about 12 miles below Washington, was open during April and May, 1890, and produced during the egg-collecting period of thirty-two days, commencing April 15, 35,202,000 eggs. The catch of shad in this vicinity was less than one-half that of the four preceding years. Of the eggs obtained (35,202,000) 34,446,000, after being held thirty-six hours, were measured and forwarded on the river steamers to Central Station, and 756,000 of inferior quality were held and hatched, producing 356,000 fry, which were liberated in the Potomac River at the station. The eggs were derived from sources as follows: Fort Washington seine, 10,224,000; Chapman Point seine, 2,842,000; Tulip Hill seine, 3,835,000; Moxley Point seine, 1,078,000; gill-net fishermen, 17,223,000.

The weather of the preceding winter and of the spring months of 1890 was unusually mild, effecting no advancement in the spawning period of the shad, but probably accounting for the abnormal presence of large numbers of young shad, alewives, and sturgeon in the upper waters of the Potomac. Several schools of fingerling shad and alewives were hauled nearly ashore at different times by the seines at Fort Washington and Moxley Point. Many sturgeon, 12 to 18 inches long, were daily captured by the Fort Washington seine. The water temperature April 15 was 57° F.; April 30, 60°; May 15, 68°.

The equipment of this station was improved by the introduction of a larger steam boiler and pump, which were obtained by transfer from other stations, and a larger water tank.

1890–91.

The production of shad eggs during the season, April 21 to May 17, 1891, was, by measurement thirty-six hours subsequent to fertilization, 32,544,000. These were forwarded on trays to Central Station, except 183,000 retained for hatching, producing 170,000 fry, which were released in the Potomac River. For two months preceding the commencement of operations there were continuous freshets in the Potomac, culminating March 28 in an extreme flood which overflowed the Fort Washington wharf and freshened the water in the lower river to such an extent as to destroy thousands of acres of oyster beds. Upon the cessation of freshets the water became clear, as in the previous year, and being held at a low temperature by the prevailing cold weather, the conditions favored the spawning of the shad in the wide waters many miles below the station. In the vicinity of Fort Washington all fishing by daylight was unremunerative, as on the Susquehanna River, the catch being but two-fifths to one-half that of ordinary seasons. The operations of three of the best egg-yielding seines and many gill nets were suspended

on May 15, thus terminating the collecting season. The eggs collected amounted to only 57 per cent of the average of the four preceding seasons. The water temperature at the station differed from previous years, becoming lower instead of higher as the season advanced. On April 22 to 26 it was 66.6° F.; May 1 to 5, 66.2°; May 9 to 13, 64.8°.

The following is a statement of the egg yield from the operation of the Fort Washington seine and the shad catch during the years 1887 to 1891, inclusive:

Catch for 7 days ending—	1887.	1888.	1889.	1890.	1891.
April 13	83	382	484	873	.....
April 20	1,600	485	929	1,484	939
April 27	778	1,536	1,904	1,031	1,254
May 4	2,270	2,898	150	796	714
May 11	2,053	3,196	1,614	191	211
May 18	2,817	984	1,070	231	20
May 25	747	1,107	66	.....	.....
June 2	.....	624	.....	.....	.....
Total catch	10,348	11,212	6,217	4,606	3,138
Seine production of eggs for the year	20,956,000	22,657,000	17,738,000	10,262,000	5,276,000

For the removal of loose stone which obstructed the hauling of the Fort Washington seine an 8-foot beam trawl, in connection with the seine capstans, was successfully employed. A useful fixture for removing the fish scales from the eggs was also devised and put into practical operation. This consisted of two 18-inch flared tin pans with handles, one nesting within the other, 2 inches of the bottom of the interior one being evenly cut off and covered with quarter-inch stretched twine netting. It was operated by filling the lower pan with water above the netting, and gently ladling in 2 or 3 gallons of eggs, when they would drop through the meshes, leaving the scales behind.

An advance was made in transferring the eggs to Washington, by changing the time of shipment from evening to early morning, by which the afternoon heat was avoided.

CENTRAL STATION, WASHINGTON, D. C. (S. G. WORTH, SUPERINTENDENT).

1889-90.

The scope of work of this station has continued as in previous years. The operations in hatching were as follows:

Species.	Received from—	Number of eggs.	Number of fry hatched.
Brook trout	Northville Station	37,500	30,500
Whitefish	Sandusky Station	5,000,000	4,400,000
Landlocked salmon	Schoodic Station	30,000	18,200
Shad	Fort Washington Station	31,220,000	23,493,000
Yellow perch	Central Station	956,000	754,000
Total	.....	.....	28,695,700

In addition to the receipt and preparation of fingerling fish for distribution, there were received and distributed the following eggs: 2,500 of the brook trout, from Northville Station; 80,000 of the rainbow trout from Wytheville Station, which were repacked and forwarded to France, England, Germany, and Belgium; 3,226,000 eggs of the shad, which were partially developed and then transferred to the cars for completion of hatching en route to the places of planting.

The following table exhibits the distribution of fingerling fish:

Species.	Received from—	Number.
Carp	Fish ponds, Washington	28,700
Do	Wytheville Station	1,078
Goldfish	Fish ponds, Washington	15,972
Tench	do	24
Golden ide	do	19
Rainbow trout	Wytheville Station	1,582
Rock bass	do	1,511
Black bass	Quincy Station	1,219
Crappie	do	1,000
Spotted catfish	do	80
Yellow perch	do	375
Total		51,560

The hatching of the yellow perch was of an experimental character. Details will be found in the Bulletin of the U. S. Fish Commission for 1890, pages 331–334.

The following are the mean temperatures of the city hydrant water used at the station by months:

1889.	° Fahr.	1890.	° Fahr.
July	75	January	45
August	75	February	43
September	70	March	45
October	62	April	55
November	52	May	64
December	45	June	74

1890–91.

The hatching work proper at this station was as follows:

Species.	Received from—	Eggs.	Number of fry hatched.
Rainbow trout	Wytheville Station	25,000	11,080
Brook trout	Northville Station	25,000	20,700
Lake trout	do	100,000	87,500
Von Behr trout	do	28,000	16,400
Whitefish	do	1,122,000	722,000
Landlocked salmon	Schoodic Station	30,000	25,200
Smelt	Cold Spring Harbor Station	1,000,000	400,000
Shad	Fort Washington Station	18,800,000	14,972,000
Total fry hatched			16,255,780

There were received from Wytheville Station and forwarded to England, Germany, and Switzerland, 75,000 eggs of the rainbow trout; from the Northville Station, 20,000 Von Behr trout eggs, which were transferred to the Wytheville Station, and 2,878,000 whitefish eggs, which were transferred to one of the cars for hatching en route to Sackets Harbor, for stocking Lake Ontario. In addition, 8,140,000 shad eggs from Fort Washington Station were turned over to cars Nos. 2 and 3 for hatching en route to places of deposit.

The fingerling fish received and forwarded were as follows:

Species.	Received from.	Number.
Carp	Fish ponds, Washington, D. C	331,391
Goldfish	do	18,493
Tench	do	5,156
Rainbow trout	Wytheville Station	12,166
Rock bass	do	1,560
Black bass	Quincy Station	262
Crappie	do	170
Sunfish	do	135
Rock bass	do	59
Yellow perch	do	6
Pike	do	4
Rainbow trout	Northville Station	266
Brook trout	do	50
Goldfish	Neosho Station	2,077
Total		371,795

An account of the operations of the Aquaria at Central Station will be found on pages 54 and 55.

FISH PONDS, WASHINGTON, D. C. (R. HESSEL, SUPERINTENDENT).

1889-90.

On May 31 and June 1, 1889, the station was completely submerged by a disastrous freshet in the Potomac River, and nearly all the fish in the ponds escaped.

In November the ponds were drawn, and the fish of fingerling size available for distribution were as follows: Leather carp, 29,450; scale carp, 1,029; blue leather carp, 167; blue scale carp, 70; tench, 25; golden ide, 20; goldfish, 15,415.

On April 25 and May 5, 1890, 2,144,000 shad fry were received from Central Station and placed in the west pond for rearing.

Much care and expense was involved in repairing the damage resulting from the June overflow, and in eliminating the river fish and objectionable water plants that found unavoidable lodgment in the ponds on that occasion.

1890-91.

The ponds were drawn in October and November, 1890. The fish produced, by actual count, were: Scale carp, 50,000; leather carp, 290,000; blue leather carp, 503; blue mirror carp, 490; blue scale carp, 1,129; tench, 1,678; golden ide, 12; goldfish, 23,100.

In addition to these, a conservative estimate gave 800,000 young shad, averaging 3 to 5 inches in length, as the product of the fry placed in the ponds the previous spring. In view of the success met with, a further planting of 2,054,000 fry was made from Central Station in April, 1891.

WYTHEVILLE STATION, VIRGINIA (GEORGE A. SEAGLE, SUPERINTENDENT).

1889-90.

The tenure of the station has continued as in previous years under lease from the State of Virginia. The work embraced the propagation of the rainbow, brook, and Von Behr trouts, the black bass, rock bass, carp, and goldfish.

Of the rainbow trout there were obtained from brood fish held at the station 310,000 eggs. Of these, 158,000 were distributed to other hatcheries, as noted in the details of distribution, and from the remainder were produced 61,000 fry, which were held at the station for rearing, being reduced by July 1, 1890, to 43,960. The period of egg-taking was from November 28, 1889, to the end of the following March. The distribution of rainbows reared from the take of the previous season was begun on September 18, 1889, continuing till the close of the following March. The output was 38,796 yearlings and 480 adults. There were also distributed 900 yearling and 245 adult brook trout, and 230 Von Behr trout. The adult fish of these varieties were from three to four years old.

Fish of a summer's growth produced for distribution were: 3,484 rock bass, 2,330 carp, and 1,535 goldfish. Supplies of black bass and rock bass for brood fish were obtained from Wolf and Reed creeks in the vicinity of the station. Of the pond fish, the goldfish spawned early in April and the black bass and rock bass a month later. The first goldfish hatched in ten days and the first carp in fourteen days.

1890-91.

The spawning of the rainbow trout commenced November 10, 1890, and by March 4, 1891, there was a yield of 400,000 eggs. Of these, 195,000 were transferred to other hatcheries, and the remainder retained at the station for hatching and rearing, the survivors on July 1, 1890, being 60,000. The distribution of yearlings was commenced in the fall, and 37,990 were consigned to applicants in Virginia and adjoining States.

The fingerling fish derived from the ponds comprised 810 black bass, 4,427 rock bass, 6,931 carp, and 1,911 goldfish. A consignment of 75 adult black-spotted trout was received June 9, 1890, from the Leadville Station. Owing to injuries received in transit, only twenty of them survived the heat of the first summer, but these were in good condition July 1, 1891. A shipment of 5,000 eggs of this species arriving July 29, 1890, from the same station, hatched immediately, about one-half of the fry dying during the first week. The remainder were further reduced in numbers by the escape of some from the ponds, but several hundred were preserved in good condition.

There was the usual lack of success with brook trout. Twenty thousand eggs arriving from the Northville Station January 18, 1891, immediately hatched; 7,600 fry died in the troughs by March 1, and the remainder soon after perished in the ponds.

Unfavorable results also attended the handling of Von Behr trout eggs and fry. Of a consignment of 20,000 eggs from the Northville Station, received February 2, 1891, many were found either hatched or dead on arrival. A second consignment of 20,000 arrived in good condition February 20, 1891, but they underwent 20 per cent loss in hatching, and the fry perished, though apparently healthy—a portion in the troughs and the remainder in the ponds subsequent to transfer, April 9. Muddy water during the hatching season and the presence of lime in the station water supply are supposed to have been the obstacles to successful operations with this species and the brook trout.

Sandusky Station, Ohio (Henry Douglas, Superintendent).

1889-90.

The agreement with the Ohio State Fish Commission, under which the operation of its hatchery at Sandusky was conducted by this Commission, was renewed.

Eggs of the whitefish and pike perch were obtained from islands in the western part of Lake Erie, and from Port Clinton and Toledo. Those of the whitefish were collected during the month of November, 1889, to the number of 62,100,000. Of these, 10,000,000 were shipped to the Pennsylvania hatchery at Erie; 6,000,000 to the Wisconsin State fish commissioners; and 6,000,000 to Central Station, Washington, D. C. The remainder were hatched at the station, producing 30,628,000, all of which were liberated in Lake Erie except 100,000, sent to Warren, Ind., at the request of the Indiana State Fish Commission.

Pike-perch operations covered the period between April 12 and 26, 1890, during which 81,000,000 eggs were obtained. Of these the Pennsylvania hatchery at Erie was given a consignment of 18,000,000 and the New York Fish Commission 1,000,000. From the remainder, 36,200,000 fry were produced and liberated the first week in May.

PUT-IN BAY STATION, OHIO (J. J. STRANAHAN, SUPERINTENDENT).

The sundry civil bill approved March 2, 1889, provided $20,000 "for the purpose of establishing and equipping a station at some convenient point on Lake Erie, to be designated by the Commissioner of Fish and Fisheries, for taking spawn and the propagation of whitefish." An examination and consideration of the facilities offered by the different places contiguous to the spawning-grounds of the whitefish demonstrated the advisability of establishing the station at Put-in Bay, Ohio. Through the efforts of Mr. Valentine Doller, of Put-in Bay, the citizens of that place donated to the United States a site on the south shore of Peach Point, and containing about three-fourths of an acre. On August 31, 1889, the Attorney-General certified to the sufficiency of the deeds given to vest a valid title to the property in the United States. Cession of jurisdiction over the property having been given by an act of the legislature of Ohio, passed April 10, 1889, and the plans and specifications for the required hatchery having been prepared pending the examination of the title, advertisement calling for proposals to construct the same was made September 6. The lowest bid received in response thereto was that of Mr. George E. Gascoyne, of Put-in Bay, with whom a contract was entered into on October 12. For the erection of the necessary steam and water plant, a contract was made with Messrs. Shaw, Kendall & Co., of Toledo, Ohio, on March 11, 1890. The erection of the hatchery was completed on August 11, 1890, and on September 16 the machinery was ready for use.

The act approved September 30, 1890, provided an appropriation of $10,000 for the completion of the equipment of the station, including the purchase of a steam launch for use in the collection of the eggs of the whitefish. Plans and specifications for this vessel were prepared by the chief engineer of the Commission, Mr. W. B. Bayley, U. S. N., and after due advertisement for proposals for her construction, a contract was made with the Craig Ship Building Company, of Toledo, Ohio.

1890–91.

On July 1, 1890, Mr. J. J. Stranahan was appointed superintendent of the station. On November 5 active measures in the propagation of whitefish were begun; 157,500,000 eggs were obtained from local fishermen; 200,000 were received from the Commission's station at Alpena. Of the eggs collected, 47,500,000 were transferred to the Ohio State hatchery, Sandusky, Ohio; 10,000,000 to the Wisconsin commissioners; 14,000,000 to the Erie station of the Pennsylvania Fish Commission; and 125,000 to Mr. Carl G. Thompson, at Warren, Ind. From the eggs retained, 10,000,000 fry were produced and placed in Lake Erie. The hatching occurred in March, 1891, and the fry were liberated toward the end of that month.

About 150,000 whitefish eggs were fertilized with the product of male lake herring, the result being a fair percentage of hybrids. Late in the

season a small number of herring eggs were secured and impregnated, these producing a small percentage of fry.

On February 11, 1891, 200,000 lake trout eggs were received from the Northville Station, and produced 192,000 fry, which were liberated about the end of March, at points in the lake in the vicinity of the station.

The collection of pike perch eggs was begun April 14, 1891, they too being taken by the fishermen; 149,000,000 eggs were obtained, of which 58,000,000 were sent to the Erie hatchery of the Pennsylvania Fish Commission. In the collection of these Mr. William Buller, superintendent of the Erie hatchery, rendered active assistance. The eggs held at the station produced 60,000,000 fry, which were liberated in the lake prior to May 20, 1891, the season's operations in fish-culture terminating with their release. Experiments were made with the pike perch eggs looking to the separation of those that mass in lumps. The method pursued consisted in detaching the lumps from the eggs already free, by means of a screen. The lumps were then rubbed between the palms of the hands, separating the eggs. It was found that eggs so treated hatched with no greater loss than those naturally free. Attempts to hatch the eggs when in lumps, however, resulted in almost total loss.

NORTHVILLE STATION, MICHIGAN (FRANK N. CLARK, SUPERINTENDENT).

1889-90.

Whitefish.—The collection of whitefish eggs for this station was limited to Lake Erie, 10,000,000 being derived from the vicinity of Monroe and 25,000,000 from Sandusky. These were carefully prepared for shipment and distributed to other hatcheries for hatching. The disposition of the good eggs, 28,460,000, is given in the details of distribution.

The success heretofore attending the partial trial of graveled troughs, as practiced during the three preceding seasons in developing trout eggs, led to the adaptation of the method to all the trout eggs handled at the station, and with results highly gratifying. This consisted in spreading as evenly as possible 10,000 to 12,000 eggs over a space of gravel bottom 12 by 15 inches. The eggs were allowed to remain on the gravel until the eye spots were clearly developed (a period of about forty days), being then taken up and placed on wire trays for hatching.

Von Behr trout.—The readiness with which the Von Behr trout has become acclimated, together with its hardiness and rapid growth, has greatly encouraged its further propagation. From the brood stock 163,400 eggs were obtained, of which 58,000 were transferred and 75,000 held for hatching at the station. The spawning season began October 21, 1889, and continued seventy-three days. From 75 females, 3 and 4 years old, the production of eggs was 85,700, and from 239 females, 2 years old, 77,700. Of this species brought over from the previous season, there were 6,175 yearlings delivered for distribution.

Brook trout.—The spawning of the brook trout covered a period of eighty-five days, commencing October 14, 1889, the number of eggs obtained being 322,000. In addition to these there was a consignment of 25,000, received January 25 from the Leadville Station. The eggs from brood fish were derived as follows: From 478 females 2 and 3 years old, 269,300; and from 224 others 18 months old, 52,700. These were transferred in ten shipments 265,000 eggs. In addition to these, 75,000 were retained at the station, of which 25,000 were for stocking the waters of the Yellowstone National Park. The inconsiderable loss in hatching operations is ascribed to the development of the eggs in the earlier stages on gravel. Of brook trout yearlings, 7,800 were delivered for liberation in various waters.

Loch Leven trout.—From 300 females maintained at the station 291,100 eggs were obtained October 25 to December 30, 1889. Commencing January 20, and continuing thirty-five days, 162,000 of these eggs were transferred, and 75,000 others were held for rearing. A consignment of 13,000 eggs was received from Germany on March 11, 1890, but these developed only about 25 per cent of fry. The distribution of yearlings commenced September 17, 1889, 10,000 being liberated.

Lake trout.—The eggs taken amounted to 3,954,000, an excess of 600,000 over any previous season. The transfers from these eggs amounted to 2,600,000, and 200,000 were held to be hatched. Of those transferred, 1,000,000 were sent to Duluth Station; of those retained, 100,000 were held for the Yellowstone National Park. In February, 1890, 13,132 yearlings were turned over to car messengers for liberation.

Rainbow trout.—Results with the rainbow trout, as in preceding years, were unsatisfactory. From 2,500 brood fish, one-fifth of which were 3 and 4 years of age and the remainder 2 years of age, only 119,000 eggs were secured, and of these only 52,600 survived to the age when the eye spots are visible. 12,500 eggs were sent to the Wyoming Fish Commission, and from the remainder only 5,000 fry were produced. 19,143 yearlings were distributed through the messenger service.

Landlocked salmon.—A consignment of eggs from Schoodic Station, received February 28, 1890, was wholly without results.

1890–91.

This station, one of the first established by the Commission, and at which the work of the propagation of whitefish on the Great Lakes was inaugurated, has for many years been occupied under rental. The company owning the property having decided to sell the same, the Commission was given the opportunity to buy it. In view of its advantages, Congress was asked to make the necessary provision for its purchase. This request was met by an item in the sundry civil bill, approved August 30, 1890, appropriating $15,000 "for the purchase of the grounds and buildings located at Northville, Mich., now occupied by the U. S. Fish Commission, under lease as a fish-hatching

station, and for the purchase of additional grounds adjacent to those now occupied and used as such fish-hatching station." An appropriation of $5,000 was also made by the same bill for the erection of new buildings on the property. Deeds transferring the property already under lease and the additional adjacent grounds deemed necessary for the station, as also the right of way over contiguous lands for a pipe line and the control of certain water rights, were passed in February, 1891. These were referred to the Attorney-General, and toward the end of the following month was received his certification as to their sufficiency to vest in the United States a valid title to the property. The houses on the property being sufficient for the immediate needs of the station, it was the intention of the Commissioner to proceed at once with the construction of additional ponds, the introduction of an increased water supply, etc., to meet the expense of which the appropriation of $5,000 for new buildings was supposed to be applicable. The First Comptroller of the Treasury, however, deciding that the money could be expended only for new buildings, as defined in common parlance, the work had to be deferred till Congress could be asked to modify the phraseology of the appropriation so as to permit its use in the way desired.

The brood fish on hand at the commencement of the fiscal year were found to be as follows: Brook trout, 945; Loch Leven trout, 4,545; Von Behr trout, 2,075; rainbow trout, 4,053.

Whitefish.—The propagation of the whitefish at this station was discontinued and an expansion of the work made at Duluth and Put-in Bay stations. This permits the application of all available water supply and space to the hatching and rearing of trout, and will obviate the necessity, by reason of insufficient space for their care, of liberating the fingerlings in advance of the regular season of distribution.

Von Behr trout.—Eggs were taken during sixty-five days following October 24, 1890, and numbered 324,900, of which 226,000 were transferred. The fingerlings and yearlings furnished for distribution were 18,655. There were received from Germany, through the Cold Spring Harbor Station, in February and March, two consignments of eggs of this species aggregating 31,000.

Brook trout.—Eggs were taken through a period of seventy-three days following October 7, 1890, the number obtained being 240,200, of which 110,000 were transferred to other hatcheries. Fingerling and yearling brook trout to the number of 16,795 were furnished for liberation, commencing September, 1890.

Loch Leven trout.—The collection of eggs of this species continued during the months of November and December, 1890, the number obtained being 222,200, of which 80,000 were transferred. Fingerlings and yearlings furnished for distribution numbered 14,775.

Lake trout.—Eggs to the number of 4,901,000 were forwarded from the Alpena Station, the production being greater by 1,000,000 than in any previous year. To stations of the Commission, State commission-

ers, and foreign countries, 2,285,000 of these eggs were reshipped, and from the remainder were produced 1,200,000 fry. In April, 1891, more than 600,000 fry were liberated in inland lakes of Michigan, 513,000 being held for rearing. The number of lake trout fingerlings and yearlings distributed from August 1, 1890, to May 18, 1891, amounted to 187,805, an increase of 100 per cent over previous seasons.

Rainbow trout.—The rainbow trout heretofore used as breeders were transferred, the water at the station having been found but poorly adapted to this species.

Landlocked salmon.—A shipment of 26,000 landlocked salmon eggs from Schoodic Station produced no results, all the fry perishing.

ALPENA STATION, MICHIGAN (FRANK N. CLARK, SUPERINTENDENT).

1889-90.

The collections of the lake trout eggs which were handled at Northville Station this year were made principally through Alpena Station.

The collection of whitefish eggs began November 5, and continued into December, lakes Huron and Michigan affording about 43,000,000; about 40 per cent of the spawning fish were obtained from gill nets. Snowstorms and gales were encountered as usual in this work.

The production of fry was 33,600,000, which were mainly liberated in lakes Michigan and Huron. On account of the mild winter the eggs were fifteen to twenty days earlier in hatching. The temperature of the water in November was 38½° F. During the four months preceding April 2 the water temperature varied but one degree from 34° F. On April 8 the temperature was 38°; April 30, 42°; April 15, 52°.

1890-91.

