REPORT

OF THE

UNITED STATES COMMISSIONER OF FISH AND FISHERIES

FOR THE

FISCAL YEAR ENDING JUNE 30, 1892.

The following report exhibits the work of the Commission during the year commencing July 1, 1891, and ending June 30, 1892.

For the current expenses of the work appropriations as follows were made by Congress:

Compensation of Commissioner	$5,000
Propagation of food-fishes	155,000
Distribution of food-fishes	50,000
Maintenance of vessels	45,000
Inquiry respecting food-fishes	20,000
Statistical inquiry	20,000
	295,000

Details of the expenditure of these appropriations were submitted to Congress December 1, 1892 (Mis. Doc. No. 10, House of Representatives, Fifty-second Congress, second session).

DIVISION OF INQUIRY RESPECTING FOOD-FISHES.

This division of the Fish Commission is charged with the inquiry into the causes of the decrease of food-fishes in the lakes, rivers, and coast waters of the United States, the study of the waters of the interior in the interest of fish-culture, and the investigation of the fishing-grounds of the Atlantic, Pacific, and Gulf coasts, with the view of determining their food resources and thus directing and promoting the development of the commercial fisheries.

The responsible direction of the work has continued, as heretofore, under Mr. Richard Rathbun, the assistant in charge. A review of the more important operations of the year will indicate how important and diversified are the duties which devolve upon him, and how diligent and capable has been his administration.

On the Pacific coast the principal investigation related to the fur-seal fishery of the North Pacific Ocean and Bering Sea. The information sought was the ascertainment of other, if any, hauling-grounds for the seals on the Alaska coast than those of the Pribilof Islands, the relations that might exist between the American and Asiatic herds, and a knowledge of the pelagic habits of these animals. These inquiries were conducted for use in connection with the preparation of the Bering Sea case before the proposed Tribunal of Arbitration at Paris. By direction of the President, on July 9, 1891, the steamer *Albatross* was placed at the disposition of the agents of the Government detailed to visit the seal islands, Doctors T. C. Mendenhall and C. Hart Merriam. The ship sailed from San Francisco July 16 and did not return till toward the close of the following month, too late to permit her return to northern waters to prosecute the intended inquiries, and they were deferred till the middle of March, 1892, when they were taken up under the nominal direction of the Secretary of the Treasury, the instructions, however, emanating from the State Department and the Fish Commission. A general outline of the information gained, as also of the cruise of the vessel, will be found in the accompanying report of Mr. Rathbun.

Upon the return of the *Albatross* to the United States on August 22, 1891, she was occupied in an investigation of the fishery resources of Puget Sound and the Strait of Juan de Fuca and in some incidental fishing and dredging trials till September 18, from which date till the following March she was transferred to the direction of the Secretary of the Navy for use in the determination of a practicable route for a telegraphic cable between San Francisco and Honolulu, as provided by the act of Congress approved March 3, 1891.

On the Atlantic coast the principal work of the division was an investigation, through the agency of the schooner *Grampus*, of the distribution and abundance of fishes in Chesapeake Bay and adjacent waters, and the conduct of inquiries off the southern coast of New England for the purpose of determining the physical characteristics of the belt of water bordering the coast through which, in their seasonal migrations north and south, so many important fishes pass, the changes which occur therein, and the causes for such changes. A large part of the year was spent by the steamer *Fish Hawk* in the delineation of the oyster-grounds of Chesapeake Bay and the determination of their condition, with a view of ascertaining the possibilities of increasing the product of this mollusk.

Through arrangements made with Dr. John A. Ryder, experiments were conducted at Sea Isle City, N. J., for the purpose of determining some practical system for the collection of oyster spat so as to permit the utilization of areas of muddy bottom not suitable for oyster-planting by methods now employed. The study of the food of oysters, and of the relations of oysters to their environment in that respect, was con-

ducted near Hampton, Va., by Dr. John P. Lotsy, of the Johns Hopkins University.

Toward the close of the last fiscal year arrangements were made with Dr. Bashford Dean, of Columbia College, New York, to investigate the systems of oyster-culture pursued in France and other European countries. The reports on these inquiries have appeared in the bulletin of the Commission under the titles "Report on the Present Methods of Oyster-Culture in France," and "Report on the European Methods of Oyster-Culture."

The more important investigations of the Commission at the Woods Holl Marine Laboratory were in relation to—

(1) The embryology of certain sponges indigenous to the Vineyard Sound region, which are themselves of no economic importance, but are related in their development and habits to the more important forms of the Gulf coast—by Dr. H. V. Wilson.

(2) The anatomy, embryology, and habits of certain important crustaceans and mollusks—by Profs. Patten, Herrick, Fernald, Kellogg, and Conklin.

(3) Continuous observations through the entire year by Mr. Vinal N. Edwards in reference to the habits, abundance, and movements of the important fishes of the New England coast, and the temperature conditions existing and influencing their movements. The most interesting result of his observations for the current year was that the menhaden, in part at least, is an inshore spawner. The observations as yet are too few in number and over too small an area to warrant any general conclusions, but if more extended and continued observations disclose that this habit is general for the species, the necessity of regulation of the menhaden fishery by reasonable restraints will be as evident and imperative as for the shad and other anadromous species.

In connection with the general study of the interior waters, special attention was given during the year to the Rocky Mountain region of Montana and Wyoming, and of Texas, with the view of determining, in accordance with the special directions of Congress, suitable sites for the location of fish-hatcheries. Inquiries were also made concerning some of the water-courses of Ohio, Indiana, Kentucky, Tennessee, North Carolina, New York, and Wisconsin. Incidentally, in the work of this division, an investigation, in response to complaints, was made of the pollution of the Susquehanna River near Havre de Grace, Md., produced by the overflow of the waste liquors from a large mill manufacturing paper from wood pulp.

At the various rearing-stations of the Commission the amount of their product has been from time to time greatly affected by the presence of disease caused both by peculiar conditions of surroundings and by parasitic animals. Several special cases received the attention of the division during the year, and investigations looking toward a comprehensive study of the subject, on which successful fish-culture so greatly depends, have been inaugurated.

In the prosecution of its investigations this division has had the able assistance of a number of gentlemen connected with our colleges and other institutions of learning, to whom acknowledgment is hereby made by the Commissioner. The names of these gentlemen, and the special inquiries on which they were engaged, as also the fuller details of the work of the division, will be found in the accompanying report of the assistant in charge.

DIVISION OF STATISTICS AND METHODS OF THE FISHERIES.

During the fiscal year 1892 the work of this division continued under the general direction of Mr. J. W. Collins, assistant in charge. He having been designated by me as the representative of the Commission on the Government Board of Control of the World's Columbian Exposition, and his new duties requiring and receiving most of his attention, the immediate direction of the work of the division devolved upon Mr. Hugh M. Smith, principal assistant. His report of operations for the year is appended to and constitutes a part of the report of the Commissioner. A brief summary of the more important features of the year's work in this division is here given.

This division is charged by law with the study of the methods, relations, and statistics of the fisheries with a view to their improvement; the study of the resources of the fishing-grounds of the Atlantic, Gulf, and Pacific coasts, and the determination of methods for the development of the same; the collection and compilation of the statistics of the fisheries of all portions of the United States, including persons employed, capital invested, and quantity and value of products, and the preparation of reports relating to the inquiry.

The geographical scope of the field investigations of the commercial fisheries undertaken by the division during the year had reference to the work accomplished during the two preceding years, when the attention of the office was directed to the New England, South Atlantic, Gulf, and Pacific States. The fisheries of the Great Lakes had not been canvassed since 1885, and no complete study of the fishing industry of the Middle Atlantic States had been made since 1888; and it was, therefore, in these sections that the field force was placed. The regular inquiries heretofore conducted at Boston and Gloucester were continued.

The canvass of the fisheries of the Great Lakes placed the office in possession of interesting and useful data, showing the condition of the industry in the calendar year 1890 and permitting the institution of important comparisons with 1880 and 1885. A full synopsis of the results of the investigation is given in the appended report of the division, and the complete report on the lake fisheries will be found in the appendix (pp. 361–459).

The fisheries of the Great Lakes have from an early date attracted much attention, not only in the States directly bordering thereon, but

throughout the country. The general interest which has been manifested has been due to the great extent of the industry, the dissimilarity of the fishes from those taken in other regions, the important fish-cultural operations which have there been carried on, and the probability of a more speedy and complete impairment of the supply by overfishing than would be possible in the case of fisheries prosecuted in the open sea.

This Commission has endeavored to keep well informed regarding the condition of the lake fisheries. In 1885 the thorough canvass made by the office disclosed a very satisfactory state of the industry, the output of the commercial fisheries in that year probably being larger than during any previous year. Several minor special studies were also undertaken in the lake region in the years intervening between 1885 and the next general canvass in 1891.

The results of the inquiries conducted during the year show that, taking the entire region into consideration, 9,738 persons were directly employed in the industry, $5,420,778 was invested, and the value of the catch was $2,471,768. The yield of the principal species was as follows: Whitefish, 12,401,335 pounds; lake trout, 12,890,441 pounds; sturgeon, 4,289,759 pounds; lake herring, 48,753,349 pounds; other fish, 35,563,647 pounds.

General comparisons for the entire region show that in 1890 the number of persons employed, the amount of capital invested, and the quantity and value of the catch were greater than in 1880, while the number of fishermen and the value of the catch were less than in 1885, although the investment was considerably larger.

A knowledge of the variations which have occurred in the abundance of the principal fishes, as determined by the catch, is of great importance in shaping legislation and applying fish-cultural methods for the maintenance of the supply. Whitefish, which in 1880 were taken in larger quantities than any other species, were surpassed in 1890 by lake trout and lake herring; the decrease in the output was 43 per cent between 1880 and 1890, and 30 per cent between 1885 and 1890. The catch of lake trout increased to only a slight extent since 1885, but was almost twice as large as in 1880. The yield of sturgeon has exhibited a steady decrease, which was especially marked in the last five years. The most noticeable change has been the catch of minor whitefishes, usually classed under the general name lake herring, of which the cisco (*Coregonus artedi*) is the type. From the second place, which these fish occupied in 1880, they advanced to first in 1885, and maintained the same relative rank in 1890, becoming, at the same time, the most valuable of the lake fishes. The aggregate production of all other species was about the same in 1890 as in 1885, and was somewhat more than double that in 1880.

The general increases and decreases which have occurred in the yield of the different fishes must not be regarded wholly from the standpoint of abundance, but should be interpreted in connection with the special

conditions prevailing in each lake, among which may be noted variations in the amount of apparatus used and the transfer of fishing operations from one lake to another or from American to Canadian waters in the same lake.

During the fiscal year 1892 the field investigations in the Middle Atlantic States were, on account of the small force available for such duty, confined to the basin of the Chesapeake Bay and to the adjoining ocean shores of Maryland and Virginia. The extent of the fisheries prosecuted in this region justified the very complete inquiries made, and fully warranted the expenditure of the time necessary to study the statistics and methods of the industry in all the tributary streams of the region to the limits of economic fishing. This basin is the most productive inland fishing-ground in the country, if not in the world; the quantity of products withdrawn from it annually is enormous, and the value to the fishermen is over $10,000,000, or more than one-fifth that of the fisheries of the entire country, while the number of persons immediately connected with the industry is about 65,000 and the capital invested is nearly $10,500,000.

An interesting question comes up in connection with the consideration of the fisheries of this region: In view of the enormous annual drain on the fishery resources, what is their present condition compared with any earlier year for which data are available, and is the supply apparently being maintained? Since 1880, an increase has occurred in the fishing population amounting to over 18,000 persons, of whom two-thirds are fishermen proper and one-third shore employés. A corresponding advance has taken place in the amount of the invested capital aggregating over $2,250,000, the increase representing the use of larger numbers of boats and practically every form of fishing appliances. Especially worthy of comment is the remarkable augmentation in the number of pound nets operated, indicating a tendency to substitute this more modern class of apparatus for the less effective means of capture that formerly prevailed.

The increase in fishing population and apparatus would naturally be expected to produce an augmented yield, provided the supply had not been seriously impaired by overfishing. The returns show a general advance in output commensurate with the increases noted. The aggregate increase in the value of the yield is about $3,274,000, or nearly 50 per cent, a sum in which most of the important products are represented.

Foremost among the fishery resources of this region is the oyster, the value of which is about four-fifths that of the entire fishery output. The conservation of the oyster supply is a question that has received great attention, and the anticipation of a serious reduction in the output under existing methods is borne out by the data at hand. Notwithstanding an increase of nearly 10,000 oyster fishermen and $1,800,000 in the capital devoted to the oyster industry, the yield of oysters diminished over 1,500,000 bushels, although the market value

of the output was considerably greater, the average price increasing as a result of the comparative scarcity. It is hoped that the States immediately interested in this industry will adopt such measures as will not only secure the preservation of this important natural resource, but will permit an expansion of the fishing operations and ultimately an increased production.

The inquiries conducted by local agents at Boston and Gloucester, Mass., referred to in my previous reports, have been continued. The detailed study of the fisheries centering at these cities is warranted by the great importance of the industry. The investigations cover the operations of a large proportion of the offshore fishing fleet of New England, and the information obtained has a permanent value in permitting the institution of comparisons by which the condition of these important fisheries from time to time may be clearly judged.

The work at Boston has been efficiently performed by Mr. F. F. Dimick, who has unusual opportunities for collecting data by reason of his wide acquaintance with the fishermen and his position as secretary of the Boston fish bureau. At Gloucester, Capt. S. J. Martin, a retired vessel fisherman of extended experience, has rendered very satisfactory service.

The quantities of fish landed at Boston by American fishing vessels in 1891 was about 70,000,000 pounds, having a value to the fishermen of $1,840,000. The fish most largely represented in the receipts is the haddock, of which over 33,000,000 pounds, valued at $824,000, were landed. Of cod, the next important fish, 16,655,000 pounds, worth $548,000, were brought in.

The receipts of fish at Gloucester directly from fishing vessels are larger than at Boston; they consist chiefly of salt fish, while the fares landed at Boston are practically all fresh. In 1891, about 77,000,000 pounds of fish, valued at $2,785,000, were taken to Gloucester by the American fishing fleet. Of this amount, fresh and salt cod constituted over 44,000,000 pounds, worth $1,563,000.

During the year the consideration of the fisheries of the international lakes attracted much attention, and the agitation of the subject finally resulted in a series of meetings in New York and Canada, at which representatives from the provinces of Ontario and Quebec and most of the States bordering on the Great Lakes were present. In October, 1891, a preliminary meeting was held in New York City, which was attended by special commissioners from the Canadian provinces and the State of New York, and by other persons interested in the lake fisheries. The meeting was presided over by Hon. Robert B. Roosevelt. The object of the conferences was stated to be the protection, preservation, and propagation of food-fish in the Great Lakes, and a committee was appointed to meet at Rochester, N. Y., in November, and formulate a report for presentation to a full conference of Canadian and State representatives to be called later. At the Rochester meeting, Gen. Richard U. Sherman acted as chairman. The lake fisheries were fully considered, and

recommendations for submission to the full meeting were determined on. The final conference was held at Hamilton, Ontario, in December, and was presided over by Hon. Donald McNaughton. The recommendations of the Rochester session were affirmed, and the meeting adjourned with the understanding that similar conferences would be called each year if the condition of the lake fisheries warranted attention. At all these meetings this Commission was represented by Dr. Smith, to whose detailed account of the conferences reference is made.

A number of reports and special papers emanating from this division and germane to its work were issued during the year. Some of these were general in their scope, and some related to special subjects. There is a very active demand among the commercial fishing interests for papers of this class, and the Commission endeavors to make as judicious an allotment of such publications as the limited supply will permit; in the case of several of the more important reports, extra editions were required to satisfy the calls on the office.

The accompanying report of the assistant contains notes on the condition of some of the more prominent commercial fisheries and on some conspicuous events that transpired in connection with the fishing industry during the year. The special branches or subjects referred to comprise the great ocean fisheries for cod, haddock, halibut, and other ground fish; the mackerel fishery; the Pacific salmon industry; the whale fishery; the fur-seal fishery; the lobster fishery; the oyster fishery; improvements in fishing vessels; the attempt to establish a beam-trawl fishery on the New England coast; the Newfoundland bait question; inauguration of red-snapper fishing on offshore banks in the Gulf of Mexico.

DIVISION OF FISH-CULTURE.

The control and direction of the work of this division was retained by the Commissioner. During the year the following stations were operated:

1. Schoodic, Me
2. Craig Brook, Me.
3. Green Lake, Me.
4. Gloucester, Mass.
5. Woods Holl, Mass.
6. Cold Spring Harbor, N. Y.
7. Delaware River (steamer *Fish Hawk*).
8. Battery Island, Md.
9. Bryan Point, Md.
10. Central Station, Washington, D. C.
11. Fish Ponds, Washington, D. C.
12. Wytheville, Va.
13. Put-in Bay, Ohio.
14. Northville, Mich.
15. Alpena, Mich.
16. Duluth, Minn.
17. Quincy, Ill.
18. Neosho, Mo.
19. Leadville, Colo.
20. Baird, Cal.
21. Fort Gaston, Cal.
22. Clackamas, Oreg.

Summary of fish furnished for distribution, July 1, 1891, to June 30, 1892.

Source of supply.	Species.	Eggs.	Fry.	Adults and yearlings.
Schoodic Station, Me	Landlocked salmon	277,000	68,692	42,184
Craig Brook, Me	Atlantic salmon	450,000		254,232
	Landlocked salmon			9,979
	Loch Leven trout			10,935
	Rainbow trout			105
	Von Behr trout			698
	Swiss lake trout			45
	Brook trout			1,677
Green Lake, Me	Landlocked salmon			116,000
Gloucester, Mass	Cod	4,953,100	27,124,500	
	Pollock		2,473,500	
Woods Holl, Mass	Sea bass		200,000	
	Scup		35,000	
	Cod	560,500	25,671,500	
	Flatfish	2,763,800	3,510,400	
	Lobster		5,799,500	
Cold Spring Harbor, N. Y	Quinnat salmon			5,900
Delaware River (steamer *Fish Hawk*) N. J.	Shad	5,983,000	15,833,000	
Battery Island, Md	do	7,595,000	32,616,000	
Bryan Point, Md	do	13,378,000		
Central Station, Washington, D. C.	Catfish			76
	Shad	*1,989,000	9,891,000	
	Von Behr trout		21,978	
	Whitefish		313,000	
	Sunfish			338
Fish Ponds, Washington, D.C.	Carp			157,490
	Tench			9,600
	Golden ide			3,400
	Goldfish			10,700
	Shad			1,000,000
Wytheville, Va	Carp			4,485
	Goldfish			6,915
	Rainbow trout	154,500		49,792
	Black bass			215
	Rock bass			15,182
Put-in Bay, Ohio	Whitefish	32,500,000	6,000,000	
	Lake herring		262,500	
	Pike perch	32,600,000	40,000,000	
Northville, Mich	Loch Leven trout	185,500		3,709
	Von Behr trout	305,500		7,327
	Brook trout	10,500		13,034
	Lake trout	1,900,500		45,722
Alpena, Mich	Whitefish	12,370,000	17,750,000	
Duluth, Minn	Von Behr trout		20,000	
	Lake trout		480,000	
	Whitefish		16,727,000	
	Pike perch	30,000,000		
Quincy, Ill	Catfish			4,351
	Yellow perch			32,648
	Pike perch			100
	White bass			2,115
	Black bass			13,792
	Crappie			6,447
	Rock bass			6,502
	Pike			2,028
	Sunfish			9,884
Neosho, Mo	Catfish			62
	Carp			7,184
	Tench			26,432
	Goldfish			3,576
	Rainbow trout			11,124
	Von Behr trout			10,222
	Brook trout			6,327
	Black bass			7,559
	Crappie			109
	Rock bass			9,376
Leadville, Colo	Von Behr trout			54,200
	Black-spotted trout			19,000
	Brook trout			38,550
Baird, Cal	Quinnat salmon	2,902,000	25,500	
Fort Gaston, Cal	do		290,000	25,000
Clackamas, Oregon	do		1,332,400	
Received from Max von dem Borne, Germany.	Von Behr trout	27,000		

* Sent to fish ponds, Washington.

DISTRIBUTION OF FOOD-FISHES.

The distribution during the year is shown by the following table:

Summary of distribution, 1891-92.

Species.	Eggs.	Fry.	Adults and yearlings.	Total.
Catfish (*Ictalurus punctatus* and *Ameiurus albidus*, chiefly).	.....	.....	4,326	4,326
Carp (*Cyprinus carpio*)	.....	.....	157,093	157,093
Tench (*Tinca tinca*)	.....	.....	35,592	35,592
Golden ide (*Idus melanotus*)	.....	.....	2,186	2,186
Goldfish (*Carassius auratus*)	.....	.....	20,651	20,651
Shad (*Clupea sapidissima*)	2,497,000	66,927,000	1,000,000	70,424,000
Quinnat salmon (*Oncorhynchus chouicha*)	2,902,000	1,647,900	30,870	4,580,770
Atlantic salmon (*Salmo salar*)	450,000	.....	254,232	704,232
Landlocked salmon (*Salmo salar*, var. *sebago*)	232,000	68,692	163,163	463,855
Loch Leven trout (*Salmo levenensis*)	110,500	.....	14,579	125,079
Rainbow trout (*Salmo irideus*)	140,000	.....	54,734	194,734
Von Behr or brown trout (*Salmo fario*)	80,500	41,978	69,179	191,657
Black-spotted trout (*Salmo nykiss*)	.....	.....	18,000	18,000
Brook trout (*Salvelinus fontinalis*)	10,500	.....	58,969	69,469
Lake trout (*Salvelinus namaycush*)	900,500	480,000	43,864	1,424,364
Whitefish (*Coregonus clupeiformis*)	20,800,000	44,467,000	.....	65,267,000
Lake herring (*Coregonus artedi*)	.....	262,500	.....	262,500
Yellow perch (*Perca flavescens*)	.....	.....	29,950	29,950
Pike perch (*Stizostedion vitreum*)	45,000,000	49,300,000	100	94,300,100
Sea bass (*Serranus atrarius*)	.....	200,000	.....	200,000
White bass (*Roccus chrysops*)	.....	.....	1,946	1,946
Black bass (*Micropterus salmoides* and *M. dolomieu*)	.....	.....	19,753	19,753
Crappie (*Pomoxis annularis* and *P. sparoides*)	.....	.....	6,311	6,311
Rock bass (*Ambloplites rupestris*)	.....	.....	26,208	26,208
Sunfish (*Lepomis*)	.....	.....	9,604	9,604
Pike (*Lucius lucius*)	.....	.....	1,966	1,966
Scup (*Stenotomus chrysops*)	.....	35,000	.....	35,000
Cod (*Gadus morrhua*)	.....	52,795,500	.....	52,795,500
Pollock (*Pollachius virens*)	.....	2,473,500	.....	2,473,500
Flatfish (*Pseudopleuronectes americanus*)	2,764,000	3,510,000	.....	6,274,000
Lobster (*Homarus americanus*)	.....	5,799,000	.....	5,799,000
Total	75,887,000	228,008,070	2,023,276	305,918,346

NOTE.—In addition to the foregoing there were furnished for distribution, but lost in transit, during the year 1891-92, fry, as follows: Shad, 1,442,000; Whitefish, 10,000; Pike Perch, 8,300,000; also adults and yearlings as follows: Catfish, 128; Carp, 1,915; Tench, 428; Golden Ide, 327; Goldfish, 300; Quinnat Salmon, 30; Landlocked Salmon, 5,000; Loch Leven Trout, 65; Rainbow Trout, 6,279; Von Behr Trout, 3,111; Brook Trout, 617; Lake Trout, 1,858; Yellow Perch, 2,698; White Bass, 167; Black Bass, 1,627; Crappie, 243; Rock Bass, 4,838; Pike, 62, and Sunfish, 618.

There were also deposited for rearing and distribution 1,989,000 shad fry in the United States fish ponds, Washington, D. C., and 700,000 in the United States fish ponds at Neosho, Mo., and the following adult and yearling fish were collected from the sloughs and planted in the Illinois River, near Meredosia, Ill.: Catfish, 250,000; White Bass, 15,000; Carp, 5,000; Buffalo, 20,000; Yellow Perch, 35,000; Crappie, 5,000; but none of these figures is included in the above table.

STATION REPORTS.

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

The work at Grand Lake Stream during this year was conducted jointly with the Maine State Fish Commission, the immediate charge of the station being placed under Mr. W. O. Buck.

The 50,000 fry of the landlocked salmon held from June, 1891, for rearing, were counted and weighed during the first half of October, and liberated in Grand Lake. There were found to be 42,184, showing a total loss for the season of a little over 15 per cent, and their weight was 204,625 pounds, or an average of 7.76 ounces per hundred.

The capture of adult salmon for spawning was begun in October, the first fish being taken October 25, but no ripe females were found until November 3. Notwithstanding this unusually late start, the last ripe fish was obtained on November 23, about the usual date. In all, 579 fish were captured, 380 being females and 199 males. The males averaged 20.1 inches in length, with a weight of 3.23 pounds; the females, 19.9 inches in length, with a weight of 3.29 pounds.

The total number of eggs taken was 627,937, the product of 351 fish, or an average of about 1,785 eggs to each. The losses in these eggs up to the time of division amounted to 131,887, leaving available 496,050, of which 100,000 were allotted to the State of Maine and 396,050 to the U. S. Fish Commission. Of these latter, 119,050 were reserved for Grand Lake, in which 68,692 fry were liberated between June 11 and 18, 1892, at the end of the sac stage and 50,000 fry held beyond the year for rearing. The loss during June in the 50,000 fry retained was 159.

The following table shows the distribution of the 277,000 eggs and other information connected therewith:

Consignee.	No. of eggs.	Date of shipment.	Reached destination.	Condition.	Loss.
U. S. Fish Commission stations:					
Craig Brook, Maine	25,000	Feb. 23, 1892	Feb. 25, 1892	Excellent	51
Clackamas, Oregon	20,000	Feb. 20, 1892	Mar. 10, 1892	Bad	20,000
State fish commissions:					
Vermont, Roxbury	20,000	....do	Mar. 2, 1892	Good	10
New Hampshire, Plymouth	17,000	....do	Mar. 1, 1892	....do	
New York, Caledonia	15,000	....do	Mar. 2, 1892	....do	47
Minnesota, St. Paul	15,000	....do	Mar. 4, 1892	....do	43
Nevada, Carson City	25,000	....do	Mar. 7, 1892	....do	40
California, San Francisco	30,000	....do	Mar. 8, 1892	....do	80
Wilmurt Club, Newton Corners, N. Y.	25,000	....do	Mar. 3, 1892	Fine	173
	5,000	Mar. 14, 1892	Mar. 19, 1892	Good	35
Tuxedo Club, Tuxedo Park, N. Y	10,000	Feb. 29, 1892	Mar. 2, 1892	....do	14
A. N. Cheney, Glens Falls, N. Y	10,000	....do	Mar. 3, 1892	....do	34
Blooming Grove Park Association, Glen Eyre, Pa	10,000	....do	....do	....do	33
Mexican Government, Mexico City	25,000	....do	Mar. 10, 1892	Warm	8,760
W. P. Greenough, Lachevrotiere, Canada	10,000	....do	Mar. 6, 1892	Good	18
H. B. W. Whitmore, Bridgeworth, England	15,000	Feb. 23, 1892	Mar. 7, 1892	....do	No report.

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

In the report for the previous year reference is made to the commencement of the building of a superintendent's dwelling, under contract dated March 5, 1891. This building was completed in the fall and accepted from the contractor October 3. The other construction work was the building of two capacious filters, one for the water supplying the south ponds, and the other for the north stand of rearing troughs and the ponds connected with it; the construction of an aqueduct 800 feet long, to supply the superintendent's dwelling; the underpinning of the west end of the stable; the building of a winter road down the hill near the north stand of troughs, and the grading of the grounds near the dwelling.

