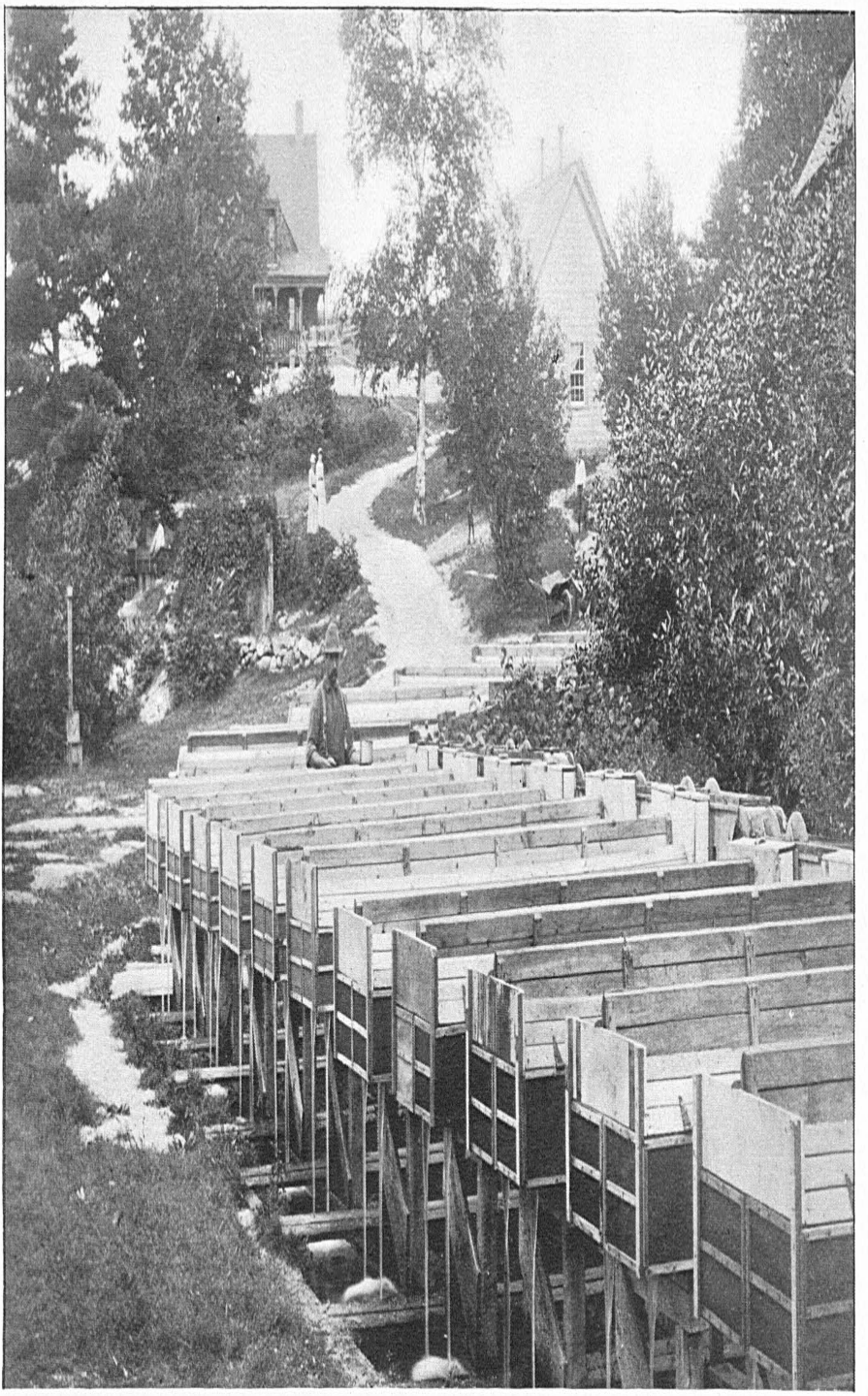


SALMON REARING TROUGHS, WITH RESIDENCE AND BARRACKS IN BACKGROUND, CRAIG BROOK STATION, ME.

REPORT ON THE PROPAGATION AND DISTRIBUTION OF FOOD-FISHES.

By W. DEC. RAVENEL, *Assistant in Charge.*

INTRODUCTION.

The work of the Division of Fish Culture was prosecuted on the same general lines as in past years, and its important features are shown in the following abstracts of the annual reports submitted by the superintendents of the various stations. The propagation and distribution of carp and tench were discontinued, the hatching of pike perch at the stations on Lakes Superior, Erie, and Ontario was suspended, and the collection and distribution of pike, catfish, yellow perch, and other coarse fishes from the overflows of the Mississippi and Illinois rivers were given up.