The whitefish eggs collected this season were mainly from Lake Huron, in the vicinity of the station. The taking of spawn began October 4 and was concluded December 6, 1890, the result being nearly 51,000,000, of which about one-third were from fish taken in gill nets. Most of the eggs were from the first run of fish, the greater portion being obtained within a period of eight days. There were transferred to other stations 20,500,000. Hatching occurred April 10 to 30, 1891, and fry to the number of 24,060,000 were liberated during April and the early part of May.

The collection of lake trout eggs commenced September 23, 1890, in the vicinity of Beaver Islands, the entire number, nearly 5,000,000, being forwarded to Northville Station.

The water temperature September 30 was 60° F.; October 31, 45°; during three months following November 30 it was 32½° to 33°; during March, 34°; on April 15, 36°; on May 5, 46°.

The immediate supervision of the station has been under Mr. S. P. Wires, foreman.

DULUTH STATION, MINNESOTA (R. O. SWEENY, SR., SUPERINTENDENT).

1889-90.

Operations consisted principally in developing eggs transferred from other stations, though a number of pike perch eggs were collected.

Whitefish.—About 26,250,000 whitefish eggs, in seven consignments of two cases each, received from Northville Station January 4 to 31, 1890, produced 24,850,000 fry. Some of the eggs hatched prematurely, owing to the high temperature attained during their transfer, resulting in the release of about 7,000,000 fry from January to March, inclusive, in advance of the normal hatching, which commenced about April 15. The fry were placed in Lake Superior, off the mouth of Lester River.

Brook trout.—Eggs to the number of 30,000, received from Northville February 3, 1890, began to hatch March 21, and 27,000 fry were released June 12, in Baptism River; 1,000 fry were held over to the succeeding fiscal year for further rearing.

Lake trout.—1,000,000 eggs received from Northville January 5, 1890, in four cases, produced 935,000 fry; of these, 400,000 of premature hatching were liberated in Lake Superior in April. There were also 300,000 released in June. The balance were held for further rearing. The normal hatching of the eggs commenced March 21.

Loch Leven trout.—There were 12,000 Loch Leven trout eggs received from Northville February 27, and from these 11,000 fry were on hand, in rearing troughs, June 30, 1890.

Von Behr trout.—Eggs to the number of 8,000 were received from Northville February 27. The fry produced therefrom, and on hand June 30, 1890, amounted to 7,280. A consignment of eggs from Cold Spring Harbor, New York, was without result, they being dead on arrival.

Landlocked salmon.—There were 48,000 landlocked salmon on hand in troughs and rearing ponds June 30, 1890, which were the product of 60,000 eggs received from Schoodic Station in March.

Pike perch.—On May 5, 1890, 600,000 pike perch eggs were collected, the fry produced therefrom amounting to 580,000, which were released May 9 to 25, at the mouth of Lester River.

The water temperature, after remaining at 32° F. for four months, rose to 34° April 10, 1890, the mean morning temperature during April being $34\frac{1}{16}$°, and during May $45\frac{2}{3}$°. In February the mean air temperature was $12\frac{1}{2}$°, maximum 40°, and minimum 16° below zero.

1890-91.

During this year many improvements were made looking to the completion of the station. In consequence of the denudation of the land areas along Lester River (caused by disastrous forest fires, the operations of lumbermen, and the clearing incident to the suburban growth of the city of Duluth) it was found that the gravity supply of water to the hatchery from that stream could no longer be relied upon. When the hard freezing weather occurred the stream was dried up, and the lake was drawn upon, water being obtained by pumping.

Whitefish.—On February 6, 1891, 12,000,000 eggs were received from the Alpena Station, and hatched April 15 to May 19 following, the product in fry being 11,330,000.

Lake trout.—There were also received from Northville 500,000 lake trout eggs, which produced 486,000 fry, a part being liberated April 28 to June 30, and 128,000 being retained for rearing.

Von Behr trout.—15,000 Von Behr trout were produced from 20,000 eggs received from Northville, the fry being released in Baptism River and other local waters, in June, 1891, except 400, which were retained.

Landlocked salmon.—50,000 eggs from Schoodic Station produced 30,000 healthy fry, which were retained for rearing.

Pike perch.—On April 29, 1891, 47,000,000 pike perch eggs were collected by the station employés at Fond du Lac, a point 30 miles distant. There were 12,000,000 of the fertilized eggs placed overboard at the spawning-grounds, and 35,000,000 put in process of hatching, the universal jar being used in their development. The fry obtained amounted to 10,100,000, which were liberated May 15 to 23.

Carp.—610 carp were distributed, these being the survivors of a shipment of 1,000 received from Washington, D. C.

Of fingerling fish, brought over from the spring of 1890, there were released in local waters 100 brook trout, 20,000 landlocked salmon, and 235,000 lake trout.

The first rainfall of 1891 at this station occurred April 10, when the water again commenced to flow through the flume from Lester River. The general thaw setting in at this time furnished an abundance of water by gravity, which, however, was turbid and unsatisfactory. The temperature of the Lester River water in October was 40⅔° F., and in November, 32° without variation. In July, 1891, it reached a maximum of 75°, the minimum being 69°.

QUINCY STATION, ILLINOIS (S. P. BARTLETT, SUPERINTENDENT).

The work of collecting and distributing the native food-fishes of the Mississippi Basin from the overflow ponds and lakes formed during the seasons of high water, inaugurated in the summer of 1888, was continued during the period covered by this report. The kinds and number of fishes collected during the two years were as follows:

Kinds.	Season of 1889–90.	Season of 1890–91.
Catfish	11,110	
Buffalo	2,215	
Brook pike	70	
Perch	16,323	9,958
Fresh-water drum	200	
Pike perch	1,000	4
White bass	10,604	
Black bass	63,145	44,405
Crappie	18,575	21,901
Rock bass	2,854	10,802
Sunfish	6,973	2,435
Total	133,075	89,505

NEOSHO STATION, MISSOURI (WILLIAM F. PAGE, SUPERINTENDENT).

As stated in the report for the year 1889, the early work at the Neosho Station was confined to the laying out of the grounds and their inclosure, the building of the necessary ponds, and the introduction of the water supply. In October, 1889, was begun the construction of the hatching house, a one-story building, 19 by 37 feet, with a two-story tower, 13 feet square, on the northeast corner. Owing to the desirability of getting the station ready for active work at an early date, the building was erected by the purchase of the necessary materials and the employment of temporary labor, instead of under contract. An appropriation of $4,000 having been made by Congress on September 30, 1890, for the completion of the station and its equipment, plans and specifications were prepared for a dwelling for the superintendent of the station and for a hatchery annex, containing an ice-house and workshops, and in February, 1891, advertisement was made calling for proposals for their construction. Contracts were awarded to the lowest bidders, that for the superintendent's dwelling being given to Mr. James T. Broughal, of Joplin, Mo., at $3,790, and that for the hatchery annex to Mr. James Robinson, of Neosho, at $890. Work on these buildings was begun in April, and at the end of the year they were rapidly nearing completion. The appropriation of $4,000, above referred to, proving insufficient for the purpose, a further appropriation of $1,000 was made by Congress by act approved March 3, 1891.

1889-90.

October, 1889, marked the commencement of fish-cultural operations at this station, 600 black bass, for breeding purposes, being received at that time from Quincy, Ill. There were received at the same time a number of crappie, which failed to thrive, and others were obtained from Indian Territory. In December, 1889, 42 carp of a summer's growth were received from Washington, D. C. Such rapid growth followed their introduction into the ponds that they spawned twice during the next summer. Other breeding fishes introduced were the tench, golden ide, and goldfish, which were derived from other stations, and channel catfish obtained from the Grand River, Indian Territory.

The fry from 25,000 lake trout eggs received from Northville Station in January, 1890, were attacked by a disease which was accompanied by a white spot in the yolk sack. Only 750 of the young survived, but these were healthy.

A consignment of 25,000 brook trout eggs from Northville Station January 16 arrived in good condition, but the fry perished during the absorption of the yolk sack, being affected in the same manner as the lake trout fry.

About 12,000 Von Behr trout fry of inferior quality were obtained from 20,000 eggs received from Northville Station February 11.

With the rainbow trout better results were secured, more than 22,000 fry being on hand June 30, 1890, as the product of 25,000 eggs received from Wytheville February 12.

The earliest observed spawning date of the goldfish was March 12; of the carp, May 5; of the tench, May 23.

Predatory birds and other animals were very numerous, and many were destroyed.

1890-91.

The fish available for distribution in October, 1890, consisted of the production of the previous fiscal year. These numbered 63,570, and were as follows: Rainbow trout, 21,051; Von Behr trout, 11,937; lake trout, 506; rock bass, 1,380; carp, 1,782; tench, 9,907; goldfish, 17,007.

The black bass commenced building their nests in the ponds toward the end of March, 1891, and more than fifty were observed. By June 30, 1891, many of the young had attained a length of 1½ inches.

Crappie, carp, tench, golden ide, rock bass, and goldfish, as well as the black bass, reproduced by natural methods, in the ponds, the young being retained there until the season for distribution in the subsèquent fall months. An addition of 23 brood crappie was obtained through the Missouri fish commissioners.

During cold weather it was observed that the carp and tench in the ponds remained active, the channel catfish, however, being dormant.

The golden ide received as fingerlings in December, 1889, made such rapid growth that they were of an average length of 18 inches by June 30, 1891. They were at first very wild, but were rendered gentle by the methods used in their feeding.

The rock bass held as stock fish commenced spawning April 21, 1891, a chain of nests being formed around the margin of the pond in water 4 to 6 inches deep. The nests were oblong hollows, the size of a hat crown, and were covered with coarse gravel. There were 1,500 to 1,800 eggs in each, of a deep straw color, somewhat smaller than shad eggs, and slightly adhesive, though not in lumps. The nests were closely guarded by the male parents, the period of hatching being eight to ten days.

A thousand rainbow trout, hatched in the spring of 1890, were retained as brood fish and have made rapid growth.

On January 17, 1891, 17,400 rainbow trout eggs were received from Wytheville Station, which afforded more than 13,000 fry for transfer to the rearing ponds.

A consignment of 17,000 brook trout eggs arrived from Northville Station January 25, 1891. The fry from these underwent a loss while in the yolk stage, as in the preceding year, but on April 1 more than 11,000 remained on hand for rearing. By June 1 some of them were 3 inches long.

A consignment of 19,000 Von Behr trout eggs, received from Northville February 5, 1891, produced satisfactorily, there being more than 17,000 fry on hand April 1. A second consignment of 6,900 eggs from the same source also produced well, there being 5,500 fry on hand May 11. These, in addition to the 17,000, were retained for rearing.

Vigilance was required to protect the stock of fish against predatory animals, and during the year there were killed 168 birds, 21 mammals, and 98 reptiles, not including frogs.

In addition to the constructions provided under the specific appropriations before mentioned, there was built, for the use of the Commission's distributing cars, a siding from the Kansas City, Fort Smith and Southern Railway. A connection was also made with the water main of Neosho for supplying the station, as well as the distribution cars while occupying the railway siding.

LEADVILLE STATION, COLORADO (E. M. ROBINSON AND H. D. DEAN, SUPERINTENDENTS).

In the report for 1888 mention was made of the location of a station near Leadville, Colo., for the breeding and rearing of trout, and of the appropriation by Congress of $15,000 for the necessary constructions. As soon as this sum became available, July 1, 1889, plans and specifications for a fish-hatchery were prepared and proposals for its erection invited by advertisement. But one bid being received, and that for a sum greater than the appropriation, a second call was made, resulting in the receipt of three bids, the lowest being that of Mr. L. G. Hunt, of Pueblo, Colo., at $12,672. This was accepted, and on October 14, 1889, formal contract for the construction of the building was made. Work was immediately begun, but owing to many causes, chiefly bad weather and roads, the building was not completed till October, 1890, final acceptance of the structure not being given till November 1.

In view of the failure to receive suitable proposals in response to the first call, and the delay that would ensue before new proposals could be obtained and the contract let, which would have resulted in the loss of a year's time in the active work of propagation, it was decided to erect a frame building which could be used as a temporary hatchery and afterward as a rearing-house for fry. A box flume, some 740 feet in length, was laid to bring, by gravity, from springs on the hillside, a supply of water to the hatchery. Active work was commenced on September 9, 1889, and the structure was ready for the reception of eggs about the middle of October. In the meantime, by permission of the owner, Dr. John Law, 8,000 brook trout were taken from the Evergreen Lakes and held in ponds till ready to spawn. From these fish 568,000 eggs were obtained and placed in troughs in the temporary hatchery. The erection of this temporary hatchery was under the general direction of Mr. John Gay, inspector of stations, assisted by Mr. William

P. Sauerhoff, an expert carpenter, who had had many years' experience in the fish-cultural work of the Commission. On September 21, Mr. E. M. Robinson, for a number of years connected with the Commission, and who had been in charge of fish-cultural work at several of its stations, was appointed superintendent.

An additional appropriation of $20,000 having been made August 30, 1890, for the completion and equipment of the station, plans and specifications were prepared for a superintendent's dwelling and stable. After due advertisement, contracts were made in May, 1891, at $5,887.93 for the dwelling, with Messrs. Baldwin & Chronister, and at $1,820 for the stable and wagon house, with Mr. W. W. Cable, both contractors doing business in Leadville. The supervision of the work of construction was placed in charge of Mr. George H. Tolbert, under the general direction of Mr. H. D. Dean, who was appointed superintendent on April 15, 1891, succeeding Mr. Robinson, who had resigned to take charge of a private fish-cultural establishment.

1889-90.

The period of active fish-cultural operations extended from November, 1889, to June 30, 1890, the collection of eggs being 568,000 of the brook trout previously referred to, and 12,000 of the black-spotted trout. In addition to these there were 25,000 brook trout eggs and 20,000 Loch Leven trout eggs forwarded from the Northville Station.

The distribution of brook trout eggs included 50,000 to Fort Gaston Station, California, and 25,000 to Northville Station, Michigan. The remainder of the eggs were retained for hatching and rearing, with the exception of 126,800 fry, which were given to Dr. John Law, in exchange for the use of his stock fish.

There were collected from Twin Lakes 1,014 black-spotted trout for breeding purposes, and from Rock Creek, 32; 100 of these were forwarded to Wytheville Station. From Rock Creek there were collected 58 brook trout.

1890-91.

The eggs obtained this year from the stock brook trout of Dr. John Law amounted to 180,000. They were of the later yield, and defective in fertilization, as a result of the scarcity of milt. From these a shipment of 5,000 was made to the Wyoming Fish Commission, at Laramie. The eggs retained hatched at different times, and a high mortality occurred among the fry as a result of cannibalism. The number remaining on hand May 1, 1891, was but 41,000.

In addition to the eggs taken by the station, 20,000 brook trout eggs were obtained from Caledonia, N. Y., January 31, 1891. On May 1 the fry from these amounted to 14,000.

A consignment of 100,000 eggs of Von Behr trout was presented by the New York Fish Commission, the young therefrom being 68,000 on May 1.

On June 30, 1891, in addition to the fish already mentioned, there were on hand the following: 149 brook trout, 1,000 black-spotted trout, and 5 rainbow trout, all breeders; of yearlings, 19,000 brook trout, 700 black-spotted trout, and 500 Loch Leven trout. Of the black-spotted trout there were also 800 fry and 50,000 eggs.

The distribution of fish took place between September 16 and November 21, 1890, when 20,000 yearling trout were furnished to Nebraska, 16,000 to South Dakota, and 23,000 to Colorado waters.

The construction of the new hatchery was sufficiently advanced by January, 1891, to permit the introduction of the water supply, and about the middle of February the eggs were transferred thereto from the temporary hatchery.

The temperature of the water supply in December and January was 44° F. without variation, and in April 43° without change. During eleven days in January, 1891, the air was below zero.

BAIRD STATION, CALIFORNIA (GEORGE B. WILLIAMS, JR., SUPERINTENDENT).

1889-90.

The act approved March 2, 1889, appropriated the sum of $4,000 "for the construction of a quarters building at the U. S. Fish Commission Station, Baird, California, and its equipments." Plans and specifications were prepared for a 1½-story building 30 by 40 feet, with two 12-foot additions. Owing to the isolation of the station it was found impossible to contract for the construction of the building, and it became necessary to do the work by the purchase of materials and the employment of such men as could be secured in the vicinity. The cost of the building, including the compensation of the employés, was $3,882.58, and for its equipment and incidental expenses, $117.42.

The construction of this building was begun October, 1889, and was completed late in April, the slow progress being caused by continued rains, which prevented the prompt delivery of materials. The building is substantial and comfortable.

On July 1, 1889, preparations were begun for the capture of the adult quinnat salmon. The high water in the preceding March having destroyed the piers, stringers, and racks of the dam in the McCloud River, built for obstructing the ascent of the salmon, the erection of a practically new structure was made necessary. Two new spawning sheds and salmon corrals were built, new seining apparatus provided, the seine-haul cleaned, the roads repaired, the buildings overhauled and painted, and a rotary pump geared to a water wheel, so that a supply of 7,000 gallons of water per hour was obtained.

By driving the salmon upward from the shallows situated below the dam, and the constant use of the seine in conjunction therewith, a sufficient number of fish was secured in the first run, August 27 to Septem-

ber 26, 1889, to produce 1,105,000 eggs. The captures amounted to 1,129 males and 382 females, 252 of the latter being in spawning condition. The small production was the result of the decreased run of adults.

Of the eggs taken, 974,000 were shipped to the hatchery of the California Fish Commission at Sisson, where they were hatched and the fry released in the Sacramento River. Those retained produced 60,000 fry, which were liberated in McCloud River.

On October 7, 1889, stormy weather began and rising waters made imperative the lifting of the obstructing racks, thereby permitting the free passage and escape of the adult salmon into the head streams. Fishing for the late run was resumed October 16, but another rise in the river, five days later, submerged and washed out a portion of the dam and endangered the safety of the power wheel and buildings. Large numbers of salmon again passed on above. Receding water permitted the renewal of the dam November 5, but there were very few brood fish subject to capture remaining in the lower stream. From November 9 to 19, something over 600,000 eggs were secured. These were from a catch of 94 males and 170 females, 119 of the latter having ripe spawn. Freshets continued every month till June, 1890, the height of the water reaching 15 feet in February. On December 2 the wheel boats requiring to be dropped into an eddy for safety, the water supply was obtained by means of the steam pump.

On December 14, 1889, 125,000 eggs were forwarded to New York, for shipment to France and Norway; on December 16, 100,000 to Fort Gaston Station; and on December 17, 355,000 to the California fish commissioners at Sisson. From those retained, 24,000 fry were produced and liberated in McCloud River, 1,000 being held till March, and successfully nourished on corn-meal mush boiled with beef. The total loss on the 1,709,000 eggs taken was 71,000, or about 4 per cent.

The early run of salmon yielded their eggs in water at about 60° F., the temperature descending as low as 50° on one day; the late run spawned in a temperature ranging from 45° to 50°.

1890-91.

In consequence of damages sustained from the high water of the previous spring, it was again necessary to renew the obstructing dam and accessories. Its rebuilding was commenced July 1, 1890, native timbers, cut in May by the station employés, being utilized.

Everything was in readiness August 27, when the schools of spawning salmon arrived. Between this date and September 23, 1890, 912 fish yielded 3,652,000 eggs. Of these, 50,000 were forwarded to E. Cházari, City of Mexico, and 2,838,000 to the California fish commissioners, from September 24 to October 10, further shipments being discontinued on the receipt of a message that their hatchery was filled. The remaining eggs were developed at Baird Station, the production of fry being 582,000.

Seining for the fish of the late run was commenced November 6, 1890. The continued low water of the river, however, permitted uninterrupted fishing by cannery operators on the Sacramento River below, and only a small number escaped their nets to reach the station. The season of collecting terminated November 25, with the obtainment of 64 ripe females, which produced 263,000 eggs. Of these eggs, 100,000 were forwarded December 31, via New York, to France. The remainder were hatched at the station and produced 140,000 fry, which, with the 582,000 fry of the earlier hatching, were liberated in McCloud River and its tributary, the Pit River. The total loss of eggs at the station was 205,000, or about 5 per cent. In releasing the 722,000 fry the seine skiff was used with much advantage, the cans being placed therein and the fry put out in small numbers at various shallows in the river occurring in a distance of about 5 miles.

FORT GASTON STATION, CALIFORNIA (CAPTS. W. E. DOUGHERTY, U. S. ARMY, AND FRANK H. EDMUNDS, U. S. ARMY, IN CHARGE).

In view of the urgent and many requests received from citizens in the regions of the Rocky Mountains and the Pacific coast to stock their waters with suitable food-fishes, and the difficulties and cost attending shipments from the eastern stations of the Commission, the question of locating fish-cultural stations on the military reservations of those regions was considered, and Lieut. Commander J. J. Brice, U. S. Navy, who was employed under detail from the Navy Department, was directed to make a reconnaissance. Upon his report and recommendations the reservation at Fort Gaston, Humboldt County, Cal., was decided upon as offering the necessary requirements; and, in compliance with the request of this office, the Secretary of War, on October 16, 1889, gave instructions permitting the use of a portion of the same by the Fish Commission. The organization of the station was intrusted to Mr. Brice, who arrived at the place the latter part of November with some of the equipment. The use of a building, 32 feet by 16 feet, into which an abundant supply of pure, cold water was led by gravity, was granted by the commandant of the post, Capt. W. E. Dougherty, U. S. Army, who also undertook the general charge of the conduct of the station. Mr. W. H. Morgan, who was serving as fish-culturist at one of the eastern stations of the Commission, was assigned as foreman. Capt. Dougherty remained in charge of the work till October 1, 1890, when he was succeeded by Capt. F. H. Edmunds, U. S. Army, who had been placed in command of the post.

1889–90.

In December, 1889, 100,000 quinnat salmon eggs were received from Baird Station. These were developed in universal hatching jars and hatched from January 5 to 25, 1890. The fry commenced feeding in February, and were transferred in March to ponds, in which they remained till the end of June, when the water temperature becoming rather high they were released in Trinity River. They were about 4 inches long and were 90,000 in number.

High water in Trinity River prevented the establishment of the proposed barrier dam in advance of the upward movement of the spring run of salmon, consequently no eggs were derived from this source.

1890–91.

Dams and traps for stopping and capturing the salmon and trout were constructed both in the Trinity and Redwood rivers. On the latter stream at Redwood, a point 13 miles distant from Fort Gaston, an auxiliary station was established.

The collecting of the eggs of the quinnat and steelhead salmon was begun in November, 1889, and continued three months. A dry season caused low water in the streams, and but a comparatively small number of fish ascended to the usual spawning-grounds. At Fort Gaston there were secured 45,000 eggs, producing 40,000 fry, 30,000 of which were liberated in Supply Creek, a tributary of Trinity River, and 10,000 retained for rearing. These latter were liberated subsequent to June 30, 1891. At the auxiliary station at Redwood 30,000 salmon eggs were collected, and produced about 25,000 fry, which, at the age of 1 month, were released in Minor Creek, a tributary of Redwood River, where they remained in schools for some weeks.

During the development of the eggs the temperature of the water was 38° to 45°, and the period of incubation fifty-seven days.

There were three new rearing ponds constructed. In one of these about 200 breeding rainbow trout were held till after June 30, 1891.

A water supply independent of that of the military reservation was obtained by means of a trench which was constructed along the mountain side over a distance of about a fourth of a mile.

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

1889–90.

By July 1, 1889, many quinnat salmon had collected below the obstructing dam across Clackamas River.

The station was visited by the Commissioner September 5, 1889, when it was decided to purchase a steam pumping plant rather than attempt to rebuild the reservoir dam on Cedar Creek. Pending the introduction of the pumping machinery, which was in operating condition by

September 19, a temporary hatchery was built for the earlier take of eggs, the building being supplied with water by gravity from a small brook.