The following table presents the results of the eggs of the different kinds of salmon and trout brought over from the previous year, ending June 30, 1891:

Kind.	Number of eggs at start.	Hatched.	Reached feeding stage (June 1).	Distributed in June.	October count.	Died after counting.	Distributed Oct., Nov. and Dec.	Reserved.
Atlantic salmon	317,218	316,308	309,308	.....	254,955	306	238,652	15,997
Landlocked salmon	21,906	21,824	20,269	5,289	9,723	12	7,491	2,310
Brook trout	23,146	14,524	8,569	4,251	1,555	3	1,352	200
Von Behr trout	15,119	13,824	2,554	.....	800	.....	.....	800
Loch Leven trout	16,583	16,457	14,900	.....	10,796	172	10,524	100
Scotch sea-trout	12,374	9,367	146	.....	87	.....	.....	87
Total	406,346	392,304	355,746	9,540	277,916	493	257,929	19,494

From these figures we may deduce the following percentages: Starting with eggs as counted in winter or early spring, and counting the few fish distributed in June as though they had been kept till October, we find that of all kinds 71 per cent were carried through. Leaving out the Von Behr and Scotch sea-trout, the eggs of which reached the station in exceedingly bad condition and the fry of which mostly died before reaching the feeding stage, the percentage is 76; of the Atlantic salmon, 80, and Loch Leven trout, 65 per cent, respectively. Starting from the fry stage, the percentage of other kinds is 81, and of the Atlantic salmon, 82. This season must therefore be ranked as an exceedingly successful one.

As in past years, part of the fish were fed on chopped meat and part on maggots. The relative growths of the several lots furnished further evidence of the superiority of live food.

The following exhibits the disposition of reared fish during the year:

Kind.	When hatched.	When liberated.	Number.	Waters in which placed.
Atlantic salmon	1891	Oct. and Nov., 1891	158,584	Tributaries of Penobscot River.
Do	1891	Mar. and Apr., 1892	15,552	Do.
Do	1891	Oct. and Nov., 1891	80,064	Tributaries of Penobscot River and other waters, by Maine Fish Commission.
Do	1890	Apr., 1892	32	Alamoosook Lake.
Landlocked salmon	1891	Oct., 1891	7,401	Toddy Pond, Orland, Me.
Do	1891	Apr., 1892	563	Do.
Do	1891	....do	1,499	Burnt Land Pond, Deer Isle.
Do	1890	....do	343	Toddy Pond.
Do	1890	....do	29	Craig Pond, Orland.
Do	1889	....do	2	Do.
Do	1889	....do	14	Toddy Pond, Orland.
Do	1888	....do	28	Craig Pond, Orland.
Do	1888	....do	9	Toddy Pond, Orland.
Do	1888-89	....do	91	Do.
Brook trout	1891	Dec., 1891	1,352	Craig Pond, Orland.
Do	1891	Apr., 1892	198	Alamoosook Lake, Orland.
Do	1889	....do	127	Craig Pond, Orland.
Rainbow trout	1889	....do	105	Heart Pond, Orland.
Von Behr trout	1891	....do	698	Toddy Pond, Orland.
Swiss lake trout	1890	....do	45	Do.
Loch Leven trout	1891	Oct., 1891	6,002	Do.
Do	1891	Dec., 1891	4,522	Do.
Do	1890	Apr., 1892	411	Do.
			277,671	

Atlantic salmon.—Adult salmon were collected between June 1 and 8, 1891, and 267 safely confined in the inclosure at Dead Brook. For the first time in the history of the station, a steamer was employed in collecting the fish, and the work was so facilitated as to permit of its completion and the inclosing of the fish in eight days. The steamer being able to make daily trips, the necessity of keeping the salmon in the cars from day to day, as was usual in previous years, was avoided. Whether from this cause, or from the coolness of the water at the time of collection, but a single fish was lost in transit, and the loss in those confined up to the spawning season was but 42. Of the 225 surviving fish, 137 were females, which yielded 1,203,285 eggs.

These eggs were placed in the hatchery between October 24 and November 25. They, however, proved to be of inferior quality, and the ratio of impregnation was lower than ever before at this station. To February, 1892, the time of division and shipment, the losses aggregated 331,835, of which probably not less than 250,000 were from lack of impregnation. No clue as to the cause of the trouble was discovered. The remaining eggs, 871,450, were divided between the United States and the Maine fish commissioners on the basis of their respective contributions towards the payment for the adult fish, 550,000 being assigned to the former and 321,450 to the latter.

The Maine Commission subsequently presented to the United States 200,000 of the eggs allotted them, thus increasing the share of the United States to 750,000. Of these eggs, 300,000 were assigned to the Pennsylvania Fish Commission, 150,000 being sent to each of the hatcheries at Corry and Allentown, and 150,000 to the New York Fish Commission, which were sent to their hatchery at Cold Spring Harbor.

The balance, together with 12,784 eggs obtained from salmon which had been artificially landlocked at the station, were retained for hatching. When about midway in the sac stage (the latter part of April) they were attacked by an epidemic that continued for several weeks, destroying almost the entire stock, and leaving at the beginning of the feeding season, about June 1, but 3,874 fry, and these far from healthy. The disease appeared to be of the same character that visited the station two years ago. The other kinds of fish at the station escaped the epidemic wholly and appeared as thrifty as usual, with the exception of the brook trout, of which about 37 per cent perished in May and June of what appeared to be a distinct disease.

Brook trout.—The taking of the eggs of this species was carried on during October and November, the total number secured being 83,068, of which 78,191 were obtained from the breeding stock at the station, and 4,877 in the vicinity of the Schoodic Station at Grand Lake stream. Reference to the epidemic which attacked them in the spring following has been heretofore made.

Landlocked salmon.—On February 25 was received the consignment of 25,000 eggs of this species transferred from the Schoodic Station, the number of eggs lost in transfer being only 51.

Whitefish (Coregonus labradoricus).—In February there were received from Schoodic Station 1,845 eggs of this whitefish, known as Musquaw River whitefish and as "whiting," which were placed in the hatchery.

From the eggs of the kinds of fishes obtained during this year, fry, for rearing, were secured as follows:

Atlantic salmon (measured)	305,353
Landlocked salmon (counted)	20,070
Brook trout (counted)	68,107
Whitefish (counted)	1,803

Owing to causes already mentioned this number was greatly reduced, so that at the commencement of the feeding stage they aggregated—

Atlantic salmon	3,874
Landlocked salmon	19,740
Brook trout	50,773
Whitefish	767

At the close of the year the complete stock of fish at the station was as follows:

Kinds.	Hatched in—						Total.
	1892.	1891.	1890.	1889.	1888.	1888-1889.	
Atlantic salmon	2,010		46		47		2,103
Landlocked salmon	19,538		30			30	19,538
Brook trout	39,531			30			39,561
Rainbow trout				30			30
Von Behr trout		49					49
Loch Leven trout			51				51
Twin Lake trout			30				30
Salbling			4				4
Scotch sea trout		86					86
Whitefish	442						442
	61,521	135	161	60	47	30	61,964

Preparatory to the work of the following year, in the propagation of the Atlantic salmon, adult fish were purchased conjointly with the Maine Fish Commission, and impounded at Dead Brook. As in the previous season, use was made of a steamer in their collection, but the work was longer protracted. The number of fish secured was 222, of which 19 were lost during transfer, owing to the hot weather; and by the close of the year there was a further loss of 12.

GREEN LAKE STATION, MAINE (H. H. BUCK, SUPERINTENDENT).

The water-supply flume, contracted for toward the close of the last fiscal year, was completed and accepted by the end of September, and the hatchery and dwelling-house by the end of the following month. During October the troughs and other apparatus in use at Mann Brook were transferred to the new station. Two of the temporary dwellings at Mann Brook were taken down and the material used in the construction of a temporary ice-house.

The other work under the appropriation for the establishment of the station consisted in graveling the banks of the reservoir, laying out roads, grading the grounds, improving the old buildings on the property, and constructing troughs and other apparatus required for the use of the station. A conduit was also laid under the south reservoir pond so as to permit the water to be run directly from the flume to the supply pipe leading into the hatchery, for the purpose of insuring a supply of clear water when the reservoir is muddy from storms, and also to insure a lower temperature of the water during hot weather.

Pending the completion of the hatchery and other constructions at the station, the use of the temporary station at Mann Brook was continued. At the beginning of the year the fry of the landlocked salmon kept for rearing from the previous season were estimated at 120,000. A good proportion of these were successfully carried through the summer to the fall, when they were distributed, with the exception of 4,000, which were retained through the winter in troughs, and in the following spring placed in the reservoir ponds at Great Brook, where their growth was rapid. Of those distributed, 20,000 were delivered in November to car No. 3 for planting in Vermont waters, the loss en route being estimated at 5,000. The remainder, estimated at 80,000, were planted during the latter part of October; 16,000 being placed in Patten Pond, Ellsworth, and 64,000 in Green Lake and its tributaries, principally Great Brook.

In the month of October preparations were made at Great Brook for the capture and impounding of spawning fish, the first fish being captured October 18 and the last November 18. The taking of eggs began November 5 and ended November 19, 148,000 being secured. Ninety-one fish were handled, 45 of which were females. Attempts were also made to secure spawning fish at the other inlets of the lake by means of net pounds, but without success; nor was any evidence obtained of the spawning of the fish at any other place on the lake than Great

Brook. The eggs commenced to hatch the beginning of the following April and concluded April 22. The development and hatching of the eggs were carried on at the new hatchery under considerable inconvenience, owing to the lack of its permanent interior fittings, as also to the presence in the water supply of fine clay sediment from the new reservoir ponds. All were safely carried through the winter, however, and hatched without unusual loss.

In January, 1892, 50,000 eggs each of the Loch Leven and Von Behr trouts were received from the Northville Station in good condition and placed in troughs. These finished hatching on April 7. On the 28th of May an unusual mortality occurred among them. The loss had been large for two weeks, and was first supposed to be due to the fact that the fry (of the Von Behr trout) were weak and puny. The landlocked salmon, however, which were an unusually fine and vigorous lot and ate well, suffered in like manner, and the cause was therefore ascribed to the high temperature of the water—68° and 69° F.—and also to its passage through a closed flume which prevented its sufficient aëration. The fish on hand at the close of the year were estimated to be—landlocked salmon, 60,000; Loch Leven trout, 16,000; Von Behr trout, 10,000; landlocked salmon hatched April, 1891, 3,800.

GLOUCESTER STATION, MASSACHUSETTS (A. C. ADAMS, MASTER, SCHOONER GRAMPUS, IN CHARGE).

Preparation for the season's work was begun October 5, 1891, in the commencement of the repairs and overhauling of the machinery and other equipment of the station. Active fish-cultural work was started December 1, on which date 876,600 cod eggs and 1,649,400 pollock eggs were secured. The taking of cod spawn continued till March 30, and of pollock till December 21. The total number of eggs in good condition received at the station during the season was about 57,075,000, of which 51,600,000 were cod and 5,475,200 pollock. Of the cod eggs, over 46,000,000 were taken in Ipswich Bay, landed at Kittery Point, Me., and thence transferred in sealed jars by rail to the station; the balance of the cod eggs, as also those of the pollock, were obtained off Gloucester. The following tables exhibit the details of the season's propagation and distribution:

Cod.

Date.	Number of eggs taken.	Loss during incubation.	Number of fish hatched.	Number of fish from which eggs were taken.	Planted.	
					Date.	Place.
1891.					1891.	
Dec. 1	876,600	338,000	538,600	13	Dec. 18	Off mouth of harbor.
3	1,971,700	1,678,500	293,200	10	Dec. 18	Do.
4	1,145,100	634,000	511,100	12	Dec. 21	Do.
7	665,600	93,400	572,200	9	Dec. 24	Off Eastern Point.
8	1,132,100	126,300	1,005,800	6	Dec. 26	Off mouth of harbor.
10	1,109,600	126,300	983,300	.....	Dec. 28	Do.
11	789,700	160,500	629,200	3	Dec. 31	Do.
11	827,300	61,900	762,400	.....	Dec. 31	Do.
12	350,100	18,400	331,700	3	Dec. 31	Do.

Cod—Continued.

Date.	Number of eggs taken.	Loss during incubation.	Number of fish hatched.	Number of fish from which eggs were taken.	Planted.	
					Date.	Place.
1891.					1892.	
Dec. 15	471,300	157,800	313,500	.....	Jan. 2	Off mouth of harbor.
18	284,300	57,800	226,500	1	Jan. 2	Do.
19	208,300	173,600	34,700	2	Jan. 5	Do.
19	681,900	242,000	439,900	.....	Jan. 5	Do.
21	402,800	240,500	162,300	2	Jan. 7	Do.
21	683,100	307,800	375,300	1	Jan. 7	Do.
22	250,400	65,800	184,600	.....	Jan. 9	Do.
23	181,700	84,200	97,500	1	Jan. 9	Do.
24	524,000	73,700	450,300	2	Jan. 9	Do.
24	260,900	11,800	249,100	.....	Jan. 9	Do.
28	320,100	136,800	192,300	2	Jan. 19	In Goose Cove Pond.
28	810,800	182,800	628,000	.....	Jan. 19	Do.
29	273,800	127,600	146,200	.....	Jan. 22	Off mouth of harbor.
29	695,500	177,600	517,900	.....	Jan. 23	Do.
1892.						
Jan. 1	1,421,600	472,300	949,300	.....	Jan. 26	Do.
4	1,690,200	998,400	691,800	.....	Feb. 1	Do.
12	450,600	146,000	304,600	2	Feb. 6	Do.
12	708,400	173,600	534,806	.....	Feb. 6	Do.
13	1,284,800	482,800	752,000	.....	Feb. 6	Do.
15	731,900	*731,900	.....	.....	.....	.....
18	400,300	360,300	40,000	2	Feb. 15	In outer harbor.
19	137,000	77,000	60,000	2	Feb. 15	Do.
22	1,397,900	1,147,900	250,000	.....	Feb. 26	Do.
23	721,300	576,200	145,100	.....	Feb. 26	Do.
Feb. 1	2,832,600	1,979,800	852,800	.....	Mar. 5	In mouth of harbor.
2	1,090,000	273,600	816,400	.....	Mar. 5	Do.
8	2,153,400	724,800	1,428,600	.....	Mar. 8	Off mouth of harbor.
9	50,000	17,100	32,900	1	Mar. 8	Do.
22	1,468,900	239,400	1,229,500	.....	Mar. 21	In Squam Pond.
29	589,700	160,500	429,200	.....	Mar. 26	Do.
Mar. 7	2,440,300	125,000	1,075,500	.....	.....	In mouth of harbor.
		172,300	1,067,500	.....	Apr. 2	In Squam Pond.
8	430,600	121,000	309,600	.....	Apr. 4	In mouth of harbor.
9	1,371,500	189,400	1,182,100	.....	Apr. 1	In Squam Pond.
16	2,077,000	584,000	1,493,000	.....	Apr. 6	In mouth of harbor.
17	1,532,200	252,600	1,279,600	.....	Apr. 7	Do.
21	1,024,000	664,500	359,500	.....	Apr. 8, 9	Off mouth of harbor.
22	3,498,700	1,303,700	2,195,000	.....	Apr. 8, 9	Do.
	44,378,600	17,254,200	27,124,400	.....		

* All dead February 10, 1892.

In addition to the foregoing there were secured a number of eggs which were disposed of as follows:

Cod.

Date.	Number taken.	Loss during incubation.	Number of good eggs.	Number of fish from which eggs were taken.	Disposition.	
					Date.	Destination.
1892.					1892.	
Mar. 22	173,700	32,900	140,800	1	Apr. 8, 9	Planted off mouth of harbor.
24	363,300	289,400	73,900	1	Apr. 4	Shipped to Woods Holl.
24	808,200	101,600	705,600	.....	Apr. 4	Do.
26	768,700	231,500	537,200	.....	Apr. 6	Planted in outer harbor.
28	3,385,400	1,110,300	2,275,100	.....	Apr. 6	Do.
30	1,719,500	499,000	1,220,500	.....	Apr. 4	Shipped to Woods Holl.
	7,218,800	2,265,700	4,953,100	.....		

Pollock.

1891.					1891.	
Dec. 1	1,649,400	915,200	734,200	6	Dec. 11	Planted off mouth of harbor.
2	2,773,300	1,517,200	1,256,100	9	Dec. 12	Do.
3	403,700	237,800	165,900	3	Dec. 14	Do.
					1892.	
21	648,800	331,400	317,400	2	Jan. 4	Do.
	5,475,200	3,001,600	2,473,600	20		

The best results in hatching were obtained with the water at 38° to 45° F. Towards the latter part of January, the temperature of the water in the hatchery reached 34½°, causing a retarding and non-uniformity in the development of the eggs. With a view of obviating this difficulty, the Commissioner, who visited the station on February 18, directed the utilizing of the warm water from the condenser of the boiler by arranging for its discharge through the main suction pipe to the supply tank. By the use of valves, this discharge could be either entirely cut off or regulated, which permitted the maintenance of a practically uniform temperature of the water furnished the hatchery. The results of the season's work were considerably augmented by this arrangement.

It was anticipated that, as in previous years, a large supply of spawn could be secured from the fishing-grounds of Gloucester, but not till the end of March, as the station was about being closed, were ripe fish secured in any quantity. From this it would appear that there is no uniformity as to the time the fish return to their spawning-grounds.

Regarding the collecting of eggs in Ipswich Bay, Capt. Adams reports:

During the early part of December cod eggs were found plentiful among the net fishermen in Ipswich Bay, and from day to day each spawn-taker took from one to three millions, which appeared in good condition, but would nearly all die inside of twenty-four hours, this being something new to our oldest spawn-takers even. These eggs were invariably taken from live fish, which is always the case, and we found that our work was being seriously injured. One experienced spawn-taker took about three millions in the usual way, half of which died in three or four hours, and before he landed with them at Kittery Point. Finally, a few vessels fishing with trawls came into the bay, and Mr. Conley very soon found that eggs taken from fish caught on trawls could be taken to Gloucester in good condition. As soon as possible, the force was placed on the trawling vessels, after which good eggs were secured throughout the winter. Early in March, as the trawling vessels began to leave the bay, the men were gradually returned to the net fishermen, and this time they found good eggs. These being the facts, I mention them, hoping that some good will be derived from them for future work.

It may also be worthy of mention here that our largest take of eggs in Ipswich Bay during the past season occurred immediately after easterly storms. During cold, offshore winds codfish are supposed by the fishermen to be gradually nearing the shores or beaches, the fishermen following them up with their trawls till an easterly or onshore wind comes on, when the undertow starts them offshore again in double-quick time and the ripe fish are attracted by the trawl baits.

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

The fish-cultural work at the station was commenced about the first of November, and carried on till the close of the fiscal year. Attention was mainly given to the propagation of the cod, the flatfish, and the lobster, some experiments being made with the sea bass and the scup. Till the end of March the direction of the fish-cultural work was under Mr. Alexander Jones, and from that time till the close of the year under Superintendent Maxwell.

Cod.—The station being dependent for a supply of breeding fish by purchase from fishermen, in September an agreement was made with Messrs. Spindle & Co., of Woods Holl, large fish-dealers, to deliver at the station between October 25 and December 25, 3,000 live codfish of a minimum weight of 5 pounds each. Owing to a succession of severe storms the smack fishermen, from whom the supply in question had been expected, were unable to get on the fishing-grounds till the first part of November, and the time limit of the contract was therefore extended till the end of February. The smack fishermen, however, could not be induced to go offshore to the deep water at that season of the year, and the contractors were, therefore, unable to furnish the number of fish that had been anticipated. But 1,620 fish were furnished, of which 1,341, caught off Nantucket Island, and called by the fishermen "inshore" cod, were delivered between November 6 and December 7, and 279, caught off Block Island, were brought to the station November 23. The fish from each of these grounds were kept separate for the purpose of comparing their relative fecundity, the result being in favor of the Block Island fish, the former averaging 93,800 eggs to each fish, and the latter 118,200. Of the Nantucket fish there were but 281 gravid, while of the Block Island fish there were 163. The fish, as received from the fishermen, were placed in floating fish-boxes and occasionally fed. From December 1, the date the first eggs were taken, the fish were at intervals overhauled for spawn till February 8, during which time 444 fish were stripped, yielding 45,627,200 eggs, producing 25,671,500 fry.

The following table presents the details of hatching:

Number of eggs taken.	Number of fry hatched.	Apparatus.	Period of incubation.			Average temperature of water.
			Commenced.	Ended.	No. of hours.	
			1891.	1891.		° F.
1,692,500	603,300	Chester jars	Dec. 1	Dec. 17	408	44
1,576,500	682,300	....do	Dec. 4	Dec. 21	408	42
3,050,400	1,309,300	....do	Dec. 7	Dec. 23	384	42
2,503,800	1,520,100	....do	Dec. 10	Dec. 28	432	41
2,828,600	1,777,100	....do	Dec. 12	Dec. 30	432	41
3,779,100	2,582,300	....do	Dec. 14	Dec. 31	408	41
1,830,600	1,958,600	McDonald boxes	Dec. 16	Jan. 4	456	41
2,080,600		....do	Dec. 16	Jan. 4	432	41
2,689,400	1,374,400	....do	Dec. 18	Jan. 5	432	39½
2,635,700	1,226,100	....do	Dec. 21	Jan. 8	432	39½
2,249,000	1,091,700	....do	Dec. 23	Jan. 13	480	39½
3,779,100	2,358,800	Chester jars	Dec. 26	Jan. 16	504	39½
3,315,500	2,812,500	....do	Dec. 28	Jan. 20	552	39
1,312,500	881,300	....do	Dec. 31	Jan. 22	574	38½
			1892.	1892.		
2,907,700	2,267,700	McDonald boxes	Jan. 1	Jan. 25	600	38
2,109,500	1,955,000	....do	Jan. 4	Jan. 28	576	37
417,300	208,700	....do	Jan. 6	Feb. 1	600	36
510,100	255,000	....do	Jan. 8	Feb. 2	600	36
463,700	194,800	Chester jars	Jan. 11	Feb. 8	672	35½
602,800	230,000	....do	Jan. 15	Feb. 12	672	35½
626,000	312,000	....do	Jan. 18	Feb. 18	744	34
811,500	405,200	....do	Jan. 22	Feb. 27	716	31½
695,500	340,000	....do	Jan. 25	Mar. 1	864	31½
533,300	225,300	....do	Jan. 29	Mar. 7	840	31½
440,500	(*)	....do	Feb. 2	.....	.....	32
120,000	(*)	....do	Feb. 8	.....	.....	32
45,627,200	25,671,500					

* Placed in open waters March 7, before completion of hatching.

In addition to the eggs secured from the supply of fish at the station, on April 4 a consignment of 2,000,000 eggs, carried in eight 4-pound butter jars which were sealed and packed in ice, was received from the Gloucester Station. Three of the jars contained about 779,500 eggs, which were taken March 24 and in which the embryos were well developed. All these were dead on arrival. The remaining jars contained eggs taken on March 30. Of these, only 400,000 were alive, but notwithstanding their having the usual care they soon died. From these facts Mr. Maxwell concludes that if the eggs had been transferred immediately after being fertilized, instead of being deferred till an advanced stage of development, when they are more tender, better results would have been possible.

Flatfish.—The propagation of this species was prosecuted during the period from February 2 to April 14, the last lot of eggs being obtained March 18. The parent fish were secured from a fyke net placed in Woods Holl Harbor. From 94 fish were taken 8,527,800 eggs. The largest number of eggs taken from one fish was 384,000. The weight of this fish when secured was 3 pounds, but after stripping 1¾ pounds.

The details of propagation follow:

Number of eggs taken.	Number of fry hatched.	Period of incubation.			Average temperature of water.
		Commenced.	Ended.	Number of hours.	
					°F.
57,600	20,000	Feb. 2	Mar. 1	638	31½
76,800	35,000	Feb. 8	Mar. 7	638	31½
288,000	(*)	Feb. 12	.....	696	31½
268,800	(*)	Feb. 13	.....	672	31½
76,800	(*)	Feb. 15	.....	624	31½
326,400	(*)	Feb. 16	.....	600	31½
306,200	(*)	Feb. 17	.....	576	31½
326,400	(*)	Feb. 18	.....	552	31½
172,800	(*)	Feb. 20	.....	480	30¼
384,000	225,000	Feb. 22	Mar. 23	696	31½
259,600	170,000	Feb. 23	Mar. 23	696	31½
192,000	90,000	Feb. 26	Mar. 26	696	32
307,200	185,000	Feb. 29	Mar. 27	638	32
614,400	450,000	Mar. 1	Mar. 28	672	32
454,800	260,400	...do	Mar. 29	696	33
384,000	220,000	Mar. 3	Mar. 31	672	33
307,200	180,200	Mar. 4	Apr. 1	638	34
230,400	160,000	Mar. 5	Apr. 1	624	34
345,600	295,300	Mar. 8	Apr. 1	552	34½
614,400	425,400	Mar. 9	Apr. 1	528	34½
307,200	199,600	Mar. 10	Apr. 8	672	37
345,600	221,100	Mar. 11	Apr. 8	658	37
768,000	(†)	Mar. 14	.....	.....	32
230,400	(†)	Mar. 15	.....	.....	32
384,000	253,400	Mar. 16	Apr. 13	672	34
230,400	100,000	Mar. 17	Apr. 14	672	34
268,800	110,000	Mar. 18	Apr. 14	696	34
8,527,800	3,510,400				

* Deposited March 12, before completion of hatching, owing to stoppage of water supply.
† Deposited March 14, before completion of hatching, owing to stoppage of water supply.

Lobster.—In prior seasons the propagation of the lobster has been conducted during the months of April, March, and June; this year, however, it was decided to try the experiment of hatching eggs secured during the winter months. Eggs were first obtained on December 12

and continued to be taken till January 25. During this period 148 lobsters were stripped, yielding 1,717,700 eggs, which were placed in the McDonald hatching jars, the temperature of the water being about 45° F. None of these eggs, however, began hatching till May 25, the water being 54°, and on the 6th and 7th of June 856,500 fry were released in local waters. The period of incubation, therefore, ranged from about 5½ to 4½ months, the loss being a little over 50 per cent. From January 25 to April 25 no eggs were taken. On this latter date the taking of eggs was again commenced and prosecuted till June 28. In this period 5,883,200 eggs were obtained from 456 lobsters. From these 4,943,000 fry were produced, which were liberated at intervals from May 30 to June 30. The period of incubation of these eggs ranged from 840 hours for those taken April 25 to 264 hours for those taken June 18 and 48 hours for those secured June 28, the water temperature on the dates mentioned being 50½°, 64½°, and 64½°. The loss was about 16 per cent. The largest number of eggs taken from one lobster was 24,300, the individual measuring 12½ inches, and the smallest number, 6,000, from one measuring 8½ inches. The average take from 131 lobsters, varying in size from 8½ to 13½ inches, was 12,265.

Sea bass.—On June 16th 208,600 eggs of the sea bass, taken from fish caught in Buzzards Bay, were brought into the hatchery and placed in the McDonald and Chester boxes. The period of incubation was four days and the number of fry produced 200,000, which were released in local waters.

Scup.—On June 17th 50,000 eggs of the scup were secured in Buzzards Bay and brought to the hatchery and hatched in three days, producing 35,000 fry.

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

Through the courtesy of the fish commission of New York the privilege of using the facilities of this station as a depot for the receipt of consignments of eggs of foreign species of fishes presented to the United States, as also for the shipment of eggs of our indigenous species to other countries, was continued. In addition the United States made use of the station for the propagation and rearing of certain species of fish, the distribution of which was mainly to waters of the State.

The receipts of eggs at the station were as follows:

Date.	Kind.	Number.	Loss.	Whence received.
1892.				
Jan. 3	Von Behr trout	18,380	380	Germany.
Feb. 10	Whitefish	40,000	All.	Do.
16	Lake trout	5,000	All.	Do.
16	Brook trout	9,000	All.	Do.
Mar. 14	Von Behr trout	10,000	970	
Feb. 4	Atlantic salmon	80,000	39	Craig Brook Station.
11	do	70,000	120	Do.