Recognizing the necessity of maintaining the supply of mackerel and lobsters, two of the most important fisheries of New England, the steamer *Fish Hawk* and the schooner *Grampus* were detailed by the Commissioner during the spring to collect eggs of these species. They were stationed in Casco Bay, Maine, where the eggs collected were hatched and the fry liberated. At Woods Hole and Gloucester stations the lobster work was increased and the propagation of mackerel was undertaken. While the results attained with the mackerel were not as large as anticipated, it is hoped, with the experience gained this year, that important work may be done in the future. At Woods Hole Station the propagation of tautog was also taken up, and the results were encouraging.

On the Pacific Coast a field station was established on the Snake River, near Weiser, Idaho, with the view to increasing the plants of salmon in the Columbia River Basin, and in addition to the usual plants of salmon fry in the Columbia and Sacramento rivers over 500,000 fingerling salmon, measuring from 2½ to 3 inches, were liberated in Clackamas River and 250,000 in the McCloud during May, from which it is believed important results will follow. Large deposits of steelhead fry were again made this year in the tributaries of Lakes Superior, Michigan, Huron, and Ontario, also in the Hudson River under the direction of the New York Fish Commission, and in the tributaries of Penobscot River, Maine.

In addition to his regular work the writer acted as representative of the United States Fish Commission on the Government board of management at the Cotton States and International Exposition, held at Atlanta, Ga., from September 18 to December 31. His presence was required in Atlanta during the month of September to superintend the installation of the exhibit, which embraced a display of the apparatus used in fish-cultural work and scientific investigations and fisheries of America, also a hatchery where practical fish-cultural work was conducted and a large aquarium where the important food-fishes of the South Atlantic, Gulf, and Middle States were displayed. While the writer was absent from Washington the work of the division was directed by J. F. Ellis, superintendent of the car and messenger service.

INSPECTION OF STATIONS.

The assistant inspected the fish-cultural stations at St. Johnsbury, Vt., Woods Hole and Gloucester, Mass., Wytheville, Va., Northville, Mich., and Put-in Bay, Ohio, during the year and submitted reports covering recommendations for improvements, etc.

STATION OPERATIONS.

The stations operated during the year and the number of fish and eggs furnished for distribution by each are shown in the following tables, also a summary of the fish distributed, including 32 species and 1 crustacean, the lobster. A comparison of this season's work with the previous one shows a large increase in the output of fry of most of the important commercial species propagated—such as the shad, salmon, lake trout, whitefish, cod, flatfish, and lobster.

Statement of fish and fish eggs furnished for distribution by the stations of the United States Commission of Fish and Fisheries during the fiscal year 1895–96.

Source of supply.	Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Green Lake, Me	Landlocked salmon	4,000	67,621	37,382
	Brook trout	65,000	41,549	10,896
	Von Behr trout	35,000	19,305	
	Lake trout			2,175
	Golden trout		21,700	10
Craig Brook, Me	Atlantic salmon	279,000		151,676
	Landlocked salmon			12,225
	Brook trout			27,763
	Rainbow trout			10,000
	Scotch sea trout	5,100		1,376
	Steelhead trout		50,086	
St. Johnsbury, Vt	Atlantic salmon		19,000	
	Steelhead trout		4,000	1,035
	Brook trout	25,000	5,000	
	Rainbow trout		26,000	
	Lake trout		54,174	
Gloucester, Mass	Lobster		13,050,000	
	Cod		24,859,000	
	Mackerel		897,000	
Woods Hole, Mass	Lobster		83,707,000	
	Cod	846,000	40,507,000	
	Tautog		17,575,000	
	Flatfish		8,472,000	
	Mackerel		831,000	
Cape Vincent, N. Y	Lake trout		1,650,000	
	Brook trout		22,100	
	Rainbow trout		6,600	
	Whitefish		20,000,000	

Statement of fish and fish eggs furnished for distribution by the stations of the United States Commission of Fish and Fisheries during the fiscal year 1895-96—Continued.