From August 19 to September 11 four slat traps were constructed, one being placed in the Clackamas dam and the others on the shallows below, at the lower end of the ripple, in the swiftest water, and in such a position that the current passed through, leaving the fish stranded. Wings were extended from the trap mouths upward at an angle, throwing nearly the entire volume of the stream through the slats. The fish were then surrounded by a seine, which, being drawn downward, forced them into the trap. Fish were also captured by means of dip nets and the seine.

The period occupied in collecting eggs was from August 28 to November 6, 1889, the production being 4,314,000 from 957 fish. The largest day's operations, September 27, yielded 208,000 eggs, the smallest day's production being 4,000. There were only two days when no eggs were taken. No record was made of the number of male fish caught; they were, however, largely in excess of the females.

Mr. Reed, of the Oregon Fish Commission, received 1,000,000 of the eggs late in October, 1889. These were hatched and released, under State supervision, at the Cascades on the Columbia River. All other eggs taken were hatched at the station, and the fry, 8 to 10 weeks old, deposited in Clackamas River and Cedar Creek. The distribution of fry extended from November 5 to April 15, 1,000,000 being conveyed 7 to 10 miles up the stream and put out in small lots in the rapids. The fry liberated amounted to 85 per cent of the eggs retained at the station.

All eggs were measured in a cup of 1,000 capacity and remeasured just prior to hatching.

On November 7 the brook had increased in volume, in consequence of rainfall, and the pumping outfit was but little used in the subsequent operations.

From January 2 to 8, 1890, there was snowfall and such cold weather that it was with difficulty the hatching troughs were prevented from filling with ice, the thermometer registering as low as zero. Another cold spell prevailed late in February, when the water in the station was down to 31° F. On February 1 the river rose 14 feet, covering to a depth of 3 inches the grounds occupied by the hatchery and quarters buildings.

1890-91.

An additional steam pump, as a reserve in case of accident, was provided. In the month of July, 1890, the obstruction rack was placed in the dam to arrest the upward passage of the adult salmon. A gate with sheerbooms, for facilitating the onward passage of drift timber on high water, was introduced into the dam. Five days were consumed in removing the saw logs, which had grounded in the seining area, but all could not be cleared out, and the strong current incident to their presence being a barrier to successful operations in hauling, it became necessary to use gill nets in the capture of the adult fish. Owing to the construction of a dam in the river below the station and the operation of nets by commercial fishermen, the ascent of a great number of fish was hindered.

The collection of the eggs was commenced September 16, 1890, and the first hatching took place about the end of October. Eggs continued to be taken until November 16, the total from 1,094 females amounting to 5,860,000. Of these, 700,000 were delivered October 22 and November 5, 1890, to the Oregon fish commissioners. The remainder were hatched at the station and the fry placed in Clackamas River and its tributaries. The fry produced were 4,902,000 or about 95 per cent of the eggs retained.

In January, 1891, the hatching took place so rapidly that use had to be made of the troughs of the improvised hatchery of the previous year, to prevent suffocation among the fry. Hatching terminated in February, the fry having been liberated from week to week, within a river scope of 3 miles, as they arrived at the age to begin to take food. About 1,000,000 were released subsequent to March 1. In the months of May and June, 1891, the rack and traps were again overhauled and put in position for the operations of the coming season.

AQUARIA AT CENTRAL STATION, WASHINGTON, D. C. (W. P. SEAL, IN CHARGE).

1889-90.

In July, 1889, a new hot-air engine, equipped with vulcanized rubber pump and piping, was introduced for circulating the salt water, the brass piping being laid aside. By February, 1890, the water was rendered so clear by means of filters that all objects could be distinctly seen. The salt water lost by leakage was made up by supplies produced at the station by dissolving Turk Island salt in filtered water at the proper density; 1,000 gallons of sea water from Chesapeake Bay were furnished by the steamer *Fish Hawk*.

Collections of salt-water objects were received throughout the year, principally from Woods Holl Station, some being received from Gloucester Station, Mass., and others from Portland, Me., and the New Jersey coast. Fresh-water specimens were derived from the fish ponds,

Washington, D. C., the Potomac River, creeks in Virginia accessible to the station by wagon, and from Fort Washington Station, Md.

Spawning was observed in the fresh-water aquaria as follows: Yellow perch, fifteen deposits of eggs from December to April, inclusive; three mussels in March and April; rainbow and tessellated darters in April. Yearling rainbow trout were held through the month of May in a temperature of 72° to 76° F.

In the salt water a rainbow trout spawned in March, 1890, after having deposited eggs a month previous in fresh water; several nests were built by the two-spined sticklebacks in April and May; several common killifish spawned in April; and in June king crab eggs were received and hatched. From unknown causes mollusca, hermit-crabs, anemones, starfish, and sea-urchins could not be successfully kept.

Colored and plain sketches were made by Mr. S. F. Denton illustrating the spawning habits of mussels and of rainbow and tessellated darters.

1890–91.

Two collecting trips were made down the Chesapeake Bay, and specimens were also obtained from Woods Holl Station, Cold Spring Harbor, and from other sources through the distribution cars. Young shad, 3 to 4 inches long, received from the fish ponds, Washington, D. C., in October, 1890, were with partial success held in the salt-water aquaria. Atlantic and quinnat salmon, and rainbow, brook, and lake trout yearlings were successfully kept in the salt water. About November 1, 1890, a large female skate was received and placed in a salt-water tank; in January several eggs were deposited, which, on May 12, were found to contain living embryos. Both the common newt and top-minnow reproduced in April in fresh water.

In December, 1890, the salt-water temperature fell to 48° F., when artificial heat was introduced into the tank room, which maintained a temperature of 50° to 54° during the remainder of the winter. In June the temperature went up to 80°.

STEAMER FISH HAWK (LIEUT. ROBERT PLATT, U. S. N., COMMANDING).

1889–90.

After the establishment of the shore station at Gloucester City the *Fish Hawk*, as in previous years, entered upon the propagation of shad on the Delaware River. The vessel was anchored off Gloucester, the water supply used in hatching operations being taken directly from the river. The crew began taking eggs April 30, using the launch *Petrel*. The river temperature was 57° F. By May 15 the water had risen to 63°, when the collections of eggs amounted to 27,234,000. On May 23 they amounted to 33,915,000, when the work closed, the temperature being 64°. There were produced 20,596,000 fry, which were liberated

principally in the headwaters of the Delaware River. In addition, 3,654,000 eggs were transferred to the land station, for lack of space, and 15,000 forwarded to H. H. Fields, Museum of Comparative Zoölogy, Cambridge, Mass., for biological study.

The Gloucester Point seine afforded 2,488,000 eggs, which produced 81 per cent in fry; Faunce's seine, 10,566,000 eggs, which produced 70 per cent in fry; and Howell Cove seine, 20,861,000, which yielded 65 per cent in fry. The number of days when eggs were obtainable from these seines was 12, 14, and 17, respectively. More than 1,000,000 eggs per day were procured during five days at Faunce's; at Howell Cove more than 1,000,000 a day for five days and more than 2,000,000 a day during five other days. The average production of eggs to each fish was 49,000, which is largely in excess of the yield at the Susquehanna and Potomac river stations.

1890–91.

On June 17, 1891, operations were commenced in the propagation of Spanish mackerel, the locality selected being Cape Charles, Virginia. At the end of the fiscal year covered by this report, June 30, 1891, the work was in progress, the results to that date being embodied in tabular form. Subsequently, 1,364,000 eggs were obtained. These were collected on sixteen days between July 7 and 30, the fry produced and liberated therefrom being 410,000. The total eggs obtained were 2,494,000 and the total output of fry 776,000.

The ova were derived from adults taken in trap nets, which were regularly used in market fishing. The most forward eggs produced fry in 21½ hours, the longest period of hatching being 32¾ hours, and the average period about 26 hours. The fry were released in Chesapeake Bay.

Table showing operations in the propagation of the Spanish mackerel.

Date.	Fish stripped.		Number of eggs taken.	Hour of—		Date of release.	Number of fry released.
	Males.	Females.		Impregnation.	Hatching.		
1891.							
June 17	15	5	240,000	7:30 a. m.	5 a. m. June 18.	June 19	80,000
18	10	7	300,000	8 a. m.	5 a. m. June 18.	.....	.....
19	3	3	315,000	8:15 a. m.	5 p. m. June 20.	June 21	200,000
23	5	3	80,000	5:30 a. m.	8 a. m. June 24.	25	20,000
25	1	1	60,000	7 a. m.	8 a. m. June 26.	27	20,000
25	3	3	20,000	8 a. m.	9 a. m. June 26.	.....	.....
29	7	5	115,000	5 a. m.	8 a. m. June 30.	June 30	46,000
Total..	44	27	1,130,000	.....	.....	.....	366,000

ADDITIONAL FISH-CULTURAL STATIONS.

New York.—In response to a resolution of the United States Senate of December 18, 1890, directing the U. S. Fish Commissioner to report to it upon the desirability of the Government's establishing a fish-hatchery in northern New York, near the St. Lawrence River, the following communication was addressed to the President of the Senate:

U. S. COMMISSION OF FISH AND FISHERIES,
Washington, D. C., January 26, 1891.

SIR: In obedience to Senate resolution of December 18, 1890, directing the U. S. Commissioner of Fish and Fisheries to report to the Senate as to the desirability of the establishment of a fish-hatchery in northern New York, near the St. Lawrence River, I have the honor to report as follows:

The basin of the St. Lawrence, including Lake Ontario and Lake Champlain and the innumerable smaller lakes and tributary streams which drain into these, comprises fully one-half of the area of the State of New York, about one-fourth of the State of Vermont, and on the Canadian side a more considerable drainage area.

In Lake Ontario whitefish were formerly very abundant. The value of this fishery has declined year by year, and at present the production is relatively insignificant compared with the whitefish fisheries of Lake Erie, Lake Huron, and Lake Michigan.

In the waters referred to a like decline was in progress, but those who were interested in those fisheries were prompt to recognize the necessity of legislation to restrain and regulate the methods and apparatus and seasons of capture.

Artificial propagation was also systematically resorted to to supplement and reinforce natural reproduction, and whitefish hatcheries were established by the States of Michigan, Ohio, and Wisconsin and by the Canadian Government. Entering the field at a later date, the U. S. Commission has established stations for the collection and hatching of whitefish at Alpena, Mich., Duluth, Minn., and Put-in Bay, Ohio.

The result of the coöperative fish-culture work by the Canadian, State, and United States Fish Commissions has been not only to arrest the alarming decline that was in progress, but to determine a marked increase in the catch of whitefish in those waters in which fish-cultural work has been carried on.

The marked contrast between the present conditions of the whitefish fisheries of Lake Erie and Lake Ontario sharply defines and emphasizes the necessity of artificial propagation as a means of maintaining and improving our important commercial fisheries and of creating such in waters where they have not before existed.

We can not afford to neglect so important an economic resource—one which gives such substantial and valuable returns for moderate expenditures.

We can not expect individual enterprise to undertake such work in public waters in the expectation of private gain. Men, however public-spirited, will not sow the seed of a harvest which all men may gather. Our lakes and rivers and coast waters must be farmed by the Government for the general use and under such regulations as will establish and maintain the largest production.

Another important commercial species which formerly existed in Lake Ontario in marvelous abundance, but which is now so rare as to be an object of curious interest when seen, is the Atlantic salmon. Sixty years ago each season it ascended the St. Lawrence in vast numbers and swarmed in all its tributaries. Following both shores of Lake Ontario it ascended all the smaller streams which fall into it and which afford suitable spawning-grounds for the mature fish and favorable nurseries for the fry during their period of river life.

The following extract from the annual report of the department of marine and fisheries of Canada for the year ending June 30, 1869, will be instructive as well as suggestive.

[Special report of Messrs. Whitcher and Venning on fish-breeding at New Castle, Ontario.]

"We proceeded yesterday to New Castle, Ontario, in compliance with your directions, and made a personal inspection of the fish-breeding establishment there under charge of Mr. Wilmot. The premises are situated on Baldwin or Wilmot Creek, a small stream traversing the township of Clarke, in the county of Durham, and discharging into Lake Ontario, about 40 miles east of Toronto. This creek is well situated for salmon, as it forms a natural inlet of the sheltered bend of the lake between Bendhead and Darlington.

"Although at the entrance into the lake it passes through a marshy lagoon, the bed of the stream farther inland is of a gravelly nature and the water is pretty clear, regular, and lively in its flow.

"In early times it was famous for salmon, great numbers of which frequented it every autumn for the purpose of spawning. They were so plentiful forty years ago that men killed them with clubs and pitchforks, women seined them with flannel petticoats, and settlers bought and paid for farms and built houses from the sale of salmon. Later they were taken by nets and spears, over 1,000 being often caught in the course of one night.

"Concurrently with such annual slaughter manufactories and farming along the banks had obstructed, fouled, and changed the creek from its natural state and made it less capable of affording shelter and spawning.

"Their yearly decreasing numbers at length succumbed to the destruction practiced upon them each season from the time of entering the creek until nearly the last straggler had been speared, netted, or killed."

The history of the salmon fisheries of Wilmot Creek, so graphically told by the Canadian commissioners, has been repeated in every stream of the State of New York which drains into Lake Ontario and the St. Lawrence River. All were frequented by the salmon, and from each, each season, went out a numerous colony of parr and smolts, which descended the St. Lawrence to the gulf, where they remained until they had attained size and maturity, when, obeying the impulse of reproduction, they ascended the St. Lawrence and distributed themselves to all the tributaries of lake and river, carrying back to these inland waters the rich harvest of the sea which they had garnered.

This magnificent fishery has ceased to be. Did it exist to-day, and were the conditions which made such a fishery possible prevailing to-day, a hundred streams now barren would afford salmon fishing as attractive as the more favored waters of Canada, and the catch by net in the lake itself would furnish the motive of a valuable commercial fishery.

The cause of the disappearance, practically, of salmon from the streams of the St. Lawrence Basin has been chiefly and primarily the erection of obstructions in all of the rivers, which have prevented the salmon from reaching their spawning-grounds, and so natural reproduction has been absolutely inhibited.

The restoration and maintenance of the whitefish fisheries of Lake Erie, or of the salmon fishery of the lake and rivers, would either of them furnish sufficient motive for liberal expenditures on the part of the Government, if we consider the matter from a purely practical and economic standpoint. It is not only possible, it is entirely practicable, to restore and maintain these fisheries, by adequate recourse to means and agencies entirely within our control.

The regeneration of the fisheries must be accomplished through fish-cultural work, systematically and persistently pursued. Their maintenance must be assured by concurrent regulation of the lake fisheries by the United States and Canada and by the enforcement on the part of the State of New York of such regulations and requirements as will permit the salmon to ascend to their spawning-grounds. In the absence of such regulations and requirements it will not be reasonable to expect that the results of fish-cultural work will be permanent or compensating, however extensive such work may be.

A fish-cultural station planned to meet all the requirements must be very extensive and complete in all its appointments, and will involve larger expenditure than would be required for a station devoted exclusively to the production of whitefish or the salmonidæ. The hatchery must be commodious, providing at once for the hatching of 100,000,000 of whitefish and for the incubation of 1,000,000 salmon ova. It must also provide trough accommodations for holding 1,000,000 salmon fry for some weeks after they begin feeding. Quarters, offices, storage rooms, and shops must be erected; an extensive system of ponds for rearing the salmon must be constructed, for none would be released in open waters until they were of sufficient size to have comparative immunity from capture by other fish.

At the first installation of the station and for several years it would be necessary to draw our supplies of whitefish ova from our collecting stations on the upper lakes and our salmon ova from Maine. With the improvement of the fisheries we should expect to find our eventual source of supply in Ontario waters, and the location of the station should be with reference to this. Wherever placed it should be convenient to transportation routes, and should control a gravity water supply which should be without stint or measure.

The cost of such a station as I have indicated, complete in all its appointments, would not be less than $20,000, exclusive of cost of site and water franchises, and for its maintenance there would be required an appropriation of $9,000 per annum.

Respectfully,

MARSHALL MCDONALD,
U. S. Commissioner of Fisheries.

Hon. LEVI P. MORTON,
Vice-President.

A consideration of the report resulted in an appropriation of $5,000 in the bill approved March 3, 1891, providing for the sundry civil expenses of the Government during the fiscal year ending June 30, 1892. This appropriation not being available till July 1, 1891, action in the matter was necessarily deferred.

Vermont.—On January 12, 1891, Hon. W. W. Grout, Representative from Vermont, introduced in the House of Representatives a bill providing the sum of $15,000, "for the purchase of ground, construction of buildings and ponds, and the purchase of the equipment for a fish-hatchery and rearing station to be established in the State of Vermont, at a place to be designated by the United States Fish Commissioner." The bill was referred to the Committee on Commerce, by which it was returned to the House on January 30, with the recommendation that it pass. The bill as presented failed to become a law, though provision for the station was made in the sundry civil bill approved March 3, 1891. The appropriation not being available till July 1, 1891, no action could be taken till after that date.

Montana and Gulf States.—Congress, by act approved March 3, 1891, provided the sum of $2,000 "for investigation respecting the advisability of establishing a fish-hatching station in the Rocky Mountain region in the State of Montana or Wyoming, and also a station in the Gulf States." Instructions were prepared covering the extent and character of the investigations and early in the following July, when the appropriation became available, Prof. B. W. Evermann, assistant in the Division of Scientific Inquiry, was charged with the same.

RAILROAD SERVICE.

The following statement exhibits the mileage of cars and detached messengers in the work of distribution:

Items.	Carp.	Shad.	Salmon and trout.	White-fish.	Pike perch.	Other fish.	Other work.	Total.
Fiscal year 1889-90:								
Car No. 1	.....	683	9,014	719	2,775	18,104	.....	31,295
Car No. 2	.....	4,503	4,798	.....	.....	11,642	.....	20,943
Car No. 3	9,455	5,483	.....	.....	.....	.....	8,136	23,074
Car No. 101, Philadelphia, Wilmington and Baltimore R. R.	.....	.....	.....	.....	.....	.....	.....	.....
Messengers	284	12,233	20,615	1,647	.....	15,230	.....	50,009
	9,739	22,902	34,427	2,366	2,775	44,976	8,136	125,321
Fiscal year 1890-91:								
Car No. 1	.....	932	9,451	773	2,652	23,547	.....	37,355
Car No. 2	9,045	8,239	21,458	1,002	.....	5,591	.....	45,335
Car No. 3	1,564	7,881	6,879	2,540	.....	20,149	.....	39,013
Car No. 101, Philadelphia, Wilmington and Baltimore R. R.	.....	3,281	.....	.....	.....	.....	.....	3,281
Messengers	10,385	17,252	19,860	.....	1,127	6,642	.....	55,266
	20,994	37,585	57,648	4,315	3,779	55,929	.....	180,250

Thanks are due to the following-mentioned railroads, which have furnished free transportation for the cars of the Commission:

Name of railroad.	1890.	1891.	Name of railroad.	1890.	1891.
	Miles.	*Miles.*		*Miles.*	*Miles.*
Atchison, Topeka and Santa Fe	1,089	2,136	Louisville, New Albany and Chicago	755	632
Burlington and Missouri River in Nebraska	354	.....	Louisville, St. Louis and Texas	.....	170
Burlington, Cedar Rapids and Northern	1,063	1,818	Louisville and Nashville	262	.....
Canada Southern	251	.....	Michigan Central	2,546	5,627
Chicago, Burlington and Quincy	6,558	10,086	Missouri Pacific	770	985
Chicago, Milwaukee and St. Paul	34	.....	Missouri, Kansas and Texas	2,175	234
Chicago and Iowa	.....	124	Mobile and Ohio	70	28
Chicago and Northwestern	397	226	Montana Central	90	.....
Chicago and West Michigan	.....	352	Montana Union	.....	45
Chicago, Burlington and Northern	2,575	.....	Northern Pacific	4,119	11,465
Chicago, Rock Island and Pacific	.....	206	Ohio and Mississippi	202	.....
Cleveland, Cincinnati, Chicago and St. Louis	307	904	Oregon Railway and Navigation Company	211	.....
Delaware and Hudson	.....	128	Pittsburg, Cincinnati, Chicago and St. Louis	.....	136
Denver and Rio Grande	.....	72	St. Louis, Arkansas and Texas	186	.....
Detroit, Bay City and Alpena	210	1,260	St. Louis, Iron Mountain and Southern	198	490
Detroit, Lansing and Northern	.....	886	St. Louis, Keokuk and Northwestern	1,149	822
Duluth, South Shore and Atlantic	410	2,898	St. Paul, Minneapolis and Manitoba	4,292	.....
Duluth and Iron Range	.....	12	St. Louis and San Francisco	987	1,598
Flint and Pere Marquette	1,331	3,545	Texas Pacific	648	612
Fremont, Elkhorn and Missouri Valley	452	1,057	Toledo, Ann Arbor and North Michigan	.....	36
Grand Rapids and Indiana	758	1,374	Toledo, Peoria and Western	.....	64
Grand Trunk	.....	22	Union Pacific	.....	15,379
Hannibal and St. Joe	1,808	.....	Utah Central	74	.....
Illinois Central	441	431	Wabash	2,795	4,933
International and Great Northern	.....	360	Wisconsin Central	462	962
Jacksonville Southeastern	262	362	Total	41,339	73,344
Kansas City, Fort Scott and Memphis	.....	646			
Kansas City, Fort Smith and Southern	.....	120			
Lake Shore and Michigan Southern	448	101			

GENERAL ADMINISTRATION.

In the conduct of the routine of the office and matters of administration the Commission has continued to receive the efficient aid of the chief clerk, Mr. J. J. O'Connor, and the disbursing agent, Mr. Herbert A. Gill.

INVESTIGATION BY UNITED STATES SENATE.

During the latter part of the fiscal year 1890 there appeared in the public press a number of articles adversely criticising the administration of the Commission, and making charges of inefficiency, extravagance, and dishonesty on the part of its personnel. These charges were given such a wide circulation that the Commissioner deemed it proper to call them to the attention of Congress, and at his request the following resolution was introduced in the Senate by Senator Edmunds on June 3, 1890:

Resolved, That the Committee on Fish and Fisheries be, and it is hereby, instructed to make an early inquiry into the administration of the affairs of the United States Fish Commissioners's office, and especially in respect to the changes in the force, compensation paid to employés, and any alleged favoritism, or other undue administration, and report to the Senate thereon.

Resolved, That the said committee have power to send for persons and papers.

On June 5, 1890, the resolution was agreed to, and the investigation was placed in the charge of a subcommittee consisting of Senators Stockbridge, Squire, and Blodgett. The first session of the committee was held on June 13, 1890, and was continued at intervals until September 15, 1890. The testimony (Mis. Doc. No. 77, U. S. Senate, Fifty-first Congress, second session) embraced 666 octavo pages of printed matter, and the report of the committee (Report No. 2361, U. S. Senate, Fifty-first Congress, second session), with a synopsis of the testimony, 86 pages additional. The report is as follows:

The Committee on Fish and Fisheries of the Senate, to whom was referred the resolution of June 3, 1890, as follows:

> *Resolved*, That the Committee on Fish and Fisheries be, and it is hereby, instructed to make an early inquiry into the administration of the affairs of the United States Fish Commissioner's office, and especially in respect of the changes in the force, compensation paid to employés, and any alleged favoritism, or other undue administration, and report to the Senate thereon.
>
> *Resolved*, That the said committee have power to send for persons and papers.

Beg leave to make the following report:

The passage of the foregoing resolution was owing to the publication of certain charges of a rather sensational character which appeared in the press of the country, seriously reflecting, not only upon the administration of the affairs of the Fish Commission, but also upon the character and integrity of some of the officials connected therewith.

The charges so made, having been brought to the attention of the Commissioner, he very promptly asked an investigation.

The maladministration charged included among other things:

(*a*) Entire lack of system and proper discipline in every department of the Commission, resulting in a greatly increased and useless expenditure of money.

(*b*) That the Commissioner and other officials, taking advantage of their positions, at the expense of the Government used the boats and fish-hatchery stations of the Commission as a means of private enjoyment for themselves and friends.