The 18,000 good eggs of the Von Behr trout received in January were forwarded to the Commission's station at Northville, Mich. Of 9,030

eggs of the same species received March 14 from Mr. von dem Borne, half were sent to Central Station, Washington, and the remainder were retained at this station as the property of the New York Fish Commission. The loss in the latter was very great, and but 1,530 were saved. The number of fry resulting from the 150,000 eggs of the Atlantic salmon was 142,000, which were planted at the expense of the New York Fish Commission in the waters of the State, as follows:

Date.	Locality.	No.
Apr. 19, 1892	Nissequogue River, Long Island	10,000
May 4, 1892	Clendon Brook, Glens Falls	50,000
9, 1892	Balm of Gilead Brook, North Creek	30,000
9, 1892	Raymond Brook, North Creek	30,000
9, 1892	Carr Brook, North Creek	22,000

All of these waters, with the exception of the first mentioned, are tributaries of the Upper Hudson River.

On November 6, 1891, there were delivered to Mr. J. F. Ellis, in charge of the Commission's car No. 3, 3,500 quinnat salmon from 2½ to 6 inches long and nine months old, which were planted in the Battenkill, a tributary of the Hudson River. On the first of the following month 2,400 of the same species, averaging from 3 to 7½ inches long, were planted by Mr. Mather in the Nissequogue River at Smithtown.

The consignment of eggs of the whitefish (*Coregonus wortmanni*), lake trout (*Trutta lacustris*), and brook trout (*Salmo salvelinus*) received February 16, 1892, from Mr. Max von dem Borne, Berneuchen, Germany, was entirely spoiled on receipt. These eggs were to have been shipped on a steamer sailing several days earlier than that on which they arrived, but were left on the wharf at Geestemunde.

The foreign shipments from the station, with the exception of a few adults of several varieties of our more common fishes delivered to Dr. Charles von dem Borne for Mr. Max von dem Borne, consisted of a consignment on January 5, 1892, of 10,000 eggs each of the brook trout, Von Behr trout, and Loch Leven trout to Dr. J. G. Bluhm (Rio Negro), Sabanilla, Colombia, for his government. These eggs were furnished by the Northville, Mich., Station.

Delaware River Shad-Propagating Station (Lieut. Robert Platt, U. S. N., in charge).

Owing to the unfavorable results which had been obtained at the shore station at Gloucester City, N. J., in previous years, it was decided to close it and reassign the work of propagating the shad of the Delaware River to the officers and crew of the steamer *Fish Hawk*. The vessel was moved off Gloucester City and the first eggs obtained May 9 and the last June 1. During this time eggs to the number of 30,521,000 were taken from 611 fish. The number of fry produced was 15,833,000; eggs partially developed to the number of 2,497,000 were placed in Timber Creek, and 3,486,000 were transferred to the cars of

the Commission to be hatched en route to distant waters. The work was stopped June 6. As in previous years, dependence was had on the larger fishing shores in the vicinity—Faunce's, Bennett's, and that at Howell Cove—for the supply of spawn. During the entire season the condition of the water was muddy.

The following table exhibits the take of eggs, etc., during the season:

Date.	Fish stripped.		Number of eggs.	Noon temperatures.	
	Male.	Female.		Air.	Water.
				° F.	° F.
May 9	37	37	2,045,000	65	63
10	27	27	1,140,000	69	64
11	15	15	623,000	65	64
12	18	18	998,000	64	63
13	39	39	2,003,000	63	62
16	84	84	4,764,000	75	63
17	46	46	2,486,000	71	64
18	29	29	1,581,000	72	64
19	17	17	953,000	65	64
20	20	20	861,000	65	64
23	43	43	2,118,000	62	62
24	24	24	1,240,000	64	60
25	30	30	1,729,000	69	59
26	24	24	957,000	73	60
27	22	22	1,256,000	66	61
28	2	2	129,000	62	61
30	62	62	2,578,000	81	64
31	40	40	1,878,000	75	65
June 1	32	32	1,182,000	81	67
	611	611	30,521,000		

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

Preparations for the conduct of the propagation of the shad were commenced in the early part of April. The auxiliary station on the mainland in the vicinity of the railroad station at Havre de Grace, which had been used for several years on account of the facilities it furnished for the transfer of eggs and fry to the messenger force of the Commission, was abandoned, owing to the limited funds available for the work on the Susquehanna River, and the operations were confined to the Battery Island Station. In lieu of the auxiliary station, two serviceable launches were furnished, which permitted the shipments of eggs and fry to be properly made, and also allowed the seines and gill nets to the eastward of the island to be more readily attended.

A small force, under the direction of Alexander Jones, fish-culturist, commenced early in April to get the hatchery equipped and the boats and other apparatus in order. On April 21 the spawn-taking force, 18 in number, was employed, and the collection of eggs commenced. From this date to May 31 the work was actively pushed, though the force was materially reduced on May 25, owing to the interruption to the collection of eggs occasioned by the heavy freshet prevailing in the river. The result of the season's work was 53,556,000 eggs, from which were obtained 32,616,000 fry, in addition to 7,595,000 partially-developed eggs which were transferred to the cars to be

hatched en route to distant waters. The fry were unusually strong and stood transportation well, due, to some extent, to the low temperature of the water during April and part of May.

The temperature from April 15 to April 30 was much below that of any previous season recorded at the station, averaging 49° F. The take of eggs, however, was about the same as in 1889 and 1890, when the average temperature during corresponding periods was 57° and 56°, respectively.

The catch of shad at the head of the bay was the best for several years, particularly with gill nets between Battery and Pools islands; and but for the two freshets during the season, the one occurring on May 7, when the fishing was at its best, and the other on May 20 and lasting for eight days, the number of eggs collected would unquestionably have been greater than in any previous year, possibly excepting 1888.

The following table exhibits the take of eggs, etc., during the season:

Date.	Fish stripped.		Number of eggs.	Noon temperatures.		Date.	Fish stripped.		Number of eggs.	Noon temperatures.	
	Male.	Female.		Air.	Water.*		Male.	Female.		Air.	Water.*
1892.				° F.	° F.	1892.				° F.	° F.
Apr. 21	8	8	282,000	46	47	May 13	84	84	2,316,000	62	65
Apr. 22	4	4	106,000	51	49	May 14	85	85	2,771,000	57	58
Apr. 23	2	2	63,000	55	51	May 15	10	10	331,000	63	61
Apr. 25	18	18	761,000	44	48	May 16	67	67	2,721,000	72	66
Apr. 26	25	25	733,000	52	52	May 17	69	69	2,379,000	72	65
Apr. 27	31	31	1,101,000	56	53	May 18	28	28	1,153,000	67	65
Apr. 28	120	120	4,643,000	59	55	May 19	8	8	198,000	66	69
Apr. 29	98	98	5,071,000	56	55	May 20	.....	.....	.....	67	66
Apr. 30	63	63	2,949,000	56	56	May 21	1	1	28,000	56	60
May 1	49	49	1,673,000	62	58	May 22	.....	.....	.....	58	60
May 2	132	132	4,767,000	71	62	May 23	2	2	48,000	60	59
May 3	95	95	3,869,000	72	68	May 24	.....	.....	.....	62	59
May 4	232	232	6,637,000	65	67	May 25	.....	.....	.....	65	60
May 5	28	28	1,455,000	62	65	May 26	.....	.....	.....	71	62
May 6	38	38	1,346,000	62	62	May 27	17	17	526,000	66	68
May 7	2	2	101,000	65	66	May 28	3	3	100,000	62	64
May 8	3	3	257,000	60	60	May 29	6	6	225,000	68	64
May 9	19	19	766,000	62	63	May 30	15	15	529,000	69	66
May 10	21	21	863,000	63	63	May 31	20	20	610,000	71	68
May 11	25	25	879,000	65	66						
May 12	32	32	1,299,000	60	60		1,460	1,460	53,556,000		

*At surface.

Striped bass were caught in large quantities during the early part of the season, and efforts to obtain their spawn were made, but without success. Occasionally a ripe female is found, but only about once in six years are both sexes found together in condition for spawning. Several attempts were made to impregnate the eggs of the shad with the milt of the striped bass, but unsuccessfully. In every instance observed by Mr. Ravenel eggs so treated have failed to hatch.

The title to Battery Island was vested in the United States by deed from Mr. T. B. Ferguson, bearing date of July 11, 1891, and the consideration therefor passed July 15, 1891.

BRYAN POINT STATION, MARYLAND (S. G. WORTH, SUPERINTENDENT).

The propagation of the shad of the Potomac River had for a number of seasons past been conducted at the military reservation at Fort Washington, Md., under authority granted by the Secretary of War, and the use of the unoccupied buildings and other facilities of the place permitted the work to be done advantageously and economically. The expense also of caring for the equipment of the station from season to season was avoided through the courtesy of the custodian of the reservation, Ordnance-Sergeant Joyce, U. S. Army, by whom many acts of voluntary assistance were also rendered.

Shortly after the close of the season of 1891 preparations were made by the War Department for the construction of a new battery. A large wharf for the receipt of material was built near the middle of the seine-haul, and the use of the buildings occupied by the Commission was withdrawn, as they were needed by the construction force. It therefore became evident that if the propagation of the shad of the Potomac was to be continued another site for a station must be secured. Accordingly, on November 30, 1891, the Commissioner appointed a committee, consisting of Mr. S. G. Worth, superintendent in charge of the Commission's work on the Potomac River; Mr. C. E. Gorham, the civil engineer of the Commission, and Mr. L. G. Harron, seine captain, to make an investigation with the view of obtaining a suitable location. The committee recommended Bryan Point, situated on the Maryland side of the river at the junction of Accokeek Creek, about 2 miles below Fort Washington, and a lease of the same for five years, at an annual rental of $100, together with an option for the purchase of the property within the period at $1,300, was made with the owner, Mr. F. Snowden Hill, of Baltimore, Md.

On March 9, 1892, the removal of the equipment and certain small buildings from Fort Washington to Bryan Point was commenced. The buildings transferred were a small hatchery, a boiler and pump house, and a small quarters building for the use of the seine captain. These were supplemented by the repair of several dilapidated structures belonging to the property, consisting of a large boat shed, which was utilized for boat and general storage, and quarters for the seine-haulers. The frame of another building was made use of to provide a mess room, to which was joined a part of another old building to serve as a kitchen. A wharf 10 feet wide and running out 132 feet to water 10 feet deep at ordinary low tide was built.

The removal of the buildings and boiler from Fort Washington was very difficult, but was accomplished and the buildings set up at Bryan Point in good order, the boiler being transferred and put in place without even disturbing its asbestus covering. The work was done under the direction of Lieut. Robert Platt and Mate J. A. Smith, of the *Fish Hawk*, with the aid of the vessel crew and the use of a small scow kindly loaned for the purpose by Maj. C. E. L. B. Davis, Corps of

Engineers, in charge of the Army construction work at Fort Washington. The removal from Fort Washington was commenced April 5 and completed in about six days. In this connection attention is called to the intelligent and energetic aid given by Lieut. Platt and Mate Smith in all this work. The station not being owned by the Government, no expenditure for a building for the office and spawn-taking force was made. Accommodations, however, were provided through the courtesy of Gen. Albert Ordway, commanding the District of Columbia Militia, who loaned 5 hospital and 11 wall tents. The station was laid out and staked off by Mr. Worth and Mr. Harron without the aid of an engineer, and in this matter, as also in the transfer and successful opening and operation of the station, they deserve much credit. The thanks of the Commission are also due to Mr. James Bryan, the owner of the adjacent property, for the cordial support extended by him to the work.

Bryan Point is central to the egg-producing area of the river, and affords a proper shore for the operation of a seine for the collection of parent fish. The water is deep and well adapted for the development of eggs, also allowing the landing of river steamers for the delivery of the station supplies and the shipment of the station's product. The facilities for the construction of rearing ponds are excellent and the water supply from Accokeek Creek ample.

Disappointment was experienced in the seine operations, owing to the foul state of the berth, which had been lying idle for ten years and had become filled with sunken logs. By unflagging effort the obstructions were finally removed, cords of logs and stumps being pulled ashore.

The first eggs were taken by the station seine on April 16 and the next on the 20th, both lots being placed in the river and not included in the following table of shipments. Besides the shipments 68,000 eggs obtained from the Stony Point seine were lost May 5 by the breaking of a jar. No eggs were hatched at the station, owing to the continuance throughout the season of the work necessary to adjust the station.

The following table exhibits the shipments of eggs made to Central Station, as also the sources of supply:

Date.	From seines at—				From gillers.	Total.
	Bryan Point.	Chapman.	Stony Point.	Tulip Hill.		
May 2	436,000	.....	26,000	461,000	1,498,000	2,421,000
3	231,000	.....	.....	.....	.....	231,000
4	84,000	.....	.....	694,000	397,000	1,175,000
5	362,000	147,000	181,000	432,000	1,035,000	2,157,000
6	142,000	77,000	465,000	232,000	264,000	1,180,000
7	194,000	42,000	327,000	327,000	527,000	1,417,000
8	186,000	146,000	.....	121,000	354,000	807,000
9	110,000	126,000	.....	.....	93,000	329,000
10	50,000	.....	.....	.....	432,000	482,000
11	21,000	122,000	.....	164,000	399,000	706,000
12	.....	45,000	.....	32,000	591,000	668,000
13	.....	24,000	.....	40,000	566,000	630,000
14	.....	.....	.....	.....	331,000	331,000
15	.....	69,000	.....	.....	210,000	279,000
17	.....	.....	.....	.....	565,000	565,000
Total	1,816,000	798,000	999,000	2,503,000	7,262,000	13,378,000

Of the eggs secured from gillers, there were obtained from the men fishing off Moxley and Bryan Points 4,899,000; White House, 1,587,000; and Mount Vernon Flats, 776,000, the first being the product from 11 gillers, the second from 10, and the third from 1.

This season's collection of eggs was the smallest of any year since the commencement of the work on the Potomac River, though the quality of the eggs was better than usual.

Shad were very scarce; one of the largest seines caught but 32,000 as against 52,000 in 1891, 66,000 in 1890, and 72,000 in 1889. The Commissioner's seine caught but 1,082, but this is of no value for comparison for reasons already stated. A fair standard can be arrived at by a comparison of the number of eggs obtained from gillers during the seasons mentioned below, from 1888 to 1892:

Season.	Moxley Point gillers.	White House gillers.	Total.
1888	20,007,000	7,820,000	27,827,000
1889	15,726,000	4,705,000	20,431,000
1890	13,114,000	4,886,000	18,000,000
1892	4,899,000	1,587,000	6,486,000

As regards the weather, it may be said that few such bad springs are known in this latitude. The prevailing winds were from the west and northwest, from which latter point a blow set in on March 10 and lasted for a week. What effect the weather had on the run of shad does not appear quite clear. At Battery Island Station on the Susquehanna River the temperature of the water was lower than at Bryan Point, yet at the former place the catch of shad and production of eggs was very good. The condition of the Potomac River was the same as during the two previous seasons, clear, resulting in a poor catch. During the seasons of 1887 to 1889 it was the opposite, with numerous freshets, and greatly increased catch. The fact that more fish can be caught in stained than in clear water is scarcely a sufficient reason for this difference, nor does a comparison of the water temperatures afford any further light on the subject. During the three freshet seasons the yield of eggs was 59,435,000, 81,117,000, and 58,233,000, respectively, an average per year of 66,282,000; and during the seasons of clear water 34,865,000, 32,445,000, and 13,446,000, respectively, an average per year of 26,918,000. The water temperatures during these seasons were as follows:

Date.	1887.	1888.	1889.	1890.	1891.	1892.
Mar. 2-11	47.30	40.15	39.90	39.70	36.65	40.70
12-21	37.80	41.10	48.95	50.50	43.05	37.25
22-31	39.10	44.80	52.95	47.80	45.02	42.46
Apr. 1-10	52.85	60.60	53.40	55.85	44.60	53.73
11-20	55.95	52.25	59.35	56.25	58.50	51.02
21-30	57.55	63.00	62.45	63.35	66.75	54.33
May 1-10	72.35	71.35	69.05	69.05	63.52	65.66
11-20	74.80	62.10	77.00	72.20	63.57	67.06
21-30	72.80	68.75	65.95	71.95	67.37	65.50

As showing the fluctuations in the yields of eggs on the Potomac River the table below will prove of interest:

Table of Potomac River shad-egg production, by localities and years, 1880–92.

Sources.	1880.	1881.	1882.	1883.	1884.	1885.	1886.
Indefinite	20,749,000						
Gunston and Pomonkey		43,200,000					
Moxley Point seine			15,800,000	7,518,000		4,228,000	
Bryan Point seine			6,000,000				
Fort Washington seine				1,089,000	6,000,000	7,280,000	11,848,000
Chapman Point seine				1,097,000		1,610,000	5,506,000
Ferry Landing seine				3,312,000		2,536,000	4,349,000
White House seine				5,315,000			1,487,000
Gillers				5,943,000	10,000,000	5,361,000	10,981,000
Other seines					3,000,000		
Greenway seine						432,000	
Pomonkey seine						333,000	
Tent Landing seine						796,000	
Stony Point seine							2,191,000
Total	20,749,000	43,200,000	21,800,000	24,274,000	19,000,000	22,576,000	36,362,000

Sources.	1887.	1888.	1889.	1890.	1891.	1892.	Total.
Indefinite	38,479,000						59,228,000
Gunston and Pomonkey							43,200,000
Moxley Point seine		18,828,000	8,987,000	1,078,000			56,439,000
Moxley Point gillers		20,007,000	15,726,000		13,114,000	4,899,000	53,746,000
Bryan Point seine						1,816,000	7,816,000
Fort Washington seine	20,956,000	22,657,000	17,738,000	10,224,000	5,378,000		103,170,000
Chapman Point seine		1,723,000	6,834,000	2,842,000	1,660,000	798,000	22,070,000
Ferry Landing seine		2,250,000	1,717,000				14,164,000
White House seine							6,802,000
Gillers				17,223,000			49,508,000
Other seines							3,000,000
Greenway seine							432,000
Pomonkey seine							333,000
Tent Landing seine							796,000
Stony Point seine		838,000				1,067,000	4,096,000
Tulip Hill seine		3,340,000		3,835,000	4,231,000	2,503,000	13,909,000
White House gillers		7,820,000	4,705,000		4,886,000	1,587,000	18,998,000
Sandy Bar gillers		3,714,000	2,526,000				6,240,000
Greenway gillers					2,503,000		2,503,000
Cruney Island gillers					1,208,000		1,208,000
Mount Vernon Flats gillers						776,000	776,000
Total	59,435,000	81,177,000	58,233,000	35,202,000	32,980,000	13,446,000	468,434,000

During many years it has been observed that the eggs secured from certain seines have developed badly, notably in those obtained from the Stony Point fishery. The seine at this fishery is probably the largest in the world, being $1\frac{1}{6}$ miles long and sweeping on each ebb tide an area of 3 square miles. Great numbers of spawning shad are caught there, but the quality of eggs was so poor as to cause dissatisfaction both to the proprietor of the shore and to the Fish Commission's employés. The greater the take of eggs the greater the disappointment when the eggs were measured for payment, and as a consequence it was deemed best to greatly intermit the attendance on the shore. During the season Mr. Worth personally investigated the matter and attended the hauls as often as other work would permit, stripping the fish himself. He discovered that no eggs could be depended upon which were found in partially spent fish, and that it was unprofitable to devote time to that class of spawners, however numerous. He then gave his attention only to those fish which were found by actual handling

to be plump and full-roed, and made a gain in quality of 50 to 75 per cent. The application of this principle was not infallible, however, as the eggs in some of the shad were dead, a condition not always discernible at the time of stripping.

It is recommended that the gillers of Occoquan Bay, Mattawoman Creek, and Craney Island flats, where about 30 boats with good outfits operate in shoal water, be attended with as much regularity as those nearer the station, as these latter, owing to the poor condition of their equipments, would not be able to catch many fish were they ever so abundant.

The hatching of the white perch should also have some attention. During the season the station's seine caught between 200 and 300 large fish containing full roes, with some of the eggs in excellent condition for impregnation, but attempts to fertilize them were unsuccessful. Their propagation could probably be successfully accomplished by digging shallow right-angled trenches in the ground near the hatchery tank, flooring the bottoms and making partitions or walls with old roofing slates, and then keeping them filled with the river water, transferring the fish into the subdivisions by pairs (male and female). When the slates are found to be covered with eggs, the parent fish could be removed and returned to the river. These recommendations are based upon observations made in the distribution of the perch, the eggs of which are often seen adhering to the sides of the distributing cans.

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

As in previous years, the hatching of the eggs of the shad secured in the Potomac River was conducted at this station. While the number received was small, for reasons stated in the Bryan Point Station report, the quality was better than ever before known. The following table gives a comparison of the development of the eggs of the shad secured on the Potomac River during the past eight years:

Year.	Shipped from collecting station.	Received at Central Station.	Number of fry shipped.*	Losses.			
				In transfer.		Hatching.	
				Number.	Per cent.	Number.	Per cent.
1885							
1886	21,019,000	16,581,000	14,791,000	4,438,000	21.11	1,790,000	10.80
1887	33,254,000	28,260,000	26,560,000	4,994,000	15.00	1,700,000	6.02
1888	54,979,000	45,450,000	44,736,000	9,529,000	17.33	714,000	1.60
1889	70,249,000	58,151,000	53,015,000	12,098,000	17.22	5,136,000	8.33
1890	54,954,000	47,254,000	34,501,000	7,700,000	14.00	12,753,000	27.00
1891	34,446,000	29,884,000	26,812,000	4,562,000	13.26	3,072,000	10.28
1892	32,448,000	26,940,000	23,172,000	5,508,000	16.62	3,768,000	14.00
	13,378,000	12,698,000	11,880,000	680,000	5.00	818,000	6.44

* Including developed eggs transferred to cars for hatching en route to distant waters.

As in several years past, the eggs were placed on trays and transferred from the collecting station to Central Station by steamer. The field stations being from 12 to 14 miles below Washington, the eggs were thus kept out of water several hours.

The other kinds of fish hatched at this station were:

Kind.	Number of eggs.	Whence received.	Number of fry produced.
Von Behr trout	20,000	Northville Station	18,454
Do	4,515	Germany	3,524
Whitefish	314,000	Alpena Station	313,000

There were also received at the station and distributed therefrom the following yearling and adult fish:

Kind.	Number received.	Whence received.	Distributed.
Catfish (*Ictalurus punctatus*)	76	Fish Ponds, Washington, D. C	1,300
Do	1,248	Quincy Station, Illinois	
Catfish, spoonbill	3	do	3
Carp, scale	60,860	Fish Ponds, Washington, D. C	58,595
Carp, scale, blue	2,500	do	2,500
Carp, leather	91,004	do	86,244
Carp, leather, blue	263	do	
Goldfish	10,716	do	15,161
Do	775	Neosho Station, Missouri	
Do	5,300	Wytheville Station, Virginia	
Golden ide	2,901	Fish Ponds, Washington, D. C	2,901
Tench	9,695	do	15,675
Do	6,300	Neosho Station, Missouri	
Rainbow trout	2,560	Wytheville Station, Virginia	2,445
Brook pike	30	Quincy Station, Illinois	28
Yellow or ring perch	3,692	do	1,770
Pike perch	37	do	37
Black bass	920	do	3,048
Do	215	Wytheville Station, Virginia	
Do	1,900	Neosho Station, Missouri	
White bass	33	Quincy Station, Illinois	26
Crappie	320	do	305
Rock bass	246	do	7,772
Do	2,532	Wytheville Station, Virginia	
Do	5,168	Neosho Station, Missouri	
Do	350	Fish Ponds, Washington, D. C	
Sunfish	338	do	571
Do	286	Quincy Station, Illinois	
Gars	5	do	5
Dogfish	8	do	8
Turtles	2	do	2

There were also received from the Wytheville Station two lots of eggs of the rainbow trout, 20,000 and 30,000, respectively, which were forwarded to France and the United States of Colombia.

In addition to its fish-cultural work this station serves as the purchasing and shipping agency for many of the supplies of all the other stations of the Commission, also as the freight receiving and shipping office of the general offices, and the custody of the distribution equipment. During the current year much of the time of its employés has been consumed in assisting in the preparation of the Commission's exhibit for the World's Columbian Exposition.

Considerable attention was given to experiments in keeping fishes alive in standing water aërated by spray atomizers. Very encouraging results were obtained in holding yearling trout, one of the species most difficult to thus care for. Owing to the insufficiency of the air supply under pressure, conclusions could not be reached. Enough was learned, however, to warrant the belief that by this method the transportation of fish can be made more uniformly successful as well as

more simple and economical. The system may also prove to be capable of practical application to aquaria, doing away with the necessity of new-water circulation. The idea is to atomize the water in a vessel under an inverted cylinder so as to return the aërated water without evaporation, and to cause the waste air used in atomizing to pass through the water of the vessel, thereby imparting to it additional oxygen. The water which is atomized is drawn from the bottom of the vessel, thus inducing circulation. In experiments made in 1889 it was found that one atomizer would aërate 100 gallons in twenty-four hours under 10 pounds air pressure. This method is free from the objection found in the use of nozzle jets, which cover the bodies of the fish with air bubbles. It can also, probably, be made applicable in the movement of fry, which can not be done with the first method.

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

In addition to the propagation of the carps, tench, golden ide, and goldfish, and the rearing of the shad, the culture of the black bass and the spotted catfish was also undertaken. The distribution of the product of the station was made through Central Station, the work having been commenced in November.

Carp.—The fish distributed in the fall of 1891 were reared in two large and two small ponds, the product being:

Leather carp	94,000
Blue leather carp	2,630
Scale carp	54,300
Blue scale carp	6,560
Total	157,490

The arrangements necessary for the spawning of this and the other species of fish propagated at this station were changed from previous years owing to the attention given to the black bass and spotted catfish, and the pond space formerly allotted to the carp was reduced. The stock of large breeding fish was placed in the ponds about the middle of May, 1892, and a few days after they gave the first indications of spawning, which quickly followed. The eggs developed rapidly and three days after their appearance the dark spots were plainly visible, and on the fourth and fifth days the young appeared in considerable numbers. Large quantities of eggs secured from the other breeding fish were also placed in the ponds in proper beds, and they also rapidly developed. The growth of the young was not so rapid as in the preceding season. The cause of this is ascribed to the cool nights of May, which lowered the temperature of the water and thereby retarded their growth.

Tench.—The product of this species for the summer of 1891 was 9,600, the fish being reared in four small ponds. In 1892 they were confined to two ponds. They commenced to spawn the early part of June, sparingly in one, but abundantly in the other, with a fair prospect

of satisfactory results, though it is impossible to estimate the number, owing to the habit of the fish of keeping close to the bottom of the ponds.

Golden ides.—The number of this species raised was 3,400, the distribution of which was commenced in the early part of November, 1891. On April 13, 1892, they spawned in two ponds, and the prospect for an early and fair result was good. The eggs, however, had been deposited on the water plants near the surface of the water when one night's frost, making ice one-half inch thick, killed them all.

Goldfish.—Early in May, 1891, the ponds were well stocked with healthy brood fish. The temperature of the summer of 1891 was lower than for several seasons, making the water too cool and causing a scarcity of live food. Efforts to replace this by artificial means met with no good result, a large number of the fish dying, and the survivors being unthrifty. Many also failed to attain their golden color. The product was about 10,700. Immediately after the emptying of the ponds in the fall they were carefully cleaned, especial care being taken to destroy all injurious fish, crustaceans, and vermin. Early in April, 1892, 10 ponds were stocked with the brood fish, partly with the Japanese and partly with the ordinary variety. Spawning began May 8 and on May 18 and 19 a few additional spawning beds were placed in the different ponds. The low temperature of the season, however, as in the case of the carp, greatly retarded the growth of the young brood.

Shad.—In April, 1891, there were placed in the west pond (6¾ acres surface area) 2,054,000 fry of the shad. They thrived marvelously well, finding abundance of suitable food about the water-grasses (*Daphnia*, *Cyclops*, etc.), and in July quantities of *Gammarus pulex*. Constant care had to be given to freeing the pond from obnoxious weeds, introduced and disseminated by the great flood of 1889, and which greatly interfered with the proper growth of such plants as were advantageous to the culture of the fish. As illustrative of the density of the vegetation caused by the overflow mentioned, from the one pond where the shad were reared not less than 600 and from the north pond some 400 cart loads of these weeds were removed. Their rapid growth and early decay rendering the water unwholesome, necessitated their prompt destruction. The result of the rearing of the shad was very gratifying, and in November, when they were released in the Potomac River, a very large percentage of the fry had reached a length of from 3 to 4 inches. An extremely conservative estimate of the number released is not less than 1,000,000. On May 9 and 10, 1892, consignments of fry aggregating 1,989,000 were sent from Central Station and placed in the west pond.