Source of supply.	Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Delaware River (steamer *Fish Hawk*).	Shad	1,183,000	22,056,000	
	Lobster		322,000	
	Mackerel		213,500	
Battery Island, Md	Shad	1,165,000	36,117,000	
Fish Ponds, District of Columbia.	Carp			91,105
	Goldfish			2,137
	Black bass (large mouth)			5,959
	Black bass (small mouth)			1,208
	Tench			50,363
	Golden tench			44
	Golden ide			87
	Shad			1,000,000
Central Station, District of Columbia.	Lake trout		8,947	
	Rainbow trout		12,540	
	Von Behr trout		8,422	
	Yellow perch		812,000	
	Shad		36,529,000	
Bryan Point, Md	Shad	44,174,000		
Wytheville, Va	Rainbow trout	185,000	112,000	74,243
	Black-spotted trout			(adult) 17
	Black bass			1,460
	Rock bass			12,945
	Carp			75
	Goldfish			30
Put-in Bay, Ohio	Whitefish		122,890,000	
	Lake trout		685,400	
	Lake herring		696,000	
Northville, Mich	Lake trout	955,000	1,295,000	
	Brook trout	40,000	210,000	300
	Von Behr trout		30 000	
	Loch Leven trout	20,000	17,000	
	Rainbow trout		21,000	
	Steelhead trout		55,000	
Alpena, Mich	Whitefish	50,000	35,850,000	
Duluth, Minn	Whitefish		10,000,000	
	Lake trout	50,000	4,400,000	
	Steelhead trout		135,000	
	Rainbow trout		16,000	
	Brook trout		3,200	
Quincy, Ill	Black bass			18,637
	Ring perch			3,100
	Pickerel			1,550
	Warmouth bass			200
	Crappie			51
	White bass		20,000	
	Carp			7,008
Neosho, Mo	Rainbow trout	222,694	30,940	88,933
	Von Behr trout			2,186
	Brook trout			600
	Black bass			9,338
	Rock bass			25,248
	Tench			49
	Goldfish			994
Leadville, Colo	Brook trout		332,000	47,800
	Rainbow trout		25,050	4,530
	Yellow-finned trout		7,700	
	Black-spotted trout	35,000	11,000	
	Loch Leven trout	30,000		
Baird, Cal	Quinnat salmon	6,170,800	650,000	
Fort Gaston, Cal	Von Behr trout	10,000		
	Rainbow trout	30,000		
	Steelhead trout	175,000	107,808	
	Quinnat salmon		65,700	
Clackamas, Oreg	Quinnat salmon		2,832,150	557,150

Summary of distribution.

Species.	Eggs.	Fry.	Adults and yearlings.	Total.
Carp			87,203	87,203
Tench			44,149	44,149
Goldfish			2,875	2,875
Golden ide			8	8
Golden tench			45	45
Shad	2,228,000	90,253,500	1,000,000	93,481,500
Quinnat salmon	6,170,800	3,297,850	807,150	10,275,800
Atlantic salmon	279,000	19,000	151,676	449,676
Landlocked salmon	4,000	67,525	48,851	120,376
Steelhead trout	175,000	345,715	1,035	521,750
Loch Leven trout	50,000	17,000		67,000
Rainbow trout	437,694	237,248	145,934	820,876
Von Behr trout	45,000	57,717	1,000	103,717
Black-spotted trout	35,000	11,600	17	46,617
Brook trout	130,000	601,880	82,179	814,059
Lake trout	1,005,000	7,989,618	2,000	8,996,618
Yellow-fin trout		7,700		7,700
Golden trout		21,700	10	21,710
Scotch sea trout	5,100		1,376	6,476
Whitefish	50,000	189,690,000		189,740,000
Yellow perch		812,000	2,235	814,235
Pickerel			1,400	1,400
Lake herring		696,000		696,000
Black bass (large mouth)			33,737	33,737
Black bass (small mouth)			915	915
Rock bass			34,791	34,791
Sunfish			35	35
White bass		19,500		19,500
Cod	846,000	65,366,000		66,212,000
Flatfish		8,472,000		8,472,000
Lobster		97,079,000		97,079,000
Tautog		17,575,000		17,575,000
Mackerel		1,941,500		1,941,500
Total	11,460,594	484,579,053	2,448,621	498,488,268

NOTE.—2,333,000 shad fry were deposited for rearing in the Fish Ponds, Washington, D. C., but these figures are not included in the summations.