(*c*) That the employés of the Commission were addicted to the use of intoxicating liquors to the extent of neglecting their duties and disgracing the service.

(*d*) That falsified statements of numbers of fish planted in the various lakes and rivers of the country had been prepared under the direction of the Commissioner, with the deliberate purpose in view of using the same before the committees of Congress in order to influence more liberal appropriations than might otherwise be made.

(*e*) That political considerations were governing the matter of appointments within the Commission.

(*f*) That the Commissioner was guilty of nepotism.

(*g*) That under the present régime the rule was, increased appropriations and an extravagant expenditure of money in all branches of the work of the Commission; among other things an unwarranted increase in the salaries of certain favored employés.

(*h*) That the time of certain employés was being taken up, and material belonging to the Government used, in perfecting certain patents solely for the personal benefit of the Commissioner.

(*i*) That the present force of clerks and assistants in the Commission had been very greatly increased, with a corresponding expenditure of money, while the practical and scientific results do not compare favorably with those attained under Prof. Baird.

The charges summed up can be best expressed in three words, viz, inefficiency, extravagance, dishonesty.

Your committee at its first meeting after the passage of the resolution of investigation appointed a subcommittee, consisting of its chairman and Senators Blodgett and Squire, to investigate the affairs of the Fish Commission in respect to the charges referred to. Every person whose name was known to the committee as being in any way connected with the publication or dissemination of the said charges was notified that the committee would give him an opportunity to be heard and would also be glad to have him submit the names of any persons whom he desired subpœnaed; also that any material and relevant interrogatories which he might desire to have propounded to witnesses would be so propounded upon filing the same in writing with the clerk of the committee.

The hearings of the subcommittee were not public; neither were those who stood in the light of prosecuting the charges nor any member of the Fish Commission permitted to be present or represented by attorney.

In all, 63 witnesses were sworn and examined, a very great majority of whom were subpœnaed at the special instance of the persons appearing to have charge of the case against the Fish Commission. In every instance the committee accepted all the interrogatories filed, and although many were of doubtful relevancy, they were propounded to the witnesses designated, and also upon request of the same individuals subpœnas were issued for every person whose name was furnished where it was in the least made to appear that the testimony of such persons would be at

all relevant to the subject-matter of the investigation, and great care was exercised to secure a full and impartial investigation of the pending charges without favor to anyone.

The testimony so taken and submitted with this report comprises over 650 printed pages, so that, in order to facilitate an examination of the same, your committee have prepared, and herewith submit as a part of this report, a synopsis of the testimony, indexed and arranged under separate topics, with references by page to the printed volume of testimony, which, as your committee believe, renders any lengthy detailed report entirely unnecessary.

It will suffice to say, in a general way, that not one of the charges affecting the administration of the affairs of the Commission, or the standing and integrity of any official connected therewith, has been proven to have any foundation in fact whatever; further, that after a most searching examination into the administration of the affairs and methods of the Commission, your committee are satisfied that there has not been extravagance, dishonesty, or inefficiency in its conduct; but, on the contrary, throughout the entire Commission the most perfect system and discipline prevail, resulting in an economical and judicious expenditure of the appropriations made by Congress.

The profligate use of money, as complained of, is not a charge which can be made against the present Commissioner and be sustained. The increase of the expenses of the Commission is entirely due to the enlarged field of work.

And right here your committee beg to call particular attention to the testimony (pp. 339 to 346) for a full statement of the work of the Commission in the past and what it is doing to-day.

We find that the Commissioner has not used the boats, fish-hatchery stations, or other property of the Government for purposes not within the scope of the work of the Commission. It is true that members of Congress and others have been invited to visit the stations and inspect the work of the Commission, but such visits have resulted in no expense to the Government, and it appears from abundant proof that where entertainment has been provided upon the occasion of these visits it has been at the private expense of the Commissioner.

The charges of intemperance, when fully examined, narrowed down practically to a specific charge that one certain official, upon a single occasion, drank liquor and became intoxicated. The testimony is not of such a character as to create the impression upon the minds of the respective members of the committee that the official was in the habit of using, even occasionally, stimulants to an excess, or in any such way as to unfit him for his duties. The party himself denies the charge of ever being intoxicated, and a number of reputable witnesses who had been intimately associated with him swear unqualifiedly that the man was not of intemperate habits.

Respecting the allegation that the records of the Commission have been falsified for the purpose of showing a greater number of fish planted in the lakes and rivers than was actually the case, your committee have to say that the records of the Commission in the matter of the distribution of fish and eggs are kept in such a manner as to almost preclude a possibility of anything of the kind, but beyond that, it satisfactorily appears from the showing made that the records respecting this branch of the work have been kept with a conscientious regard for the truth. Equally groundless are the charges that the Commissioner has been governed by political considerations in the matter of appointments to positions in the Commission, or that he is guilty of the charge of nepotism.

It is true, as has been charged, that the force of assistants employed in connection with the work of the Commission has been increased over the number employed in former years, and that there has been a corresponding increase in the cost of maintaining it; but it must be remembered that during the fiscal year ending June 30, 1887, there were but twelve fish-hatching stations in operation, while during the year ending June 30, 1890, there were twenty-one; also, that the production of eggs,

fry, and yearling fish for the fiscal year ending June 30, 1887, was 259,000,000, while for the year ending June 30, 1890, it was 358,000,000, or an increase of 99,000,000.

It should also be remembered that the amount of money available for the propagation of food-fishes and for the general administration was, in 1887, $136,614.92, while in 1890 it was only $160,000. We feel warranted in saying that the practical and scientific results of the work of the Commission exceed anything heretofore attained and that with a very moderate increase in cost to the Government over former years.

In conclusion, your committee, in view of the great importance to the country of the work of the Commission and the urgent necessity for its continuance, ask a careful examination of the testimony herewith presented, believing that it is sufficient to convince all fair-minded persons that there is no just cause to criticise the policy of the Commission or the course of the Commissioner and his subordinates in the matter of administration, but, on the contrary, that they deserve commendation for the conscientious work which they are performing.

FRANCIS B. STOCKBRIDGE.
WATSON C. SQUIRE.
RUFUS BLODGETT.

PUBLICATIONS AND LIBRARY.

The editing of the publications of the Commission and their supervision through the press has continued under the direction of Dr. T. H. Bean, the ichthyologist of the Commission. These publications consist of "Reports" and "Bulletins." In the former are published the reports of the operations of the Commission; and in the latter, such articles as are "relative to new observations, discoveries, and applications connected with fish-culture and the fisheries." Prior to 1888 the Bulletin was chiefly composed of short articles, extracts, etc., from the official correspondence, and translations of foreign publications. Since then, however, the increase of the operations of the Commission has made it possible to apply this publication almost exclusively to the results of the Commission's work. The law authorizing the Bulletin limits the number of its pages to 500, and permits its distribution in parts. The articles composing the Reports have likewise been published and issued prior to the completion of the volume as a whole, resulting in the early dissemination of the knowledge acquired by the investigations made by the Commission. The law authorizing these two volumes provides for their distribution by the United States Senate and House of Representatives, and a small quota by the Commission. From the number assigned to the Commission, the policy is to supply various public libraries and institutions of learning, and such persons who, by reason of their professions or occupations, are specially interested in the subject-matter.

During the fiscal year 1889–90 the following papers were issued:

The report proper of the Commissioner for 1886 (Report for 1886, pp. I to LVII).

The beam-trawl fishery of Great Britain, with notes on beam-trawling in other European countries, etc. By J. W. Collins. (Bulletin, 1887, pp. 289 to 407.)

The aquarium: A brief exposition of its principles and management. By William P. Seal. (Bulletin, 1887, pp. 274 to 282.)

Explorations of the fishing-grounds of Alaska, Washington Territory, and Oregon during 1888, by the U. S. Fish Commission steamer *Albatross*, Lieut. Commander Z. L. Tanner, U. S. Navy, commanding. (Bulletin, 1888, pp. 1 to 95.)

Report of explorations made during the summer and autumn of 1888 in the Alleghany region of Virginia, North Carolina, and Tennessee, and in western Indiana, with an account of the fishes found in each of the river basins of those regions. By David Starr Jordan. (Bulletin, 1888, pp. 97 to 173.)

Suggestions for the employment of improved types of vessels in the market fisheries, with notes on British fishing steamers. By J. W. Collins. (Bulletin, 1888, pp. 175 to 192.)

Notes on fishes collected at Cozumel, Yucatan, by the U. S. Fish Commission, with descriptions of new species. By Tarleton H. Bean. (Bulletin, 1888, pp. 193 to 206.)

The most recent methods of hatching fish eggs. By William F. Page. (Bulletin, 1888, pp. 207 to 218.)

During the year 1890–91, there appeared—

Review of the fisheries of the Great Lakes in 1885. Compiled by Hugh M. Smith and Merwin-Marie Snell; with introduction and description of fishing vessels and boats, by J. W. Collins. (Report, 1887, pp. 1 to 333 and 45 plates.)

A report upon the fishes of Kalamazoo, Calhoun, and Antrim counties, Mich. By Charles H. Bollman. (Bulletin, 1888, pp. 219 to 225.)

Notes on fishes from the lowlands of Georgia, with a description of a new species (*Opsopœodus bollmani*). By Charles H. Gilbert. (Bulletin, 1888, pp. 225 to 229.)

The sturgeon and sturgeon industries of the eastern coast of the United States, with an account of experiments bearing upon sturgeon-culture. By John A. Ryder. (Bulletin, 1888, pp. 231 to 328.)

A review of the genera and species of *Serranidæ* found in the waters of America and Europe. By David Starr Jordan and Carl H. Eigenmann. (Bulletin, 1888, pp. 329 to 441.)

Report on the proposed introduction of the Jamaica mountain mullet into the United States. By Tarleton H. Bean. (Bulletin, 1888, pp. 443 to 451.)

The transplanting of lobsters to the Pacific Coast of the United States. By Richard Rathbun. (Bulletin, 1888, pp. 453 to 472.)

Preliminary report upon the invertebrate animals inhabiting lakes Geneva and Mendota, Wisconsin, with an account of the fish epidemic in Lake Mendota in 1884. By S. A. Forbes. (Bulletin, 1888, pp. 473 to 487.)

Report of explorations in Colorado and Utah during the summer of 1889, with an account of the fishes found in each of the river basins examined. By David Starr Jordan. (Bulletin, 1889, pp. 1 to 40.)

On two species of larval dibothria from the Yellowstone National Park. By Edwin Linton. (Bulletin, 1889, pp. 65 to 79.)

The artificial propagation of sturgeon in Schleswig-Holstein, Germany. (Translated from the German.) (Bulletin, 1889, pp. 81 to 90.)

On certain wart-like excrescences, occurring on the short minnow, *Cyprinodon variegatus*, due to psorosperms. By Edwin Linton. (Bulletin, 1889, pp. 99 to 102.)

Notes on the crab-fishery of Crisfield, Md. By Hugh M. Smith. (Bulletin, 1889. pp. 103 to 112.)

Report of explorations made in Missouri and Arkansas during 1889, with an account of the fishes observed in each of the river basins examined. By Seth Eugene Meek. (Bulletin, 1889, pp. 113 to 141.)

Report of explorations made in Alabama during 1889, with notes on the fishes of the Tennessee, Alabama, and Escambia rivers. By Charles H. Gilbert. (Bulletin, 1889, pp. 143 to 159.)

Report on the salmon and salmon rivers of Alaska, with notes on the conditions, methods, and needs of the salmon fisheries. By Tarleton H. Bean. (Bulletin, 1889, pp. 165 to 208.)

The fishing-grounds of Bristol Bay, Alaska: A preliminary report upon the investigations of the U. S. Fish Commission steamer *Albatross* during the summer of 1890. By Lieut. Commander Z. L. Tanner, U. S. Navy. (Bulletin, 1889, pp. 279 to 288.)

Notes on an improved form of oyster-tongs. By Hugh M. Smith. (Bulletin, 1889, pp. 161 to 163.)

A contribution to the life-history of *Dibothrium cordiceps* Leidy, a parasite infesting the trout of Yellowstone Lake. By Edwin Linton, PH. D. (Bulletin, 1889, pp. 337 to 358.)

The collections made by the Fish Commission steamer *Albatross* during the years 1887, 1888, and 1889 will, in accordance with law, be deposited in the U. S. National Museum, under direction of the Smithsonian Institution. The following papers giving the results of the study of the collections, were published in the Proceedings of the U. S. National Museum under the general title, "Scientific Results of Explorations by the U. S. Fish Commission steamer *Albatross*." They are:

No. I. Birds collected on the Galapagos Islands in 1888. By Robert Ridgway, curator of the department of birds. (Proc. U. S. N. M., 1889, pp. 101 to 128.)

No. II. Birds collected on the island of Santa Lucia, West Indies, the Abrolhos Islands, Brazil, and at the Straits of Magellan, in 1887–88. By Robert Ridgway, curator of the department of birds. (Proc. U. S. N. M., 1889, pp. 129 to 139.)

No. III. Report on the batrachians and reptiles collected in 1887–88. By E. D. Cope. (Proc. U. S. N. M., 1889, pp. 141 to 147.)

No. IV. Descriptions of new species of fishes collected at the Galapagos Islands and along the coast of the United States of Colombia, 1887–88. By David Starr Jordan and Charles Harvey Bollman. (Proc. U. S. N. M., 1889, pp. 149 to 183.)

No. V. Annotated catalogue of the insects collected in 1887–88. By L. O. Howard, acting curator of the department of insects. (Proc. U. S. N. M., 1889, pp. 185 to 216.)

No. VI. List of the plants collected in Alaska in 1888. By Dr. George Vasey. (Proc. U. S. N. M., 1889, pp. 217 to 218.)

No. VII. Preliminary report of the collection of mollusca and brachiopoda obtained in 1887–88. By William Healy Dall, A. M., curator of the department of mollusks. (Proc. U. S. N. M., 1889, pp. 219 to 362.)

No. VIII. Description of a new cottoid fish from British Columbia. By Tarleton H. Bean, ichthyologist, U. S. Fish Commission. (Proc. U. S. N. M., 1889, pp. 641 to 642.)

No. IX. Catalogue of fishes collected at Port Castries, St. Lucia, by the steamer *Albatross*, November, 1888. By David Starr Jordan. (Proc. U. S. N. M., 1889, pp. 645 to 652.)

No. X. On certain mesozoic fossils from the islands of St. Paul and St. Peter, in the Straits of Magellan. By Charles A. White. (Proc. U. S. N. M., 1890, pp. 13, 14.)

No. XI. New fishes collected off the coast of Alaska and the adjacent region southward. By Tarleton H. Bean. (Proc. U. S. N. M., 1890, pp. 37 to 45.)

No. XII. A preliminary report on the fishes collected by the steamer *Albatross* on the Pacific coast of North America during the year 1889, with descriptions of twelve new genera and ninety-two new species. By Charles H. Gilbert, professor of zoölogy, University of Indiana. (Proc. U. S. N. M., 1890, pp. 49 to 126.)

No. XIII. Catalogue of skeletons of birds collected at the Abrolhos Islands, Brazil, the Straits of Magellan, and the Galapagos Islands, in 1887–88. By Frederic A. Lucas, assistant curator of the department of comparative anatomy. (Proc. U.S.N.M., 1890, pp. 127 to 130.)

No. XIV. Birds from the coasts of western North America and adjacent islands, collected in 1888–89, with descriptions of new species. By Chas. H. Townsend, resident naturalist of the steamer *Albatross*. (Proc. U. S. N. M., 1890, pp. 131 to 142.)

No. XV. Reptiles from the Clarion and Socorro islands and the Gulf of California, with descriptions of a new species. By Chas. H. Townsend, resident naturalist of the steamer *Albatross*. (Proc. U. S. N. M., 1890, pp. 143, 144.)

No. XVI. Plants collected in 1889 at Socorro and Clarion islands, Pacific Ocean. By Dr. Geo. Vasey and J. N. Rose, botanist and assistant botanist, Department of Agriculture. (Proc. U. S. N. M., 1890, pp. 145 to 149.)

No. XVII. Descriptions of new West American land, fresh-water, and marine shells, with notes and comments. By Robert E. C. Stearns, adjunct curator of the department of mollusks. (Proc. U. S. N. M., 1890, pp. 205 to 225).

No. XVIII. Lists of fishes obtained in the harbor of Bahia, Brazil, and in adjacent waters. By David Starr Jordan, president of the University of Indiana. (Proc. U. S. N. M., 1890, pp. 313 to 336.)

No. XIX. A supplementary list of fishes collected at the Galapagos Islands and Panama, with descriptions of one new genus and three new species. By Charles H. Gilbert, professor of zoölogy, University of Indiana. (Proc. U. S. N. M., 1890, pp. 449 to 455).

During the period covering the months from February to May, 1891, the Fish Commission steamer *Albatross*, by special authorization of the President, made an extended cruise along the west coast of Central America and the Galapagos Islands, including also the west coast of Mexico and the Gulf of California. The scientific work of the vessel was under the direction of Prof. Alexander Agassiz, of the Museum of Comparative Zoölogy, Cambridge, Mass. The specimens collected were taken in charge by him, and groups distributed to specialists for examination and report, and the results will be duly published.

The distribution of the publications of the Commission consisted of 1,953 copies of the Reports, 2,045 copies of the Bulletins, and about 6,500 copies of articles, in pamphlet form, extracted from the Reports and Bulletins. In addition to these there were issued 1,372 copies of the reports prepared by the Commission in conjunction with the Tenth Census on the "Fisheries and Fishery Industries of the United States," and 1,278 copies of the report from the Committee on Merchant Marine and Fisheries of the House of Representatives in an "Investigation of the Fur-Seal and other Fisheries of Alaska" (Report No. 3883, House of Representatives, Fiftieth Congress, second session), of which a number were assigned by act of Congress to this Commission.

The accessions to the library, mainly obtained through gift and exchange for the publications of the Commission, embraced 1,694 volumes, including pamphlets and periodicals. Of these 457 related to fish, fish-culture, and the fisheries, and 1,237 to geology, botany, zoölogy, and the natural sciences in general.

ERECTION OF FISHWAYS AT THE GREAT FALLS OF THE POTOMAC.

By act of Congress approved February 1, 1888, an additional appropriation of $25,000 was made for completing the construction of the fishways at the Great Falls of the Potomac, there being already available for this purpose $5,042.32, the balance of the previous appropriation of $50,000 made by act approved July 12, 1882. In pursuance of instructions from the Chief of Engineers, U. S. Army, Col. J. M. Wilson, then in charge of the Washington Aqueduct, addressed me under date of June 4, 1889, as follows:

OFFICE OF THE WASHINGTON AQUEDUCT,
Washington, D. C., June 4, 1889.

SIR: I have the honor to inform you that I have this day received from the Chief of Engineers your letter of the 14th ultimo to the Secretary of War, with various indorsements thereon, together with copies of the letter of the 31st ultimo to you from the Acting Secretary of War.

The Chief of Engineers has directed me as follows:

"Col. Wilson will place himself in communication with the Commissioner of Fish and Fisheries with a view to having detailed plans and specifications prepared, contracts drawn, and an inspector nominated. After approval by this office, the work will be carried out under the direction of said inspector, Col. Wilson confining his supervision to seeing that the dam is not injured and that the disbursement of the money is properly made."

In view of the foregoing order I have the honor to request that you will please cause to be prepared and sent to me, at your convenience, plans and specifications in detail of the proposed fishways, and that you will nominate as inspector such person as you may deem fit to inspect this important work.

It has been the custom of this office to pay ordinary inspectors about $100 per month, but in view of the character of your work, which will probably require the services of an expert, I think his salary should be higher, probably from $120 to $140 or $150 per month, depending upon his skill and capacity.

The plans and specifications should be complete, the latter entering into the minutest detail, as they become a part of the contract, and any omission, however trifling, may lead to complications with contractors.

As soon as these plans and specifications reach me, I will prepare advertisements inviting proposals, and after the work is awarded will, subject to the approval of the Chief of Engineers, enter into contract for the work.

As soon as the contractor is ready to begin, I will notify you, and your inspector can then be appointed and assigned to duty.

In all payments upon vouchers, I shall request your certificates as to quantity of materials received, time employed, etc., and, based upon them, will make payments as required by order of the Secretary of War.

If agreeable to you, I will be glad to see you at this office any day between 11 a. m. and 12:30 p. m., to consult in reference to this matter; or, if you prefer it, I will take pleasure in coming to your office any day you may mention after 4 p. m.

I am, sir, very respectfully, your obedient servant,

JOHN M. WILSON,
Colonel, U. S. Army.

Hon. MARSHALL MCDONALD,
Commissioner of Fish and Fisheries, Washington, D. C.

After conference with Col. Wilson and acting in accordance with his suggestions, the work of preparing the necessary plans and specifications was assigned to Mr. C. E. Gorham, the engineer officer of the Commission.

During the winter of 1889–90, the plans and specifications were carefully studied and revised and were ready for transmission in April, 1890, but owing to various delays and the difficulty of finding a suitable person to designate as inspector, were not transmitted until after the close of the fiscal year covered by this report.

WORLD'S COLUMBIAN EXPOSITION.

Section 16 of the act of Congress approved April 25, 1890, "To provide for celebrating the four hundredth anniversary of the discovery of America by Christopher Columbus by holding an international exhibition of arts, industries, manufactures, and the products of the soil, mines, and sea, in the city of Chicago, in the State of Illinois," directs—

That there shall be exhibited at said Exposition by the Government of the United States, from its executive departments, the Smithsonian Institution, the U. S. Fish Commission, and the National Museum, such articles and materials as illustrate the function and administrative faculty of the Government in time of peace and its resources as a war power, tending to demonstrate the nature of our institutions and their adaptation to the wants of the people; and to secure a complete and harmonious arrangement of such a Government exhibit, a board shall be created to be charged with the selection, preparation, arrangement, safe keeping, and exhibition of such articles and materials as the heads of the several departments and the directors of the Smithsonian Institution and National Museum may respectively decide shall be embraced in said Government exhibit. The President may also designate additional articles for exhibition. Such board shall be composed of one person to be named by the head of each executive department, and one by the directors of the Smithsonian Institution and National Museum, and one by the Fish Commission, such selections to be approved by the President of the United States. (U. S. Stat. 26, pp. 62 *et seq.*)

In pursuance of law, the Commissioner named Mr. J. W. Collins, assistant in charge of the Division of Fisheries, as the representative of the Commission on the Government Board of Control and Management, and his designation having been approved by the President, Mr. Collins entered upon his duties in August, 1890. No active work was undertaken until April, 1891, when certain of the personnel were appointed, a building at 210 Tenth street, N. W., Washington, was leased and fitted up for offices and work shops, and the preparations commenced.

In response to a communication from the Secretary of the Treasury requesting an estimate of the money and space required for an adequate exhibit of the fisheries and fishery resources of the United States at the World's Columbian Exposition, the Commissioner of Fisheries replied as follows:

In compliance with your request, I have the honor to transmit herewith estimates of the cost of preparing, placing, caring for, and returning such an exhibit of the

fisheries and fishery resources of the United States as should in my judgment be made at the World's Fair in Chicago in 1893.

Such an exhibit should not only be an exposition of our fishery resources, and of the present conditions, methods, and results of the fisheries, but should also show the origin, progress, present conditions, methods, and results of the inquiry in regard to food-fishes and the fishing-grounds—an inquiry which has been most fruitful in results, economic as well as scientific, and which has served as a model, a stimulus, and an inspiration to other nations seeking the best means for the utilization of the resources of their waters.

The exhibit should show also the beginning and progress, as well as the present condition, of the commercial fisheries, and the development of methods, apparatus, vessels, and boats to meet the new conditions or exigencies arising from time to time. It should show the origin and development of public fish-culture in the United States, and the present conditions, methods, and results of the work of the U. S. Fish Commission.