Black bass.—As before indicated, during this year was inaugurated the first systematic effort at this station for the propagation of the black bass. In the fall of 1891 there were received from the Neosho Station 173 specimens of this fish, which were placed in the north pond.

Thirty of the consignment were subsequently transferred to the Wytheville Station. On their arrival at the fish ponds the fish were apparently in excellent condition, but some died shortly afterwards and others in quick succession, and but 13 strong, healthy specimens were left. A careful investigation showed that the fish had been injured by the jolting of the cars while in transit from Neosho to Washington, broken points of fins being found in their bodies, showing that during their close contact and long confinement they had wounded one another. These wounds produced sores which soon became more and more inflamed and caused death in a short time. Two fish, weighing 2½ pounds each, were subsequently procured from Mr. Samuel Einstein, of the health office, District of Columbia. These 15 fish commenced to spawn about May 18, but the muddiness of the water, caused by constant rains, prevented regular and daily observations. On May 30 the young were seen for the first time, and their innate voracity was shown by their attacks on tadpoles and other animal life that came within their reach. At first food was furnished in the shape of frog and toad spawn, later in that of chopped and live fish, 20 to 30 pounds being supplied them daily. Their appetite was unappeasable, apparently; the more they were fed the hungrier they seemed to become. As they grew older their voracity knew no bounds, and in the absence of other food they hesitated not to devour each other. This trait undoubtedly will cause a reduction in the number that will be available for distribution in the fall.

Spotted catfish.—There were also received from the Neosho Station 30 specimens of the spotted catfish for a brood stock. These were held during the winter in one of the small ponds and in March, 1892, transferred to the south pond, which had an abundant and favorable vegetation and a depth of 2 to 5 feet. They immediately disappeared and no glimpse was had of them, even at the feeding hour (they apparently preferred feeding at night), nor was there any knowledge of the existence of their eggs till May 29, when their young were noticed for the first time. From that date they were seen in considerable numbers. They were fed daily and a good result may be expected.

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

The work of this station was confined to the propagation and rearing of the rainbow trout, black-spotted trout, carp, black bass, rock bass and goldfish.

Rainbow trout.—The station has about 2,500 breeding rainbow trout, of which probably 35 to 40 per cent do not spawn each year. The spawning season began November 10 and ended March 20, during which time 491,000 eggs were collected. Of these, 154,500 were transferred to other hatcheries, national, State, private, and foreign, and the remainder, 336,500, held at the station for incubation, producing 147,500 fry. The loss during incubation, 189,000, was greater than usual, due mainly to a period of muddy water. There was also a larger

number of the hard, "glassy" eggs. There was a further loss up to the end of the fiscal year in the fry and young fish of 27,500, leaving 120,000 fish, from 4 to 6 months old, to be reared for distribution in the fall of 1892.

The distribution of the young fish brought over from the preceding year was begun December 22, and finished February 18, the whole, with the exception of three shipments of 50 each, being done by car No. 2, in charge of Mr. Giles H. Lambson. The number distributed was 49,670. In addition, 122 adult fish were planted, 115 being placed in local waters.

Black-spotted trout.—There remain of this species about 200 two-year-old fish, the survivors of the fish produced from the consignment of 5,000 eggs received from the Leadville station July 29, 1890.

Black bass.—The year opened with 810 bass, all young with the exception of two spawners. At the end of the year the whole stock was estimated at 1,200. But 215 yearling fish were distributed during the year.

Rock bass.—On October 10 the ponds were drawn for the purpose of bringing together, ready for assignment, the rock bass, carp, and goldfish, the first shipment being made November 3. The number of rock bass, of a season's growth, distributed were 15,182.

Carp.—The number of yearling carp distributed was 4,395, of which number 1,260 were released in Reed Creek, a local stream. In addition, 90 breeders, from 3 to 6 years old, were supplied to applicants in Bland and Wythe counties, Va.

Goldfish.—The number of goldfish distributed was 6,915, of which 5,300 were consigned to Central Station for shipment to applicants from Washington.

On July 1, 1892, the kinds and numbers of fish retained at the station were as follows:

Rainbow trout (counted)	120,000
Black-spotted trout (counted)	200
Black bass (estimated)	1,200
Rock bass (estimated)	15,000
Carp (estimated)	8,000
Goldfish (estimated)	6,000

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

The work at this station, as in previous years, was mainly with the whitefish and pike perch, some experimental work being done in the cultivation of the lake herring and the crossing of the lake herring with the whitefish.

Whitefish.—The first eggs, about 300,000, were obtained November 4, being taken at the fishery at North Bass. During the early part of the spawn-taking period the season was favorable, but the run of fish was light; as the period approached when we expected to secure our largest yield of eggs, heavy gales prevailed, which injured many of the

nets and drove the fish from their spawning-grounds. The collecting of eggs ceased on November 21. During the heavy gale from the southwest on November 17, the new suction pipe, which had been placed 150 feet out in the lake, parted about 70 feet from the shore, and as the heavy wind had forced the water down the lake both the old and new suction pipes were exposed, thus preventing pumping and leaving the hatchery without water supply, other than that held in the tanks, for ten hours. On the 23d of November a similar storm had a like effect on the water supply. The collecting fields and the number of eggs taken at each were:

Monroe and West Sister Island (delivered at Toledo)	5,256,000
Port Clinton	12,528,000
Catawba Island	2,592,000
Kelley Island	3,708,000
The Bass Islands	42,732,000
Total	66,816,000

Of these eggs there were delivered to the superintendent of the Sandusky station of the Ohio Fish Commission (November 7–25), 8,000,000; to the superintendent of the Erie station of the Pennsylvania Fish Commission (November 7–25), 12,500,000, and forwarded to the U. S. Fish Commission station at Duluth (February 26), 12,000,000; making a total of 32,500,000. The remainder were hatched out at the station and the fry placed in Lake Erie. The plantings were made from April 4–10, as follows:

Near North Bass Island	1,000,000
Near Rattlesnake Island	750,000
Near Middle Bass Island	1,000,000
Near Kelley Island	1,000,000
Near Put-in Bay Island	1,000,000
Near Ballast Island	1,250,000
Total	6,000,000

The small percentage of fry produced from the eggs retained at the station is undoubtedly partly due to the temporary suspension of the water supply to the hatchery during the first month of incubation, and also in part to the rough weather during the spawning season, which not only made the taking and proper impregnating of eggs difficult, but also prevented the daily lifting of the pounds and gill nets, so that much spawn was obtained from fish which had been netted and held in the pounds two or three days. By the end of December the eggs were all eyed. The hatching began toward the end of March and was completed by the early part of April. The fry deposited were in excellent condition.

Pike perch.—The collection of the eggs of the pike perch was carried on from April 11 to 22. The season opened with good prospects, but a severe gale which set in on April 14 drove the fish from their spawning-grounds, to which they returned only in small numbers. The total

take of eggs was 134,560,000, which were obtained from the following grounds:

Toledo	42,400,000
Port Clinton	11,200,000
East Sister Island	22,400,000
Bass Island	58,560,000

Of these, 15,000,000 were delivered on April 27 to the agent of the Pennsylvania Fish Commission for its Erie hatchery; 17,600,000 were transferred at Toledo to U. S. Fish Commission car No. 3 and taken to Louisville, Ky., where they were hatched, the fry being estimated at 10,000,000 and placed in Kentucky waters. The remaining eggs were held and hatched at the station, producing 40,000,000 fry, of which 12,000.000 were planted in Lake Erie and the balance mainly in the waters of Michigan, Ohio, and Indiana, the period of distribution being from May 13 to 25.

Lake herring.—Experiments were made in the propagation of the lake herring, 1,500,000 eggs of this species being obtained. The eggs are non-adhesive, and average about 75,000 to the quart. They can be impregnated and handled as readily as those of the whitefish, with which they were simultaneously hatched, a good percentage of fry being produced. Further attention to the propagation of this species will be given the next season.

Table of water temperatures (at 8 a. m.).

Date.	Temp.	Date.	Temp.	Date.	Temp.	Date.	Temp.
1891.		1891.		1892.		1892.	
Nov. 1	50	Dec. 1	36	Mar. 28	35	Apr. 27	45
2	48	2	37	29	35	28	46
3	48	3	37	30	35	29	46
4	47	4	37	31	36	30	47
5	49	5	36	Apr. 1	37	May 1	48
6	47	6	35	2	39	2	48
7	48	7	35	3	40	3	48
8	48	8	37	4	41	4	50
9	48	9	36	5	43	5	50
10	48	10	35	6	42	6	49
11	48	11	35	7	48	7	50
12	47	12	36	8	47	8	50
13	46	13	36	9	46	9	50
14	46	14	36	10	42	10	51
15	45	15	36	11	42	11	51
16	45½	16	36	12	42	12	50
17	45	17	35	13	43	13	50
18	42	18	34	14	42	14	52
19	40	19	34	15	42	15	53
20	41	20	35	16	42	16	54
21	42	21	35	17	42	17	55
22	42	22	35	18	43	18	54
23	42	23	36	19	43	19	56
24	41	24	36	20	43	20	56
25	39	25	35	21	43	21	57
26	40	26	34	22	43	22	57
27	39			23	44	23	57
28	38			24	45	24	57
29	37			25	44	25	58
30	37			26	45		

NOTE.—From Dec. 27, 1891, to Mar. 27, 1892, the temperature remained uniformly 33° to 34°.

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

The operations of this station were confined to the propagation and rearing of trouts.

Von Behr trout.—The spawning of this trout began October 30, 1891, and ended January 7, 1892, during which time 587,000 eggs were secured from the station's stock fish, 795 females and 653 males being used. In addition to these, a consignment of 18,000 eggs was received from Germany, making a total of 605,000. Of this number, 116,000 were hatched (commencing in February) and retained at the station for rearing; the remainder were distributed as follows:

Date.	Consignee.	Number.
Dec. 1, 1891	Prof. J. E. Reighard, Ann Arbor, Mich	500
16, 1891	Central Station, Washington	20,000
28, 1891	Duluth Station, Mich	50,000
30, 1891	New York Fish Commission, Cold Spring Harbor	10,000
Jan. 5, 1892	Leadville Station, Colorado	50,000
6, 1892	John H. Gordon, Cheyenne, Wyo	20,000
9, 1892	Wyoming Fish Commission, Laramie	10,000
16, 1892	Mexican Government, City of Mexico	20,000
21, 1892	Green Lake Station, Maine	50,000
22, 1892	Fort Gaston Station, California	25,000
Feb. 12, 1892	Nebraska Fish Commission, South Bend	20,000
13, 1892	Leadville Station, Colorado	30,000

Record of spawn-taking.

Date.	Males.	Females.	Eggs obtained.	Average number eggs per female.	Date.	Males.	Females.	Eggs obtained.	Average number eggs per female.
Oct. 30, 1891	1	1	600	600	Nov. 30, 1891	25	30	18,600	620
Oct. 31, 1891	3	3	3,000	1,000	Dec. 1, 1891	2	2	3,450	1,725
Nov. 2, 1891	15	19	15,000	790	Dec. 2, 1891	3	3	1,500	500
Nov. 3, 1891	3	3	3,300	1,100	Dec. 3, 1891	15	20	18,300	915
Nov. 4, 1891	1	1	450	450	Dec. 4, 1891	1	1	600	600
Nov. 5, 1891	36	54	42,300	783	Dec. 5, 1891	1	1	300	300
Nov. 6, 1891	1	1	2,500	2,500	Dec. 7, 1891	30	35	23,100	660
Nov. 7, 1891	21	27	22,900	848	Dec. 9, 1891	4	4	1,500	375
Nov. 9, 1891	40	64	43,900	686	Dec. 10, 1891	1	1	450	450
Nov. 10, 1891	7	7	7,250	1,035	Dec. 11, 1891	12	12	7,350	612
Nov. 11, 1891	25	34	25,500	750	Dec. 14, 1891	1	1	1,800	1,800
Nov. 13, 1891	65	72	55,200	766	Dec. 15, 1891	8	8	6,600	825
Nov. 14, 1891	4	5	9,600	1,920	Dec. 18, 1891	10	10	7,950	795
Nov. 16, 1891	75	81	51,900	640	Dec. 21, 1891	1	1	400	400
Nov. 17, 1891	1	1	450	450	Dec. 24, 1891	5	9	5,700	630
Nov. 18, 1891	60	78	64,850	831	Dec. 28, 1891	5	7	6,000	857
Nov. 20, 1891	35	41	26,700	651	Dec. 31, 1891	2	2	1,000	500
Nov. 21, 1891	1	1	400	400	Jan. 2, 1892	1	1	300	300
Nov. 23, 1891	60	68	56,100	886	Jan. 4, 1892	1	1	400	400
Nov. 24, 1891	1	1	300	300	Jan. 7, 1892	3	3	1,050	350
Nov. 25, 1891	30	39	22,500	577					
Nov. 27, 1891	35	40	24,000	600		653	795	587,000	736
Nov. 28, 1891	2	2	1,950	975					

The distribution of yearlings was commenced January 23, 1892, and terminated March 28. The fish to distant waters were consigned to applicants in Kentucky, Ohio, Indiana, Illinois, Wisconsin, Pennsylvania, and Michigan. The number sent out was 7,127; the transfers being made by car No. 1. In local waters 200 fish were planted.

Brook trout.—Owing to the heavy mortality that had occurred during the previous spawning season in the breeding fish of this species, it became necessary to replenish the stock. Accordingly, in the early part of July, 1891, Mr. S. P. Wires, the foreman of the Alpena Station, was sent to Grand Marais, Mich., to secure a number of the wild trout from the streams of that vicinity. With the aid of a small force of men he secured 600 specimens, which were shipped to this station July 14. These readily adapted themselves to domestication and suffered no loss.

On October 19 the spawning season commenced, and continued till January 19. The number of females stripped was 294, 264 males being used. In all, 147,200 eggs were obtained. Of these, 500 were sent to Prof. J. E. Reighard, at the University of Michigan, and 10,000 to Mr. Mather, at Cold Spring Harbor, N. Y., for reshipment to the United States of Colombia. The balance of good eggs, about 100,000, were retained at the station for rearing. They began hatching in January. The average number of eggs per fish was 500; the largest number obtained from 1 fish being 1,800, on November 28, 1891, and the smallest number, 180. (900 being taken from 5 fish December 7).

The number of yearlings distributed was 13,000. Of these, 10,000 were placed in the stream near the hatchery on October 23, and 3,000 sent by car No. 1, on July 24, 1891, to Dubuque, Iowa.

Loch Leven trout.—The season of spawning of this species was from October 27, 1891, to January 19, 1892. The number of fish spawned was 1,229 (males used, 1,023), which furnished 571,850 eggs. Of these, 132,000 were retained at the station for hatching (commencing in February) and rearing, and the balance of good eggs, 185,500, shipped as follows:

Date.	Consignee.	Number.
Dec. 19, 1891	Prof. Reighard, Ann Arbor, Mich	500
19, 1891	New Hampshire Fish Commission, Plymouth	25,000
29, 1891	Leadville Station, Colorado	25,000
30, 1891	Government of United States of Colombia*	10,000
31, 1891	Vermont Fish Commission, Waterbury	30,000
Jan. 15, 1892	Green Lake Station, Maine	50,000
26, 1892	A. N. Cheney, Glens Falls, N. Y.†	20,000
29, 1892	West Virginia Fish Commission, Romney	10,000
30, 1892	Nebraska Fish Commission, South Bend	15,000

* Through Fred Mather, Cold Spring Harbor, N. Y. † Through C. F. Orvis, Manchester, Vt.

The greatest number of eggs from 1 fish was 1,900, that of 3 fish spawned November 18 being 5,700; the lowest 336, the average of 83 fish spawned December 22; the average for the whole take of eggs, 465.

The distribution of the yearling fish extended from January 17 to March 15, 1892, the number shipped being 3,709, which were consigned to applicants in Wisconsin, Michigan, Kentucky, and Pennsylvania.

Lake trout.—The eggs of this species were collected by the employés of the Alpena Station, under the report of which station are given the details of the work. Of the 2,853,000 eggs received, 1,900,500 were shipped as follows:

Date.	Consignee.	Number.
1891.		
Dec. 1	Prof. Reighard, Ann Arbor, Mich	500
26	Duluth Station, Minnesota	500,000
1892.		
Jan. 4	do	250,000
6	Cheyenne, Wyo., for J. H. Gordon, South Bend, Wyo	50,000
8	Duluth Station, Minnesota	250,000
9	Wyoming Fish Commission, Laramie	100,000
11	Minnesota Fish Commission, St. Paul	50,000
12	New York Fish Commission, Saranac Lake Village	300,000
13	Vermont Fish Commission, Waterbury	100,000
14	New Hampshire Fish Commission, Laconia	100,000
19	Nebraska Fish Commission, South Bend	200,000

The eggs retained at the station, which began in January to hatch, produced 200,000 fry.

The distribution of yearlings was commenced January 23, 1892, and completed April 12. The number shipped was 45,722, which were consigned to applicants in Wisconsin, Michigan, Iowa, Indiana, Ohio, Kentucky, New York, Pennsylvania, and Vermont.

Black-spotted trout.—On February 5, 1892, 1,000 seven-months old trout of this species were received at the station, having been brought by Mr. H. D. Dean, superintendent of the Leadville Station. They were immediately placed in tanks, and commenced feeding well.

Whitefish.—Of the 370,000 eggs of the whitefish received from the Alpena Station, 100,000 each were forwarded to Switzerland, France, and the Indiana Fish Commission at Richmond.

A noticeable feature in the work of the station was the success which attended the shipments of eggs. In no shipment, which was reported upon, was the loss more than 5 per cent, and in many cases there was none.

The loss among the rearing fish during the season was very great, especially among the brook trout, which were attacked by a fungus. The cause of this was not definitely determined, but was probably due to the scarcity of water occasioned by the continued drought and unprecedentedly warm weather during the whole season. The following table exhibits the progress of trout fry produced from the eggs of the fall of 1891 to July 1, 1892:

Items.	Von Behr.	Brook.	Loch Leven.	Lake.	Totals.
Fry hatched	116,000	100,000	142,000	200,000	558,000
Lost	52,000	40,800	72,000	125,000	289,800
Distributed		200			200
On hand July 1, 1892	64,000	59,000	70,000	75,000	268,000

For the purpose of incorporating them in the exhibit of the Commission at the World's Fair, specimens of artificially reared trout were obtained from several of the stations. Those furnished by that at Northville were of the following kinds, ages, and weights:

Age.	Von Behr.	Brook.	Loch Leven.	Lake.
	Ounces.	*Ounces.*	*Ounces.*	*Ounces.*
One year	¾	¾ and 1¾	1	1
Two years	4	3½ and 4	4 and 6½	6½ and 7
Three years	13 and 14	8 and 9	10½ and 15	
Four years		13½ and 14½		
Five years	34 and 38			
Six years			50 and 56	

The stock of breeding fish on hand towards the close of the year consisted of 939 Von Behr trout, 616 brook trout, and 2,975 Loch Leven trout.

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

The occupancy of this station has continued under lease from Mr. George N. Fletcher, of Alpena, and its supply of water under contract with the Alpena Water Company. The operations of the station, consisting of the collection of the eggs of the lake trout for the Northville Station and the propagation of the whitefish, were under the immediate direction of Mr. S. P. Wires, foreman. Owing to the frequent and severe gales of wind during the last of October and throughout November and December, fewer eggs than usual, of all kinds, were taken at the spawning-grounds of lakes Huron and Michigan and Detour Passage. The especially severe and cold gales in the early part of December on Lake Michigan were the cause of an unprecedentedly small catch of fish in that lake, which accounts for the small supply of whitefish eggs taken from Beaver Island and Charlevoix.

Lake trout.—The eggs of this species were obtained from the spawning-grounds of Lake Huron on reefs in the vicinity of Thunder Bay Island, and from Lake Michigan on reefs near the Beaver Islands off Thompson. The first eggs, which were of the shoal-water race, from Thunder Bay, were received about October 15, and the work of collection was carried on till about the 1st of November, when a severe gale tore up the nets and prevented its continuance. The eggs were developed at the station and then transferred to the Northville Station, seven consignments being made between November 4 and December 14. The season of collection represented two hundred and twelve days of one man's time, during which 2,853,000 eggs were secured, as follows:

From Manistique, Lake Michigan, seventy-five days	2,275,000
From North Point and Alpena, Lake Huron, seventy-five days	280,000
From Au Sable, Lake Huron, sixty-two days	298,000

Whitefish.—The first eggs, 160,000, were received November 4, and the last 1,600,000, from Beaver Island, on December 16. The season's receipts were 40,700,000 eggs, as follows:

Lake Michigan.	Days.	Number.	Lake Huron.	Days.	Number.
Epoufetto	41	2,600,000	Point Savitau	21	1,500,000
Naubinway	46	3,200,000	Hay Point and Detour Passage	30½	2,400,000
Heymann's fishery	17	1,280,000	Middle and Thunder Bay islands	53	6,620,000
Schlein's fishery	26	3,500,000	North Point and Alpena		
Scott Point and Point Patterson	28	1,800,000	Sturgeon Point	21	4,700,000
Beaver Island	41	1,600,000	Miller Point	30	11,500,000

The loss of eggs during development was 10,580,000, nearly 26 per cent. This loss was mainly due to neglect on the part of the fishermen in not hauling their nets oftener, frequently allowing them to remain four or five days during severe storms and bad weather. Eggs taken from fish caught in gill nets are invariably poorer than those from fish taken in any other manner, from the fact that when the spawn is taken many of the fish are in a half-lifeless condition. Another factor was the quantity of sawdust in the water supplied to the hatchery. Owing to the direction of the prevailing winds during November and the early part of December, the sawdust which was deposited in the bottom of the bay was so stirred up at times as to be forced into the hatchery in such quantities as to almost stop the working of every jar.

Of the good eggs there were shipped between February 12 and March 15, 1892, to the Northville Station 370,000; to the Duluth Station, 8,000,000, and to Central Station, 4,000,000. The balance of the eggs, 17,750,000, were hatched at the station and the fry distributed from April 15 to May 4 at points in lakes Huron, Michigan, and Superior. The first eggs hatched April 5, but owing to the very low temperature of the water the hatching was very slow and not completed till April 25. The temperature of the water fell from 55° on October 1 to 33° on December 5, remaining at 32½° from December 6 to March 29. From 33° on March 30 it rose to 39° on April 10, falling back to 36° on April 13, where it remained till April 15. On the 16th it had advanced to 40°, rising slowly until May 8, when it was 48°.

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

The operations of this station were confined to the propagation of the whitefish, lake trout, pike perch, and Von Behr trout.

Whitefish.—On February 27, 1892, 10,000,000 eggs were received from the Put-in Bay Station, and on March 9, 8,000,000 from the Alpena Station. The first lot began to hatch February 29, and the second lot, the delivery of which to the station had been delayed by reason of the intensely cold and stormy weather, on the day of their receipt. On March 5 the first planting of fry was made, these being placed in the current of Lester River, off its mouth, by which they were carried into

the lake, this being rendered necessary owing to the rough and hummocky condition of the ice, which made it impossible to get out to the usual planting-grounds with the cans of fry. Plantings were continued at intervals till the 30th of April, during which time 11,727,000 fry were placed off Lester River; 3,000,000 at the mouth of the ship canal, Duluth, and 2,000,000 in Lake St. Croix, St. Croix River, near Hudson, Wis. The loss in eggs and fry was 1,273,000.

Lake trout.—On September 23, 1891, one man was sent to the north shore of Lake Superior, in the vicinity of Isle Royale, to arrange for the taking of eggs of this species. Owing to the continued rough and stormy weather no eggs were secured by the force till the second week in October, the first consignment reaching the station October 13, and the last November 10, and at the end of the month there were in the hatchery about 700,000 good eggs. The eggs of the Lake Superior lake trout are larger and of deeper color than those from the Lake Erie fish, and the fry, when hatched, are much larger and more vigorous and grow more rapidly. The eggs commenced to hatch January 12, 1892, and on March 31 there were 504,500 strong fry from this collection. In addition to the eggs collected by this station there were received from the Northville Station, of eggs collected by the Alpena Station, three consignments, on December 29, January 7, and January 10, from which were obtained 920,300 good eggs. On January 10 these eggs began to hatch. The distribution of fry commenced June 6, during the month 480,000 being planted, all in Lake Superior. Of these, 130,000 were produced from eggs obtained at Isle Royale and 350,000 from those sent from the Northville Station. The number of fry retained at the station after the close of the year was 843,400.

Pike perch.—The eggs of this fish were obtained from Pike River, an affluent of Vermilion Lake, in the vicinity of Tower, Minn., and from the St. Louis River, near Fond du Lac, Minn. The fish in Pike River usually spawn a week to ten days earlier than those in the St. Louis River. On April 18 one of the men was sent to Pike River to make preparations for the gathering of eggs as soon as the fish began to run and indicated their readiness to spawn. A short distance up the river is a sloping barrier of rock, which stops the ascent of the fish, and here they congregate in countless numbers as the spawning season approaches. The fish of the first catches were hard and unripe and were held in crates till ready to spawn, a course that had proved successful in previous years. At Pike River this season it failed completely, the eggs from fish held for twenty-four hours proving worthless, the spots being so defined as to give a mottled appearance to the mass in the pans upon first extrusion and in an hour or two the entire egg becoming opaque and lifeless.

On April 25 a man was sent to the St. Louis River, the fish having there commenced to run, but no ripe ones were secured till May 7, and on May 12 the work was terminated, owing to the rising river and heavy current, which practically stopped the run of the fish. The eggs

taken were abnormal, but not to the same number or extent as those from Pike River, nor were those from fish held in cribs more badly affected than the ones taken from fish freshly caught. The total take of good eggs from both sources was 48,000,000. The foul condition of the hatchery's supply of water, owing to the continued succession of rain storms, injured about 18,000,000 of the eggs. The balance were developing normally, and to save them they were planted between May 20 and 26 in the clear water of Lake Superior, about 2 miles from the shore. Good fertilized ova were deposited between May 1 to 6, to the number of 15,000,000 in Pike River, and from May 1 to 12, 10,000,000 in the St. Louis River.

Von Behr trout.—The eggs of this species shipped from the Northville Station were received on January 1, 1892, in the best condition, the number of dead eggs on arrival being 374. On the basis of measurement by Dr. Sweeny there were 36,125 eggs, which began to hatch January 20. The loss during hatching on account of the condition of the water was very great. On June 3d 15,000 fry were planted near Amberg, Wis., and on June 22d 5,000 in Baptism River, Minnesota.

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

The work of this station was continued on the same lines as in previous years. The fish obtained were mostly large, of a breeding size. The number distributed for this season was less than in former years, but the area of distribution was greatly enlarged. The following table shows the distribution work of the season:

State.	Catfish.	Pike.	Pike perch.	Yellow perch.	Black bass.	Crappie.	Rock bass.	White bass.	Sunfish.	Total.
California	500	500	.....	6,980	2,610	285	500	.....	.....	11,375
Illinois	180	923	.....	2,980	655	1,580	1,764	200	2,639	10,921
Indiana	300	200	.....	.....	511	155	325	.....	600	2,091
Iowa	440	190	.....	.....	795	240	619	500	700	3,484
Kansas	300	70	.....	4,000	2,150	570	100	225	1,090	9,105
Kentucky	95	.....	100	4,500	1,715	902	395	.....	1,410	9,207
Michigan	.....	.....	.....	.....	85	.....	.....	.....	.....	85
Missouri	480	25	.....	425	455	925	150	450	1,060	3,970
New Mexico	80	.....	.....	350	77	.....	350	25	.....	882
Ohio	375	90	.....	5,088	1,540	300	550	.....	1,150	9,093
South Dakota	.....	.....	.....	3,300	1,175	390	1,270	.....	.....	6,135
Texas	140	.....	.....	.....	940	.....	.....	80	160	1,320
Washington	200	.....	.....	500	125	270	.....	600	500	2,195
Wisconsin	.....	.....	.....	233	233	408	233	.....	328	1,435
Central Station*	1,201	30	.....	3,692	726	332	246	33	247	6,567
Total	4,351	2,028	100	32,648	13,792	6,447	6,502	2,115	9,884	77,865

* For distribution.