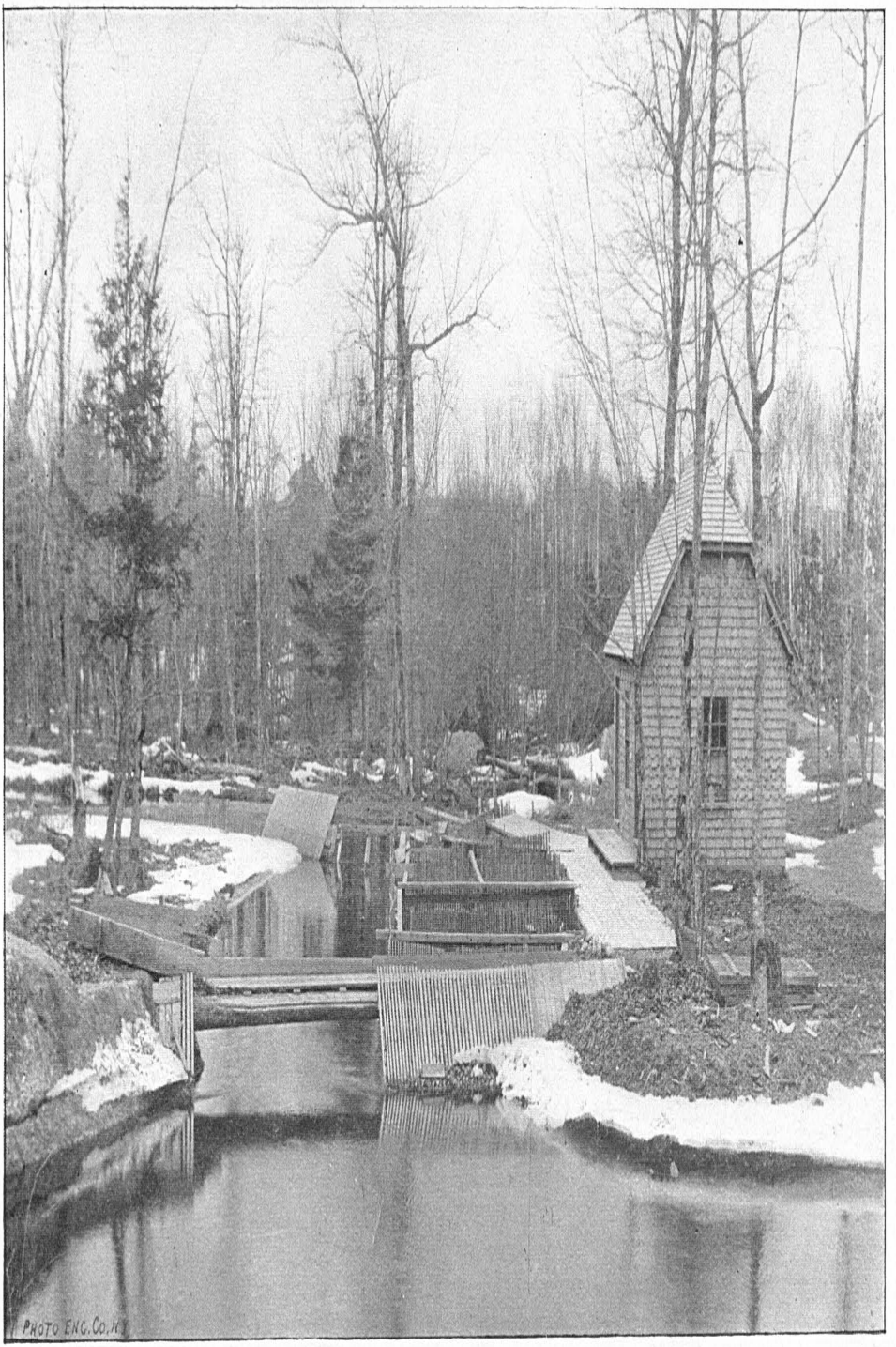
In addition to the foregoing there were furnished for distribution, but lost in transit, 10,985 carp, 6,263 tench, 280 goldfish, 79 golden ide, 756 landlocked salmon, 31,772 rainbow trout, 1,186 Von Behr trout, 5,180 brook trout, 175 lake trout, 865 yellow perch, 150 pickerel, 1,657 black bass (large mouth), 293 black bass (small mouth), 3,602 rock bass (yearlings and adults). The following losses occurred in fry and fingerlings: 4,448,500 shad, 50,000 whitefish, 500 white bass, 103,903 lake trout.

GREEN LAKE STATION, MAINE (E. E. RACE, SUPERINTENDENT).

At the beginning of the year the stock of fish on hand was as follows:

Species.	Calendar year in which hatched.			
	1895.	1893.	1892.	1891.
Landlocked salmon	54,050	3		3,000
Brook trout	13,350	138		
Golden trout	6,480			
Lake trout	61,539			
Von Behr trout			1,150	
Rainbow trout		7		
Total	136,319	148	1,150	3,000

Owing to the small amount of water available for the rearing-troughs and tubs at the temporary nursery east of the spawning-house, it became necessary to remove the brook and golden trout to the hatchery and the lake trout to the spring on the Government property near the main flume, between the hatchery and Rocky Pond.



RACK AND PENS FOR CAPTURING AND HOLDING SALMON AND TROUT AT GREAT BROOK, WHERE IT ENTERS GREEN LAKE. SPAWNING HOUSE TO THE RIGHT.