The exhibit, in its essential features, would illustrate an industrial and economic evolution, probably as distinctively characteristic of the genius of our people as is the evolution of our social and political institutions.

Detailed estimates, aggregating $150,000, were submitted as necessary to carry out the plans of the exhibit proposed, and an allotment of 40,000 feet of floor space indicated as requisite to provide for the convenient and proper display of the exhibit contemplated. In the estimates submitted to the Secretary of the Treasury provision was made for a limited aquarial display in the Government building, having for its object an exhibit of a series of the economic fishes of the country, more especially those which have been bred artificially for the purpose of stocking new waters or the improvement of the fisheries in those waters to which the species are indigenous, but which had been depleted by improvident fishing.

The suggestion that an aquarial display was contemplated awakened general interest and commanded such approval and expectation that it was determined, if practicable, to enlarge greatly the plans first contemplated, and make an extensive and systematic exhibit of the water resources of our entire country, both marine and fresh. These plans required the erection of an expensive building with suitable plant for installation and maintenance. It was recognized that it was not proper to expect the General Government to appropriate so much money to a building for temporary uses. The subject was brought to the attention of the Director-General by the Commissioner of Fisheries, and the difficulties of the enterprise discussed. In view of the interest and instructiveness of the exhibit suggested, the directory of the Exposition determined to erect a suitable building according to the plans of the Commissioner of Fisheries and to equip it with the necessary plant. The Government Board of Control and Management undertook, in conjunction and coöperation with the Commissioner of Fisheries, to install and maintain the exhibit during the period of the Exposition. The display thus arranged for by the liberality of the management and the coöperation of the U. S. Fish Commission will doubtless be one of the most novel, attractive, and interesting features of the Exposition.

STATE FISH COMMISSIONS.

The Commission has continued to coöperate with the fish commissions of the States and Territories in stocking our waters with suitable kinds of food-fishes. The accompanying table exhibits this association:

Statement showing the kinds and number of eggs and fish furnished to State and Territorial fish commissions during the fiscal years 1890 and 1891.

State or Territory.	Species.	1890.		1891.	
		Eggs.	Fish.	Eggs.	Fish.
Arizona	Carp				500
Arkansas	do				3,000
California	Quinnat salmon	1,329,000		2,837,000	
Colorado	Rainbow trout	20,000			
	Carp				5,000
Delaware	Von Behr trout	8,000		8,500	
	Whitefish	1,000,000			
	Shad	2,249,000		837,000	2,200,500
	Carp		400		4,000
	Black bass		125		
	Rock bass		75		450
Georgia	Carp				3,000
Illinois	Pike perch		*17,170,000		*18,000,000
	Carp		1,500		6,690
	Black bass		*13,040		*11,782
	Crappie		*7,631		*5,535
	Yellow perch		*6,075		*1,495
	White bass		*6,380		
	Catfish		*5,070		
	Sunfish		*4,408		*995
	Pike perch		*1,000		
	Buffalo		*1,760		
	Brook pike		*70		
	Rock bass				3,159
Indiana	Landlocked salmon	10,000			
	Whitefish	10,000	*†100,000		
	Pike perch		†500,000		
Iowa	Black bass		900		
Kansas	Carp				5,000
Kentucky	Crappie				820
	Rock bass				520
	Yellow perch				390
Maine	Landlocked salmon	50,000			
Massachusetts	do			25,000	
Michigan	do	50,000			
	Lake trout	16,000			
	Loch Leven trout	30,000			
Minnesota	Landlocked salmon	40,000		20,000	
	Lake trout	250,000		150,000	
	Carp		1,500		2,000
	Von Behr trout			20,000	
Missouri	Carp				45,000
Nebraska	Lake trout	200,000		50,000	
	Crappie		2,000		
	Black bass		1,200		
	Yellow perch		300		
	Von Behr trout			10,000	
	Loch Leven trout			10,000	
Nevada	Landlocked salmon	25,000		20,000	
New Hampshire	Atlantic salmon	40,000			
	Landlocked salmon	20,000		50,000	
	Rainbow trout	25,000		10,000	
	Lake trout	59,000		500,000	
	Loch Leven trout	25,000		10,000	
	Saibling	4,000			
New Jersey	Von Behr trout	5,000			
	Lake trout				162,400
New York	Atlantic salmon	600,000			
	Landlocked salmon	15,000		50,000	
	Loch Leven trout	30,000		20,000	
	Saibling	4,000			
	Whitefish	1,000,000		4,000,000	
	Pike perch	1,000,000			
	Lake trout		1,082	500,000	
	Von Behr trout			12,750	
	Carp				5,200
	Black bass				200
	Crappie				200

*Deposited by the U. S. Fish Commission in waters designated by the State Commissioners. †Fry.

Statement showing the kinds and number of eggs and fish furnished to State and Territorial fish commissions, etc.—Continued.

State or Territory.	Species.	1890.		1891.	
		Eggs.	Fish.	Eggs.	Fish.
Ohio	Brook trout				500
	Von Behr trout				1,425
	Loch Leven trout				800
	Catfish				50
	Whitefish			47,500,000	
Oregon	Quinnat salmon	1,000,000		700,000	
Pennsylvania	Atlantic salmon	100,000			
	Whitefish	10,000,000		14,000,000	
	Pike perch	18,000,000		58,000,000	
	Shad		†2,000,000		
	Carp		2,000		5,000
	Landlocked salmon			40,000	
	Crappie				*1,350
	Rock bass				*425
	Black bass				*200
Rhode Island	Atlantic salmon	10,000			
	Landlocked salmon	10,000			
	Lake trout			20,000	
Utah	Carp		1,700		2,000
	Black bass				1,718
	Yellow perch				636
Vermont	Landlocked salmon	25,000		25,000	
	Lake trout	325,000			
	Von Behr trout	10,000			
	Carp		600		500
	Rainbow trout			20,000	
West Virginia	Carp		100		1,000
Wisconsin	Von Behr trout	20,000			
	Whitefish	6,000,000		10,000,000	
	Carp				25,000
Wyoming	Rainbow trout	12,500			
	Lake trout	200,000		100,000	
	Brook trout			20,000	5,000
	Carp				5,000
	Black bass				710
	Crappie				1,470
	Sunfish				200

* Deposited by the U. S. Fish Commission in waters designated by the State commissioners. † Fry.

COURTESIES EXTENDED AND RECEIVED.

RELATIONS WITH OTHER GOVERNMENT DEPARTMENTS.

The work of the Fish Commission was very much facilitated by the coöperation of the other offices of the Government.

The Light-House Board granted permission to place observers and physical apparatus on board the light ship at Nantucket New South Shoal, to make temperature observations.

The Navy Department furnished officers and crews for the steamers and granted facilities to the vessels at the various navy-yards.

A dredging outfit was furnished to the eclipse expedition to West Africa in 1889.

The Superintendent of the Census, after conferring with the Commissioner, appointed Capt. J. W. Collins and Mr. Charles W. Smiley to take charge of the fishery census. Free use of the records in the Division of Fisheries was granted to the census employés and desk room was furnished to several clerks. At the request of the Superintendent

of the Census, the statistics gathered by the Commission concerning the whale, porpoise, seal, and walrus fisheries of the United States were furnished to the Census Office.

The Secretary of War authorized the location of a fish-hatchery on the military reservation at Fort Gaston, Cal., and continued the privilege of allowing Fort Washington, on the Potomac River, to be used as a shad-hatchery.

Acknowledgments are due to the Government Printing Office for the excellent manner in which the publications of the Commission have been handled and for many courtesies extended in the matter of prompt compliance with requests for other official printing and binding.

To the Signal Office we are indebted for records of temperature observations on the North Atlantic Coast.

The Agricultural Department furnished flowers and grass seed for the Neosho Station.

The health officer of the District furnished monthly statistics of the Washington fish markets.

The steam launch *Blue Wing* was loaned to the District Commissioners while the police boat was being repaired.

The steamer *Albatross* brought animals from the Galapagos Islands for the National Zoölogical Park, Washington, D. C.

RELATIONS WITH FOREIGN COUNTRIES.

Belgium.—In February, 1890, 25,000 eggs of the rainbow trout were forwarded to Maj. W. Turner, Florinville, in exchange for 25,000 eggs of the Von Behr trout, which were received during that month.

Canada.—During the fall of 1890 100 carp were sent to the inspector of fisheries at Winnepeg, Manitoba, and during the winter of 1890–91 10,000 eggs of the Von Behr trout, 10,000 eggs of the Loch Leven trout, and 10,000 landlocked salmon eggs were forwarded to Mr. W. P. Greenough, Portneuf, Quebec.

France.—100,000 eggs of the California salmon were sent to the Société Nationale d'Acclimatation, Paris, in January, 1890, and 90,000 in January, 1891. Both of these shipments were received in excellent condition.

Germany.—In the fall and winter of 1889, crawfish, catfish, sunfish, white perch, and tortoises were sent to Max von dem Borne. Of these 90 crawfish, 3 catfish, 14 sunfish, and 3 tortoise were received alive. In May of 1890 and in the winter of 1890–91 white perch, sunfish, and strawberry bass were sent to him, but all except two white perch died before reaching their destination.

To Herr von Behr, president of the Deutsche Fischerei Verein, were sent, in 1890, 20,000 brook trout eggs and 40,000 landlocked salmon eggs; and in 1891, 100,000 whitefish eggs, 10,000 rainbow trout eggs, and 20,000 landlocked salmon eggs.

In January, 1890, 10,000 rainbow trout eggs were sent to Herr Carl Schuster, Freiburg.

There were received from Max von dem Borne, in January, 1890, 50,000 eggs of the Alpine variety of the Von Behr trout and 20,000 saibling eggs, and in March 15,000 eggs of the Loch Leven trout which had been obtained from Seeweise. In April of the same year 10 large golden tench were also received from him.

About the middle of February 70,000 Von Behr trout eggs arrived by the steamer *Aller*, 60,000 being given by the Deutsche Fischerei Verein and 10,000 by Herr Carl Schuster. Of these about 56,000 proved to be in good condition. In the following winter there were also received from this society 70,000 eggs of the Von Behr trout, of which 60,000 were in good condition.

The 300,000 whitefish eggs and 30,000 Von Behr trout eggs sent by this society in February and March were an entire loss.

Great Britain.—To the Midland Counties Fish Culture Establishment the following shipments were made: In the winter of 1889–90, 15,000 rainbow trout eggs, 200,000 whitefish eggs, and 15,000 landlocked salmon eggs; in the winter of 1890–91 200,000 whitefish eggs and 15,000 rainbow trout eggs.

In July, 1890, 13 garfish, 3 or 4 inches long, were sent to the Brighton Aquarium.

Mexico.—In response to an application from the Mexican Government, 50,000 lake trout eggs were sent to Señor Esteban Cházari in January, 1890, and 50,000 in January, 1891; 25,000 rainbow trout eggs and 10,000 Von Behr trout eggs were also sent to him in January, 1891.

Norway.—Twenty-five thousand eggs of the California salmon were sent to Walter E. Archer, Stavanger, on December 28, 1889.

Switzerland.—At the request of Mr. Alfred de Claparède, the Swiss minister at Washington, 30,000 eggs of the rainbow trout were sent to Switzerland in January, 1890; these were followed in January, 1891, by a shipment of 40,000 more.

MARSHALL MCDONALD,
Commissioner.

A.—*Details of distribution, 1889–90.*

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Catfish:			
Indian Creek, New Albany, Ind			500
Silver Creek, New Albany, Ind			500
Sangamon River, Decatur, Ill			1,745
Pistaqua Lake, McHenry, Ill			900
Fox Lake, McHenry, Ill			1,585
Pond of Chicago, Burlington and Quincy Railroad, Galesburg, Ill			1,100
City Reservoir, Belleville, Ill			200
Island Lake, Waterloo, Ill			50
Schoor Lake, Waterloo, Ill			50
Mill pond, Red Bud, Ill			40
Creve Cœur Lake, Creve Cœur, Mo			2,160
Echo Lake, Kansas City, Mo			79
Pond, Little Blue, Mo			800
Independence, Mo			800
Soldiers' Home, Leavenworth, Kans			79
Sibley Lake, Concordia, Kans			400
Chappawamsee Creek, Quantico, Va			80
Carp:			
Applicants in Alabama			260
Arizona			80
Arkansas			210
California			30
Colorado			100
Connecticut			200
Delaware			660
Florida			200
Georgia			495
Idaho			180
Illinois			1,602
Indian Territory			50
Indiana			130
Iowa			190
Kansas			965
Kentucky			210
Louisiana			112
Maine			70
Maryland			204
Massachusetts			40
Michigan			160
Minnesota			1,040
Mississippi			140
Missouri			190
Montana			500
Nebraska			80
Nevada			20
New Hampshire			20
New Jersey			54
New Mexico			90
New York			330
North Carolina			370
North Dakota			230
Ohio			570
Oregon			10
Pennsylvania			3,719
Rhode Island			10
South Carolina			60
South Dakota			80
Tennessee			575
Texas			200
Utah			1,900
Vermont			610
Virginia			1,220
Washington			90
West Virginia			240
Wisconsin			110
Wyoming			7,010
Manitoba			100
Goldfish:			
Applicants in Alabama			395
Arkansas			6
Connecticut			12
Delaware			168
District of Columbia			5,450
Florida			100
Georgia			507
Idaho			6
Illinois			1,308
Indiana			138
Indian Territory			6
Iowa			242

A.—*Details of distribution, 1889-90*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Goldfish—Continued.			
Applicants in Kansas			67
Kentucky			49
Louisiana			216
Maryland			592
Massachusetts			90
Michigan			78
Minnesota			284
Missouri			124
Mississippi			146
Montana			4
Nebraska			112
New Hampshire			12
New Jersey			566
New Mexico			22
New York			1,372
North Carolina			198
Ohio			135
Oregon			18
Pennsylvania			776
Rhode Island			400
South Carolina			280
Tennessee			332
Texas			48
Utah			324
Vermont			6
Virginia			1,193
West Virginia			88
Wisconsin			60
Wyoming			75
Buffalo:			
Indian Creek, New Albany, Ind			50
Silver Creek, New Albany, Ind			50
Sangamon River, Decatur, Ill			1,010
Ponds of Chicago, Burlington and Quincy Railroad Company, Galesburg, Ill			450
City reservoir, Belleville, Ill			300
Creve Cœur Lake, Creve Cœur, Mo			85
Private pond, Frost, Tex			100
Athens, Tex			150
Shad:			
Scantic River, Sun Mill, Conn		152,000	
Farmington River, Poquantic, Conn		411,000	
Connecticut River, Windsor Locks, Conn		167,000	
Holyoke, Mass		35,000	
Delaware River, Gloucester, N. J		6,204,000	
Connecticut River, Warehouse Point, Conn		4,026,000	
Housatonic River, New Milford, Conn		2,254,000	
Hudson River, West Point, N. Y		2,619,000	
Newburg, N. Y		375,000	
Catskill, N. Y		1,952,000	
Delaware River, Callicoon, N. Y		3,557,000	
Lambertville, N. J		3,272,000	
Lackawaxen, Pa		500,000	
Gloucester, N. J		521,000	
Delaware Water Gap, Pa		799,000	
Mullica River, Elwood, N. J		500,000	
U. S. Fish Commission station, Gloucester, N. J	(3,654,000)		
Harvard University	15,000		
U. S. Fish Commission, Central Station, Washington, D. C	*a*(34,446,000)	356,000	
Patuxent River, Laurel, Md		1,500,000	
Patapsco River, Relay Station, Md		1,518,000	
U. S. Fish Ponds, Washington, D. C		*b*(2,144,000)	
Potomac River, Wide Water, Va		720,000	
Quantico Creek, Quantico, Va		1,180,000	
Rapidan, Rapidan River, Va		1,207,000	
Mattaponi River, Milford, Va		2,470,000	
Little River, Taylorsville, Va		909,000	
Rivanna River, Charlottesville, Va		500,000	
Appomattox River, Petersburg, Va		326,000	
Rappahannock River, Fredericksburg, Va		1,162,000	
Occoquan Creek, Woodbridge, Va		506,000	
Cedar Run, Catletts, Va		471,000	
Stony Creek, Stony Creek, Va		1,000,000	
Meherrin River, Belfield, Va		1,489,000	

a Distributed as fry from Central Station.
b Deposited for rearing and distribution in fall of 1890.

A.—*Details of distribution, 1889–90*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Shad—Continued.			
Neuse River, Goldsboro, N. C	.....	1,328,000	.....
Pasquotank River, Elizabeth, N. C	.....	1,042,000	.....
Six Runs, Clinton, N. C	.....	497,000	.....
Hurricane Creek, Blackshear, Ga	.....	388,000	.....
Withlacoochee River, Quitman, Ga	.....	650,000	.....
Ocklocknee River, Thomasville, Ga	.....	650,000	.....
Chattahoochee River, West Point, Ga	.....	300,000	.....
Alabama River, Montgomery, Ala	.....	1,290,000	.....
Escambia River, Flomaton, Ala	.....	400,000	.....
Tombigbee River, Demopolis, Ala	.....	400,000	.....
Taunton River, East Taunton, Mass	.....	1,505,000	.....
Hudson River, Newburg, N. Y	.....	1,420,000	.....
Jones Creek, Dover, Del	.....	500,000	.....
Susquehanna River, Havre de Grace, Md	.....	1,250,000	.....
Susquehanna River, Fites Eddy, Pa	.....	985,000	.....
Bush River, Bush Station, Md	.....	850,000	.....
Elk River, Elkton, Md	.....	1,317,000	.....
Gunpowder River, Gunpowder Station, Md	.....	1,000,000	.....
North-East River, North-East, Md	.....	1,700,000	.....
James River, Richmond, Va	.....	200,000	.....
Savannah River, Augusta, Ga	.....	2,600,000	.....
Ocmulgee River, Macon, Ga	.....	2,565,000	.....
Ogeechee River, Midville, Ga	.....	1,000,000	.....
Flint River, Reynolds, Ga	.....	900,000	.....
Big Whitewater Creek, Butler, Ga	.....	1,000,000	.....
Delaware Fish Commission	2,240,000	.....	.....
Quinnat salmon:			
California Fish Commission	1,329,000	.....	.....
Société Nationale d'Acclimation, Paris, France	100,000	.....	.....
Walter E. Archer, Stavanger, Norway	25,000	.....	.....
U. S. Fish Commission Station, Fort Gaston, Cal	*a* (100,000)	.....	.....
McCloud River, near Baird, Cal	.....	84,000	.....
Trinity River, near Fort Gaston, Cal	.....	90,000	.....
Oregon Fish Commission	1,000,000	.....	.....
Clackamas River and tributaries	.....	2,766,475	.....
Atlantic Salmon (*Salmo salar*):			
New Hampshire Fish Commission	40,000	.....	.....
Rhode Island Fish Commission	10,000	.....	.....
Pennsylvania Fish Commission	100,000	.....	.....
Benjamin Lincoln, Dennysville, Me	40,000	.....	.....
U. S. Fish Commission Station, Cold Spring Harbor	*b* (600,000)	.....	.....
U. S. Fish Commission Station, Fort Gaston, Cal	(100,000)	.....	.....
Alamoosook Lake, tributary to Penobscot River, Maine	.....	.....	23,884
Craig Brook, tributary to Alamoosook Lake, Maine	.....	.....	21,056
Meadow Brook, tributary to Alamoosook Lake, Maine	.....	.....	12,511
Colton Brook, tributary to Alamoosook Lake, Maine	.....	.....	1,862
Wardwell Brook, tributary to Alamoosook Lake, Maine	.....	.....	3,765
Leach Brook, tributary to Alamoosook Lake, Maine	.....	.....	1,738
Toddy Pond, tributary to Alamoosook Lake, Maine	.....	.....	5,642
Canary Brook, tributary to Toddy Pond, Maine	.....	.....	959
Harriman Brook, tributary to Toddy Pond, Maine	.....	.....	8,784
Sucker Brook, tributary to Toddy Pond, Maine	.....	.....	3,639
Heart Pond, tributary to Toddy Pond, Maine	.....	.....	4,166
Grays Brook, tributary to Toddy Pond, Maine	.....	.....	3,449
Raymond Brook, tributary of Hudson River, New York	.....	49,700	.....
Balm of Gilead Brook, tributary of Hudson River, New York	.....	49,800	.....
Carr Brook, tributary of Hudson River, New York	.....	49,500	.....
Thirteenth Brook, tributary of Hudson River, New York	.....	49,750	.....
Minerva Brook, tributary of Hudson River, New York	.....	49,800	.....
Deer Creek, tributary of Hudson River, New York	.....	49,400	.....
Clendon Brook, tributary of Hudson River, New York	.....	49,750	.....
Whipple Brook, tributary of Hudson River, New York	.....	49,600	.....
Eleventh Brook, tributary of Hudson River, New York	.....	49,500	.....
Wallkill River, tributary of Hudson River, New York	.....	26,350	.....
Nussequage River, tributary of Long Island Sound	.....	30,000	.....
Landlocked Salmon:			
Maine Fish Commission	50,000	.....	.....
New Hampshire Fish Commission	20,000	.....	.....
Vermont Fish Commission	25,000	.....	.....
Rhode Island Fish Commission	10,000	.....	.....
New York Fish Commission	15,000	.....	.....
Indiana Fish Commission	10,000	.....	.....
Michigan Fish Commission	50,000	.....	.....
Minnesota Fish Commission	40,000	.....	.....
Nevada Fish Commission	25,000	.....	.....
E. R. Hewitt, Ringwood, N. J	10,000	.....	.....
Geo. W. Hooker, Brattleboro, Vt	25,000	.....	.....
Megantic Fish and Game Club, New York	10,000	.....	.....
Herr von Behr, Schmaldow, Germany	40,000	.....	.....

a Distributed as fry from Fort Gaston Station.
b Distributed as fry from Cold Spring Harbor Station.