The distribution of this collection necessitated the use of the three cars of the Commission, which performed a total mileage of 36,420 miles, of which 27,899 miles were given free by the railroads, and 8,521 miles paid for.

The main collecting-grounds were in the vicinity of Meredosia, Ill., among lakes and sloughs formed by the overflow of the Illinois River. Owing to the continued dry season these so rapidly dried up that their supplies of fish could not be cared for by the available facilities for

transportation, and many, which would otherwise have died, were gathered and placed in the Illinois River.

The plantings thus made consisted of:

Catfish, yearlings	250,000
Carp, different varieties and sizes	5,000
Buffalo, different varieties and sizes	20,000
Yellow perch, yearlings	25,000
Crappie, yearlings	5,000
White bass, yearlings	10,000
White bass, matured	5,000
Total	320,000

There were also deposited in the river at Meredosia the following fish that had become fungussed during their retention in the live-boxes while awaiting distribution:

Spotted catfish	1,000
Pike	500
Black bass	2,000
Crappie	3,000
Rock bass	1,500
White bass	5,000
Sunfish	10,000
Total	23,500

During the season there were taken by the fishermen of the vicinity quantities of carp of varying sizes. A ready sale of these was had in the markets, Chicago paying 8 cents per pound, double the price of other varieties of fish indigenous to the locality.

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

Rainbow trout.—The fish retained from the product of the spring of 1890 for brood stock began to spawn in December, 1891, though but 20 months old. The first eggs were taken December 15, and the last February 23. During this period 112,185 eggs were obtained from 207 fish, an average of 542 eggs to each. The number of males used was 288. Great difficulty was experienced in securing proper impregnation of the eggs, and not more than 35 per cent of the eggs taken were fertilized. The trouble was the same as is described by Mr. Frank N. Clark in his report of the operations at the Northville Station during 1882. (Report U. S. F. C., 1882, p. 819.)

On January 16, 1892, Prof. Charles E. Riley, of Drury College, Springfield, Mo., arrived at the station, and made a microscopic examination of the eggs and milt, in various stages, to discover, if possible, the cause of the hard, glassy eggs so frequently occurring in this trout, and a cure for the disease. His stay at the station was limited, but at his request a series of eggs were prepared in a hardening mixture, and sent him for further examination. In eggs which had had no contact with milt, as also in the fluid which so frequently accompanies the extrusion of these hard, plump eggs, he discovered a tapeworm-like parasite. It is hoped that from the results of Prof. Riley's investiga-

tion means may be discovered to overcome this difficulty in the propagation of this species.

On February 11 a package of rainbow trout eggs, consigned as 20,000, were received from the Wytheville Station. These eggs, Mr. Page reports, were the largest ever seen by him and in fine condition. When counted, however, there were found to be but 14,538, the discrepancy being probably due to the consignor's using a measure established for eggs of normal size. On June 30, 1892, the number of fry on hand that were produced from these eggs was 12,000; from those taken at the station, estimated, between 25,000 and 28,000.

During the breeding season a continual warfare was waged among the breeding males. Every effort was made to stop the fighting, but it was ineffectual, and the loss among them averaged about 10 a week.

The season of distribution was from January 14 to March 2, 1892, during which there were sent out 11,110 yearlings (product of season of 1890–91) and 14 fish two years old.

Brook trout.—On March 27, 1892, there was received from Mr. James Annin, jr., of Caledonia, N. Y., a consignment of 8,000 eggs of the brook trout. These were in good condition on arrival, the loss en route being 218. The eggs hatched with reasonable loss, but the fry produced were weak and puny, and the death rate among them very high. At the end of the year there were but 1,500 alive and in very poor condition.

From the fry brought over from the previous year there were available for distribution 6,327 yearlings, which were shipped from the station between January 28 and March 12.

Von Behr trout.—From the 25,900 eggs of this species received from the Northville Station in the spring of 1891, there were produced by November 1, 1891, actual count, 15,200 fish, and 10,222 were distributed between December 17 and March 17, 1892.

Black bass.—Of the stock of breeding fish, 175 three-year olds were sent to Washington in December, 1891, leaving but 33 at the station. Owing to the continued cold rains and cloudy weather the bass were somewhat late in spawning. Immediately after hatching and before the schools had dispersed, the fry were netted and transferred to another pond. It is estimated that the number available for distribution in the fall of 1892 will be about 2,000. The distribution of yearlings was commenced November 27 and ended February 8; 7,384 fish were shipped.

Rock bass.—The number of yearlings distributed was 9,374; of 3-year olds, 2.

Crappie.—Of this species 95 yearlings and 14 breeding fish were distributed.

Tench.—The gratifying results attained the previous season in the propagation of the tench made it desirable to increase the work during the present year, and 40 of the largest fish were reserved and added to the brood stock, and an additional pond, two in all, assigned to them. The number of yearling fish available for distribution was 26,432, which were shipped between November 9 and February 8.

Carp.—The work with the carp was restricted to two ponds. The brood stock continue in good condition. The number of yearlings distributed was 7,184, all to private ponds with the exception of 1,000 placed in Shoal Creek near Neosho.

Golden ides.—The parent fish are in good condition, and occupy one of the best ponds. No young were obtained from these fish last year, and success with them at this station is doubtful.

Goldfish.—The goldfish spawned (in pond No. 5, February 24, 1892) freely and frequently, only to have their eggs and fry killed by the cold rains. The number for distribution in the fall will be small. The number of yearlings distributed during the year was 3,576.

Spotted or channel catfish (Ictalurus punctatus).—The want of success with this fish during the previous year being thought to be due to overstocking, but one-third, or twenty of the breeders, were retained at the station. In May, 1892, they were quite active, and it is believed have prepared several nests. Of the breeders, 30 were transferred to the fish ponds at Washington, and 27 to the Missouri Fish Commission.

Shad.—On June 3, 1892, 700,000 shad fry were received from the Gloucester Station, N. J. Their growth during June was satisfactory, and the very large schools of them seen throughout the entire pond excited the interest and admiration of the numerous visitors to the station. These were for rearing and final liberation in Gulf tributaries.

In January, 1892, a severe cold spell prevailed from the 17th to the 22d, the temperature falling to 22° F. On the 19th, pond No. 1, in which is kept the brood stock of rainbow trout, froze over for the first time. Unusually heavy rainfalls prevailed during April and May, the total precipitation from May 3 to 30 being 11.12 inches. The disastrous effect of these rains, coming at the spawning time of most of the pond fishes, is made apparent by the limited number of fish hatched during this season. The following table exhibits the midsummer and midwinter temperatures of the water in the pond:

Water.	Summer, August 6, 1891.*				Winter, December 23, 1891.†			
	Inlet.	Outlet.		Fish in pond.	Inlet.	Outlet.		Kind of fish.
		Surface.	Bottom.			Surface.	Bottom.	
Spring	58	58	58		57	57	57	
Hatchery	58	58	58		57	57	57	
Trout pools	58	59	59	Rainbow, brook, Von Behr trout.	57	57	57	Rainbow, brook, and Von Behr trout.
Pond No. 1	58	64	63	Rainbow, 17 months	56	54	52	Rainbow, brood stock.
2	63	73	72	Golden ides	56	48	49	Golden ides.
3	72	74	74	Carp, breeders	49	47	47	Carp.
4	74	76	76	Carp, fry	47	46	46	
5	58	70	70	Goldfish	57	46	46	Goldfish.
6	75	78	78	Crappie	48	46	46	
7	60	74	72	Catfish	49	48	48	Catfish, largo.
8	62	74	72	Rock bass	55	48	49	Rock bass.
9	74	77	77	Tench	48	44	45	Tench.
10	60	76	74	Black bass	57	49	49	Black bass.
11	76	78	76	....do	48	46	46	
12	64	69	68	Carp fry	54	51	51	
13					57	55	55	

*Air, 73° in shade; cloudy and showery. †Air, 43°; clear.

The residence and annex to hatchery which were under construction at the close of the last report were finished by October 1. In the ice room of the annex 50 tons of ice, which was cut from the large pond, were stored in January, 1892. Two footbridges, leading, respectively, to the residence and annex buildings, were built across Hearrell Branch. An additional pond, No. 13, was built during the year. It affords a water surface of 1,200 square feet, and its greatest depth is 18 inches. In December, 1891, 30 American arbor-vitæ and 30 Norway pines were planted about the grounds.

Food.—The base of the food used at this station is a mush made of "shorts" or mill-middlings, to which beef liver is added in varying proportions, according to the season and the kinds of fish to be fed. The best quality of shorts is used, as the mush made from the inferior qualities is too readily soluble in water and divides into particles finer than the fish will eat. To obviate this it is arranged that when the shorts runs poor 5 to 10 per cent of common flour is mixed by the miller. A 25-gallon farm boiler is nearly filled with clean water, which is brought to the boiling point; shorts is then added, about half a peck at a time, and thoroughly stirred in, so as to cook in an even pasty mass without lumps; 3 to 4 pints of salt is added during boiling, and the whole mass is kept constantly and vigorously stirred. When a thick mush is attained, it is poured into pails, in which it is allowed to become well set and cool before using, as thereby it is not so liable to too freely dissolve in the pond. With each 25 gallons of water about 30 pounds of shorts is used, which produces 166 pounds of mush. Forty-five minutes is usually sufficient time to prepare this quantity.

For preparing the liver a No. 22 meat cutter, made by the Enterprise Manufacturing Company, of Third and Dauphin streets, Philadelphia, is used. The size of the "cut" of the liver is regulated by a plate, which has perforations varying from one-sixteenth to three-eighths of an inch, providing food of a size suitable for all sizes of fish, except very young trout. The machines cost $4 each, and will prepare 10 pounds of liver in four to five minutes.

Mr. Page summarizes in regard to the methods of feeding as follows:

Our present (April 12, 1892) stock of brood rainbow trout number 1,000. They are 2 years old. Their aggregate weight is about 1,500 pounds. They are fed morning and evening. Their daily ration consists of 30 pounds of mush and 3 pounds of liver well mixed. Such has been their diet for twelve months. They are and have been in perfect health, many of them weighing 2 pounds. We have never lost a fish from this stock by reason of choking, "pop-eye," or inflamed intestines, fatal diseases usually resulting from improper feeding.

Of young trout we have at present (April 12, 1892) 40,000 rainbow trout, averaging 6 weeks old. To these we are feeding daily from 6 to 7 pounds of liver, without any mush. When the trout are from 2 to 3 months old we commence to mix a little mush with their food, gradually increasing the proportion of mush (and quantity of food) until, by the time they are 6 months old, the proportion would be one part mush to one part liver. After that time the addition of mush is made freely, so that, by the time the fish become "yearlings," the proportion of liver may be reduced to a minimum. They can then easily be made to eat mush without any liver for several days in succession. They do not allow this "unnatural" food to

sink to the bottom and eat it lazily, but rise to the surface, lashing the water into foam, and exhibit every appearance of enjoyment.

The black bass (*Micropterus salmoides*) in our ponds decline mush in any form, and can not be made to eat it. When sometimes mixed with considerable liver they will take it in the mouth, but quickly spit it out. The same results have attended frequent trials with crackers, bakers' bread, and dog biscuit. They seem averse to vegetable diet. We have been able to induce them to eat nothing but liver—and it must be fresh and sweet. (Of course we have not tried minnows or other fish, our efforts being to overcome their natural instincts to eat fish.) When the liver, as it will occasionally in the summer, becomes the least tainted, the bass decline it. Occasionally they decline any and every thing to eat. This peculiarity of the bass is well known to anglers. (Book of the Black Bass, Henshall, p. 360.) In our ponds they never eat on "nasty," raw days; but on pretty days they follow one around the pond seeming to beg for food. They are very active after the flies here in summer (but less so than the rainbow trout), and have been seen to kill and partially eat a snake. Unquestionably they devour the largest part of their young after the school leaves the nests and disperses.

The channel catfish (the original stock from Grand River, Indian Territory) eat the mush greedily. During the late fall, winter, and early spring they are dormant and never come for their food. Such as may be offered to them at this time sinks to the bottom and remains unnoticed. At other times of the year they rise to the surface and eat the mush ravenously, reminding one of pigs. They are, as is generally known among anglers, very fond of liver, it, in fact, being a favorite bait for them. Very rarely we mix a small amount of liver with their mush. (*See* U. S. Fish Commission Bulletins, 1883, p. 419; 1884, p. 321; 1886, p. 137.)

To our rock bass we occasionally give a small quantity of liver, but it is very doubtful if they ever eat any of it. They will at times pugnaciously dart out and take a small piece in their mouth, to immediately spit it out, It is thought that the presence of small quantities of liver in their pond assists in breeding the insects which seem to furnish the bulk of their food.

To the golden ides, goldfish, tench, and carp we feed mush unmixed with liver. They are fond of liver, but it does not seem necessary to their keeping.

The quantity of food given to the pond fish is varied according to the number of fish, size of pond, season of year, and condition of weather. No definite rule seems possible. Not only does the appetite of the fish vary, but scarcely any two ponds have the same capacity for producing natural food to supply the lacking necessary ingredients of the artificial food. Again, the artificial food which might be economically used in one locality would be beyond profitable employment in another. It may be found that cotton seed can be profitably employed in feeding certain warm-pond fish in some southern localities. It would scarcely be economical in Pennsylvania or Ohio. At the Cold Spring Harbor hatchery on Long Island, New York, they have been using horse meat for the past six months. At the Forest Hill hatchery, St. Louis, Mo., the refuse of the cracker factories of St. Louis is used for feeding carp.

The trout mentioned in the letter following was 28 months old at the time of capture:

ROGERS, ARK., *June 3, 1892.*

DEAR SIR: Your kind favor of April 21 was received. To-day I received a rainbow trout from Silver Springs race and spring, where we deposited 500 trout received from you December, 1890, or January, 1891. It weighs, dressed, 3 pounds, measures 22 inches from tip to tip, and was full of spawn. Am sorry it was caught. We do not allow fishing, but this one jumped the bars. Have taken a cast of it in plaster. Two or three smaller fish have been taken out, but this seems to show what they can do in our water. No food has been furnished them. * * *

Respectfully, yours,

J. G. BAILEY,
President Silver Springs Milling Company.

MR. PAGE, *Neosho, Mo.*

LEADVILLE STATION, COLORADO (H. D. DEAN, SUPERINTENDENT).

The operations of this station were confined to the propagation of the trouts, the varieties handled being the black-spotted, yellow-finned, brook, rainbow, Loch Leven and Von Behr. On July 1, 1891, fish and eggs as follows were on hand:

Species.	Breeders.	Yearlings and fingerlings.	Fry.	Eggs.
Black-spotted trout (*Salmo mykiss*)	1,025	1,631	.....	37,244
Yellow-finned trout (*Salmo mykiss macdonaldi*)	.....	.....	.....	5,379
Brook trout (*Salvelinus fontinalis*)	149	18,773	49,604	.....
Rainbow (*Salmo irideus*)	5	.....	.....	.....
Loch Leven (*Salmo levenensis*)	.....	552	.....	.....
Von Behr (*Salmo fario*)	.....	.....	65,493	.....
Total	1,179	20,956	115,097	42,623

Black-spotted trout.—On August 11, 1891, a trap was placed in Lake Creek, about 1 mile from the hatchery, and kept there until the last of September. During this time 543 fish, of an average length of 6 to 8 inches, were caught and transferred to the station. The collection of eggs was commenced in May. From May 10 to June 6, 120,300 eggs were secured from 218 stock fish, an average of 550 eggs to each fish. The greatest take of eggs on one day was 36,500 on May 24. In May 5,100 eggs were secured from Twin Lakes; of these, about 40 per cent hatched. From the same waters, through the courtesy of the Colorado Fish Commission, 96,000 eggs were taken between June 24 and 29, 75 per cent of which were good. Through the kindness of Gen. A. H. Jones, of Denver, 121,000 eggs were obtained at Black Lake in the early part of June. Of these about 50 per cent were good. The time of incubation of the eggs of this trout is from twenty to thirty days.

Brook trout.—As in previous years, an agreement was made with Dr. John Law, by which the Commission was to spawn his stock of fish, and after furnishing him with 350,000 eggs, receive the balance secured for the Leadville Station. The spawning season of these fish was from November 2 to January 29, during which 2,283 fish were stripped, producing 672,400 eggs, the station's share being 322,400. The largest number of eggs, 29,900, was taken November 29. The stock fish of the station spawned from November 9 to December 5, 21,000 eggs being taken from 25 fish. Hatching commenced in the middle of February, 1892. During the last of the egg-taking season difficulty was experienced in finding enough ripe males. Accordingly 21,500 eggs were fertilized with the milt of the Von Behr trout. Of this lot but 2,000 were alive by the end of April.

During the last week of March, when the sac was about half absorbed, the fry commenced dying rapidly. They were liberally treated with salt and earth, and for a short time given salt every day. In three or four days the disease was checked and the mortality was then not greater than usual. The younger fry were given occasional doses of

salt and escaped the disease entirely. Salt and earth were thereafter put in all the nursery tanks two or three times a week till the fry were transferred to the ponds.

Loch Leven trout.—On January 2, 1892, the 25,000 eggs of this trout shipped from the Northville Station December 29, 1891, were received, in good condition, and hatched during the month, producing 24,746 fry. The white spot in the sac soon appeared, and a heavy mortality occurred during February and March.

Von Behr trout.—Eggs of the Von Behr trout were secured from the stock fish of Dr. John Law. The spawning season commenced in December, and was over by February 3. There were taken 21,400 eggs, which were very poor, only 20 per cent being good. From the Northville Station there were received on January 9, 1892, 50,000 eggs, shipped January 5, and on February 16th 30,000 eggs, shipped February 13. Both lots were in good condition on arrival at the station. At the end of February about 70 per cent of the good eggs had hatched, and the remainder were all hatched before the close of May. The number of fry on hand May 31 was 72,986, nearly the whole of which were from the eggs sent from the Northville Station. In June 10,000 were placed in waters of Lake County, as follows: Arkansas River, 5,000; Rock Creek, both above and below the falls, 3,000, and in Lower Evergreen Lake, 2,000.

At the close of the year the stock of fish, fry, and eggs at the station was as follows:

Species.	Breeders.	2-year olds.	Yearlings.	Fry.	Eggs.
Black-spotted trout	938	733	321	91,168	144,983
Yellow-finned trout	.....	.....	1,314	1,755	.....
Brook trout	93	1,480	1,907	169,492	.....
Rainbow trout	3	30	.....	1,900	3,145
Loch Leven trout	.....	105	.....	12,013	.....
Von Behr trout	.....	.....	.....	56,190	.....
Total	1,034	2,348	2,542	332,518	148,128

The distribution from the station commenced October 16, 1891, and was completed by November 18, with the exception of one shipment of 1,000 black-spotted trout, which were taken by the superintendent on February 3, 1892, to the Northville Station. There were distributed 19,000 black-spotted trout, 54,200 Von Behr trout, and 38,550 brook trout.

Before the introduction of water from the lower Evergreen Lake, November, 1891, the temperature of the water was 43° F., and the growth of the fish was slow. Prior to May 1, 1892, the lake water lowered the temperature to 39° F., but after that date there was a rapid rise, ranging from 52° to 60°, the average daily change being about 6°. In May and June, 1892, the fish grew rapidly, owing to the higher temperature of the water and the increase therein of vegetable and animal food. On account of the uneven growth of the fish the product of the station will undoubtedly be reduced by increased cannibalism among the fish.

During the summer and fall of 1891 the dwelling-house and stable were completed, as also 32 rearing and 5 other ponds.

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

The work at this station is confined to the quinnat salmon. Fishing was commenced on August 31, 164,500 eggs being obtained, and continued to September 19. The total of eggs secured was 3,026,000. The fish were unusually large and productive and the eggs healthy. Some difficulty, however, was experienced with a few of the females first taken, on account of the fluid ejected when being stripped, preventing full impregnation. The eggs in the hatchery matured rapidly, and on September 29 shipments to the State hatchery at Sisson were commenced. For shipping, preference was given to the packing-chests with canton-flannel trays, over the method of crates and moss. The superintendent of the hatchery reported that each of the seven shipments arrived in good condition, and favorable reports were also received in regard to the 50,000 eggs sent to the Mexican Government at the City of Mexico. This latter shipment was made in December and from eggs taken from fish of the late run.

The second run of fish commenced October 24, on which date about 100 fish were caught in the traps, but they were mostly unripe ones. Hauling of the seine was begun on October 27, but few ripe fish were secured. On October 30 the fish on hand were spawned, and the fishing was continued till November 10. The total of eggs secured from this run was 350,000. Of these, 25,500 were hatched at the station, and when sufficiently matured the fry were placed in the McCloud River.

In the latter part of September, after the close of the first run of the quinnat salmon, there were caught in one of the traps two females and one male of the humpback salmon (*Oncorhynchus gorbuscha*), which were spawned, the eggs hatched at the station, and in February the fry planted in the McCloud River.

During the summer run of the salmon, there were taken 1,117 males and 1,345 females, of which latter 651 were ripe; in the fall run, 435 males and 286 females, of which latter 62 were ripe.

The following table presents the spawning operations:

Date.	Females spawned.	Number of eggs.	Date.	Females spawned.	Number of eggs.
Aug. 31	33	164,500	Sept. 12	31	144,000
Sept. 1	17	69,500	Sept. 14	62	271,000
Sept. 2	18	74,000	Sept. 15	24	114,000
Sept. 3	24	97,000	Sept. 16	31	140,000
Sept. 4	38	147,250	Sept. 17	31	145,000
Sept. 5	31	142,750	Sept. 18	36	179,000
Sept. 6	38	165,000	Sept. 19	22	105,000
Sept. 7	44	204,000	Oct. 30	16	84,000
Sept. 8	50	222,000	Nov. 4	26	140,000
Sept. 9	49	190,000	Nov. 10	29	126,000
Sept. 10	58	268,000			
Sept. 11	41	184,000		749	3,370,000

Of the take of eggs, 2,852,250 were sent to the Sisson hatchery of the California Fish Commission; 50,000 to the Mexican Government at the City of Mexico; 25,500 were hatched and the fry liberated at the station; and 448,250, or about 13.25 per cent, were lost in developing.

FORT GASTON STATION, CALIFORNIA (CAPT. F. H. EDMUNDS, U. S. A., IN CHARGE).

The conduct of this station and its auxiliary at Redwood has continued under the direction of Capt. Frank H. Edmunds, U. S. Army.

In July the ponds for young salmon and breeding trout were completed and the extension of the hatchery building so as to contain 40 troughs was begun, being completed by October. Arrangements were made in August for the construction of a small hatchery, 14 feet square, with a capacity of 8 troughs, at Redwood, which was completed in October. In November a water-supply tank was built for the Redwood hatchery.

The first salmon eggs collected at the Redwood hatchery were taken December 3, and their gathering was continued to March 10, the total yield being 300,000, of which 150,000 were transferred to the Fort Gaston Station and 150,000 retained for hatching at Redwood. Of those taken to Fort Gaston 2,000 died during transfer. The remainder began to hatch February 9, and were all hatched by March 10. The loss in fry was about 400. On May 30 and 31, 147,600 young salmon were turned into Supply Creek, a branch of the Trinity River, and distant from the station about a quarter of a mile. The eggs retained at the Redwood hatchery commenced hatching March 12. These eggs were taken February 2, and the period of their incubation was much shorter than heretofore, the usual time being sixty to ninety days. The unusually mild weather prevailing during the winter was undoubtedly the cause. The hatching was completed by April 30, producing 142,500 fry, which were released through a sluice, on May 1, into Minor Creek, a tributary of Redwood Creek. During August 25,000 young salmon reared at the station were turned into Supply Creek.

The rainbow trout taken during the previous season, and held in the station ponds for breeders, were spawned February 24 to 27, yielding about 9,000 eggs, and a further gathering of 12,000 eggs was made between March 1 and 19, making a total collection of 21,000. Hatching commenced April 10, and was completed May 29, producing 18,450 fry.

On January 30, 1892, 20,000 eggs of the eastern brook trout purchased of Mr. J. Annin, jr., of Caledonia, N. Y., were received at the station. On unpacking, the number of dead eggs was 225, and the subsequent loss was 9,393. The remainder began hatching February 5, and nearly 80 per cent were hatched by the close of the month. The loss in fry was a little over 500, mainly occurring during April.

The 25,000 eggs of the Von Behr trout shipped from the Northville Station January 22 were received February 2 in excellent condition, on unpacking but 10 eggs being found dead. The subsequent loss in eggs was 113. Hatching commenced February 18 and was finished Febru-

ary 26, the number of fry produced being 24,877. At the close of the year there were at the station—

Rainbow trout (breeders)	300
Rainbow trout (fry)	18,450
Von Behr trout (fry)	24,856
Brook trout (fry)	9,854

On July 1 the reservation was turned over to the Interior Department for Indian school purposes, in accordance with the act of July 31, 1892, and Capt. Edmunds and his command transferred to Benicia Barracks, Cal. In this connection the Commissioner takes pleasure in acknowledging the hearty and efficient aid extended by Capt. Edmunds in the conduct of the Commission's work at Fort Gaston and Redwood.

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

The work of this station consists in the propagation of the quinnat salmon. On August 25, 1891, the work of clearing the fishing-grounds and building the traps was begun. Some distance below the rack, which was built at the end of the previous year, were two channels, in each of which a trap was placed. Between the rack and the traps all the large rocks were removed from the river, which left a bed of fine gravel where the salmon came to spawn and thence were driven into the traps. A second fishing-place, further down the river, was made. Here the fish were caught by a net and put in pens, where they were kept till stripped of their spawn.

On September 8 the first eggs were taken from four salmon caught in one of the traps. It soon became evident, however, that but few fish could be caught at the station, owing to the existence, about five miles below, of a dam across the river which in low water prevented the ascent of the salmon. As a good many fish were seen below this dam a temporary collecting-station was there established September 21. A large tent, to serve as a hatchery, was placed on a small island below the dam, from which, by means of a flume, water was led into the hatching troughs. Two spawn-takers were left at this station, the parent fish being purchased from the fishermen in the vicinity.

Eggs were obtained daily during October, the total amount gathered being 1,185,000. The number of eggs taken at the regular station during the season, from September 8 to October 31, was 851,500. The total take of eggs was 2,036,500. The number of salmon spawned at the station was 198, and at the tent 247. The average number of eggs to the full-roed fish was about 5,000. Eye-spots began showing in the eggs taken at the temporary hatchery about October 24, when 90,000 eggs packed in boxes, on canton-flannel trays, were transferred to the station without loss.

Experiments were made in transferring eggs of different ages, but the loss among those not showing eye-spots was very great. The eggs at the temporary station were transferred in installment, up to November 3, when a heavy rise in the river, which washed away the flume and floated some of the troughs, necessitated the immediate removal of the remainder. It was found that eggs 16 to 18 days old could be transferred with but little loss; when younger than that the loss was very great, while those under 10 days were all killed. About 500,000 eggs were lost by transfer. The balance of the eggs hatched, with a loss of about 10 per cent. The loss among the fry during the time they were held in the hatching troughs was small, with the exception of about 50,000 which were diseased at the time of hatching, some living but a few days and others two or three weeks. The fry were all placed in the Clackamas River and Clear Creek, near the station, between December 1, 1891, and February 27, 1892.

On September 28, 25,000 eggs were placed on exhibition at the Portland Industrial Exposition. The water supply here was very poor, sometimes stopping altogether, and the majority of the eggs were killed. The few fry produced were afterwards brought back to the station.

On March 16, 1892, 20,000 eggs of the landlocked salmon were received from the Schoodic Station, but they were all dead.