Heavy losses of salmon and lake-trout fry were sustained during July and August, due to the high temperature of the water. In September the stock remaining at the station was distributed, consisting of 37,382 landlocked salmon, 10,896 brook trout, 2,175 lake trout, 22,834 brook trout, and 9,208 rainbow trout, which had been transferred from Craig Brook Station.

The usual arrangements were made for collecting eggs from wild fish taken in Green Lake, Flood Pond, Patton Pond, and Winkempaugh Brook. In Green Lake a V-shaped trap was built at the entrance of Great Brook, and seven pens, varying in length from 30 to 50 feet, were constructed for holding the brood fish. Similar pens were constructed in Winkempaugh Brook, Patton Pond, and Flood Pond, and a pound net was set in Mann Brook, the crib being located in water 10 feet deep. The first landlocked salmon was caught in Green Lake on September 18 and the last on November 28. The first eggs were taken on November 3 and the last on November 27. The spawning season of the brook trout commenced October 19 and ended November 27.

The following table shows the number of brook trout and landlocked salmon taken from the various traps and the number of eggs obtained. At the close of the season the adult fish were returned without loss to the waters from which they had been taken.

Body of water.	Landlocked salmon.		Brook trout.		Golden trout.	
	Fish.	Eggs.	Fish.	Eggs.	Fish.	Eggs.
Green Lake	64	73,000	14	90,900		
Flood Pond	4	11,000	110	40,000	60	34,000
Patton Pond	15	2,500	136	60,000		
Winkempaugh Brook	5	9,400	232	198,000		
Total	88	95,900	501	343,900	60	34,000

The small collections of landlocked salmon eggs were very discouraging, as every effort had been made to increase the output of that species. The poor results were undoubtedly due to the fact that the water in Green Lake and its tributaries was so low that the salmon could not ascend to their usual spawning-grounds. Throughout the entire summer the water in the lake was lower than had been known for years, and the steamer *Senator* was unable to land at the station wharf for several weeks.

In addition to the collections secured from wild fish, 14,300 brook-trout eggs, 190,600 Von Behr, and 700 hybrid Von Behr and brook-trout eggs were taken from the brood stock at the station. Seventy-six domesticated landlocked salmon, which had been reared in the reservoir, were stripped during December, but most of the eggs secured from them were worthless. A lot of 4,500 was placed in the hatching-troughs, but no fry were hatched from them. The eggs from these fish were smaller and the color darker than those taken from the wild fish. The fish also differed materially in shape and color, those reared in the reservoir being

darker and having long, slender bodies interspersed with black spots, whereas the wild fish in Green Lake are almost similar in color to the sea salmon.

On December 1 the total number of eggs on hand was as follows: Landlocked salmon, 90,400; brook trout, 407,700; Von Behr trout, 149,000; golden trout, 34,000.

During the fall shipments of eggs were made as follows:

Applicant.	Species.	Number furnished.
Maine Fish Commission, Enfield, Me	Brook trout	40,000
Vermont Fish Commission, Roxbury, Vt	Von Behr trout	10,000
Central Station, Washington, D. C	do	10,000
C. W. Willard, Westerly, R. I	do	10,000
Jno. W. Forbes, Bedford, Ohio	do	15,000
E. C. Kent, Tuxedo Park, N. Y	Landlocked salmon	2,000
Edward Layton, Branchville, N. J	do	2,000
Total		89,000

Large losses of fry occurred in the early part of May, when the air temperature reached a height unprecedented at that season for many years. On May 10 the temperature in the hatchery from 10 a. m. to 5 p. m. ranged from 90° to 92°, and the water temperature rose from 54° to 62½°. The principal losses occurred among the landlocked salmon, being especially heavy among those which had not absorbed the sac. The brook-trout eggs commenced hatching on March 15 and finished on April 1. The balance of the eggs hatched during April, the last of the landlocked salmon and Von Behrs hatching on the 29th.

The losses of brook-trout eggs during the winter were very heavy, due, probably, to imperfect fertilization and to injuries received in transportation to the hatchery. In May, when the fry were all transferred to the troughs outside the hatchery, there remained on hand 85,307 landlocked salmon, 114,174 brook trout, 37,732 Von Behr, and 29,983 golden trout.

In May the architect of the Commission visited the station, and after consultation with the superintendent prepared the necessary plans for improving and increasing the water supply for the hatchery; he also arranged for the acquirement of additional spring water, for the construction of new ponds, and for repairs to Mountainy Pond Dam. These recommendations having been approved, it became necessary to cut off the water supply from the hatchery and ponds and to distribute all of the fry on hand before undertaking the improvements. During the latter part of June 67,817 landlocked salmon, 41,215 brook trout, 19,305 Von Behr trout, and 21,710 golden trout were distributed to applicants in Maine, Vermont, New Hampshire, and Massachusetts. The improvements were then commenced under the direction of the superintendent.