A.—*Details of distribution, 1889-90*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Landlocked salmon—Continued.			
Midland Counties' Fish Culture Association, Malvern Wells, England	15,000		
U. S. Fish Commission Station, Northville, Mich	(30,000)		
Fort Gaston, Cal	(20,000)		
Duluth, Minn	*a*(60,000)		
Cold Spring Harbor, N. Y	*b*(85,000)		
Washington, D. C	*c*(30,000)		
Green Lake, Me	*d*(60,000)		
Bucksport, Me	(5,000)		
Grand Lake Stream, tributary to Schoodic River, Maine		214,000	
U. S. Fish Commission Station, Cold Spring Harbor, N. Y	10,000		
Great and Mann brooks, tributary to Green Lake, Maine		150,000	
Green Lake, tributary to Union River, Maine			16,980
Eastern River, tributary to Penobscot River, Maine			400
Tributaries of Lake George near Caldwell, N. Y		5,000	
Mianus River in Westchester County, New York		20,000	
Pleasant Lake in Sullivan County, New York		23,000	
Silver Lake in Sullivan County, New York		23,000	
E. P. Thorn, Plainfield, N. J		9,000	
Deer Creek, near Bel Air, Md		17,650	
Hazel Run, near Fredericksburg, Va		450	
Loch Leven trout:			
Michigan Fish Commission	(30,000)		
New Hampshire Fish Commission	(25,000)		
New York Fish Commission	(30,000)		
U. S. Fish Commission Station, Fort Gaston, Cal	(25,000)		
Leadville, Colo	(20,000)		
Craig Brook, Me	(20,000)		
Duluth, Minn	(12,000)		
Pine Lake, near LaPorte, Ind			500
Madison River, Yellowstone Park, Wyo			995
Caldwell Creek, near Cresco, Iowa			750
Light Springs, near Cresco, Iowa			750
Colfax Lake, near Hart, Mich			500
Star Lake, near Baldwin, Mich			1,500
Crooked Lake, near Baldwin, Mich			494
Esall Lake, near Alpena, Mich			1,000
Turtle Lake, near Alpena, Mich			1,000
Zukey Lake, near Hamburg Junction, Mich			1,000
Indian River, Indian River, Mich			1,500
U. S. Fish Commission Station, Northville, Mich	15,000		
Rainbow trout:			
Green Lake, near Dedham, Me			747
Colorado State Fish Commission	20,000		
New Hampshire State Fish Commission	25,000		
Henry Stewart, Walhalla, S. C	8,000		
The Government of Switzerland	30,000		
Midland Counties Fish Culture Establishment, Malvern Wells, England	15,000		
Carl Shuster, Freiburg, Germany	10,000		
Major W. Turner, Floronville, Belgium	25,000		
U. S. Fish Commission Station, Neosho, Mo	(25,000)		
Mountain Creek, near Carlisle, Pa			2,000
Running Mountain Stream, near Carlisle, Pa			800
Yellow Breeches Creek, near Mechanicsburg, Pa			1,100
Trindles Run, near Mechanicsburg, Pa			300
Hoglands Run, near Williamsport, Pa			1,500
East Deer Creek, near Stewardstown, Pa			500
West Deer Creek, near Stewardstown, Pa			500
Ebaugh Creek, near Stewardstown, Pa			500
Bowman Creek, near Stewardstown, Pa			500
Sutton Run, near Stewardstown, Pa			480
Thompson Run, near Stewardstown, Pa			1,000
Fuller Brook, near Bradford, Pa			1,000
North Branch, near Houtzdale, Pa			1,000
Officer Run, near Parkersburg, Pa			120
Doe Run, near Parkersburg, Pa			115
Buck Run, near Parkersburg, Pa			115
Dennis Run, near Ercildoun, Pa			500
Dipping Pond Stream, near Brooklandville, Md			2,235
Staley Creek, near Marion, Va			1,000
Wheat and Gunstock Creeks, near Liberty, Va			500
Clear Fork Creek, near Rocky Gap, Va			800
Peach Bottom Creek, in Grayson County, Va			1,500
Clinch River, near Tazewell C. H., Va			1,000
Elk Creek, near North Branch, Va			1,500
Fox Creek, near Seven Mile Ford, Va			1,450

a Distributed as fry, from Duluth Station, Minnesota.
b Distributed as fry, from Cold Spring Harbor Station, New York.
c Distributed as fry, from Central Station, Washington, D. C.
d Distributed as fry, from Green Lake Station, Maine.

A.—*Details of distribution, 1889–90*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Rainbow trout—Continued.			
Little Calf Pasture River, near Goshen, Va			2,000
Calf Pasture River, near Goshen, Va			1,075
Cripple Creek, near Beverly Furnace, Va			400
Reed Creek, near Wytheville, Va			480
Applicants in Virginia			576
Nowberry Fork of Catawba River, near Old Fork, N. C			500
Nantahalia River, near Jarretts, N. C			1,000
Valley River, near Westfield, N. C			200
Running Creek, near Asheville, N. C			500
Tuckasege River, near Dillsboro, N. C			1,500
Applicants in North Carolina			750
Clear Fork River, near Robbins, Tenn			500
Horse Creek, near Bethel, Tenn			250
Applicants in Tennessee			1,250
Curtiss Manufacturing Company's Dam, near Baltimore, Md			450
Applicants in Maryland			2,200
Beaver Dam Creek, near Alexandria, Va			350
Pike Branch, near Alexandria, Va			75
Difficult Creek, near Hunters, Va			250
Applicants in Pennsylvania			407
U. S. Fish Commission Station, Northville, Mich			157
Wyoming Fish Commission	12,500		
Gibbon River, Yellowstone National Park			990
Rattlesnake Creek, near Petersburg, Ohio			100
Rocky Fork Creek, near Petersburg, Ohio			100
Harden Creek, near Petersburg, Ohio			200
Fall Creek, near Petersburg, Ohio			100
Applicants in Ohio			518
Pinchen Creek, near Dover, Del			200
Tyler and Poplar creeks, near Elgin, Ill			490
Applicants in Illinois			100
Tippecanoe River, near Monticello, Ind			1,000
Fall Creek, near Indianapolis, Ind			250
White River, near Indianapolis, Ind			250
Brandywine Creek, near Shelbyville, Ind			368
Big Blue River, near Shelbyville, Ind			368
Little Blue River, near Shelbyville, Ind			368
Coms Creek, near Shelbyville, Ind			368
Flat Rock River, near Shelbyville, Ind			358
Flat Rock River, near St. Paul, Ind			1,800
Applicants in Indiana			950
South branch of Catfish Creek, near Peosta, Iowa			500
Spring Branch, near Manchester, Iowa			500
Kinney Creek, near Vanceburg, Ky			1,000
Passaic River, near Providence, N. J			200
Stoney Brook, near Boonton, N. J			150
Troy Brook, near Boonton, N. J			150
North branch of Raritan River, near Boonton, N. J			100
Whipping River, near Boonton, N. J			100
Iron River, near Iron River Station, Mich			1,300
Spring Brook, near Columbiaville, Mich			500
Barker Creek, near Oscoda, Mich			500
Cold Brook, near Lawton, Mich			600
South Branch of Paw Paw River, near Paw Paw, Mich			500
Sisson Creek, near Paw Paw, Mich			275
Trowbridge Creek, near Vanderbilt, Mich			1,500
Stewart Creek, near Wolverine, Mich			1,000
Applicants in Michigan			750
Collins Lake, near Schenectady, N. Y			100
Applicants in Massachusetts			250
Rattlesnake Creek, near White Mills, Pa			250
Von Behr trout:			
Egypt Branch, near Brooklandville, Md			237
Vermont Fish Commission	10,000		
Wisconsin Fish Commission	20,000		
U. S. Fish Commission Station, Neosho, Mo	(20,000)		
Duluth, Minn	(8,000)		
West Aspetuck Creek, near New Haven, Conn			200
Pinchen Creek, near Dover, Del			200
North and South Branch of Bear Creek, near Decorah, Iowa			2,070
Baldwin Creek, near Cresco, Iowa			250
Barlois Creek, near Cresco, Iowa			250
Passaic River, near Providence, N. J			200
Lincoln Lake, near Reed City, Mich			497
Applicants in Michigan			1,275
Rattlesnake Creek, near White Mills, Pa			200
Delaware Fish Commission	8,000		
New Jersey Fish Commission	5,000		
P. C. Hewitt, Ringwood, N. J	8,000		
U. S. Fish Commission Station, Duluth, Minn	(35,000)		
Michigan Fish Commission	16,000		
New Hampshire Fish Commission	9,000		
U. S. Fish Commission Station, Craig Brook, Me	(9,000)		

A.—*Details of distribution, 1889-90*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Black-spotted trout:			
East Fork Gardiner River, Yellowstone National Park	.....	.....	1,000
Brook trout:			
Meadow Brook, near Orland, Me	.....	.....	250
Craig Brook, near Orland, Me	.....	.....	772
Pine Creek, near Felton, Pa	.....	23,000	.....
Paris G. Engle, Hancock, Pa	.....	5,000	.....
A. B. Hayward, Washington, D. C	.....	2,500	.....
Clinch River, near Tazewell, Va	.....	.....	900
Egypt Branch, near Brooklandville, Md	.....	.....	184
E. F. Warner, St. Paul, Minn	40,000	.....	.....
Bellevue Trout Club, Castalia, Ohio	20,000	.....	.....
Henry E. Maynard, Northampton, Mass	25,000	.....	.....
Dr. E. S. Bowen, Brattleboro, Vt	25,000	.....	.....
Charles F. Orvis, Manchester, Vt	15,000	.....	.....
Baptism River Club, St. Paul, Minn	30,000	.....	.....
S. Holmes, Stroudsburg, Pa	2,500	.....	.....
Deutsche Fischerei Verein, Germany	20,000	.....	.....
U. S. F. C. Station, Neosho, Mo	(25,000)	.....	.....
Leadville, Colo	(25,000)	.....	.....
Central Station, Washington, D. C	*a*(37,500)	.....	.....
Bloody Run, near Dubuque Iowa	.....	10,000	.....
Spring Creek, near Decorah, Iowa	.....	.....	985
Vernon Springs, near Cresco, Iowa	.....	.....	500
Trout Stream on Island of Marthas Vineyard	.....	.....	200
Gardiner River, Yellowstone National Park	.....	.....	4,975
Spring Brook, near Oxford, Mich	.....	.....	100
Applicants in Michigan	.....	.....	500
New Jersey	.....	.....	500
Baptism River, tributary to Lake Superior in Minnesota	.....	27,000	.....
Lester River, tributary to Lake Superior in Minnesota	.....	1,000	.....
U. S. Fish Commission Station, Fort Gaston, Cal	50,000	.....	.....
Northville, Mich	25,000	.....	.....
Dr. John Law, Leadville, Colo	.....	126,881	.....
Lake trout:			
Pleasant Lake, Sullivan County, N. Y	.....	265,000	.....
Sackett Lake, Sullivan County, N. Y	.....	105,000	.....
Otsego Lake, Otsego County, N. Y	.....	50,000	.....
Lake in Westchester County, N. Y	.....	50,000	.....
Wyoming Fish Commission	200,000	.....	.....
New Hampshire Fish Commission	50,000	.....	.....
Vermont Fish Commission	325,000	.....	.....
Minnesota Fish Commission	250,000	.....	.....
Nebraska Fish Commission	200,000	.....	.....
E. Cházari, City of Mexico, for Republic of Mexico	50,000	.....	.....
U. S. Fish Commission Station, Neosho, Mo	(25,000)	.....	.....
Cold Spring Harbor, N. Y	*b*(500,000)	.....	.....
Duluth, Minn	*c*(1,000,000)	.....	.....
Pine Lake, near La Porte, Ind	.....	.....	500
Elder, Green, and Otter Lakes, near Fremont, Ind	.....	.....	390
Lake near Richmond, Ind	.....	.....	1,000
Lake Maxinkuckee, near Indianapolis, Ind	.....	.....	1,900
Applicants in Indiana	.....	.....	1,150
Zukey Lake, near Ann Arbor, Mich	.....	.....	2,500
Applicants in Michigan	.....	.....	1,993
Stoney Creek, near Hunter Land, N. Y	.....	.....	1,000
New York Fish Commission	.....	.....	1,082
Applicants in Connecticut	.....	.....	1,480
Lake Superior, off mouth of Lester River, Minn	.....	935,000	.....
Saibling:			
New Hampshire Fish Commission	4,000	.....	.....
New York Fish Commission	4,000	.....	.....
U. S. Fish Commission Station, Craig Brook, Me	(4,000)	.....	.....
Whitefish:			
Lake Ontario, near Sacketts Harbor, N. Y	.....	1,800,000	.....
Black River Bay, near Sacketts Harbor, N. Y	.....	1,000,000	.....
Chaumont Bay, near Chaumont, N. Y	.....	1,000,000	.....
Detroit River, near Detroit, Mich	.....	500,000	.....
Pennsylvania Fish Commission	10,000,000	.....	.....
Wisconsin Fish Commission	6,000,000	.....	.....
U. S. Fish Commission, Central Station, Washington, D. C	*a*(6,000,000)	.....	.....
Lake Erie, near North, Middle Bass, and Put-in Bay Islands	.....	27,984,000	.....
Lake Erie, near Monroe, Mich	.....	2,544,000	.....
Indiana Fish Commission	.....	100,000	.....
Delaware Fish Commission	1,000,000	.....	.....
New York Fish Commission	1,000,000	.....	.....
Indiana Fish Commission	10,000	.....	.....
Midland Counties Fish Culture Establishment, Malvern Wells, England	200,000	.....	.....
U. S. Fish Commission station, Duluth, Minn	*c*(26,250,000)	.....	.....

a Distributed as fry from Central Station.
b Distributed as fry from Cold Spring Harbor Station.
c Distributed as fry from Duluth Station.

A.—*Details of distribution, 1889–90*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Whitefish—Continued.			
Lake Huron, near North Point, Mich		2,000,000	
South Point, Mich		2,000,000	
Sulphur Island, Mich		1,400,000	
Middle Island, Mich		2,000,000	
Thunder Bay Island, Mich		3,000,000	
East Tawas, Mich		2,000,000	
Miller Point, Mich		3,000,000	
Sturgeon Point, Mich		3,000,000	
Mackinac Island, Mich		3,000,000	
Lake Michigan, near Epoufette, Mich		1,500,000	
Scott Point, Mich		1,500,000	
Manistique, Mich		1,500,000	
Thompson, Mich		1,500,000	
Long Lake, near Alpena, Mich		2,000,000	
Turtle Lake, near Montmorency, Mich		1,000,000	
Grand Lake, Presque Isle County, Mich		200,000	
Detour Passage, near Hay Point, Mich		3,000,000	
Lake Superior, off mouth of Lester River, near Duluth, Minn		24,850,000	
Yellowstone River, Yellowstone National Park			1,000
Twin Lakes, Yellowstone National Park			2,000
Brook pike:			
Sangamon River, Decatur, Ill			70
Yellow perch:			
Potomac River, near Washington, D. C		704,000	
Applicants in Maryland		50,000	
Flat Rock River, Flat Rock, Ind			50
Blue Ridge, Ind			25
Big Blue River, Shelbyville, Ind			50
Little Blue River, Ray Crossing, Ind			50
Brandywine Creek, Fairland, Ind			100
Comus Creek, Waldron, Ind			100
Des Plaines River, Riverside, Ill			995
Chicago, Burlington and Quincy Railroad Company's ponds, Galesburg, Ill			500
Island Lake, Waterloo, Ill			500
Schoors Lake, Waterloo, Ill			500
Mill pond, Red Bud, Ill			100
Kipple Creek, Plymouth, Ill			150
Crooked Creek, Macomb, Ill			500
Bigger Head Lake, Bardolph, Ill			50
Little Wabash River, Louisville, Ill			480
City reservoir, Litchfield, Ill			400
Saylor Springs Lake, Saylor Springs, Ill			900
Illinois Central Railroad Company's ponds, Clinton, Ill			200
Private pond, Potomac, Ill			250
Kankakee River, Kankakee, Ill			300
Insane Asylum reservoir, Jacksonville, Ill			300
Deaf and Dumb Asylum reservoir, Jacksonville, Ill			150
Macoupin River, Macoupin, Ill			150
Beaver Dam Lake, Macoupin, Ill			200
Mill pond, Monmouth, Ill			50
Echo Lake, Kansas City, Mo			118
Pertle Springs, Warrensburg, Mo			760
Private pond, Little Blue, Mo			345
Private pond, Independence, Mo			350
Reed Creek, Liberty, Mo			200
James River, Nichols, Mo			350
City water-works pond, Moberly, Mo			200
Lake at Soldiers' Home, Leavenworth, Kans			119
Sibley Lake, Concordia, Kans			575
Lake Geneva, Lake Geneva, Wis			1,020
Cedar River, Waterloo, Iowa			200
Charles City, Iowa			200
Cedar Rapids, Iowa			300
Lake in city park, Keokuk, Iowa			100
Blue River, Milford, Nebr			240
Loup River, Ravenna, Nebr			250
North fork of Elkhorn River, Norfolk, Nebr			175
Headwaters of Elkhorn River, Stuart, Nebr			175
Nebraska State fish ponds, South Bend, Nebr			300
Sun River, Great Falls, Mont			910
Missouri River, Mid-Cañon, Mont			200
Private pond, Helena, Mont			50
Frost, Tex			500
Athens, Tex			400
Jones Fork River, Winslow, Ark			400
Barren River, Bowling Green, Ky			100
Shenandoah River, Riverton, Va			325

A.—*Details of distribution, 1889–90*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Pike perch:			
Pennsylvania Fish Commission	18,000,000		
New York Fish Commission	1,000,000		
White River, near Noblesville, Ind		2,000,000	
Tributaries of White River, near Shelbyville, Ind		2,000,000	
Flat Rock Creek, near St. Paul, Ind		2,000,000	
Turkey Lake, near Cedar Beach, Ind		9,980,000	
Flint Lake, near Valparaiso, Ind		3,500,000	
Long Lake, near Valparaiso, Ind		1,500,000	
Indiana Fish Commission		500,000	
Twin Lakes, near Earlville, Ohio		2,500,000	
Cuyahoga River, near Ravenna, Ohio		2,500,000	
Mahoning River, near Warren, Ohio		2,500,000	
Embarras River, near Charleston, Ill		1,500,000	
Sangamon River, near Virginia, Ill		1,000,000	
near Petersburg, Ill		300,000	
Spring Lake, near Pekin, Ill		500,000	
Mackinac River, near Pekin, Ill		500,000	
Kankakee River, near Kankakee, Ill		3,376,000	
Chicago, Burlington and Quincy Railroad Company's ponds			500
City reservoir, Belleville, Ill			500
Lester River, Duluth, Minn		580,000	
Sea bass:			
Buzzards Bay, off Massachusetts coast		3,893,500	
White bass:			
Indian Creek, New Albany, Ind			100
Silver Creek, New Albany, Ind			100
Flat Rock River, Flat Rock, Ind			100
Blue Ridge, Ind			50
Big Blue River, Shelbyville, Ind			100
Comus Creek, Waldron, Ind			200
Sangamon River, Riverton, Ill			1,500
Chicago, Burlington and Quincy R. R. Co. ponds, Galesburg, Ill			450
City reservoir, Belleville, Ill			400
Kipple Creek, Plymouth, Ill			150
Crooked Creek, Macomb, Ill			350
Bigger Head Lake, Bardolph, Ill			50
Little Wabash River, Louisville, Ill			990
City reservoir, Litchfield, Ill			400
Saylor Springs Lake, Saylor Springs, Ill			600
Wabash Railroad Company's ponds, Lancsville, Ill			1,490
James River, Nichols, Mo			300
City water-works pond, Moberly, Mo			400
Sibley Lake, Concordia, Kans			230
Lake Geneva, Lake Geneva, Wis			814
Cedar River, Waterloo, Iowa			200
Charles City, Iowa			190
Cedar Rapids, Iowa			40
Private pond, Frost, Tex			200
Private pond, Athens, Tex			100
Jones Fork River, Winslow, Ark			500
Fresh-water drum:			
Indian Creek, New Albany, Ind			100
Silver Creek, New Albany, Ind			100
Black bass:			
Small lakes in cemetery, Winton Place, Ohio			150
Indian Creek, New Albany, Ind			1,000
Silver Creek, New Albany, Ind			1,000
Flat Rock River, Flat Rock, Ind			300
Blue Ridge, Ind			250
Big Blue River, Shelbyville, Ind			500
Little Blue River, Ray Crossing, Ind			200
Brandywine Creek, Fairland, Ind			200
Comus Creek, Waldron, Ind			400
Sangamon River, Decatur, Ill			275
Des Plaines River, Riverside, Ill			1,990
Chicago, Burlington and Quincy R. R. Co. ponds, Galesburg, Ill			650
City reservoir, Belleville, Ill			1,200
Island Lake, Waterloo, Ill			500
Schoors Lake, Waterloo, Ill			500
Mill pond, Red Bud, Ill			350
Kipple Creek, Plymouth, Ill			100
Crooked Creek, Macomb, Ill			500
Bigger Head Lake, Bardolph, Ill			50
Little Wabash River, Louisville, Ill			300
City reservoir, Litchfield, Ill			200
Saylor Springs Lake, Saylor Springs, Ill			300
Illinois Central Railroad Company's ponds, Clinton, Ill			800
Private pond, Potomac, Ill			500
Kankakee River, Kankakee, Ill			1,800
Insane Asylum reservoir, Jacksonville, Ill			1,000
Deaf and Dumb Asylum reservoir, Jacksonville, Ill			300
Embarras River, Charleston, Ill			475

A.—*Details of distribution, 1889-90*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Black bass—Continued.			
Macoupin River, Macoupin, Ill			300
Beaver Dam Lake, Macoupin, Ill			850
Mill pond, Monmouth, Ill			100
Creve Cœur Lake, Creve Cœur, Mo			270
Echo Lake, Kansas City, Mo			1,865
Pertle Springs, Warrensburg, Mo			2,655
Private pond, Little Blue, Mo			2,995
Independence, Mo			2,998
Reed Creek, Liberty, Mo			300
James River, Nichols, Mo			150
U. S. Fish Commission ponds, Neosho, Mo			600
City water works pond, Moberly, Mo			900
Lake at Soldiers' Home, Leavenworth, Kans			1,865
Sibley Lake, Concordia, Kans			2,000
Private lake, Monroe, Wis			200
Lake Geneva, Lake Geneva, Wis			4,940
Mississippi River, Ferryville, Wis			1,498
Cedar River, Waterloo, Iowa			1,400
Charles City, Iowa			1,390
Cedar Rapids, Iowa			1,700
Spirit Lake, Spirit Lake, Iowa			900
Lake in city park, Keokuk, Iowa			200
Blue River, Milford, Nebr			1,962
Loup River, Ravenna, Nebr			1,963
North Fork Elkhorn River, Norfolk, Nebr			175
Headwaters Elkhorn River, Stuart, Nebr			165
Nebraska State fish ponds, South Bend, Nebr			1,200
Sun River, Great Falls, Mont			4,358
Missouri River, Mid-Cañon, Mont			1,000
Private pond, Helena, Mont			100
Frost, Tex			600
Athens, Tex			1,000
Jones Fork River, Winslow, Ark			790
Barren River, Bowling Green, Ky			1,800
Private pond, Gordonsville, Va			50
City reservoir, Charlottesville, Va			113
North River, Lexington, Va			640
Peony Falls, Marriottsville, Md			250
Delaware Fish Commission, Wilmington, Del			125
Crappie:			
Small lakes in cemetery, Winton Place, Ohio			150
Indian Creek, New Albany, Ind			200
Silver Creek, New Albany, Ind			200
Flat Rock River, Flat Rock, Ind			47
Blue Ridge, Ind			75
Big Blue River, Shelbyville, Ind			100
Little Blue River, Ray Crossing, Ind			300
Brandywine Creek, Fairland, Ind			100
Sangamon River, Decatur, Ill			350
Chicago, Burlington and Quincy Railroad Company's ponds, Galesburg, Ill			290
City reservoir, Belleville, Ill			800
Island Lake, Waterloo, Ill			150
Schoors Lake, Waterloo, Ill			150
Kipple Creek, Plymouth, Ill			50
Crooked Creek, Macomb, Ill			150
Little Wabash River, Louisville, Ill			95
Saylor Springs Lake, Saylor Springs, Ill			100
Insane asylum reservoir, Jacksonville, Ill			1,500
Deaf and dumb asylum reservoir, Jacksonville, Ill			500
Embarras River, Charleston, Ill			1,500
Macoupin River, Macoupin, Ill			1,000
Beaver Dam Lake, Macoupin, Ill			900
Mill Pond, Monmouth, Ill			96
Creve Cœur Lake, Creve Cœur, Mo			135
Pertle Springs, Warrensburg, Mo			180
Private pond, Independence, Mo			295
U. S. Fish Commission ponds, Neosho, Mo			13
Sibley Lake, Concordia, Kans			95
Private lake, Monroe, Wis			50
Lake Geneva, Lake Geneva, Wis			414
Mississippi River, Ferryville, Wis			2,490
Cedar River, Waterloo, Iowa			200
Charles City, Iowa			180
Lake in City Park, Keokuk, Iowa			100
North Fork of Elkhorn River, Norfolk, Nebr			175
Headwaters of Elkhorn River, Stuart, Nebr			165
Nebraska State fish ponds, South Bend, Nebr			2,000
Sun River, Great Falls, Mont			548
Missouri River, Mid-Cañon, Mont			200

A.—*Details of distribution, 1889-90*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Crappie—Continued:			
Private pond, Helena, Mont			25
Frost, Tex			200
Athens, Tex			150
Barren River, Bowling Green, Ky			900
Shenandoah River Riverton, Va			750
Rock bass:			
Applicants in Maryland			150
West Virginia			150
North Carolina			300
Virginia			411
Pennsylvania			375
Delaware			75
Georgia			50
Arizona			355
Texas			56
Republic of Mexico, City of Mexico			150
U. S. Fish Commission Station, Neosho, Mo			275
North Fork of Elkhorn River, Norfolk, Nebr			1,400
Headwaters of Elkhorn River, Stuart, Nebr			1,350
Sunfish:			
Flat Rock River, Blue Ridge, Ind			100
Big Blue River, Shelbyville, Ind			50
Little Blue River, Ray Crossing, Ind			60
Chicago, Burlington and Quincy Railroad Company's ponds, Galesburg, Ill			100
City reservoir, Belleville, Ill			100
Island Lake, Waterloo, Ill			300
Schoors Lake, Waterloo, Ill			300
Kipple Creek, Plymouth, Ill			50
Crooked Creek, Macomb, Ill			250
Biggar Head Lake, Bardolph, Ill			50
Little Wabash River, Louisville, Ill			50
City reservoir, Litchfield, Ill			100
Saylor Springs Lake, Saylor Springs, Ill			150
Private pond, Potomac, Ill			50
Kankakee River, Kankakee, Ill			65
Insane asylum reservoir, Jacksonville, Ill			200
Deaf and dumb asylum reservoir, Jacksonville, Ill			50
Embarras River, Charleston, Ill			2,500
Macoupin River, Macoupin, Ill			50
Beaver Dam Lake, Macoupin, Ill			43
Pertle Springs, Warrensburg, Mo			185
Private pond, Little Blue, Mo			340
Private pond, Independence, Mo			347
Cedar River, Cedar Rapids, Iowa			50
Blue River, Milford, Nebr			235
Loup River, Ravenna, Nebr			250
Sun River, Great Falls, Mont			100
Missouri River, Mid-Cañon, Mont			100
Private pond, Athens, Tex			200
Jones Fork River, Winslow, Ark			100
Barren River, Bowling Green, Ky			300
Scup:			
Buzzards Bay, off Massachusetts coast		396,000	
Squeteague:			
Buzzards Bay, off Massachusetts coast		227,500	
Mackerel:			
Buzzards Bay, off Massachusetts coast		688,500	
Tautog:			
Buzzards Bay, off Massachusetts coast		732,000	
Cod:			
Massachusetts Bay, off Massachusetts coast		14,957,500	
Vineyard Sound, off Massachusetts coast		6,826,000	
Pollock:			
Massachusetts Bay, off Massachusetts coast		14,899,000	
Haddock:			
Massachusetts Bay, off Massachusetts coast		5,192,000	
Vineyard Sound, off Massachusetts coast		528,000	
Flatfish:			
Buzzards Bay, off Massachusetts coast		4,086,500	
Lobsters:			
Galveston Bay, near Galveston, Texas	250,000		
Buzzards Bay, off Massachusetts coast		4,511,000	
Total*	44,280,000	261,706,606	383,942

* Figures inclosed in parentheses are not included in summations.