In May, 1892, an attempt was made at the falls of the Willamette River, at Oregon City, to secure some eggs of the steelhead salmon, the effort being based upon statements of the local fishermen that a great many ripe-roed fish were caught there. On May 9 some hatching troughs were taken to Oregon City and placed near a steamboat basin, from which a supply of water was obtainable. Pens were built and placed in the river for holding such fish as might be secured through the fishermen. Just before preparations were completed the fishermen were catching a good many fish, but few, however, were ripe; after all arrangements were ready no more fish were caught. At this time occurred an unusual rise in the river, which permitted the fish to clear the fall and ascend the river. In ordinary seasons the river is low and the fish can not get above the falls, below which they remain till they spawn. A spawn-taker was kept at the place for twelve days in the hope that eggs could be obtained, but none being secured the attempt was given up and the equipment brought back to the station.

Towards the end of June preparations were commenced for the coming season's work.

AQUARIA AT CENTRAL STATION, WASHINGTON, D. C. (L. G. HARRON, IN CHARGE).

During this year the aquaria were under the charge of Mr. L. G. Harron, who assumed the duty in July, 1891. The aquaria and grotto were thoroughly repaired, and wire-screen covers were made for each aquarium to prevent the escape of specimens and the entrance of any natural enemies.

In the marine aquaria two-thirds of the water used was artificial, being prepared from Turks Island salt. The balance was natural sea water, the supply of which was obtained from Chesapeake Bay, in the vicinity of Old Point Comfort, Va., and brought to the aquaria with the collections secured at that place. The density of water maintained during the year was from 17 to 19, the aim being to keep it at 18, that of the previous year having been 20 to 22. This reduction resulted in greater success in the carrying of the more delicate specimens, both animal and vegetable. For the aëration of the water, dependence was had on the reduced glass jets. The greatest trouble in the management of the aquaria is the regulation of temperature. In the winter it was held between 50° and 60°, which was satisfactory, by attaching a steam drum to the supply pipe; in the summer, however, no economical method for keeping a suitable temperature was discovered, and as a consequence the maintenance of the aquaria during that season was practically abandoned.

The collections were obtained mainly at Old Point Comfort, Va. Instead of detailing our own launches to this work, as in former years, involving much time and expense, arrangements were made with a local agent, by whom specimens were gathered and placed in live cars. As soon as a sufficient quantity was secured advice was sent to Washington and a messenger was directed to proceed by the Norfolk and Washington steamers for them. By this way the collections were received at the aquaria in twelve to twenty-four hours after being taken from the live cars and at a very slight expense. Collections were also received from the Woods Holl Station.

About 250 young shad, the product of fry artificially hatched at Central Station and placed in fish ponds, Monument Lot, on the 26th of the preceding April, were received October 21, 1891. These fish were about five months old and 2 to 3 inches long. At first they were put in brackish water having a density of 1.005, which was increased from day to day for about six days, when it was brought up to 1.018, the general density of the water used in the marine aquaria. At the time these were placed in the brackish water others were placed in fresh water, but all of the latter died within three days. The former, however, began to take food, consisting of chopped oysters, clams, and beef—the preference being for the oysters—in from two to three days. At first they would not take the food from the bottom but would catch it while falling in the water. Later on, however, they began taking it off the plants where it had lodged, and finally from the bottom. Nearly

all these remained healthy, plump, and active for six months, some living beyond the end of the fiscal year.

In February, 1892, some of the flounders were found to be in spawning condition. Their eggs were stripped, but none seemed to be fertilized. They were heavy. Two of the blue crabs underwent their shedding in September, 1891. On first coming out they seemed to be healthy and strong, but they died in from three to five days; the cause, however, was not determined.

A number of young oysters obtained from a water tank of the steamer *Fish Hawk*, on which the spat was supposed to have been deposited in August, 1891, were placed in the aquaria in December. These, when received, were from 1 to 1½ inches in diameter. They lived about four months, during which time their growth had increased a half inch in diameter. Whelk eggs sent from Woods Holl hatched out in pod-like envelopes in about three months after their receipt. None of the young, however, lived longer than a few days.

Very successful results were had with the specimens kept in the fresh-water aquaria. But few specimens, however, spawned, probably due to the presence of alum in the water, resulting from the use of the Loomis filter. Owing to this it was found impracticable to place any dependence upon successful results in the growing of plants.

ADDITIONAL FISH-CULTURAL STATIONS.

Montana.—The appropriation providing $1,000 for investigation respecting the advisability of establishing a fish-hatching station in the Rocky Mountain region in the State of Montana or Wyoming being available July 1, 1891, Prof. B. W. Evermann, assistant in the division of inquiry respecting food-fishes, was placed in charge and began his investigations at Helena, Mont., on July 18, 1891, and prosecuted them continuously until August 27.

The establishment of a fish-cultural station in the Rocky Mountain region is advisable, without doubt, since the wide extent of country centering around the Yellowstone National Park has no fish-cultural establishment, and the waters of this region can be stocked only by costly transfers from remote stations, with a great loss of the fish in transit. The character of the fish-cultural operations which may be profitably undertaken in any region varies with climatic conditions, and with the physical, chemical, and biotic features of the water. These facts must be more or less accurately known in order to determine the extent and nature of the fish-cultural installation needed, and to direct advantageously the stocking of the waters, in the interest of which a station is sought to be established.

One of the principal objects of the investigation was for the purpose of determining the best location for fish-cultural operations, and as the station for this region would be largely devoted to the hatching and rearing of various species of trout and other salmonidæ, visits were

limited to such places as would furnish a constant supply of pure water of not less than 1,000 gallons per minute, the temperature of which should not exceed 55°, and which should be of sufficient height above the hatchery building to permit a gravity supply. The station should be centrally located with reference to the region to be stocked, and should afford good railroad facilities.

Of the localities examined, Davies Spring, near Bozeman, Mont., seems to be the one most available for the purpose named. A detailed account of the investigation will be found in the Bulletin of the Commission for 1891, pages 1–60.

Gulf States.—On the completion of his investigations in Montana and Wyoming, Prof. Evermann proceeded to Texas, reaching Galveston November 4. In establishing a fish-cultural station for the Gulf States it was desired, if practicable, to secure a site where there existed facilities for work with the salt-water as well as fresh-water species, as also for the investigation and development of the methods of propagation and rearing of the oyster and for the investigation of marine life of the Gulf coast. In carrying out his instructions Prof. Evermann visited Galveston and Corpus Christi on the coast, and Houston, Palestine, San Antonio, New Braunfels, San Marcos, Austin, and Fort Worth in the interior. It was found, however, that the coast afforded no satisfactory conditions for the establishment of the station desired. Of the sites examined for the propagation of the fresh-water species of fishes the most desirable was found to be that at San Marcos, situated at the head of the San Marcos River, a tributary of the Guadalupe. The river has its rise in a number of springs at the foot of a limestone ledge or hill just above the town. All these springs together form a large, deep stream, from the bottom of which, near the upper end, wells up the principal spring. The temperature of the water was found to be about 75°. Many water-plants were found in the river and such species of fish as large-mouth black bass, sunfish, and various species of cyprinoids are abundant. A short way below the spring is a tract of land of some 25 acres, which lies exceedingly well for the establishment of a station. Water can be carried in pipes from the dam, which is some distance below the springs, and which furnishes power for a large mill and for the electric light of the town, to any part of the tract. The slope is sufficient for the easy construction of ponds. San Marcos is also centrally located and has satisfactory railroad facilities. No definite selection, however, was made during the fiscal year. A full report of the investigations can be seen in the Bulletin of the Commission for 1891, pages 61–90.

Vermont.—In the early part of August, 1891, a tour of inspection was made by the Commissioner, accompanied by the engineer of the Commission, Mr. C. E. Gorham, looking to the selection of a suitable site for the establishment of a fish-cultural station in the State of Vermont. Toward the end of the following October the engineer was directed to

proceed to Vermont and prepare a report upon such places as from a general examination presented suitable possibilities. Among the places visited were Roxbury, Washington County; Healdville, Forge Flat, Pittsford, and Mendon, Rutland County; Manchester, Bennington County; Williamstown, Orange County; Vergennes, Addison County; and St. Johnsbury, Caledonia County. After a due consideration of the relative merits of these places a site in the vicinity of St. Johnsbury, Vt., and in close proximity to Sleepers River, was fixed upon as more nearly meeting the requirements. It having been learned that the owners of the different pieces of property involved in this site were willing to dispose of them at reasonable prices to the United States, in June, 1892, the engineer of the Commission was directed to proceed to St. Johnsbury and survey the plat of ground which was necessary to be obtained.

The property which it was decided to secure is embraced in four lots—the first two containing 21.31 acres, owned by E. & T. Fairbanks Company; the third, containing 3 acres, immediately south of the Fairbanks property and fronting on Sleepers River for 630 feet. The fourth place belongs to Mr. Asa S. Livingston and includes water rights to the Emerson Falls, on Sleepers River. The land selected is about 2½ miles from the railroad station at St. Johnsbury and about 1½ miles from that at Fairbanks village. It was also deemed desirable to secure rights to the Chickering mill property situated about a mile above the site selected, in order to have full control of the river in the vicinity and for the purpose of erecting a dam for the introduction of a suitable water supply additional to that furnished by the springs. Arrangements were made with the owners of the property by which the site in its entirety was obtained for $2,470. As soon as the proper plat is made, the question of examination of title and preparation of deeds will be referred to the Attorney-General, as required by law.

RAILROAD SERVICE.

The following shows the mileage of cars and detached messengers in the distribution of food-fishes:

Service.	Indigenous fish.	Trout.	Carp.	Whitefish.	Pike perch.	Shad.	Miscellaneous.	Miles paid.	Miles free.	Total miles.
Car No. 1	11,271	15,108	2,408	2,193	1,363	1,976	111	9,607	24,823	34,430
Car No. 2	7,215	10,515	3,719	.....	.....	11,996	111	19,252	14,214	33,466
Car No. 3	17,769	13,040	2,524	1,020	2,075	9,459	1,911	24,074	23,724	47,798
Detached messengers.	5,622	25,131	1,676	3,268	2,623	19,166	11,552	62,371	6,665	69,036
Total	41,877	63,794	10,327	6,481	6,059	42,507	13,685	115,304	69,426	184,730

The following table shows the name of railroads and total number of miles of free transportation furnished by the railroad companies, to which the thanks of the Commission are hereby tendered for the aid given:

Name of railroad.	Car No. 1.	Car No. 2.	Car No. 3.	Total.
Atchison, Topeka and Santa Fe	.....	1,657	4,738	6,395
Atlantic and Pacific	.....	712	1,494	2,206
Bennington and Rutland	.....	.....	36	36
Burlington, Cedar Rapids and Northern	684	.....	994	1,678
Chesapeake and Ohio	.....	.....	577	577
Chicago and Northwestern	23	.....	1,707	1,730
Chicago, Burlington and Quincy	2,028	264	1,614	3,906
Chicago, St. Paul, Minn., and Omaha	260	.....	.....	260
Cleveland, Cincinnati, Chicago and St. Louis	1,612	220	2,327	4,159
Colorado Midland	.....	836	.....	836
Cooperstown and Charlotte Valley	32	.....	.....	32
Delaware and Hudson	408	.....	101	509
Detroit, Bay City and Alpena	1,400	.....	.....	1,400
Detroit, Lansing and Northern	300	.....	.....	300
Duluth, South Shore and Atlantic	620	.....	.....	620
Flint and Pere Marquette	2,752	.....	.....	2,752
Grand Rapids and Indiana	438	.....	.....	438
Illinois Central	304	.....	112	416
International and Great Northern	.....	766	.....	766
Iowa Central	.....	.....	332	332
Jacksonville Southeastern	206	.....	220	426
Kansas City, Fort Scott and Memphis	.....	.....	1,182	1,182
Kansas City, Fort Smith and Southern	.....	.....	192	192
Kentucky Central	99	.....	.....	99
Kentucky Midland	16	.....	.....	16
Louisville and Nashville	94	.....	316	410
Michigan Central	6,553	.....	.....	6,553
Milwaukee, Lake Shore and Western	254	.....	.....	254
Minneapolis and St. Louis	120	.....	.....	120
Minn., St. Paul and Sault Ste. Marie	405	.....	.....	405
Missouri, Kansas and Texas	.....	162	2,314	2,476
Missouri Pacific	.....	.....	1,711	1,711
Mobile and Ohio	46	.....	.....	46
New York, Ontario and Western	102	.....	.....	102
Northern Pacific	71	982	.....	1,053
Pecos Valley	.....	.....	178	178
Pittsburg and Western	22	.....	.....	22
Sioux City and Pacific	76	.....	.....	76
Spokane Falls and Northern	.....	80	.....	80
St. Louis and San Francisco	.....	.....	2,210	2,210
Texas and Pacific	.....	954	802	1,756
Union Pacific	1,379	7,016	34	8,429
Wabash	3,284	565	533	4,382
Wisconsin Central	1,235	.....	.....	1,235
Total	24,822	14,214	23,724	62,761

The following table presents the numbers and sizes of each species of fish distributed, and their assignment to the States and Territories:

Distribution and assignment of fish.

States and Territories.	Catfish.	Carp.	Tench.	Golden ide.	Gold-fish.	Shad.		
	Adults and year-lings.	Year-lings.	Year-lings.	Year-lings.	Year-lings.	Eggs.	Fry.	Year-lings.
Alabama		8,350		50	250		3,899,000	
Arkansas		5,860			277			
California	500	60			25			
Colorado		1,485		70	129			
Connecticut		280			60		1,939,000	
Delaware		4,253			152		5,848,000	
District of Columbia		200			6,314			1,000,000
Florida		710		100	277		2,300,000	
Georgia		4,220			321		3,045,000	
Idaho		2,970			12			
Illinois	180	6,900	1,000		832			
Indiana	295	1,460	500	500	735			
Indian Territory		40			36		900,000	
Iowa	440	1,015	3,700		68			
Kansas	300	3,310		69	640			
Kentucky	95	280			180			
Louisiana		7,700		100	388		2,016,000	
Maine		30			6			
Maryland	509	5,640	2,000		1,040		15,223,000	
Massachusetts		800		25	151		1,500,000	
Michigan		1,200			133			
Minnesota		1,830			64			
Mississippi		5,190			54		2,002,000	
Missouri	434	2,100	14,300	25	1,692		930,000	
Montana		1,580			24			
Nebraska		2,720			60			
New Hampshire		130			6			
New Jersey		1,680			552	2,497,000	735,000	
New Mexico	80	280						
New York	100	5,790	2,100	975	736		8,164,000	
North Carolina		5,110	3,000	6	284		785,000	
North Dakota		1,530						
Ohio	375	2,450	1,000	200	466			
Oklahoma		800						
Oregon		120						
Pennsylvania	100	11,230	3,992	51	1,402		9,469,000	
Rhode Island					12			
South Carolina		120			108		1,200,000	
South Dakota		5,640			6			
Tennessee		1,000			432			
Texas	140	17,620	2,000		467			
Utah		6,525			66		1,998,000	
Vermont		200			37			
Virginia		4,385	2,000	15	1,818		4,974,000	
Washington	200	2,060			12			
West Virginia		5,210			221			
Wisconsin		15,030			100			
Wyoming					6			
Foreign countries	578							
Total	4,326	157,093	35,592	2,186	20,651	2,497,000	66,927,000	1,000,000

States and Territories.	Quinnat salmon.			Atlantic salmon.		Landlocked salmon.		
	Eggs.	Fry.	Year-lings.	Eggs.	Year-lings.	Eggs.	Fry.	Year-lings.
California	2,852,000	315,500	25,000			30,000		
Maine					254,232		68,692	148,163
Minnesota						15,000		
Nevada						25,000		
New Hampshire						17,000		
New York			2,400	150,000		65,000		
Oregon		1,332,400						
Pennsylvania				300,000		10,000		
Vermont			3,470			20,000		15,000
Foreign countries	50,000					50,000		
Total	2,902,000	1,647,900	30,870	450,000	254,232	232,000	68,692	163,163

Distribution and assignment of fish—Continued.

States and Territories.	Loch Leven trout.		Rainbow trout.		Von Behr trout.			Black-spotted trout.	Brook trout.	
	Eggs.	Yearlings.	Eggs.	Yearlings.	Eggs.	Fry.	Yearlings.	Yearlings.	Eggs.	Yearlings.
Alabama				1,739						
Arizona							1,200			500
Arkansas			20,000	1,100			700			
California						14,478				
Colorado							38,743	13,000		22,750
Connecticut				1,500			200			
Delaware						2,500				300
Georgia				4,694						
Illinois							50			
Indiana							1,400			
Iowa				5,000			1,980			3,700
Kansas				50			350			
Kentucky		475					1,400			
Maine		10,935		605			743			1,677
Maryland				2,835			623			
Massachusetts				3,100			200			
Michigan	500	1,209			500		3,300		500	10,034
Minnesota						5,000				
Missouri				3,208			970			245
Montana							1,500			
Nebraska	15,000				20,000		1,300			1,000
New Hampshire	25,000									
New Jersey				2,000						
New Mexico							2,350			4,000
New York	20,000			3,252						250
North Carolina				1,000						
Ohio							400			1,890
Pennsylvania		475		4,934			600			1,623
South Dakota							8,050	5,000		10,000
Tennessee				2,900						
Texas				700						
Vermont	30,000		20,000	3,556			476			
Virginia				10,223		5,000	419			
West Virginia	10,000			1,384						
Wisconsin		1,485		900		15,000	2,225			1,000
Wyoming			50,000		30,000					
Foreign countries	10,000		50,000		30,000				10,000	
Total	110,500	14,579	140,000	54,734	80,500	41,978	69,179	18,000	10,500	58,969

States and Territories.	Lake trout.			Lake herring.	Whitefish.		Yellow perch.	Pike perch.		
	Eggs.	Fry.	Yearlings.	Fry.	Eggs.	Fry.	Yearlings.	Eggs.	Fry.	Yearlings.
California	*						6,980			
Connecticut									1,000,000	
Illinois							2,930			
Indiana			11,962		100,000				16,000,000	
Iowa			1,927							
Kansas							4,600			
Kentucky			500				4,500		10,600,000	100
Maryland							1,487			
Michigan	500		7,900			17,750,000			3,700,000	
Minnesota	50,000	480,000	950			14,727,000		30,000,000		
Missouri							125			
Nebraska	200,000									
New Hampshire	100,000									
New Mexico							350			
New York	300,000		3,425			3,990,000				
Ohio			700	262,500	8,000,000	6,000,000	4,945		18,000,000	
Pennsylvania			7,600		12,500,000			15,000,000		
South Dakota							3,300			
Vermont	100,000		2,000							
Washington							500			
Wisconsin			6,900			2,000,000	233			
Wyoming	150,000									
Foreign countries					200,000					
Total	900,500	480,000	43,864	262,500	20,800,000	44,467,000	29,950	45,000,000	49,300,000	100

Distribution and assignment of fish—Continued.

States and Territories.	Sea bass.	White bass.	Black bass.	Crappie.	Rock bass.	Sunfish.	Pike.
	Fry.	Yearlings.	Yearlings.	Yearlings.	Yearlings.	Yearlings.	Yearlings.
Alabama					500		
Arkansas			50		50		
California			2,610	285	500		500
Connecticut			222	25			
District of Columbia			400				
Georgia					500		
Illinois		600	650	1,780	1,540	2,594	898
Indiana			511	155	325	470	200
Iowa		447	789	240	589	667	190
Kansas		225	1,850	570	100	1,090	70
Kentucky			1,844	1,140	875	1,401	
Maryland		24	2,176		814	168	
Massachusetts	200,000		700		200		
Michigan			55				
Missouri		50	1,430	532	1,262	965	25
New Jersey					350		
New Mexico			67	25	350		
New York			198	211			
North Carolina				50	1,800	152	
Ohio			1,390	150	850	974	83
Pennsylvania			159		2,000		
South Carolina					500		
South Dakota			1,175	390	770		
Tennessee					1,050		
Texas			2,385	80	1,200		
Vermont			600				
Virginia					9,800		
Washington		600	125	270		500	
West Virginia					50		
Wisconsin			367	408	233	285	
Foreign countries						338	
Total	200,000	1,946	19,753	6,311	26,208	9,604	1,066

State.	Scup.	Cod.	Pollock.	Flatfish.		Lobsters.
	Fry.	Fry.	Fry.	Eggs.	Fry.	Fry.
Massachusetts	35,000	52,795,500	2,473,500	2,764,000	3,510,000	5,799,000
Total	35,000	52,795,500	2,473,500	2,764,000	3,510,000	5,799,000

SUMMARY.

States and Territories.	Number.	States and Territories.	Number.
Alabama	3,909,889	Nevada	25,000
Arizona	1,700	New Hampshire	141,136
Arkansas	28,037	New Jersey	3,236,582
California	3,248,438	New Mexico	7,502
Colorado	76,177	New York	12,708,437
Connecticut	2,941,287	North Carolina	796,402
Delaware	5,855,205	North Dakota	1,530
District of Columbia	1,006,914	Ohio	32,278,373
Florida	2,301,087	Oklahoma	800
Georgia	3,054,737	Oregon	1,332,520
Idaho	2,982	Pennsylvania	37,313,166
Illinois	19,954	Rhode Island	12
Indiana	16,118,513	South Carolina	1,200,728
Indian Territory	900,076	South Dakota	34,331
Iowa	20,752	Tennessee	5,382
Kansas	13,224	Texas	24,592
Kentucky	10,612,790	Utah	2,004,591
Louisiana	2,024,188	Vermont	195,333
Maine	485,083	Virginia	5,007,660
Maryland	15,240,316	Washington	4,207
Massachusetts	69,082,176	West Virginia	16,805
Michigan	21,475,831	Wisconsin	2,044,166
Minnesota	45,279,844	Wyoming	230,006
Mississippi	2,007,244	Foreign countries	400,916
Missouri	957,423		
Montana	3,104	Total	305,918,346
Nebraska	240,080		

GENERAL ADMINISTRATION.

Mr. J. J. O'Connor, who had been chief clerk of the Commission from June, 1888, died on May 4, 1892. He was succeeded by Mr. Herbert A. Gill, who had been the disbursing agent of the Commission for many years.

On May 19 Mr. W. P. Titcomb was appointed disbursing agent.

CIVIL SERVICE.

Owing to the increase of the personnel of the Commission and the desirability that faithful employés should have such assurance of permanency of tenure of their positions as is conveyed by the civil-service law, the President was requested to order the classification of the Commission as a part of the classified departmental service. This request was approved, and the executive order issued May 5, 1892.

MENHADEN AND MACKEREL FISHERIES.

During the first session of the Fifty-second Congress much conflicting testimony was had before the House Committee on Merchant Marine and Fisheries relative to the natural history and habits of mackerel and menhaden, as also the influence upon their abundance of certain methods of fishing. On the 21st of March, 1892, the Commissioner was called upon by the chairman of the Senate Committee on Fisheries to make replies to certain interrogatories. Response was made May 9, 1892, which was printed as Senate Miscellaneous Document No. 156, Fifty-second Congress, first session.

PUBLICATIONS AND LIBRARY.

During the year the following papers, forming parts of the reports and bulletins, were issued:

A reconnoissance of the streams and lakes of the Yellowstone National Park, Wyoming, in the interest of the U. S. Fish Commission, by David Starr Jordan. (Bulletin for 1889, pp. 1–40.)

Report upon the pearl fishery of the Gulf of California, by Charles H. Townsend. (Bulletin for 1889, pp. 91–94.)

Report upon certain investigations relating to the planting of oysters in southern California, by Charles H. Gilbert. (Bulletin for 1889, pp. 95–98.)

The embryology of the sea bass (*Serranus atrarius*), by Henry V. Wilson. (Bulletin for 1889, pp. 209–273.)

Report upon the investigations of the fishing grounds off the west coast of Florida, by A. C. Adams and W. C. Kendall. (Bulletin for 1889, pp. 289–312.)

The giant scallop fishery of Maine, by Hugh M. Smith. (Bulletin for 1889, pp. 313–335.)

Notes on the occurrence of protozoan parasites (Psorosperms) on Cyprinoid fishes in Ohio, by Edwin Linton. (Bulletin for 1889, pp. 359–361.)

Notes on the king crab fishery of Delaware Bay, by Hugh M. Smith. (Bulletin for 1889, pp. 363–370.)

Report upon a collection of fishes made in southern Florida during 1889, by James A. Henshall. (Bulletin for 1889, pp. 371–389.)

Notes on the oyster fishery of Connecticut, by J. W. Collins. (Bulletin for 1889, pp. 461–497.)

Report on the work of the U. S. Fish Commission steamer *Albatross*, from January 1, 1887, to June 30, 1888, by Z. L. Tanner. (Report for 1887, pp. 371–435.)

Report upon the construction and equipment of the schooner *Grampus*, by J. W. Collins. (Report for 1887, pp. 436–490.)

Report upon the operations of the U. S. Fish Commission schooner *Grampus*, from March 15, 1887, to June 30, 1888, by J. W. Collins. (Report for 1887, pp. 491–598.)

A review of the labroid fishes of America and Europe, by David Starr Jordan. (Report for 1887, pp. 599–699.)

On some Lake Superior Entomostraca, by S. A. Forbes. (Report for 1887, pp. 701–718.)

Notes on entozoa of marine fishes of New England, with descriptions of several new species, Part II, by Edwin Linton. (Report for 1887, pp. 719–899.)

Report of the Commissioner for 1887, by Marshall McDonald. (Report for 1887, pp. I–LXIII.)

Statistical review of the coast fisheries of the United States, by J. W. Collins. (Report for 1888, pp. 271–378.)

Report on the fisheries of the Pacific coast of the United States, by J. W. Collins. (Report for 1888, pp. 3–269.)

Report on the investigations of the U. S. Fish Commission steamer *Albatross* for the year ending June 30, 1889, by Z. L. Tanner. (Report for 1888, pp. 395–512.)

Report on the operations at the laboratory of the U. S. Fish Commission, Woods Holl, Massachusetts, during the summer of 1888, by John A. Ryder. (Report for 1888, pp. 513–522.)

A preliminary review of the apodal fishes or eels inhabiting the waters of America and Europe, by David Starr Jordan and Bradley Moore Davis. (Report for 1888, pp. 581–677.)

The chemical composition and nutritive values of food-fishes and aquatic invertebrates, by W. O. Atwater. (Report for 1888, pp. 679–868.)

Observations on the aquaria of the U. S. Fish Commission at Central Station, Washington, D. C., by William P. Seal. (Bulletin for 1890, pp. 1–12.)

The fishing vessels and boats of the Pacific coast, by J. W. Collins. (Bulletin for 1890, pp. 13–48.)

Observations upon fishes and fish-culture. (Bulletin for 1890, pp. 49–61.)

Notes on a collection of fishes from the Lower Potomac River, by Hugh M. Smith. (Bulletin for 1890, pp. 63–72.)

A review of the Centrarchidæ or fresh-water sunfishes of North America, by Charles H. Bollman. (Report for 1888, pp. 557–579.)

There was also issued as Senate Miscellaneous Document No. 65, a "Report on the establishment of a fish-cultural station in the Rocky Mountain region and Gulf States" by Marshall McDonald, Commissioner, and Barton W. Evermann, assistant.

The following publications relating to the cruise of the U. S. Fish Commission steamer *Albatross*, under the direction of Prof. Alexander Agassiz, have been published by the Museum of Comparative Zoology:

Three letters from Alexander Agassiz to the Hon. Marshall McDonald, U. S. Commissioner of Fish and Fisheries, on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission steamer *Albatross*, Lieut. Commander Z. L. Tanner, U. S. Navy, commanding. (Bulletin of the Museum of Comparative Zoology at Harvard College, vol. XXI, No. 4.)

General sketch of the expedition of the *Albatross*, from February to May, 1891, by Alexander Agassiz. (Bulletin of the Museum of Comparative Zoology at Harvard College, vol. XXIII, No. 1.)

Calamocrinus Diomedæ, a new stalked Crinoid, with notes on the Apical System and the Homologies of Echinoderms, by Alexander Agassiz. (Memoirs of the Museum of Comparative Zoology at Harvard College, vol. XVII, No. 2.)

Over 2,000 bound copies of the reports and bulletins were distributed to collaborators of the Commission, libraries, and scientific institutions, and about 7,500 pamphlets, copies of papers appearing in these volumes and issued in advance of the full volumes.