REARING PONDS—LAKE ALAMOOSOOK IN BACKGROUND—CRAIG BROOK STATION, ME.

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

During the year ten species of fish were handled at the station. The stock on hand July 1, 1895, was as follows:

Species.	Calendar year in which hatched.				
	1895.	1894.	1893.	1892.	1891 or earlier.
Atlantic salmon	176,954	624	342	.....	.....
Atlantic salmon, domesticated	.....	216	725	50	.....
Landlocked salmon	12,590	.....	.....	.....	5
Brook trout	39,331	.....	.....	.....	.....
Rainbow trout	11,506	.....	.....	.....	1
Scotch sea trout	3,313	.....	.....	.....	22
Swiss lake trout	20	.....	.....	.....	.....
Total	243,714	840	1,067	50	28

These fish were cared for during the summer in the usual manner, in troughs and ponds, being fed on chopped beef, butchers' offal, and maggots. In the fall the Atlantic salmon were liberated in adjacent waters tributary to the Penobscot, and the landlocked salmon, brook and rainbow trout were shipped to Green Lake for distribution from that point to applicants in Maine and neighboring States.

The total distribution of yearling fish from the station consisted of 151,676 Atlantic salmon, 12,225 landlocked salmon, 27,763 brook trout, 10,000 rainbow trout, and 1,376 Scotch sea trout.

The following table shows the number of eggs from which the fish distributed in the fall were reared, also the percentage of fish distributed as compared with the number of eggs, the fry hatched, and number on hand June 1, when they were placed in the rearing-ponds:

Species.	Number of eggs.	Number of fry hatched.	On hand June 1, 1895.	Remaining at fall count.		
				Number.	Per cent.	
Atlantic salmon	206,350	206,109	199,779	151,761	74	74 76
Landlocked salmon	14,867	14,670	13,187	12,228	83	83 93
Brook trout	61,341	61,145	45,959	27,777	45	45 61
Scotch sea trout	9,309	8,150	6,297	3,384	36	36 55
Rainbow trout	20,961	20,260	12,290	10,590	51	52 86
Swiss lake trout	2,234	541	57	39	2	7 69
Total	315,062	310,875	277,569	205,779	65	66 78

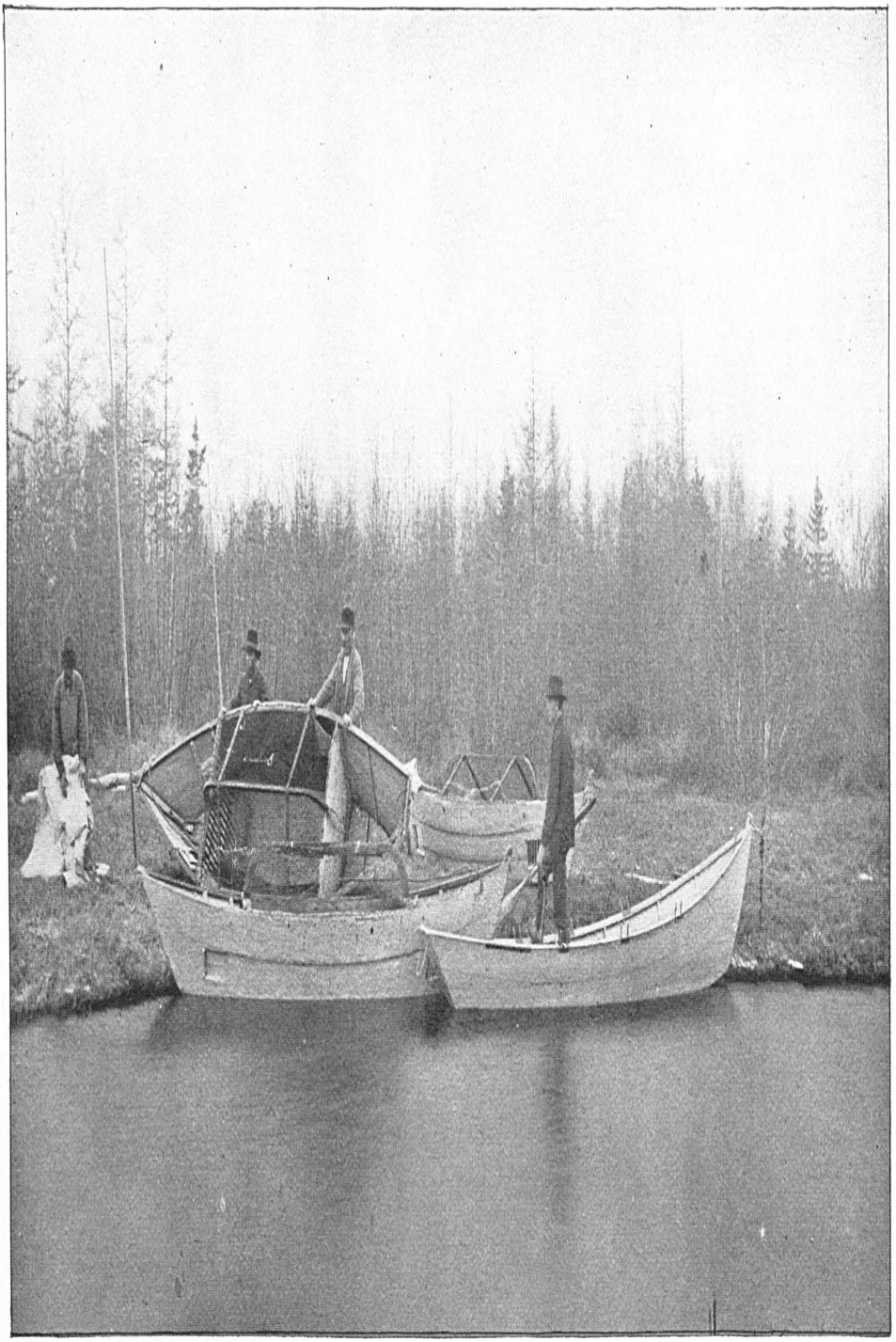
As in previous years, the United States Commission and the State of Maine operated conjointly in the collection and maintenance of brood salmon from the Penobscot and in the incubation up to the point of shipment of such eggs as were removed to other stations for hatching, and also of those falling to the share of the State. The salmon were confined in an inclosure at Dead Brook, less than 2 miles from the station, and there the spawning operations took place, the impregnated eggs being removed immediately to Craig Brook hatchery. The collection of salmon for the season of 1895 was made during May and June of the previous fiscal year. Arrangements were made as usual for a number of weirs about the mouth of the Penobscot to furnish live fish.