B.—Details of distribution, 1890–91.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Carp:			
Applicants in Alabama			860
Tallapoosa River, Cowles Station, Ala			4,000
Applicants in Arizona			1,620
Arkansas			690
Washita River, Arkadelphia, Ark			5,000
Arkansas Fish Commission			3,000
Applicants in California			60
Colorado			255
Colorado Fish Commission			5,000
Applicants in Connecticut			210
Delaware			120
Delaware Fish Commission			4,000
Applicants in District of Columbia			65
Florida			250
Georgia			880
Chattahoochee River, West Point, Ga			2,000
Georgia Fish Commission			3,000
Applicants in Idaho			1,220
Illinois			750
Illinois Fish Commission			6,690
Applicants in Indiana			260
Indian Territory			510
Shawnee Lake, Shawnee, Indian Territory			1,500
Spring River, Quapaw Agency, Indian Territory			500
Applicants in Iowa			690
Kansas			6,170
Kansas Fish Commission			5,000
Applicants in Kentucky			340
Kinney River, Vancoburg, Ky			6,000
Cumberland River, Barboursville, Ky			5,957
Applicants in Louisiana			570
Maine			150
Maryland			660
Monocacy River, Frederick Junction, Md			4,980
Patuxent River, Laurel, Md			4,989
Patapsco River, Relay House			4,000
Gunpowder River, Cockeysville, Md			4,000
Elk River, Elkton, Md			4,490
North East River, North East, Md			4,490
Applicants in Massachusetts			800
Michigan			430
Zukey Lake, Hamburg Junction, Mich			5,000
Applicants in Minnesota			1,150
Mississippi River, St. Paul, Minn			6,000
Lake Superior, near Duluth, Minn			500
Minnesota Fish Commission, Minn			2,000
Applicants in Mississippi			270
Pearl River, Jackson, Miss			3,000
Applicants in Missouri			150
Hickory Creek, Neosho, Mo			450
Shoal Creek, Boyden, Mo			3,500
North Fork Spring River, Lamar, Mo			4,000
Missouri Fish Commission			45,000
Applicants in Montana			1,000
Nebraska			1,150
Nevada			110
New Jersey			150
New Hampshire			100
New Mexico			150
New York			1,270
Oquaga Lake, Deposit, N. Y			2,000
New York Fish Commission			5,200
Applicants in North Carolina			2,080
North Dakota			90
Ohio			810
Muzzy Lake, Ravenna, Ohio			2,000
Twin Lake, Earlville, Ohio			2,000
Punderson Pond, Burton, Ohio			2,050
Bass Lake, Chardon, Ohio			2,050
Applicants in Oklahoma			300
Pennsylvania			3,190
Brandywine River, Coatsville, Pa			3,000
East Branch Brandywine River, Downington, Pa			3,000
Perkiomen Creek, Perkiomen, Pa			2,943
Pennsylvania Fish Commission			5,000
Applicants in Rhode Island			30
South Carolina			150
Long Cane Creek, Abbeville, S. C			5,055
Applicants in South Dakota			870
Tennessee			2,110
Texas			2,120

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Carp—Continued.			
Trinity River, Dallas, Tex			5,000
Brazos River, Waco, Tex			4,000
San Marcos, San Marcos, Tex			6,000
Texas Pacific R. R. Co. ponds, Wills Point, Tex			2,000
Mesquit, Tex			2,000
Arlington, Tex			2,000
Red River, Texarkana, Tex			5,000
Applicants in Utah			5,840
Utah Fish Commission			2,000
Vermont Fish Commission			500
Applicants in Virginia			5,350
Middle River, West View, Va			7,000
Bull Run, Manassas, Va			5,000
Rapidan River, Rapidan, Va			5,000
Little River, Taylorsville, Va			4,000
Mattaponi River, Milford, Va			4,000
Neabsco Creek, Freestone, Va			4,000
Stoney Creek, Stoney Creek, Va			4,000
Meherrin River, Belfield, Va			4,000
Cedar Run, Catletts, Va			4,000
Rockfish River, Rockfish, Va			4,000
Tye River, Tye River Station, Va			4,000
Reed Creek, Wytheville, Va			2,405
Applicants in Washington			330
West Virginia			570
West Virginia Fish Commission			1,000
Applicants in Wisconsin			300
Wisconsin Fish Commission			25,000
Applicants in Wyoming			270
Wyoming Fish Commission			5,000
Tench:			
Applicants in Colorado			60
Shawnee Lake, Shawnee, Indian Territory			1,000
Applicants in Indiana			15
Kansas			320
Monocacy River, Frederick Junction, Md			400
Patuxent River, Laurel, Md			1,000
Applicants in Michigan			30
Missouri			200
Hickory Creek, Neosho, Mo			860
Shoal Creek, Boyden, Mo			3,500
North Fork Spring River, Lamar, Mo			4,000
Goldfish:			
Applicants in Alabama			176
Arizona Territory			41
Arkansas			462
California			30
Colorado			103
Connecticut			24
Delaware			42
District of Columbia			11,721
Florida			42
Georgia			270
Idaho			6
Applicants and public waters in Illinois			1,796
Applicants in Indiana			814
Indian Territory			124
Iowa			99
Kansas			890
Kentucky			294
Louisiana			170
Maine			6
Maryland			790
Massachusetts			129
Michigan			48
Applicants and public waters in Minnesota			398
Applicants and public waters in Missouri			11,542
Applicants in Mississippi			48
Nebraska			73
New Jersey			252
New Mexico			6
New York			455
North Carolina			174
Ohio			283
Ontario			6
Pennsylvania			970
Rhode Island			18
South Carolina			176
South Dakota			6
Tennessee			400
Texas			503

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Goldfish—Continued.			
Applicants in Utah Territory			226
Vermont			6
Virginia			2,676
West Virginia			170
Wisconsin			34
Wyoming			62
Shad:			
Hudson River, West Point, N. Y		388,000	
Albany, N. Y		332,000	
Chesapeake and Delaware Canal, Delaware City, Del		400,000	
Delaware River, Lackawaxen, Pa		824,000	
Delaware Water Gap, Pa		558,000	
Port Jervis, N. Y		841,000	
Callicoon, N. Y		859,000	
Gloucester City, N. J		25,000	
Big Timber Creek, Westville, N. J		1,200,000	
Cohansey River, Bridgeton, N. J		500,000	
Potomac River, Fort Washington, Md		170,000	
U. S. Fish Commission, Central Station, Washington, D. C.	a(32,361,000)		
United States Fish Ponds, Washington, D. C		b(2,054,000)	
Cedar Run, Catletts, Va		360,000	
Occoquan Creek, Woodbridge, Va		638,000	
Chappawansic Creek, Quantico, Va		333,000	
Rappahannock River Fredericksburg, Va		385,000	
Mattaponi River, Milford, Va		375,000	
Rockfish River, Rockfish, Va		653,000	
Little River, Taylorsville, Va		360,000	
Potomac River, Wide Water, Va		360,000	
Rapidan River, Rapidan, Va		354,000	
Tye River, Tye River Station, Va		390,000	
Neabsco Creek, Freestone, Va		365,000	
Otter River, Evington, Va		363,000	
Patapsco River, Relay, Md		681,000	
Patuxent River, Laurel, Md		820,000	
Meherrin River, Belfield, Va		723,000	
Stoney Creek, Stoney Creek, Va		480,000	
Neuse River, Goldsboro, N. C		568,000	
Pasquotank River, Elizabeth City, N. C		351,000	
Lumber River, Lumberton, N. C		600,000	
Newport River, Newport, N. C		495,000	
Congaree River, Columbia, S. C		1,594,000	
Savannah River, Augusta, Ga		1,570,000	
Ocmulgee River, Macon, Ga		931,000	
White Water Creek, Butler, Ga		558,000	
Flint River, Reynolds, Ga		558,000	
Alabama River, Montgomery, Ala		947,000	
Chattahoochee River, West Point, Ga		947,000	
Chattahoochee River, Bolton, Ga		637,000	
Palmer River, Providence, R. I		1,030,000	
Taunton River, Dighton, Mass		3,890,000	
Connecticut River, Warehouse Point, Conn		1,959,000	
Hudson River, West Point, N. Y		1,900,000	
Albany, N. Y		2,559,000	
Newburg, N. Y		2,113,000	
Glen Falls, N. Y		2,056,000	
Brandywine Creek, Wilmington, Del		1,800,000	
Blackbird Creek, Middletown, Del		138,000	
Appoquinnack Creek, Middletown, Del		137,000	
Smyrna Creek, Clayton, Del		275,000	
Leipsic Creek, Creswold, Del		275,000	
Jones Creek, Dover, Del		413,000	
Murderkill Creek, Felton, Del		495,000	
Mispillion Creek, Milford, Del		275,000	
Broadkill Creek, Ellendale, Del		192,000	
Susquehanna River, Peach Bottom, Pa		1,350,000	
Columbia, Pa		1,900,000	
Fites Eddy, Pa		2,100,000	
near Battery Station		412,000	
Nanticoke River, Seaford, Del		960,000	
Gunpowder River, Gunpowder, Md		1,300,000	
Elk River, Elkton, Md		1,350,000	
North East River, North East, Md		1,660,000	
Bush River, Bush River, Md		1,670,000	
Tuckahoe River, Queen Anne, Md		1,350,000	
Chester River, Chestertown, Md		450,000	
Back River, Back River, Md		450,000	
Wicomico River, Salisbury, Md		1,165,000	

a Distributed as fry from Central Station.
b Deposited for rearing and distribution in fall of 1891.

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Shad—Continued.			
Satilla River, Waycross, Ga		285,000	
Ocmulgee River, Macon, Ga		240,000	
Ocklocknee River, Ocklocknee, Ga		600,000	
Alapaha River, Alapaha, Ga		540,000	
Withlacoochee River, Quitman, Ga		513,000	
Arkansas River, Fort Smith, Ark		400,000	
Van Buren, Ark		1,462,000	
Weber River, Ogden, Utah		500,000	
Bear River, Montpelier, Idaho		571,000	
Bear Lake, Bear Lake, Idaho		1,194,000	
Delaware Fish Commission, Wilmington, Del	837,000		
Savannah River, Augusta, Ga		300,000	
Withlacoochee River, Quitman, Ga		513,000	
Arkansas River, Ozark, Ark		800,000	
Potomac River, Washington, D. C			*a* 800,000
Quinnat salmon:			
California Fish Commission, Sisson, Cal	2,837,900		
E. Chazari, city of Mexico, Mexico	50,000		
Société Nationale d'Acclimatation, Paris, France	90,000		
McCloud River, near Baird, Cal		722,000	
Trinity River, near Fort Gaston, Cal		30,000	
Redwood River, Fort Gaston, Cal		25,000	
Oregon Fish Commission, Warrendale, Oregon	700,000		
Clackamas River, Clackamas, Oregon		4,902,000	
Atlantic salmon:			
Tributaries of Penobscot River, near Craig Brook, Maine			103,506
Hudson River, near Troy, N. Y			10,329
Landlocked salmon:			
Pennsylvania Fish Commission	40,000		
New York Fish Commission	50,000		
New Hampshire Fish Commission	50,000		
Massachusetts Fish Commission	25,000		
Vermont Fish Commission	25,000		
Nevada Fish Commission	20,000		
Minnesota Fish Commission	20,000		
Wilmurt Fishing Club, Newton Corners, N. Y	25,000		
Bisby Fishing Club, Prospect, N. Y	20,000		
Blooming Grove Park Association, Glen Eyre, Pa	10,000		
George A. Starkey, Troy, N. H. (for A. N. Cheney)	10,000		
W. P. Greenough, Lachevroliene, Canada	10,000		
Herr von Behr, Schmaldow, Germany	20,000		
U. S. Fish Commission Station, Washington, D. C	*b* (30,000)		
Northville, Mich	(30,000)		
Duluth, Minn	(50,000)		
Craig Brook, Me	*c* (21,900)		
Schoodic Lake, Schoodic, Me		113,000	
Green Lake, in Hancock County, Me		3,000	
Commodore Club, Hartford, Me		5,289	
Craig Pond, near the station			48
Green Lake, in Hancock County, Me			7,319
Twin Lake, near Como, Wayne County, Pa		25,000	
Lake Superior, off the mouth of Lester River, Minnesota		20,000	
Loch Leven trout:			
Mountainy Pond, near Green Lake, Me			11,297
Long Island Sound, Glen Cove, N. Y		3,000	
Bayville, N. Y		5,000	
Great South Bay, Newton, N. Y		10,000	
Nebraska Fish Commission	10,000		
New Hampshire Fish Commission	10,000		
Berkshire Trout Club, Great Barrington, Mass	10,000		
W. P. Greenough, Portneuf, Quebec, Canada	10,000		
U. S. Fish Commission Station, Cold Spring Harbor, N. Y	*d* (20,000)		
U. S. Fish Commission, Craig Brook, Maine	(20,000)		
Shoshone Lake, Yellowstone National Park			3,350
Lewis Lake, Yellowstone National Park			3,350
Catfish Creek, Dubuque, Iowa			300
Bloody Run, Dubuque, Iowa			300
Waskqukoto Creek, Dubuque, Iowa			300
Clear Creek, Lansing, Iowa			1,800
Big and Little Blue River, Shelbyville, Ind			900
Tributaries of Eagle Lake, Warsaw, Ind			225
Private applicants in Michigan			450
Ohio Fish Commission at Toledo			400
Dayton			400
Garrettsville Anglers' Association, Garrettsville			450
Private applicants in Vermont			2,250

a Estimated product of 2,144,000 fry deposited in May, 1890.
b Distributed as fry from Central Station.
c Distributed as fry from Craig Brook Station.
d Distributed as fry from Cold Spring Harbor Station.

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Rainbow trout:			
Starrucca Creek, Starrucca, Pa	.....	11,981	.....
Charles Run, Monkton, Md	.....	.....	200
Carroll Run, Monkton, Md	.....	.....	250
Bee Tree Run, Freeland, Md	.....	.....	219
Creeks near New Market, Md	.....	.....	950
Tributary of Gunpowder River, Long Green, Md	.....	.....	490
Tributary of Deer Creek, Belair, Md	.....	.....	550
Patapsco River, Glen Falls, Md	.....	.....	889
Western Run, branch of Jones Falls, Baltimore, Md	.....	.....	800
Big Hunting Creek, Mechanicstown, Md	.....	.....	700
Little Hunting Creek, Mechanicstown, Md	.....	.....	700
Applicants in Maryland	.....	.....	979
Burns Brook, Delaware, N. J	.....	.....	110
Jacksonburg Creek, Delaware, N. J	.....	.....	982
Yards Creek, Haynesburg, N. J	.....	.....	226
Blairstown, Haynesburg, N. J	.....	.....	875
Musconiteung Creek, Hackettstown, N. J	.....	.....	876
Trout brook, Hackettstown, N. J	.....	.....	500
New Hampshire Fish Commission	10,000	.....	.....
Vermont Fish Commission	20,000	.....	.....
John H. Gordon, South Bend, Wyo	5,000	.....	.....
Hon. Otto Gramm, Laramie, Wyo	5,000	.....	.....
W. C. Harris, American Angler, New York City	10,000	.....	.....
E. Cházari City of Mexico (for Mexican Government)	25,000	.....	.....
Midland Counties Fish Culture Establishment, Malvern Wells, England	15,000	.....	.....
Herr von Behr, Schmaldow, Germany	10,000	.....	.....
E. Warner, Swiss consul, Havre, France, for the Government of Switzerland	40,000	.....	.....
Frank H. Mason, Frankfort on the Main, Germany	10,000	.....	.....
U. S. Fish Commission Station, Neosho, Mo	(20,000)	.....	.....
Central Station, Washington, D. C	*a* (25,000)	.....	.....
Reedy Creek, Concord, Va	.....	.....	493
Flat Creek, Lawyers, Va	.....	.....	500
Fowl Ground Creek, Redwood, Va	.....	.....	142
Tributaries of Clinch River, Tazewell, Va	.....	.....	50
Big Cedar Creek, Cleveland, Va	.....	.....	230
Tats Run, Wytheville, Va	.....	.....	75
Colvin Run, Herndon, Va	.....	.....	100
Elk Creek, Natural Bridge, Va	.....	.....	500
Applicants in Virginia	.....	.....	1,180
Trout and Meadow runs, Romney, W. Va	.....	.....	400
Big Sandy Creek, Bruceton Mills, W. Va	.....	.....	400
Mill Run, Fairchance, Pa	.....	.....	400
Alder Run, Kylertown, Pa	.....	.....	400
Carmul Run, Kennedy, Pa	.....	.....	90
Waste-House Run, Shenandoah, Pa	.....	.....	400
Trindle Run, Mechanicsburg, Pa	.....	.....	700
Cochlin Run, Mechanicsburg, Pa	.....	.....	1,500
Yellow Breeches Creek, Williams Grove, Pa	.....	.....	2,790
Applicants in Pennsylvania	.....	.....	450
North Fork, Swananoa River, Black Mountain Station, N. C	.....	.....	675
Sugar Fork, Swananoa River, Black Mountain Station, N. C	.....	.....	675
Stony Fork, Swananoa River, Black Mountain Station, N. C	.....	.....	450
Flat Creek, Black Mountain Station, N. C	.....	.....	675
Yadkin River, Salisbury, N. C	.....	.....	1,700
Elkin, N. C	.....	.....	630
Applicants in North Carolina	.....	.....	2,205
Dykes Creek, Rome, Ga	.....	.....	1,350
Applicants in Georgia	.....	.....	450
East Cohoba River, near Birmingham, Ala	.....	.....	450
Linsey Creek, Florence, Ala	.....	.....	200
Cypress Creek, Florence, Ala	.....	.....	200
Applicants in Alabama	.....	.....	180
Vermont	.....	.....	917
East Branch Cedar Creek, Meredith, Mich	.....	.....	467
North Branch Cedar Creek, Meredith, Mich	.....	.....	468
Tobacco Creek, Hatton, Mich	.....	.....	800
Chippewa Creek, Hatton, Mich	.....	.....	200
Stacy Creek, branch of Sturgeon River, Vanderbilt, Mich	.....	.....	535
Applicants in Michigan	.....	.....	380
Ohio	.....	.....	525
Trout Run, Avonia, Pa	.....	.....	113
Hickory Creek, Newton County, Mo	.....	.....	1,000
Baynham Branch, Newton County, Mo	.....	.....	500
Big Lost Creek, Racine, Mo	.....	.....	250
Five Mile Creek, Newton County, Mo	.....	.....	250

a Distributed as fry from Central Station.

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Rainbow trout—Continued.			
North Branch Indian Creek, McDonald County, Mo			400
North Fork of Elkhorn Creek, McDonald County, Mo			400
Sugar Fork of Buffalo Creek, McDonald County, Mo			400
Big Sugar Fork of Elk River, McDonald County, Mo			400
Little Sugar Fork of Elk River, McDonald County, Mo			400
Jones Creek, Jasper County, Mo			400
Turkey Creek, Jasper County, Mo			400
Tributaries of Shoal Creek, Jasper County, Mo			400
Small Lake, near Joplin, Mo			200
Spring River, Jasper County, Mo			500
Crane River, Stone County, Mo			500
Sac River, Ash Grove, Mo			801
James River, Turner, Mo			800
Gasconade, Mansfield, Mo			800
Big Branch, Gasconade River, Cabool, Mo			846
Copper Mine Branch, Carter County, Mo			500
Applicants in Missouri			1,000
Marmaton River, Fort Scott, Kans			1,048
Marisdescygne River, Boiscourt, Kans			1,050
Big Sugar Creek, Boiscourt, Kans			1,077
Five Mile Creek, Leavenworth, Kans			200
Applicants in Kansas			2,300
War Eagle Creek, War Eagle Mills, Ark			970
Tributaries of White River, Fayetteville, Ark			1,847
Applicants in Arkansas			1,400
Von Behr trout:			
Great Brook, Green Lake, Maine			3,413
Heart Pond near Orland, Maine			167
U. S. Fish Commission Station, Leadville, Colo	(100,000)		
Starrucca Creek, Brandt, Pennsylvania		13,200	
Hemlock Creek, Stevens Point, Pennsylvania		3,200	
Lake Superior off mouth of Lester River		10,000	
Baptism River, in Minnesota		5,000	
Nebraska Fish Commission	10,000		
Wyoming Fish Commission	20,000		
Minnesota Fish Commission	20,000		
Otto Gramm, Laramie, Wyo	5,000		
A. N. Cheney, Manchester, Vt	10,000		
A. B. Smith, Bellevue, Ohio	25,000		
W. P. Greenough, Portneuf, Quebec, Canada	10,000		
E. Cházari, Mexico City (for Mexican government)	10,000		
U. S. F. C. Station, Wytheville, Va	(40,000)		
Central Station, Washington, D. C	*a* (28,000)		
Neosho, Mo	(28,000)		
Duluth, Minn	*b* (20,000)		
Nez Percé Creek, Yellowstone National Park			9,800
Thornington Pond, Romeo, Mich			250
Catfish Creek, Dubuque, Iowa			300
Bloody Run, Dubuque, Iowa			300
Wasqukoto Creek, Dubuque, Iowa			300
Clear Creek, Lansing, Iowa			1,800
White River, Noblesville, Indiana			450
Big and Little Blue River, Shelbyville, Indiana			900
Spearfish Creek, Spearfish, South Dakota			350
Tributaries of Menominee River, Marinette, Wis			450
Ohio Fish Commission, Toledo, Ohio			525
Dayton, Ohio			900
Garrettsville Anglers' Association, Garrettsville, Ohio			450
Applicants in Ohio			270
Hoosac River, North Adams, Mass			330
Otsego Creek, Oneonta, N. Y			425
Applicants in New York			455
North Branch of Indian Creek, Stella, Mo			400
Sugar Forks of Buffalo Creek, McDonald County, Mo			400
Big Sugar Fork of Elk River, Pineville, Mo			400
South Fork of Elkhorn River, Indiana Springs, Mo			400
Little Sugar Fork of Elk River, Pineville, Mo			400
Jones Creek, Fidelity, Mo			400
Turkey Creek, Scotland, Mo			400
Grand River, Harrisonville, Mo			835
Spring River, Jasper County, Mo			1,200
Crane Creek, Stone County, Mo			500
Piney River, Cabool County, Mo			1,750
Bull Creek, Paola, Kans			840
War Eagle Creek, War Eagle, Ark			1,000
West Fork, White River, Fayetteville, Ark			2,000

a Distributed as fry from Central Station. *b* Distributed as fry from Duluth Station.