The library acquired 713 books, chiefly through gift and exchange for the publications of the Commission. Of those donated we are indebted to the officers of the Government Printing Office for over 100 volumes and to the Société Nationale d'Acclimatation de France for 72 volumes, which were presented by that society in return for eggs of the quinnat salmon sent to it the previous year.

ERECTION OF A FISHWAY AT THE GREAT FALLS OF THE POTOMAC RIVER.

A contract having been entered into June 9, 1891, by the Chief of Engineers, U. S. Army, with Isaac H. Hathaway, of Philadelphia, for the construction of a fishway at Great Falls, in accordance with plans and specifications prepared in this office, work was begun early in July and sections 4, 5, and 6 were completed during the year.

THE WORLD'S COLUMBIAN EXPOSITION.

The preparation of the Commission's exhibit at the World's Columbian Exposition was actively prosecuted under the immediate direction of Mr. J. W. Collins, the representative of the Commission on the Board of Management, U. S. Government Exhibit. As assistants the following special agents were appointed: E. C. Bryan, in charge of administration and of preparation of section of fisheries; W. de C. Ravenel, in charge of section of fish-culture; and W. P. Seal, in charge of construction of aquaria.

The scope of the fisheries section embraces a series of vessel and boat models, and drawings of sail and builders' plans of fishing vessels; specimens and casts of fishes; mounted skins of sea-lions, seals, and birds; fishermen's clothing, nets, and other apparatus used in the fisheries; photographs, cartoons, and water-color illustrations of the fisheries and fishery industries of the United States and Alaska; also a series of the angling appliances manufactured and used in the United States. In the preparation of the cartoons and water-color sketches the Commission availed itself of the services of Mr. Henry W. Elliott; in the drawings of plans of fishing vessels, of the services of Mr. C. B. Hudson, and in the making of casts of fishes, of those of Mr. S. F. Denton.

The representation of the section of fish-culture will be by means of specimens, models, and illustrations (graphic and photographic) of fish-cultural stations (hatcheries, ponds, etc.); cars, vessels, boats, cans, etc., used in the transportation of eggs, fry, and adults of fishes; apparatus used in the artificial propagation of fish; the eggs, fry, and adults of fishes artificially propagated; the methods of fish-cultural work, and of fish-ladders or fishways. The models of the fish-cultural

stations were prepared under the direction of Mr. W. P. Sauerhoff, one of the expert fish-culturists of the Commission.

By an arrangement made with the executive board, the Exposition authorities constructed a suitable building and arranged for proper aquaria for the exhibition of fresh-water and marine life, the furnishing of the specimens and the general maintenance of the exhibit to be by the Fish Commission. Plans for the necessary water mains, pumps, etc., required for the supply of both fresh and salt water, and its circulation, were prepared by W. B. Bayley, U. S. Navy, the engineer of the Commission. The plans for the aquaria were likewise furnished by the Commission, and Mr. W. P. Seal, superintendent of the Commission's aquaria, was detailed in August, 1891, to superintend their construction.

STATE FISH COMMISSIONS.

The coöperation of the Commission with the various State fish commissions in their fish-cultural work is indicated by the following table:

Statement showing the kinds and number of eggs and fish furnished to State fish commissions during the fiscal year ending June 30, 1892.

State.	Species.	Eggs.	Fish.
California	Quinnat salmon	2,852,000	.....
	Landlocked salmon	30,000	.....
Delaware	Carp	.....	1,500
	Shad	.....	†1,800,000
	Von Behr trout	.....	†2,500
	Brook trout	.....	300
Georgia	Carp	.....	2,500
Illinois	Catfish	.....	*180
	Carp	.....	5,000
	Yellow perch	.....	*2,930
	White bass	.....	*600
	Crappie	.....	*1,780
	Rock bass	.....	*1,540
	Sunfish	.....	*2,594
Indiana	Whitefish	100,000	.....
Minnesota	Carp	.....	1,500
	Landlocked salmon	15,000	.....
	Lake trout	50,000	.....
Missouri	Catfish	.....	240
	Tench	.....	5,000
	Rainbow trout	.....	12
	Brook trout	.....	12
Nebraska	Loch Leven trout	15,000	.....
	Von Behr trout	20,000	.....
	Lake trout	200,000	.....
Nevada	Landlocked salmon	25,000	.....
New Hampshire	....do	17,000	.....
	Loch Leven trout	25,000	.....
	Lake trout	100,000	.....
New York	Carp	.....	5,000
	Tench	.....	2,100
	Golden ide	.....	975
	Atlantic salmon	150,000	.....
	Landlocked salmon	15,000	.....
	Lake trout	300,000	.....
Ohio	Whitefish	8,000,000	.....
	Yellow perch	.....	2,750
	Black bass	.....	175
	Crappie	.....	25
	Sunfish	.....	376

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

Statement showing the kinds and number of eggs and fish furnished to State fish commissions during the fiscal year ending June 30, 1892—Continued.

State.	Species.	Eggs.	Fish.
Pennsylvania	Carp		4,000
	Shad		*2,348,750
	Atlantic salmon	300,000	
	Whitefish	12,500,000	
	Pike perch	15,000,000	
Utah	Carp		2,000
Vermont	Landlocked salmon	20,000	
	Loch Leven trout	30,000	
	Rainbow trout	20,000	
	Von Behr trout		290
	Lake trout	100,000	
West Virginia	Loch Leven trout	10,000	
Wisconsin	Carp		15,000
Wyoming	Rainbow trout	20,000	
	Von Behr trout	10,000	
	Lake trout	100,000	

*Fry.

COURTESIES EXTENDED AND RECEIVED.

RELATIONS WITH OTHER GOVERNMENT DEPARTMENTS.

Acknowledgments are due the Coast and Geodetic Survey for charts and sounding books and the loan of instruments.

The War Department, through Maj. C. E. L. B. Davis, in charge of the improvement of the Potomac River, for the use of scows to transfer buildings and equipment from Fort Washington to Bryan Point.

The Interior Department for continuing the authority issued by the War Department for the use of a portion of the reservation at Fort Gaston, Cal., as a fish-cultural station.

The Navy Department for the extension of the facilities of the navy-yards for the outfit and repair of the Commission's ships. Passed Assistant Engineer W. B. Bayley was detached April 1, 1892, as consulting engineer, and Passed Assistant Engineer I. S. K. Reeves detailed in his stead. The steamer *Albatross* was transferred to the Navy Department for use in making a survey for a telegraphic cable between the United States and the Hawaiian Islands.

By direction of the President the steamer *Albatross* was detailed to convey to Bering Sea Drs. T. C. Mendenhall and C. Hart Merriam, agents of the State Department to investigate the seal fisheries of Alaska.

At the request of the Superintendent of the Eleventh Census the appointment of Dr. H. M. Smith as special agent of the census in charge of fish and fisheries was sanctioned.

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

For use during the shad-hatching season at Bryan Point, loan of tents and equipment was made by Gen. Albert Ordway, commanding the District of Columbia militia.

RELATIONS WITH FOREIGN COUNTRIES.

Canada.—Eggs of the landlocked salmon were furnished Mr. W. P. Greenough, Portneuf, Quebec.

Mexico.—Eggs of the Von Behr trout, landlocked salmon, and quinnat salmon were furnished the Mexican Fish Commission.

United States of Colombia.—Through Lieut. H. R. Lemly the Government of the United States of Colombia was supplied with eggs of the brook, Loch Leven, Von Behr, and rainbow trout. The shipment resulted in entire loss.

Great Britain.—At the request of U. S. Minister Robert T. Lincoln, a shipment of landlocked salmon eggs was made to Bridgeworth, England. In March, 1892, 100,000 eggs of the whitefish were forwarded to the Midland Counties Fish Culture Establishment. Report was made December 30, 1891, that the consignment made during the previous season had successfully hatched and that many of the fish had attained a length of 8 inches.

Germany.—On October 25, 1891, a quantity of catfish, sunfish, and calico bass were furnished Dr. Charles von dem Borne for his father, the eminent German fish-culturist, Mr. Max. von dem Borne, of Berneuchen. A small consignment of whitefish was also sent in April, 1892. During the year there were received from Mr. von dem Borne eggs of the Von Behr trout, brook trout, lake trout, and whitefish.

France.—Eggs of the rainbow trout were sent to Mr. Le Conteula de Caumont, Oise.

Belgium.—In compliance with request of the Belgium Commission of Pisciculture, about 500 catfish were collected at Quincy, Ill., and forwarded to Antwerp in December, 1891.

Switzerland.—In February, 1892, 100,000 eggs of the common whitefish were sent to Mr. E. Covelle, Geneva.

MARSHALL MCDONALD,
U. S. Commissioner of Fish and Fisheries.

Details of distribution, 1891–92.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Catfish (*Ictalurus punctatus*, chiefly):			
Deer Creek, Bel Air, Md			509
Private ponds in Pennsylvania			100
New York			100
Max von dem Borne, Berneuchen, Germany			76
Belgium, Government of			502
Lake Cuyamaca, San Diego, Cal			250
Feather River, Gridley, Cal			250
Illinois River, La Salle, Ill			100
Meredosia, Ill			(250, 000)
Private ponds in Illinois			80
Flat Rock River, Flat Rock, Ind			295
Upper Iowa River, Decorah, Iowa			50
Wall Lake, Lake View, Iowa			195
Mineral Park Lake, Dow City, Iowa			195
Lake Evelyn, Bonner Springs, Kans			300
Cumberland River, Williamsburg, Ky			20
Spring Lake, Madisonville, Ky			25
Reinecke Lake, Madisonville, Ky			25
Loch Mony Lake, Earlington, Ky			25
Salisbury fish ponds, Salisbury, Mo			65
City reservoir, Moberly, Mo			75
Missouri Fish Commission, St. Joseph, Mo			240
Cockrell Lake, Independence, Mo			27
Private ponds in New Mexico			80
Brady Lake, Ravenna, Ohio			200
Lake Lakemore, Kenton, Ohio			15
Private ponds in Ohio			160
Private ponds in Texas			140
Liberty Lake, Spokane Falls, Wash			50
Loon Lake, Loon Lake, Wash			150
Private ponds in Missouri			27
Carp (*Cyprinus carpio*):			
Private ponds in Alabama			850
Larapee Creek, Chehaw, Ala			2,500
Tombigbee River, near Demopolis, Ala			2,500
Alabama River, near Selma, Ala			2,500
Private ponds in Arkansas			860
Washita River, Arkadelphia, Ark			5,000
Private ponds in California			60
Colorado			1,485
Connecticut			280
Delaware Fish Commission			1,500
Nanticoke River, Seaford, Del			2,753
Private ponds in District of Columbia			200
Florida			710
Georgia			1,720
Georgia Fish Commission			2,500
Private ponds in Idaho			970
Mud Lake, near Paris, Idaho			2,000
Private ponds in Illinois			150
Illinois River, Meredosia, Ill			(5,000)
Fox River, near Elgin, Ill			500
Embarras River, near Greenup, Ill			1,250
Illinois Fish Commission			5,000
Private ponds in Indiana			210
Wabash River, Terre Haute, Ind			1,250
Private ponds in Indian Territory			40
Iowa			715
Fifteen-acre lake, near Dow City, Iowa			300
Private ponds in Kansas			3,310
Kentucky			280
Louisiana			200
Crocodile River, near Bunkie, La			2,500
Bayou Scie, near Robeline, La			2,500
Cypre Bayou, near Stonewall, La			2,500
Private ponds in Maine			30
Maryland			640
Big Pool, Hagerstown, Md			1,000
Tuckahoe Creek, Queen Anne, Md			3,000
Deer Creek, Bel Air, Md			1,000
Private ponds in Massachusetts			800
Michigan			1,200
Minnesota			330
Minnesota Fish Commission			1,500
Private ponds in Mississippi			190
Chunkey River, Chunkey's Station, Miss			2,500
Bayou Chitto near Johnston's Station, Miss			2,500
Private ponds in Missouri			600
Shoal Creek, near Neosho, Mo			1,000
Tributary of Spring River, near Seneca, Mo			500

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Carp (*Cyprinus carpio*)—Continued:			
Private ponds in Montana			1,580
Nebraska			2,720
New Hampshire			130
New Jersey			1,680
New Mexico			280
New York			790
New York Fish Commission			5,000
Private ponds in North Carolina			2,110
Mayo and Dan rivers in North Carolina			3,000
Private ponds in North Dakota			1,530
Ohio			300
Licking River, Newark, Ohio			1,250
Stillwater River, Bradford Junction, Ohio			900
Private ponds in Oklahoma			800
Oregon			120
Pennsylvania			2,230
Tulpehocken Creek, Stouchsburg, Pa			5,000
Pennsylvania Fish Commission			4,000
Private ponds in South Carolina			120
South Dakota			840
Vermillion River, Vermillion, S. Dak			4,700
Small lake, near Forestburg, S. Dak			100
Private ponds in Tennessee			1,000
Texas			1,020
Red River, near Dawn, Tex			1,000
Texas and Pacific R. R. Co.'s pond, near Westbrook, Tex			600
Sabin River, near Mineola, Tex			2,500
Neches River, near Prices, Tex			2,500
Navasota River between Lake and Dean, Tex			2,500
Trinity River, near Dallas, Tex			2,500
San Marcos River, near San Marcos, Tex			2,500
Nueces River, near Cotulla, Tex			2,500
Private ponds in Utah			3,830
Streams near Tooele, Utah			300
in Emery County, Utah			395
Utah Fish Commission			2,000
Private ponds in Vermont			200
Virginia			3,330
Mill pond tributary to Reed Creek, near Wytheville, Va			55
Pohick Run, near Springman, Va			1,000
Private ponds in Washington			420
Small lake near Clear Lake, Wash			300
Seattle, Wash			540
Sedalia, Wash			300
Houghton, Wash			500
Private ponds in West Virginia			210
West Virginia Fish Commission			5,000
Wisconsin Fish Commission			15,000
Private pond in Wisconsin			80
Tench (*Tinca tinca*):			
Big Darby Creek, near Plain City, Ohio			500
Spring Creek, near Urbana, Ohio			500
Whitewater River, near Richmond, Ind			500
Current River, near Chilton, Mo			2,300
Private pond in Missouri			200
Texas and Pacific R. R. Co.'s pond, Arlington, Tex			500
Texas and Pacific R. R. Co.'s pond, Loraine, Tex			1,500
Hickory Creek, Martinsville, Ill			500
Kaskaskia River, Vandalia, Ill			500
Brandywine River, near Chadds Ford, Pa			992
Deer Creek, near Bel Air, Md			1,000
Big Pool, near Hagerstown, Md			1,000
Tulpehocken River, near Reading, Pa			1,500
Ontelaunee River, near Reading, Pa			1,500
Missouri Fish Commission			5,000
Hickory Creek, near Neosho, Mo			1,100
Shoal Creek, near Boyden, Mo			2,000
New York Fish Commission			2,100
Appomattox River, near Petersburg, Va			2,000
Grand River, Chillicothe, Mo			3,700
Des Moines River, Ottumwa, Iowa			3,700
Mayo and Dan rivers, near Reidsville, N. C			3,000
Golden ide (*Idus melanotus*):			
Applicants in Alabama			50
Colorado			70
Florida			100
Indiana			500
Kansas			60
Louisiana			100
Massachusetts			25
Missouri			25

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Golden ide (*Idus melanotus*)—Continued:			
New York Fish Commission			975
Applicants in North Carolina			6
Ohio			200
Pennsylvania			51
Virginia			15
Goldfish (*Carassius auratus*):			
Applicants in Alabama			250
Arkansas			277
California			25
Colorado			129
Connecticut			60
Delaware			152
District of Columbia			6,314
Florida			277
Georgia			321
Idaho			12
Illinois			832
Indiana			735
Indian Territory			36
Iowa			68
Kansas			640
Kentucky			180
Louisiana			388
Maine			6
Maryland			1,040
Massachusetts			151
Michigan			133
Minnesota			64
Mississippi			53
Missouri			1,435
Hearrell Branch, *near Neosho, Mo*			257
Applicants in Montana			24
Nebraska			60
New Hampshire			6
New Jersey			552
New York			736
North Carolina			284
Ohio			466
Pennsylvania			1,402
Rhode Island			12
South Carolina			108
South Dakota			6
Tennessee			432
Texas			467
Utah			66
Virginia			1,818
Vermont			37
Washington			12
West Virginia			221
Wyoming			6
Wisconsin			100
Buffalo (*Ictiobus*, sp.):			
Illinois River, Meredosia, Ill			(20,000)
Shad (*Clupea sapidissima*):			
Alabama River, Montgomery, Ala		2,499,000	
Dog River, *near Mobile, Ala*		1,400,000	
Connecticut River, Warehouse Point, Conn		1,939,000	
Nanticoke River, Seaford, Del		1,798,000	
Brandywine Creek, Wilmington, Del		2,250,000	
Black Bird Creek, Middletown, Del		120,000	
Appoquinimink Creek, near Middletown, Del		120,000	
Little Duck Creek, Clayton, Del		240,000	
Jones River, Dover, Del		300,000	
Murderkill Creek, Felton, Del		240,000	
Mispillion Creek, Milford, Del		180,000	
Duck Creek, Ellendale, Del		90,000	
Indian River, Millsboro, Del		510,000	
Potomac River, Washington, D. C			*a* 1,000,000
Tomoka River, Daytona, Fla		750,000	
Suwanee River, New Bradford, Fla		750,000	
St. Johns River, Buffalo Bluffs, Fla		800,000	
U. S. Fish Ponds, *Washington, D. C*		*b*(1,089,000)	
Chattahoochee River, West Point, Ga		925,000	
Savannah River, Augusta, Ga		1,220,000	
Ocmulgee River, Macon, Ga		900,000	
Grand River, Shawnee, Ind. T		900,000	
Atchafalaya River, Melville, La		669,000	

a Estimated product of 2,054,000 *fry deposited in April*, 1891.
b Deposited for rearing and distribution in fall of 1892.

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Shad (*Clupea sapidissima*)—Continued:			
Crocodile River, near Bunkie, La		672,000	
Vermilion River, near Lafayette, La		675,000	
North-East River, North-East, Md		1,800,000	
Gunpowder River, Gunpowder Station, Md		2,250,000	
Elk River, Elkton, Md		2,680,000	
Bush River, Bush River Station, Md		2,250,000	
Wicomico River, Salisbury, Md		1,349,000	
Tuckahoe Creek, Queen Anne, Md		1,320,000	
Patapsco River, Relay House, Md		448,000	
Susquehanna River, near Havre de Grace, Md		1,025,000	
Peach Bottom, Pa		1,800,000	
Fites Eddy, Pa		1,800,000	
Columbia, Pa		1,200,000	
Back River, near Back River Station, Md		450,000	
Patuxent River, Laurel, Md		301,000	
Chester River, Chestertown, Md		1,350,000	
Taunton River, Dighton, Mass		1,500,000	
Jordan River, near Bay St. Louis, Miss		500,500	
Wolf River, near Bay St. Louis, Miss		500,500	
Bayou de Lisle, near Bay St. Louis, Miss		500,500	
Rotten Bayou, near Bay St. Louis, Miss		500,500	
James River, Springfield, Mo		180,000	
U. S. Fish Commission Station, Neosho, Mo		*a* (700,000)	
St. Francis River, Knob Lick, Mo		750,000	
Timber Creek, Gloucester, N. J	2,497,000	261,000	
Woodbury Creek, near Gloucester, N. J		24,000	
Delaware River, Lambertville, N. J		450,000	
Callicoon, N. Y		1,450,000	
Port Jervis, N. Y		1,515,000	
Lackawaxen, Pa		2,069,000	
Delaware Water Gap, Pa		2,600,000	
Hudson River, Albany, N. Y		2,524,000	
West Point, N. Y		1,350,000	
Newburg, N. Y		1,325,000	
Catawba River, near Morganton, N. C		260,000	
Neuse River, Goldsboro, N. C		275,000	
Yadkin River, Salisbury, N. C		250,000	
Congaree River, Columbia, S. C		1,200,000	
Bear River, Cache Junction, Utah		1,998,000	
Chappawansic Creek, Quantico, Va		474,000	
Elizabeth River, Norfolk, Va		429,000	
Otter River, Evington, Va		361,000	
Rapidan River, Rapidan, Va		594,000	
Stony Creek, Stony Creek, Va		379,000	
Tye River, Tye River Station, Va		688,000	
Meherrin River, Belfield, Va		396,000	
Cedar Run, Catlett, Va		437,000	
Little River, Taylorsville, Va		421,000	
Rockfish River, Rockfish Station, Va		395,000	
Machipongo Creek, Machipongo, Va		400,000	
Quinnat salmon (*Oncorhynchus chouicha*):			
California Fish Commission	2,852,000		
E. Cházari for Mexican Government	50,000		
McCloud River, Baird, Cal		25,500	
Clackamas River, Clackamas, Oreg		1,332,400	
Tributaries of Trinity River, near Fort Gaston, Cal		140,000	
Redmond Creek, near Fort Gaston, Cal		150,000	
Supply Creek, near Fort Gaston, Cal			25,000
Nissequogue River, near Smithtown, Long Island, N. J			2,400
Green River, near Arlington, Vt			1,500
Benedict Brook, near Arlington, Vt			1,000
Madison Brook, near Arlington, Vt			485
Denning Brook, near Arlington, Vt			485
Atlantic salmon (*Salmo salar*):			
Pennsylvania Fish Commission	300,000		
New York Fish Commission	150,000		
Tributaries of Penobscot River, Maine			254,200
Alamoosook Lake, near Craig Brook Station, Maine			32
Landlocked salmon (*Salmo salar*, var. *sebago*):			
Toddy Pond, near Orland, Me			8,421
Burnt Land Pond, near Deer Isle, Me			1,499
Craig Pond, near Orland, Me			59
Winooski River, near Waterbury, Vt			5,000
Browns River, near Essex Junction, Vt			5,000
Indian Brook, near Essex Junction, Vt			2,000
Malletts Creek, near Essex Junction, Vt			2,000
Sunderland Hollow Brook, near Essex Junction, Vt			1,000
Patten Pond, near Green Lake, Me			20,000
Green Lake and tributaries, near Green Lake, Me			76,000

a Deposited for rearing and distribution.

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Landlocked salmon (*Salmo salar*, var. *sebago*)—Continued:			
Grand Lake and Grand Lake Stream, near Schoodic Station, Me			42,184
Do		68,692	
H. B. W. Whitmore, Bridgeworth, England	15,000		
California Fish Commission	30,000		
Blooming Grove Park Association, Glen Eyre, Pa	10,000		
New York Fish Commission	15,000		
Wilmurt Club, Newton Corners, N. Y	30,000		
Tuxedo Club, Tuxedo, N. Y	10,000		
A. N. Cheney, Glens Falls, N. Y	10,000		
Minnesota Fish Commission	15,000		
Nevada Fish Commission	25,000		
Vermont Fish Commission	20,000		
New Hampshire Fish Commission	17,000		
E. Chazari, for Mexican Government	25,000		
W. P. Greenough, Lachevrotiere, Canada	10,000		
Loch Leven trout (*Salmo levenensis*):			
University of Michigan, Ann Arbor, Mich	500		
New Hampshire Fish Commission	25,000		
Vermont Fish Commission	30,000		
West Virginia Fish Commission	10,000		
Nebraska Fish Commission	15,000		
A. N. Cheney, Glens Falls, N. Y	20,000		
Lieut. H. R. Lemly, Colombia, S. A	10,000		
Toddy Pond, near Craig Brook Station, Me			10,935
University of Michigan, Ann Arbor, Mich			9
Nolin Creek, White Mills, Ky			475
Touches Creek, near Traverse City, Mich			500
Goodwin Creek, Vassar, Mich			500
Private pond in Michigan			200
Alder Run, Kylertown, Pa			275
Private pond in Pennsylvania			200
Knights Creek, Menominee, Wis			1,485
Rainbow trout (*Salmo irideus*):			
Vermont Fish Commission	20,000		
Wyoming Fish Commission	20,000		
John H. Gordon, South Bend, Wyo	20,000		
Otto Gramm, Laramie, Wyo	10,000		
E. M. Robinson, Mammoth Springs, Ark	20,000		
Le Conteula de Caumont, Havre, France	30,000		
Lieut. H. R. Lemly, Colombia, S. A	20,000		
Heart Pond, near Orland, Me			105
Coosa River, Leesburg, Ala			700
Little River, Fort Payne, Ala			489
Cypress Creek, Florence, Ala			300
Private ponds in Alabama			250
Arkansas			1,100
Lake Pocotopong, near East Hampton, Conn			1,000
Private ponds in Connecticut			500
Crawfish Springs, near Chickamauga, Ga			3,000
Raccoon Creek, Rome, Ga			800
Line Creek, Palmetto, Ga			94
Private ponds in Georgia			800
Bloody Run, Dubuque, Iowa			5,000
Private pond in Kansas			50
Little Cold River, Fryeburg, Me			500
Mill Pond, Barton, Md			95
Tributaries of Gunpowder River, near Loch Raven and Parkton, Md			550
Cowlers Creek, near Loch Raven, Md			250
Jenifer Branch, near Loch Raven, Md			250
Tributary of Deer Creek, near Bolair, Md			500
Bynum Run, near Belair, Md			100
Sideling Hill Creek, in Washington County, Md			500
Private ponds in Maryland			590
Pelham Brook, Lowell, Mass			700
Browns Brook, Northfield, Mass			700
Twelve-acre lake, near Bellingham, Mass			1,000
Private ponds in Massachusetts			700
Current River, near Chilton, Mo			1,500
Shoal Creek, in Newton County, Mo			1,256
Missouri Fish Commission			12
Private ponds in Missouri			500
Malapardis Brook, near Morristown, N. J			500
Sam Spring Brook, near Morristown, N. J			500
Quail Run, Island Heights, N. J			300
Private ponds in New Jersey			700
Otsego Creek, Onconta, N. Y			972
Dam of New City Mills, Conger, N. Y			1,000
Skanandoa Creek, Vernon, N. Y			480

Details of distribution, 1891-92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Rainbow trout (*Salmo irideus*)—Continued:			
Bouchor Creek, near Lordville, N. Y			500
Private ponds in New York			300
Flat Creek, Black Mountain, N. C			1,000
Wyalusing Creek, South Montrose, Pa			500
Metcalf Dam, Shippensburg, Pa			200
Stony Creek, Penn Haven Junction, Pa			300
Garlick Run, Coatesville, Pa			250
Big Spring Creek, Newville, Pa			200
Tributaries of Tioga River, Troy, Pa			1,000
Rock Run, Coatesville, Pa			250
Iron Mine Run, Middletown, Pa			200
Canons Run, Dickinson, Pa			500
Trout, Scott, and other runs, near Marysville, Pa			500
Doe Run, near Coatesville, Pa			100
Hensinger Run, Jordan, Pa			500
Private ponds in Pennsylvania			434
Horse Creek, Bethel, Tenn			493
Indian Creek, Harrogate, Tenn			500
Lick Creek, near Franklin, Tenn			100
Harfith Creek, near Franklin, Tenn			200
Flint River, Fayetteville, Tenn			500
Doe River, Knoxville, Tenn			357
Doe and Watauga rivers, near Elizabethton, Tenn			500
Private ponds in Tennessee			250
Texas			700
Happy Creek, Front Royal, Va			100
Holston River, Rich Valley, Va			100
Saltville, Va			500
Bradford, Va			500
Big Spring Branch, Leesburg, Va			500
Mountain stream, near Delaplane, Va			300
Holmes Creek, Dunn Loring, Va			300
Beaver Dam Creek, Hamilton, Va			495
Wolf Creek, Abingdon, Va			500
Clear Creek, Ramsey, Va			500
Roaring Run, Rocky Mount, Va			496
Thorn Spring, Newbern, Va			300
Cedar Creek, Natural Bridge, Va			1,000
Cleveland, Va			300
Augusta Springs Pond, Augusta Springs, Va			498
Reed Creek, Wytheville, Va			115
Private ponds in Virginia			3,719
Roaring Brook, Stamford, Vt			500
Menden Brook, Rutland, Vt			1,000
Metcalf Pond, E. Fairfield, Vt			500
Meadow Brook, Berlin, Vt			200
Private ponds in Vermont			750
Elkhorn Creek, Powhatan, W. Va			300
Elk River, Charleston, W. Va			987
Private ponds in West Virginia			97
Kinnickinnick River, River Falls, Wis			900
Von Behr or brown trout (*Salmo fario*):			
University of Michigan, Ann Arbor, Mich	500		
John H. Gordon, South Bend, Wyo	20,000		
Wyoming Fish Commission	10,000		
Nebraska Fish Commission	20,000		
E. Cházari, for Mexican Government	20,000		
Lieut. H. R. Lemly, Colombia, S. A	10,000		
Delaware Fish Commission		2,500	
Augusta Springs Lake, Augusta Springs, Va		5,000	
Rock Creek, Rock Creek National Park, District of Columbia		14,478	
Streams near Amberg Station, Wis		15,000	
Baptism River, Lake County, Minn		5,000	
Private ponds in Arizona			1,200
Arkansas			700
South Clear Creek, Georgetown, Colo			1,500
South Fork of White River, Glenwood, Colo			1,250
Beauty Lake, Morrison, Colo			500
Grape Creek and tributaries in Fremont County, Colo			2,000
Old Curtis Lake, Aspen, Colo			2,000
Boulder Creek, Niedorland, Colo			2,000
Mammoth Creek, Griffin County, Colo			3,000
South Boulder Creek, Griffin County, Col			3,000
Platt River, Grant, Colo			1,500
Slaghts, Colo			1,500
Estabrook, Colo			1,500
Pine Grove, Colo			1,500
Dome Rock, Colo			1,500
Lake Creek, in Lake County, Colo			1,500