The method of collection was as follows: The fishermen agreeing to furnish live salmon were supplied in advance with large, fine-meshed dip nets, lined with flannel to prevent the chafing of the fish; a car was stationed in every neighborhood, and each fisherman whose weirs were so far from the moorings of the car as to forbid their being brought alongside for the direct receipt of captured fish was provided with a large box in which to transport them short distances. As low water approached and before it became low enough to leave the fish stranded on the floor of the box, the salmon were carefully dipped out and placed in the cars. Once a day the collecting steamer made a tour of the district, taking in tow the cars containing salmon and leaving empty ones in their places. The cars were then towed as far as Orland, arriving there a short time before high water. A dam and lock at this point making it impossible for the steamer to ascend farther, the cars were here taken in tow by oarsmen and carried on nearly 2 miles farther to Dead Brook, where the fish were released in an inclosure of about a third of a mile up and down a sluggish stream, averaging 3 or 4 yards in width and having an extreme depth of about 6 feet.

The first lot was received June 1, and the work proceeded without incident from that time until the 10th. On that date 45 salmon were brought in, but owing to excessive heat 15 of them died in the cars before reaching the inclosure. The following days were also very hot, making the losses so heavy that it was found necessary to suspend operations on the 14th. Work was resumed on the 17th and, with the aid of ice, was continued without interruption until the 26th, when operations ceased. Of 390 salmon purchased, 109 were lost en route. During the season persistent efforts were made to keep the temperature down in the cars by means of ice, and positively favorable results were at last attained by arranging their interiors so that the water, admitted in a greatly reduced volume, should pass through a cooling compartment before reaching the fish. In the application of this method it was necessary to have a separate boat containing a considerable quantity of ice to accompany the fleet.

Notwithstanding the fact that every effort was made to protect the salmon from injury in handling, a great many died in a short time from the effects of bruises and chafing. Thirty per cent may be given as the ordinary ratio of loss out of those liberated in the inclosure, but the loss this year was 6 per cent greater, the number of salmon found in the inclosure in the fall being 179, of which 68 were males and 111 females.

Egg collections commenced October 26 and closed November 7. The total yield was estimated at 992,000, but a later computation based on careful measurement showed a take of 1,027,353. Of these, 106,653 were lost. The United States received as its portion 602,700 and the State of Maine 318,000. Of those belonging to the station, 329,000 were distributed as shown in the accompanying table, and the remainder were reserved for hatching and rearing. Of the 274,158 fry produced from them, 244,405 survived to the close of the year.