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Von Behr trout—Continued.			
Applicants in Arkansas			1,000
Delaware Fish Commission	8,500		
W. C. Harris, "American Angler," New York City	8,500		
New York Fish Commission	12,750		
U. S. Fish Commission Station, Northville, Mich	(31,750)		
Craig Brook, Me	(9,000)		
Brook trout:			
Moose Pond, Hartland, Me		4,251	
U. S. Fish Commission Station, Leadville, Colo	(20,000)		
Starrucca Creek, Brandt, Pa		16,660	
Hemlock Creek, Stevens Point, Pa		3,920	
Applicants in New Jersey			48
Gen. Geo. W. Hooker, Brattleboro, Vt	25,000		
Dana Pearson, Northampton, Mass	20,000		
U. S. Fish Commission Station, Wytheville, Va	(20,000)		
Central Station, Washington, D. C	a (25,000)		
Neosho, Mo	(20,000)		
West Fork of Gardiner River, Yellowstone National Park			7,875
Catfish Creek, Dubuque, Ia			400
Bloody Run, Dubuque, Ia			400
Wasqukoto Creek, Dubuque, Ia			550
Cooley Creek, Lansing, Ia			1,350
Greene River, Werley, Wis			900
Creeks tributary to Menominee River near Marinette, Wis			1,340
White River, Noblesville, Ind			450
Turtle Lake, Alpena, Mich			900
Sand Creek, Grand Rapids, Mich			360
Rush Creek, Grand Rapids, Mich			180
Spearfish Creek, Spearfish, S. Dak			450
Applicants in Indiana			450
Ohio Fish Commission, Dayton, Ohio			400
Ohio Fish Commission, Toledo, Ohio			100
Hoosac River, North Adams, Mass			100
Heywood Creek, Weston, Mass			100
West Pasture Brook, North Hatfield, Mass			100
Applicants in Massachusetts			100
Ten-Mile River, Dillon, Colo			5,000
Snake River, Dillon, Colo			5,000
Platte River, Estabrook, Colo			10,000
Willow Creek, Dillon, Colo			5,000
Grape Creek and tributaries, West Cliff, Colo			5,000
Applicants in Colorado			13,000
Wyoming State Fish Commission			5,000
Applicants for stocking public streams near Rapid City, S. D.			8,500
in South Dakota			1,000
Otto Gramm, Laramie, Wyo	5,000		
Lester River, near Duluth Station			100
Lake trout:			
Pleasant Lake, Fallsburg, N. Y		99,900	
White Lake, Liberty, N. Y		99,820	
Sheldrake Lake, Hurleyville, N. Y		99,790	
Round Lake, Rockland, N. Y		99,730	
Guilford Lake, Guilford, N. Y		82,460	
Comforts Pond, Susquehanna, Pa		24,500	
Lake Hopatcong, Lake Hopatcong, N. J		62,441	
Lake Erie, near Put-in Bay, Ohio		192,000	
Minnesota Fish Commission	150,000		
New Hampshire Fish Commission	500,000		
Rhode Island Fish Commission	20,000		
Wyoming Fish Commission	100,000		
Nebraska Fish Commission	50,000		
John H. Gordon, South Bend, Wyo	50,000		
C. F. Stoddard, Granville, N. Y	10,000		
Blooming Grove Park Association, Glen Eyre, Pa	55,000		
E. Cházari, City of Mexico (for Mexican Government)	50,000		
U. S. F. C. Station, Cold Spring Harbor, N. Y	b (500,000)		
Duluth, Minn	c (500,000)		
Put-in Bay, Ohio	d (200,000)		
Central Station, Washington, D. C	a (100,000)		
Whitefish Lake, Pierson, Mich		31,500	
Sand Lake, Sand Lake, Mich		40,500	
Crandall Lake, Cedar Springs, Mich		22,500	
South Lake, Cedar Springs, Mich		27,000	
Moore Lake, Cedar Springs, Mich		22,500	
Lincoln Lake, Spencer Mills, Mich		31,500	
Trufants, Mich		31,500	
Gowen, Mich		31,500	
Curley Lake, Harrard, Mich		31,500	

a Distributed as fry from Central Station.
b Distributed as fry from Cold Spring Harbor Station.
c Distributed as fry from Duluth Station.
d Distributed as fry from Put-in Bay Station.

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Lake trout—Continued.			
Myers Lake, Rockford, Mich		45,000	
Zukey Lake, Hamburg Junction, Mich		225,000	
Walnut Lake, Oakland, Mich			20,000
Selkirk Lake, Shelbyville, Mich			3,400
Fatal Lake, Greenville, Mich			500
Baldwin Lake, Greenville, Mich			500
Burgess Lake, Greenville, Mich			600
Murray Lake, Ionia, Mich			2,050
Fern Lake, Grand Rapids, Mich			400
Reed Lake, Grand Rapids, Mich			400
Lake Odessa, Lake Odessa, Mich			400
Camp Lake, Sparta, Mich			1,100
Carp Lake, Provemont, Mich			1,970
Meberts Creek, Meberts, Mich			1,000
Mainstay Lake, Waterford, Mich			982
Orchard Lake, Orchard Lake, Mich			6,000
Union Lake, Oakland County, Mich			74,000
Cooley Lake, Oakland County, Mich			12,000
Applicants in Iowa			3,625
Michigan			500
South Dakota			400
Lake Kampeska, Watertown, S. Dak			1,000
Lake Maxinkuckee, Marmont, Ind			2,250
Applicants in Indiana			450
Ohio			505
Shenango River, Sharon, Pa			494
Hampton Lake, Yardley, Pa			500
Applicants in New York			250
Rhode Island			500
Vermont			2,300
Maryland			955
New Jersey			55
Shoshone Lake, Yellowstone National Park			30,012
Lewis Lake, Yellowstone National Park			12,013
Lake Superior, off the mouth of Lester River in Minnesota		303,000	
Lake Menozia, in St. Louis County, Minn		55,000	
Lake Superior, off the mouth of Lester River			235,000
Elk River, Rutledge, Mo			500
Whitefish:			
Lake Ontario, near Oswego, N. Y		1,000,000	
Lake Ontario, near Sacketts Harbor, N. Y		2,312,000	
Ohio Fish Commission	47,500,000		
Pennsylvania Fish Commission	14,000,000		
Wisconsin Fish Commission	10,000,000		
Carl G. Thompson, Warren, Ind	125,000		
Lake Erie, near Put-in Bay, Ohio		10,000,000	
New York Fish Commission	4,000,000		
Herr von Behr, Schmaldow, Germany	100,000		
Midland Counties Fish Culture Establishment, Malvern Wells, England	200,000		
U. S. F. C. Station, Duluth, Minn	a(12,000,000)		
Central Station, Washington, D. C	b(4,000,000)		
Put-in Bay, Ohio	c(200,000)		
Lake Huron, north of Thunder Bay Island		1,500,000	
near Middle Island		1,500,000	
East Tawaos		2,000,000	
Miller Point		2,000,000	
Sturgeon Point		2,000,000	
Lake Michigan, near Epoufette and Warehouse		2,000,000	
Nanbinway and Scott Point		2,500,000	
Lake Superior, near Whitefish Point		2,500,000	
Straits of Mackinac, near St. Ignace		2,500,000	
Detour Passage, near Hay Point		2,000,000	
Thunder Bay, near South Point and Scarecrow Island		1,500,000	
Sulphur Island		1,000,000	
North Point		1,000,000	
Lake Superior, near mouth of Lester River		11,330,000	
Yellowstone River, above the falls, in Yellowstone National Park			10,000
Smelt:			
Potomac River, near Chain Bridge, D. C		400,000	
Yellow perch:			
Chicago, Burlington and Quincy Railroad reservoir, Rio, Ill			500
Sangamon River, Decatur, Ill			495
Lakes in vicinity of Greenville, Ill			200
Virginia, Ill			300
Big Flat Creek, St. Paul, Ind			440
Small private pond, Indianapolis, Ind			50

a Distributed as fry from Duluth Station. *b* Distributed as fry from Central Station.
c Distributed as fry from Put-in Bay Station.

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Yellow perch—Continued.			
Big Indian, New Albany, Ind			257
Silver Creek, New Albany, Ind			200
Pine Lake, La Porte, Ind			50
Elkhart River, Elkhart, Ind			50
St. Joe River, Elkhart, Ind			50
Simmons Lake, Elkhart, Ind			50
Elk River, Goshen, Ind			100
Eagle Lake, Warsaw, Ind			50
Massinneawa, Marion, Ind			50
White River, Anderson, Ind			35
Iowa River, Iowa Falls, Iowa			385
Lone Tree Lake, Burlington, Iowa			510
Cedar River, Cedar Rapids, Iowa			280
Iowa River, Decorah, Iowa			400
Middle Creek, Maple Hill, Kans			96
Mill Creek, Poxico, Kans			96
Mill Creek, Alma, Kans			98
Spring Pond, Holliday, Kans			100
Creek near Burton, Kans			100
Wakarusa Creek, Topeka, Kans			100
Chiscaki River, Nashville, Kans			100
Calvary Creek, Coldwater, Kans			100
Elm Creek, Medicine Lodge, Kans			200
Falls of the Rough, Roughdale, Ky			390
Lake Cockerell, Independence, Mo			195
Big Hole River, Butte City, Mont			2,607
Weber River, Ogden, Utah			200
Utah Lake, Battle Creek, Utah			436
Lake Colville, Sprague, Wash			30
Loon Lake, Loon Lake, Wash			25
Washington Lake, Seattle, Wash			237
Applicants in Pennsylvania			6
Pike perch:			
Pennsylvania Fish Commission	58,000,000		
West Lake, Kalamazoo, Mich		500,000	
Gourdneck Lake, Kalamazoo, Mich		750,000	
Gun Lake, Plainville, Mich		1,250,000	
Wetmore Lake, Allegan County, Mich		375,000	
Dumont Lake, Allegan County, Mich		375,000	
Miner Lake, Allegan County, Mich		750,000	
Swan Lake, Allegan County, Mich		500,000	
Little John Lake, Allegan County, Mich		250,000	
Lake 16, Allegan County, Mich		250,000	
Turkey Lake, Cedar Beach, Ind		8,000,000	
Lake Maxinkuckee, Marshall County, Ind		800,000	
Clear Lake, Springfield, Ill		2,000,000	
Kankakee River, Kankakee, Ill		6,000,000	
Susquehanna River, Susquehanna, Pa		5,000,000	
Bass Lake, Chardon, Ohio		2,300,000	
Summit Lake, Akron, Ohio		3,250,000	
Brady Lake, Kent, Ohio		3,100,000	
Muskingum River, Zanesville, Ohio		10,000,000	
Ravenna Lake, Ravenna, Ohio		2,200,000	
Mahoning River, Newton Falls, Ohio		1,000,000	
Geauga Lake, Garrettsville, Ohio		850,000	
Lake Erie, near Bass Island, Ohio		1,800,000	
Cleveland, Ohio		1,000,000	
St. Louis River, Fond du Lac, Minn	12,000,000		
Minnesota River, near Mendota, Minn		5,000,000	
Mankato, Minn		5,000,000	
Lester River, near Duluth, Minn		100,000	
Black bass:			
Applicants in North Carolina			260
South Carolina			400
Tennessee			150
Chicago, Burlington and Quincy Railroad reservoir, Rio, Ill			1,585
Lake in vicinity of Columbia, Ill			1,530
Sangamon River, Decatur, Ill			500
Lakes in vicinity of Shirley, Ill			200
Lebanon, Ill			150
Waterloo, Ill			450
Greenville, Ill			300
Embarras River, Charleston, Ill			2,280
Lakes in vicinity of Virginia, Ill			1,200
Macomb, Ill			300
Spoon Lake, Seville, Ill			500
Fox River, McHenry, Ill			494
Taylor Lake, Grays Lake, Ill			200
Second Lake, Grays Lake, Ill			493
Du Page River Naperville, Ill			800
Kaskaskia River, Keysport, Ill			200

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Black bass—Continued.			
Big Muddy River, De Soto, Ill			150
Lakes in vicinity of Carbondale, Ill			150
Anna, Ill			150
Cache River, Ullin, Ill			150
Flat Rock River, Flat Rock, Ind			300
Big and Little Blue Rivers, Shelbyville, Ind			300
Small lake near Ft. Wayne, Ft. Wayne, Ind			100
White River, Richmond, Ind			10
Big Flat Creek, St. Paul, Ind			880
Small private pond, Indianapolis, Ind			100
Big Indian, New Albany, Ind			1,008
Silver Creek, New Albany, Ind			960
Pine Lake, La Porte, Ind			250
Elkhart River, Elkhart, Ind			164
St. Joe River, Elkhart, Ind			183
Simmons Lake, Elkhart, Ind			183
Elk River, Goshen, Ind			250
Eagle Lake, Warsaw, Ind			276
Massinneawa, Marion, Ind			275
White River, Anderson, Ind			315
White River, Indianapolis, Ind			850
Iowa River, Iowa Falls, Iowa			1,475
Lone Tree Lake, Burlington, Iowa			2,440
Cedar River, Cedar Rapids, Iowa			300
Iowa River, Decorah, Iowa			1,475
Des Moines River, Ottumwa, Iowa			200
Big Creek, Rome, Iowa			200
Skunk River, Mount Pleasant, Iowa			200
East Nodaway River, Valisca, Iowa			100
Middle Nodaway River, Valisca, Iowa			100
Railroad reservoir, Moxon, Iowa			200
Des Moines River, Albia, Iowa			200
West Nishnabotna River, Hastings, Iowa			250
Des Moines River, Lovey, Iowa			200
Nishnabotna River, Red Oak, Iowa			250
Middle Creek, Maple Hill, Kans			528
Mill Creek, Poxico, Kans			328
Mill Creek, Alma, Kans			328
Spring Pond, Holliday, Kans			350
Creek near Burton, Burton, Kans			150
Wakerasa Creek, Topeka, Kans			350
Chiscaki River, Nashville, Kans			400
Calvary Creek, Coldwater, Kans			350
Elm Creek, Medicine Lodge, Kans			1,200
Private pond near Nicholasville, Nicholasville, Ky			75
Lake Ellerslie, Danville, Ky			75
Lake in vicinity of Versailles, Ky			277
Covington, Ky			100
Walton, Ky			100
Snow Island, St. Ignace, Mich			800
Lake Cockerell, Independence, Mo			990
Salt River, Hunnewell, Mo			250
Chariton River, Chariton, Mo			250
Big Hole River, Butte City, Mont			1,340
Oquaga Lake, Deposit, N. Y			296
State fish ponds, New York Fish Commission			200
Muzzy Lake, Ravenna, Ohio			580
Bass Lake, Chariton, Ohio			470
Mahoning, Leavittsburg, Ohio			500
Susquehanna River, Easton, Pa			200
Lake Kampesta, Watertown, S. Dak			800
Weber River, Ogden, Utah			300
Utah Lake, Battle Creek, Utah			1,480
Lake Colville, Sprague, Wash			150
Loon Lake, Loon Lake, Wash			300
Washington Lake, Seattle, Wash			770
Williams Bay, Geneva, Wis			1,886
State hatchery, Laramie, Wyo			710
Applicants in Pennsylvania			100
Delaware			25
Big Patuxent River, Laurel, Md			60
Middle Patuxent River, Laurel, Md			77
Crappie:			
Chicago, Burlington, and Quincy Railroad reservoir, Rio, Ill			380
Lake in vicinity of Columbia, Ill			385
Sangamon River, Decatur, Ill			500
Judge Waldin's lake, Clinton, Ill			209
Lakes in vicinity of Shirley, Ill			198
Lebanon, Ill			150
Waterloo, Ill			535
Macomb, Ill			200

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Crappie—Continued.			
Spoon River, Seville, Ill			500
Fox River, McHenry, Ill			496
Pistauqua Bay, McHenry, Ill			496
Taylor Lake, Grays Lake, Ill			200
Second Lake, Grays Lake, Ill			295
Du Page River, Naperville, Ill			500
Kaskaskia River, Keysport, Ill			100
Big Muddy River, De Soto, Ill			100
Lakes in vicinity of Carbondale, Ill			100
Anna, Ill			100
Cache River, Ullin, Ill			100
Flat Rock River, Flat Rock, Ind			394
Big and Little Blue Rivers, Shelbyville, Ind			394
Sugar Creek, Philadelphia, Ind			75
Flat Rock River, Louisville, Ind			150
Blue River, Knightstown, Ind			150
West River, Cambridge, Ind			150
White River, Richmond, Ind			775
Big Flat Creek, St. Paul, Ind			680
Small private pond, Indianapolis Ind			100
White River, Indianapolis, Ind			630
Iowa River, Iowa Falls, Iowa			250
Des Moines River, Ottumwa, Iowa			200
Big Creek, Rome, Iowa			200
Skunk River, Mount Pleasant, Iowa			200
East Nodaway River, Valisca, Iowa			100
Middle Nodaway River, Valisca, Iowa			94
Railroad reservoir, Moxon, Iowa			200
Des Moines River, Albia, Iowa			200
W. Nishnabotna River, Hastings, Iowa			244
Des Moines River, Levey, Iowa			175
Nishnabotna River, Red Oak, Iowa			238
Middle Creek, Maple Hill, Kans			129
Mill Creek, Poxico, Kans			129
Alma, Kans			131
Little Kentucky River, La Grange, Ky			100
Falls of the Rough, Roughdale, Ky			720
Private pond near Nicholasville, Ky			75
Lake Ellerslie, Danville, Ky			75
Lake in vicinity of Versailles, Ky			370
Covington, Ky			100
Walton, Ky			100
Snow Island, St. Ignace, Mich			400
Lake Cockrell, Independence, Mo			500
Salt River, Hunnewell, Mo			150
Chariton River, Chariton, Mo			150
Lakes in vicinity of Nebraska City, Nebr			1,450
Oquaga Lake, Deposit, N. Y			280
State fish ponds, New York State Fish Commission			200
Agent railroad company, Waverly, Pa			150
Delaware River, Callicoon, N. Y			150
Lackawaxen, Pa			126
Port Jervis, N. Y			250
Susquehanna River, Easton, Pa			50
Pennsylvania Fish Commission, Allentown, Pa			75
Susquehanna River, Harrisburg, Pa			300
Lancaster, Pa			350
Lake Kampesta, Watertown, S. Dak			300
Washington Lake, Seattle, Wash			285
Williams Bay, Geneva, Wis			495
State Hatchery, Laramie, Wyo			1,470
Middle Patuxent River, Laurel, Md			49
Big Patuxent River, Laurel, Md			46
Applicants in Delaware			25
Pennsylvania			50
Rock bass:			
Applicants in Virginia			1,450
Tennessee			477
North Carolina			200
Pennsylvania			635
Maryland			450
Delaware Fish Commission			450
Lake in vicinity of Columbia, Ill			490
Judge Waldin's Lake, Clinton, Ill			200
Lakes in vicinity of Shirley, Ill			200
Lebanon, Ill			200
Waterloo, Ill			495
Embarras River, Charleston, Ill			382
Taylor Lake, Grays Lake, Ill			100
Second Lake, Grays Lake, Ill			192
Du Page River, Naperville, Ill			400

B.—*Details of distribution, 1890–91*—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Rock bass—Continued.			
Kaskaskia, Keysport, Ill			100
Big Muddy River, De Soto, Ill			100
Lakes in vicinity of Carbondale, Ill			100
Anna, Ill			100
Cache River, Ullin, Ill			100
Flat Rock River, Flat Rock, Ind			300
Big and Little Blue rivers, Shelbyville, Ind			300
Big Flat Creek, St. Paul, Ind			195
White River, Indianapolis, Ind			370
Cedar River, Cedar Rapids, Iowa			185
Iowa River, Decorah, Iowa			300
Des Moines River, Ottumwa, Iowa			134
Big Creek, Rome, Iowa			133
Skunk River, Mt. Pleasant, Iowa			133
East Nodaway River, Valisca, Iowa			100
Middle Nodaway River, Valisca, Iowa			100
Railroad reservoir, Moxon, Iowa			200
Des Moines River, Albia, Iowa			200
West Nishnabotna River, Hastings, Iowa			250
Des Moines River, Levey, Iowa			200
Nishnabotna River, Red Oak, Iowa			250
Lakes in vicinity of Pee Wee Valley, Kentucky			60
Little Kentucky River, La Grange, Ky			50
Falls of the Rough, Roughdale, Ky			470
Lake in vicinity of Versailles, Ky			84
Covington, Ky			100
Walton, Ky			100
Snow Island, St. Ignace, Mich			300
Lake Cockerell, Independence, Mo			195
Salt River, Hunnewell, Mo			100
Chariton River, Chariton, Mo			100
Oquaga Lake, Deposit, N. Y			490
Neahoning River, Leavittsburg, Ohio			395
Delaware River, Callicoon, N. Y			50
Lackawaxen, Pa			25
Port Jervis, N. Y			50
Susquehanna River, Easton, Pa			50
Pennsylvania Fish Commission, Allentown, Pa			50
Susquehanna River, Harrisburg, Pa			150
Lancaster, Pa			150
Lake Kampesta, Watertown, S. Dak			350
Williams Bay, Geneva, Wis			297
State hatchery, Laramie, Wyo			200
Potomac River, Washington, D. C			59
Flagholc, Spring River, Seneca, Mo			1,368
Sunfish:			
Chicago, Burlington and Quincy Railroad reservoir, Rio, Ill			500
Sangamon River, Decatur, Ill			495
Small lake near Fort Wayne, Ind			94
Big Indian, New Albany, Ind			250
Silver Creek, New Albany, Ind			238
Iowa River, Decorah, Iowa			200
Agent Railroad Company, Waverly, Pa			50
Lake Kampesta, Watertown, S. Dak			150
Lake Colville, Sprague, Wash			25
Loon Lake, Loon Lake, Wash			25
Applicant in Pennsylvania			15
Potomac River, Washington, D. C			130
Spanish mackerel:			
Off mouth of Chesapeake Bay, near Cape Charles, Va		776,000	
Cod:			
Massachusetts Bay, off Cape Ann, Massachusetts		18,968,000	
Vineyard Sound, off the Massachusetts coast		36,416,000	
Pollock:			
Massachusetts Bay, off Cape Ann, Massachusetts		14,827,500	
Haddock:			
Massachusetts Bay, off Cape Ann, Massachusetts		78,500	
Flatfish:			
Vineyard Sound, off the Massachusetts coast		3,350,500	
Lobsters:			
Vineyard Sound, off the Massachusetts coast		3,533,500	
Total*	152,129,650	264,076,667	2,016,152

* Figures inclosed in parentheses are not included in summations.