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Von Behr or brown trout (*Salmo fario*)—Continued:			
Rock Creek, in Lake County, Colo			5,500
Arkansas River, near Boulevard, Colo			5,000
Lower Evergreen Lakes, near Evergreen, Colo			2,000
Private ponds in Colorado			1,993
Kent Hollow, Milford, Conn			200
Private ponds in Illinois			50
Tippecanoe River, Monticello, Ind			500
Hartman Creek, South Bend, Ind			300
McCarty Creek, South Bend, Ind			200
Private ponds in Indiana			400
Canoe Creek, Decorah, Iowa			1,000
Spring Branch, Strawberry Point, Iowa			980
Private ponds in Kansas			350
Blue Lick Creek, near Louisville, Ky			200
Strait Creek, near Pineville, Ky			500
Clear Creek, near Pineville, Ky			500
Private pond in Kentucky			200
Toddy Pond, near Orland, Mo			743
Sideling Hill Creek, in Washington County, Md			423
Private ponds in Maryland			200
Smith Brook, near Hoosic Tunnel, Mass			200
Texas Creek, near Kalamazoo, Mich			425
Crystal Spring Lake, near Lawton, Mich			400
Birch Lake, near Williamsville, Mich			50
Monroe Creek, near Maple Ridge, Mich			400
Van Etten Creek, near Mikado, Mich			400
Centennial Mill Creek, near Daily, Mich			425
Houghton Creek, near Vassar, Mich			200
Cass River, near Vassar, Mich			200
Pine River, near Alma, Mich			800
Private ponds in Missouri			970
Little Blackfoot River, Elliston, Mont			1,000
Private ponds in Montana			500
Otter Creek, Ogallala, Nebr			1,000
Private ponds in Nebraska			300
Dark Canyon Stream, Eddy, N. Mex			1,000
Private ponds in New Mexico			1,350
Rockwell's Mill Creek, Bellevue, Ohio			300
Private ponds in Ohio			100
Mass Hope Creek, White Mills, Pa			300
Moose Creek, Clearfield, Pa			300
Crystal Lake, Spearfish, S. Dak			250
Turkey Creek, near Yankton, S. Dak			7,800
Cowardin Run, near Warm Springs, Va			419
Small brooks near Bennington, Vt			186
Vermont Fish Commission			200
Eighteen-mile Creek, near Pratt, Wis			250
Lost Creek, near Maiden Rock, Wis			1,975
Black-spotted trout (*Salmo mykiss*):			
Mammoth Lake, in Griffin County, Colo			6,000
Lake Creek, in Lake County, Colo			1,000
Mammoth Creek, in Griffin County, Colo			4,000
Rock Creek, in Lake County, Colo			2,000
French Creek, in Custer County, S. Dak			1,000
Squaw Creek, in Custer County, S. Dak			200
Iron Creek, in Custer County, S. Dak			300
Robin Creek, in Custer County, S. Dak			200
Spring Creek, in Pennington, S. Dak			700
Castle Creek, in Pennington, S. Dak			800
Rapid Creek, in Pennington, S. Dak			500
Spearfish Creek, in Lawrence, S. Dak			1,000
Whitewood Creek, in Deadwood, S. Dak			300
Brook trout (*Salvelinus fontinalis*):			
University of Michigan, Ann Arbor, Mich	500		
Lieut. H. R. Lemly, Columbia, S. A	10,000		
Private ponds in Arizona			500
South Clear Creek, near Georgetown, Colo			1,500
South Fork of White River, near Glenwood, Colo			1,250
Woody Lake, near Woody, Colo			1,000
Grape Creek, in Fremont County, Colo			3,000
South Boulder Creek, in Griffin County, Colo			4,000
Platte River, near Grant, Colo			1,500
Slaghts, Colo			1,500
Estabrook, Colo			1,500
Pine Grove, Colo			1,500
Dome Rock, Colo			1,500
Lake Creek, in Lake County, Colo			1,500
Rock Creek, in Lake County, Colo			3,000
Delaware Fish Commission			300
Baldwin Creek, near Cresco, Iowa			700

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Brook trout (*Salvelinus fontinalis*)—Continued:			
Streams in Dubuque County, Iowa			3,000
Craig Pond, near Orland, Me			1,479
Alamoosook Lake, near East Orland, Me			198
Streams in Wayne County, Mich			10,000
University of Michigan, Ann Arbor, Mich			34
Missouri Fish Commission			12
Bolen Pond, near Jasper, Mo			233
Otter Creek, near Ogallala, Nebr			1,000
Gallinas River, near E. Las Vegas, N. Mex			1,000
Santa Fe River, near Santa Fe, N. Mex			3,000
Lovejoy Creek, near Clyde, N. Y			253
Cold Creek, near Castalia, Ohio			1,890
Chester Creek, near Green Hill, Pa			375
Paradise Run, near Leaman Place, Pa			250
Starrucca Creek, near Thompson, Pa			375
Branch Creek, near Pocono, Pa			373
Private ponds in Pennsylvania			250
Turkey Creek, near Wakonda, S. Dak			5,000
French Creek, in Custer County, S. Dak			500
Squaw Creek, in Custer County, S. Dak			300
Iron Creek, in Custer County, S. Dak			200
Robin Creek, in Custer County, S. Dak			300
Spring Creek, in Pennington County, S. Dak			800
Castle Creek, in Pennington County, S. Dak			700
Rapid Creek, in Pennington County, S. Dak			500
Spearfish Creek, in Lawrence County, S. Dak			1,500
Whitewood Creek near Deadwood S. Dak			200
Kinnickinnick River, near River Falls, Wis			1,000
Lake trout (*Salvelinus namaycush*):			
University of Michigan, Ann Arbor, Mich	500		
John H. Gordon, South Bend, Wyo	50,000		
Wyoming Fish Commission	100,000		
Minnesota Fish Commission	50,000		
Vermont Fish Commission	100,000		
New Hampshire Fish Commission	100,000		
Nebraska Fish Commission	200,000		
New York Fish Commission	300,000		
Lake Superior, off mouth of Lester River, near Duluth, Minn		420,000	
Lake Superior, near Grand Marais, Minn		10,000	
Mackletts Channel, Minn		50,000	
Weager Creek, near South Bend, Ind			100
Turkey Lake, near Cedar Beach, Ind			2,531
Lake Maxinkuckee, near Marmont, Ind			2,531
Stanfield Lake, near South Bend, Ind			2,000
Twin Lakes, near Lima, Ind			2,000
Twin Lakes, near Garner, Iowa			1,427
Pilot Mound Lake, Garner, Iowa			500
Hickman Creek, near Lexington, Ky			200
Private pond in Kentucky			300
Lake Esau, near Bell, Mich			500
Walnut Lake, near Franklin, Mich			500
Boon Lake, near Franklin, Mich			500
Zukey Lake, near Hamburg Junction, Mich			2,000
Pickerel Lake, near Newaygo, Mich			1,000
Mill Creek, near Wingleton, Mich			3,400
Pleasant Lake, near Annandale, Minn			950
Otsego Lake, near Cooperstown, N. Y			1,950
Johnson Creek, near North Ridgeway, N. Y			1,475
Paint Creek, near Chillicothe, Ohio			200
Lake in Franklin Park, Columbus, Ohio			500
Letort Spring, near Carlisle, Pa			3,700
Lake Underwood, near Como, Ind			2,800
Upper Twin Lake, near Preston Park, Pa			3,900
Forest Stream Pond, near Wilmington, Vt			2,000
Pike River, near Kirton, Wis			2,000
Long Lake, near Spooner, Wis			2,000
Tescobia Lake, near Rice Lake, Wis			2,000
Lake herring (*Coregonus artedi*):			
Lake Erie, near Bass Islands		262,500	
Whitefish (*Coregonus clupeiformis*):			
Indiana Fish Commission	100,000		
Midland Counties Fish Culture Association, England	100,000		
Switzerland, Government of	100,000		
Pennsylvania Fish Commission	12,500,000		
Ohio Fish Commission	8,000,000		
Lake Superior, off mouth of Lester River, near Duluth, Minn		11,727,000	
Lake Superior, off mouth of ship canal, near Duluth, Minn		3,000,000	

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Whitefish (*Coregonus clupeiformis*)—Continued:			
Lake Superior, near Whitefish Point, Mich		2,000,000	
Lake St. Croix, off mouth of St. Croix River, in Wisconsin		2,000,000	
Lake Erie, near North Bass Island		1,000,000	
Rattlesnake Island		750,000	
Middle Bass Island		1,000,000	
Kelley Island		1,000,000	
Put-in-Bay Island		1,000,000	
Ballast Island		1,250,000	
Thunder Bay, near Alpena, Mich		2,250,000	
Lake Huron, near Alpena, Mich		1,500,000	
East Tawas, Mich		2,000,000	
Harrisville, Mich		2,000,000	
Au Sable, Mich		2,000,000	
Lake Michigan, near Naubinway, Mich		2,000,000	
Epoufette, Mich		2,000,000	
Whitefish Lake, near Corinne, Mich		2,000,000	
Lake Ontario, near Sacketts Harbor, N. Y		2,000,000	
Oswego, N. Y		801,000	
Scriba, N. Y		875,000	
Otsego Lake, near Cooperstown, N. Y		314,000	
Yellow perch (*Perca flavescens*):			
Feather River, near Gridley, Cal			3,000
Lake Cuyamaca, San Diego, Cal			3,980
Private ponds in Illinois			750
Glenwood Lake, near Galesburg, Ill			300
Rock River, near Milan, Ill			1,230
Sni Ecarte Lake, near East Hannibal, Ill			300
Illinois River, near La Salle, Ill			50
Meredosia, Ill			(25,000)
Kankakee River, near Kankakee, Ill			200
Island Pond, near Waterloo, Ill			34
Gilmore Lake, near Columbia, Ill			33
Sucker State Pond, near Carlisle, Ill			33
Private ponds in Kansas			650
Lake Evelyn, near Bonner Springs, Kans			2,250
Elm Creek, near Sawyer, Kans			1,700
Private ponds in Kentucky			4,500
Big Pool, near Hagerstown, Md			1,487
Private ponds in Missouri			50
Salisbury Fish Pond, Salisbury, Mo			25
City reservoir, near Moberly, Mo			50
Private ponds in New Mexico			250
Blue Water, near Blue Water, N. Mex			100
Private ponds in Ohio			333
Lake Mere, near Kenton, Ohio			1,862
Ohio Fish Commission			2,750
Nixon River, near Faulkton, S. Dak			516
James River, near Huron, S. Dak			518
Turtle Creek, near Redfield, S. Dak			516
Lake Kampeska, near Pierre, S. Dak			1,750
Loon Lake, near Spokane Falls, Wash			500
Camp Lake, Camp Lake, Wis			33
Silver Lake, Silver Lake, Wis			33
Cedar Lake, near Schleisingerville, Wis			33
Browne Lake, near Burlington, Wis			33
Phantom Lake, near Mukwonago, Wis			33
Crooked Lake, near Mukwonago, Wis			33
Chain of Lakes, near Waupaca, Wis			35
Pike perch (*Stizostedion vitreum*):			
Pennsylvania Fish Commission	15,000,000		
Pike River, in Minnesota	15,000,000		
St. Louis River, in Minnesota	10,000,000		
Lake Superior, in Minnesota	5,000,000		
Lake Erie, near Put-in-Bay Island		2,500,000	
North Bass Island		1,500,000	
North Bass and Middle Bass Islands		2,000,000	
West Sister Island		6,000,000	
Quinnebaug River, near Putnam, Conn		1,000,000	
Wild Cat River, near Kokomo, Ind		1,500,000	
Salmonia River, near Warren, Ind		1,500,000	
Mississinewa River, near Marion, Ind		1,500,000	
Iroquois River, near Rensselaer, Ind		1,500,000	
Cedar Lake, near Lima, Ind		4,700,000	
Twin Lakes, near Lima, Ind		4,700,000	
Diamond Lake, near Ligonier, Ind		50,000	
Chain Lake, near South Bend, Ind		100,000	
Stone and Pine Lake, near La Porte, Ind		200,000	
Pike, Eagle, and Chapman lakes, near Warsaw, Ind		200,000	
Cedar Lake, near Ora, Ind		50,000	
Little Clam Lake, near Cadillac, Mich		1,850,000	

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Pike perch (*Stizostedion vitreum*)—Continued:			
Big Clam Lake, near Cadillac, Mich		1,850,000	
Scioto River, near Kenton, Ohio		1,000,000	
Grand Reservoir, near Carthagena, Ohio		1,000,000	
Maumee River, near Cecil, Ohio		1,000,000	
Tuscarawas River, near Zoar, Ohio		1,000,000	
Maumee River, near Toledo, Ohio		500,000	
Grand Reservoir, near Celina, Ohio		500,000	
Blanchard River, near Ottawa, Ohio		1,000,000	
Litchfield Creek, near Winchester, Ky		1,000,000	
North fork of Kentucky River, near Ford, Ky		2,000,000	
Silver Creek, near Slate Lick, Ky		1,000,000	
Rockcastle River, near Livingston, Ky		2,000,000	
Cumberland River, near Pineville, Ky		3,000,000	
Salt River, near Shepherdsville, Ky		400,000	
Elizabethtton, Ky		400,000	
Nolin Creek, near Nolin, Ky		400,000	
Big Barren River, near Bowling Green, Ky		400,000	
Private ponds in Kentucky			100
Sea bass (*Serranus atrarius*):			
Vineyard Sound, Massachusetts coast		200,000	
White bass (*Roccus chrysops*):			
Private ponds in Illinois			75
Sni Ecarte, near East Hannibal, Ill			400
Illinois River, near La Salle, Ill			100
Meredosia, Ill			(15,000)
Kankakee River, near Kankakee, Ill			25
Upper Iowa River, near Decorah, Iowa			447
Private ponds in Kansas			25
Little Blue River, near Hanover, Kans			200
Big Pool, near Hagerstown, Md			24
Pertle Spring, near Warrensburg, Mo			50
Loon Lake, near Spokane Falls, Wash			500
Liberty Lake, near Spokane Falls, Wash			100
Black bass (*Micropterus salmoides* and *M. dolomieu*):			
Private pond in Arkansas			50
Lake Cuyamaca, near San Diego, Cal			1,000
Feather River, near Gridley, Cal			620
Private pond in Connecticut			222
District of Columbia			400
Private ponds in Illinois			150
Du Page River, near Burlington Park, Ill			50
Glenwood Lake, near Galesburg, Ill			50
Rock River, near Milan, Ill			175
Sni Ecarte Lake, near East Hannibal, Ill			25
Illinois River, near La Salle, Ill			25
Kankakee River, near Kankakee, Ill			25
Island Pond, near Waterloo, Ill			50
Gilmore Lake, near Columbia, Ill			50
Sucker State Pond, near Carlisle, Ill			50
Flat Rock River, near Flat Rock, Ind			300
White River, near Indianapolis, Ind			211
Wall Lake, near Lake View, Iowa			247
Mineral Park Lake, near Dow City, Iowa			248
Upper Iowa River, near Decorah, Iowa			294
Private ponds in Kansas			175
Lake Evelyn, near Bonner Springs, Kans			900
Little Blue River, near Hanover, Kans			425
Elm Creek, near Sawyer, Kans			350
Private ponds in Kentucky			1,000
Sherman Lake, near Williamstown, Ky			15
Cumberland River, near Williamsburg, Ky			15
Reinecke Lake, near Madisonville, Ky			50
Spring Lake, near Versailles, Ky			14
Madisonville, Ky			50
Loch Mony Lake, near Madisonville, Ky			50
Licking River, near Covington, Ky			150
Drennen Creek, near Eminence, Ky			25
Elk Horn Creek, near Switzer, Ky			425
Lexington, Ky			50
Private applicants in Maryland			107
Big Pool, near Hagerstown, Md			34
Potomac River, near Woodmont Club House, Washington County, Md			2,035
Prospect Pond, near Taunton, Mass			200
Nine Mile Lake, near Centreville, Mass			500
Private pond in Michigan			55
Missouri			50
Lake Contrary, near St. Joseph, Mo			130
Miller Lake, near Moberly, Mo			50
Pertle Springs, near Warrensburg, Mo			100

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Black bass (*Micropterus salmoides and M. dolomieu*)—Cont'd:			
Salisbury Fish Pond, near Salisbury, Mo			50
City Reservoir, Moberly, Mo			50
McNutt Pond, near Indian Creek, Mo			1,000
Private pond in New York			48
Wildmere Lake, near Copake Iron Works, N. Y			150
Private ponds in New Mexico			67
Ohio			213
Muzzy Lake, near Ravenna, Ohio			100
Bass Lake, near Chardon, Ohio			350
Lake Mere, near Kenton, Ohio			502
Brady Lake, near Chardon, Ohio			50
Ohio Fish Commission			175
Private ponds in Pennsylvania			150
Nixon River, near Faulkton, S. Dak			225
James River, near Huron, S. Dak			225
Turtle Creek, near Redfield, S. Dak			225
Lake Kampeska, near Watertown, S. Dak			500
Private ponds in Texas			1,280
Texas and Pacific R. R. Company's pond, near Iatan, Texas			1,105
Hosmore Pond, near North Craftsbury, Vt			600
Loon Lake, near Spokane Falls, Wash			100
Liberty Lake, near Spokane Falls, Wash			25
Camp Lake, near Camp Lake, Wis			33
Silver Lake, near Silver Lake, Wis			33
Cedar Lake, near Schleisingerville, Wis			33
Browne Lake, near Burlington, Wis			66
Phantom Lake, near Mukwonago, Wis			66
Crooked Lake, near Mukwonago, Wis			66
Chain of Lakes, near Waupaca, Wis			70
Crappie (*Pomoxis annularis* and *P. sparoides*):			
Lake Cuyamaca, near San Diego, Cal			285
Private ponds in Connecticut			25
Private ponds in Illinois			230
Du Page River, near Burlington Park, Ill			50
Glenwood Lake, near Galesburg, Ill			50
Rock River, near Milan, Ill			75
Sni Ecarte Lake, near East Hannibal, Ill			500
Illinois River, near La Salle, Ill			300
Meredosia, Ill			(5,000)
Kankakee River, near Kankakee, Ill			75
Island Pond, near Waterloo, Ill			168
Gilmore Lake, near Columbia, Ill			166
Sucker State Pond, near Carlyle, Ill			166
Flat Rock River, near Flat Rock, Ind			150
White River, near Indianapolis, Ind			5
Wall Lake, near Lake View, Iowa			95
Mineral Park Lake, near Dow City, Iowa			95
Upper Iowa River, near Decorah, Iowa			50
Private ponds in Kansas			150
Little Blue River, near Hanover, Kans			370
Elm Creek, near Sawyer, Kans			50
Private ponds in Kentucky			355
Sherman Lake, near Williamstown, Ky			30
Cumberland River, near Williamsburg, Ky			30
Reinecke Lake, near Madisonville, Ky			25
Spring Lake, near Madisonville, Ky			25
Loch Mony Lake, near Madisonville, Ky			25
Licking River, near Covington, Ky			150
Drennen Creek, near Eminence, Ky			25
Elk Horn Creek, near Switzer, Ky			425
Lexington, Ky			50
Lake Contrary, near St. Joseph, Mo			150
Miller Lake, near Moberly, Mo			50
Pertle Springs, near Warrensburg, Mo			75
Salisbury Fish Pond, near Salisbury, Mo			75
City Reservoir, near Moberly, Mo			75
McNutt Pond, near Indian Creek, Mo			95
Hickory Creek, near Neosho, Mo			12
Susquehanna River, near Oneonta, N. Y			211
Private ponds in New Mexico			25
North Carolina			50
Ohio			75
Lake Mere, near Kenton, Ohio			50
Ohio Fish Commission			25
Nixon River, near Faulkton, S. Dak			63
James River, near Huron, S. Dak			64
Turtle Creek, near Redfield, S. Dak			63
Lake Kampeska, near Pierre, S. Dak			200
Private ponds in Texas			80
Loon Lake, near Spokane Falls, Wash			220

Details of distribution, 1891–92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Crappie (*Pomoxis annularis and P. sparoides*)—Continued:			
Liberty Lake, near Spokane Falls, Wash			50
Camp Lake, near Camp Lake, Wis			58
Silver Lake, near Silver Lake, Wis			58
Cedar Lake, near Schleisingerville, Wis			58
Browne Lake, near Burlington, Wis			58
Phantom Lake, near Mukwonago, Wis			58
Crooked Lake, near Mukwonago, Wis			58
Chain of Lakes, near Waupaca, Wis			60
Rock bass (*Ambloplites rupestris*):			
Private ponds in Alabama			500
Arkansas			50
Feather River, near Gridley, Cal			100
Lake Cuyamaca, near San Diego, Cal			400
Private ponds in Georgia			500
Illinois			400
Du Page River, near Burlington, Ill			240
Glenwood Lake, near Galesburg, Ill			50
Rock River, near Milan, Ill			75
Illinois River, near La Salle, Ill			650
Kankakee River, near Kankakee, Ill			25
Island Pond, near Waterloo, Ill			34
Gilmore Lake, near Columbia, Ill			33
Sucker State Pond, near Carlyle, Ill			33
Flat Rock River, near Flat Rock, Ind			200
White River, near Indianapolis, Ind			125
Wall Lake, near Lake View, Iowa			269
Mineral Park Lake, near Dow City, Iowa			270
Upper Iowa River, near Decorah, Iowa			50
Private ponds in Kansas			100
Kentucky			200
Clear Creek, near Shelbyville, Ky			480
Reinecke Lake, near Madisonville, Ky			65
Spring Lake, near Madisonville, Ky			65
Loch Mony Lake, near Madisonville, Ky			65
Private ponds in Maryland			690
Big Pool, near Hagerstown, Md			124
Scadings Pond, near Taunton, Mass			200
Miller Lake, near Moberly, Mo			150
Indian Creek, McDonald County, Mo			1,000
Hickory Creek, near Neosho, Mo			112
Private ponds in New Jersey			350
New Mexico			350
North Carolina			1,800
Ohio			650
Muzzy Lake, near Ravenna, Ohio			50
Bass Lake, near Chardon, Ohio			50
Brady Lake, near Chardon, Ohio			100
Private ponds in Pennsylvania			500
Connoduquinet Creek, near Mechanicsburg, Pa			1,500
Private ponds in South Carolina			500
Nixon River, near Faulkton, S. Dak			256
James River, near Huron, S. Dak			258
Turtle Creek, near Redfield, S. Dak			256
Private ponds in Tennessee			1,050
Texas			200
T. and P. R. R. Co.'s pond, near Iatan, Tex			1,000
Private ponds in Virginia			9,800
West Virginia			50
Camp Lake, near Camp Lake, Wis			33
Silver Lake, near Silver Lake, Wis			33
Cedar Lake, near Schleisingerville, Wis			33
Browne Lake, near Burlington, Wis			33
Phantom Lake, near Mukwonago, Wis			33
Crooked Lake, near Mukwonago, Wis			33
Chain of lakes, near Waupaca, Wis			35
Sunfish (*Lepomis, sp.*):			
Max von dem Borne, Berneuchen, Germany			338
Private ponds in Illinois			1,030
Du Page River, near Burlington Park, Illinois			314
Glenwood Lake, near Galesburg, Ill			25
Sni Ecarte Lake, near East Hannibal, Ill			675
Kankakee River, near Kankakee, Ill			200
Island Pond, near Waterloo, Ill			118
Gilmore Lake, near Columbia, Ill			116
Sucker State Pond, near Carlyle, Ill			116
Flat Rock River, near Flat Rock, Ind			470
Wall Lake, near Lake View, Iowa			50
Mineral Park Lake, near Dow City, Iowa			50
Upper Iowa River, near Decorah, Iowa			567
Private ponds in Kansas			200

Details of distribution, 1891-92—Continued.

Species and disposition.	Eggs.	Fry.	Adults and yearlings.
Sunfish (*Lepomis*, sp.)—Continued:			
Lake Evelyn, near Bonner Springs, Kans			300
Little Blue River, near Hanover, Kans			90
Elm Creek, near Sawyer, Kans			500
Private ponds in Kentucky			925
Sherman Lake, near Williamstown, Ky			35
Cumberland River, near Williamsburg, Ky			225
Spring Lake, near Versailles, Ky			16
Drennen Creek, near Eminence, Ky			25
Elk Horn Creek, near Switzer, Ky			150
Lexington, Ky			25
Big Pool, near Hagerstown, Md			86
Deer Creek, near Bel Air, Md			82
Private ponds in Missouri			50
Lake Contrary, near St. Joseph, Mo			250
Miller Lake, near Moberly, Mo			25
Pertle Springs, near Warrensburg, Mo			75
Salisbury Fish Pond, near Salisbury, Mo			65
City reservoir, near Moberly, Mo			500
Private ponds in Ohio			223
Muzzy Lake, near Ravenna, Ohio			150
Lake Mere, near Kenton, Ohio			75
Brady Lake, near Chardon, Ohio			150
Ohio Fish Commission			376
Private ponds in North Carolina			152
Loon Lake, near Spokane Falls, Wash			350
Liberty Lake, near Spokane Falls, Wash			150
Camp Lake, near Camp Lake, Wis			47
Silver Lake, near Silver Lake, Wis			47
Cedar Lake, near Schleisingerville, Wis			47
Phantom Lake, near Mukwonago, Wis			47
Crooked Lake, near Mukwonago, Wis			47
Chain of lakes, near Waupaca, Wis			50
Pike (*Lucius lucius*):			
Feather River, near Gridley, Cal			100
Lake Cuyamaca, near San Diego, Cal			400
Private ponds in Illinois			148
Du Page River, near Burlington Park, Ill			725
Glenwood Lake, near Galesburg, Ill			25
Flat Rock River, near Flat Rock, Ind			200
Wall Lake, near Lake View, Iowa			95
Mineral Park Lake, near Dow City, Iowa			95
Elm Creek, near Sawyer, Kans			70
Miller Lake, near Moberly, Mo			25
Private ponds in Ohio			8
Brady Lake, near Chardon, Ohio			75
Scup (*Stenotomus chrysops*):			
Buzzards Bay, off Massachusetts coast		35,000	
Cod (*Gadus morrhua*):			
Buzzards Bay, off Massachusetts coast		25,671,000	
Massachusetts Bay, off Massachusetts coast		27,124,500	
Pollock (*Pollachius virens*):			
Massachusetts Bay, off Massachusetts coast		2,473,500	
Flatfish (*Pseudopleuronectes americanus*):			
Buzzards Bay, off Massachusetts coast	2,764,000	3,510,000	
Lobster (*Homarus americanus*):			
Buzzards Bay, off Massachusetts coast		5,799,000	
Totals	75,887,000	228,008,070	2,023,276

Figures inclosed in parenthesis are not included in summations.