BOATS USED IN TRANSPORTING ATLANTIC SALMON FROM PENOBSCOT RIVER TO DEAD BROOK, WHERE THE FISH ARE HELD UNTIL THE FALL.

Atlantic salmon eggs shipped during the year ending June 30, 1896.

Applicant.	Number.	Applicant.	Number.
H. C. Ford, Philadelphia, Pa	100,000	W. S. Hadaway, Plymouth, Mass	25,000
Jas. A. Bill, Bill Hill, Conn	50,000	New Hampshire Fish Commission	50,000
New York Fish Commission	50,000	J. R. Neal & Co., Boston, Mass	4,000
United States Fish Commission	50,000		

The collection of brood salmon for the fall of 1896 was made on the same basis as in 1895. Profiting by the experience of the previous season, a large stock of ice was also provided for use, and the cars were fitted with cooling compartments and cloth partitions. The collections commenced on May 21 and by the 17th of June 678 salmon had been purchased, 677 of which were released alive in the inclosure. The loss on these to the end of June was 87, or less than 13 per cent, and as the great majority of deaths in the inclosure usually occur in June there is every reason to expect that the additional loss before the opening of the spawning season will be very small.

Domesticated salmon.—Of the descendants of salmon that have been retained in the ponds from infancy, and have therefore never visited the sea, there is now a small lot of 55 on hand, reduced from 775 at the beginning of the year by the ravages of mink. These fish were hatched in 1892 and 1893 and produced eggs in October and November of 1896. They were of poor quality, however, and none of them survived the month of January. The fish were recently removed to a larger pond, where it is expected they will be freer from the attacks of enemies. There are also on hand two small lots of salmon hatched in 1893 and 1894, and these will serve to continue the interesting experiment of artificially landlocking the Atlantic salmon.

Landlocked salmon.—Owing to lack of funds no efforts were made to collect eggs of landlocked salmon this season, except from a few spawning fish which were brought to the station from Toddy Pond by interested citizens. These yielded 19,000 eggs, from which 14,670 fry were hatched. Both the eggs and fry appeared to be healthy, but an unusually large percentage of them have died, and only 12,590 of the fish remain at the close of the year. Of the 5 landlocked salmon left on hand at the opening of the year from the hatch of 1888 and 1889, only one survives. These fish were apparently healthy, but no spawn was ever obtained from them.

Scotch sea trout.—Eggs were collected during the fall from the 22 brood fish remaining from the hatch of 1891, but they were of inferior quality, and all the good ones, amounting to 5,100, were furnished to the New York Fish Commission in February. In addition to the 22 fish mentioned there are now on hand 1,337 of the hatch of 1894.

Brook trout.—No attempt was made to collect eggs of this species except from the few fish held at the station, and but 6,364 fry were hatched from these. They proved of very poor quality, however, and only 2,668 survived to the end of the year.

Rainbow trout.—From the fish hatched in 1895, 10,000 were distributed in the fall, and 575 of the 590 retained for rearing purposes remained on hand at the close of the year. In December an invoice of 25,000 eggs was received from Wytheville Station. The fry produced from them suffered heavy losses during the sac stage, and only 12,778 survived to the close of the year.

Quinnat salmon.—A case containing 10,000 eggs of this species arrived from Baird, Cal., on December 26, 1895, in fine condition. Of the 8,248 healthy fry hatched from them, 7,796 remained in stock at the end of the year.

Lake trout.—From 50,000 eggs received from Northville, 42,906 fry were hatched, but by June 30 the number had been reduced to 38,965.

Swiss lake trout.—Another consignment of eggs of this species was shipped from Switzerland in February, and arrived in excellent condition. From the 56,000 received, 51,294 fry were hatched, 46,796 of them surviving to the close of the year. There are also in stock 27 yearlings, left from the 80,000 eggs shipped to the station in 1895.

Von Behr trout.—A shipment of 25,000 eggs of this species sent from Belgium arrived in January in such poor condition that only 9,000 were estimated to be alive, and only 487 of the 6,652 fry hatched from them were alive on June 30.

Steelhead trout.—Three invoices of eggs, amounting in all to 210,000, were received from Fort Gaston station during April and May. Owing to high temperature at the time of shipment and the length of time they were en route, the second and third consignments were in very poor condition when received. The three lots produced 115,537 fry, but there was a heavy loss during the sac stage, so that the net result was but 50,104 distributed and 12,511 remaining at the station on June 30.

The stock on hand at the close of the year is shown by the accompanying table:

Species.	Calendar year in which fish were hatched.				
	1896.	1895.	1894.	1893.	1892 or before.
Atlantic salmon	244,405	.....	451	254	.....
Atlantic salmon, domesticated	.....	.....	.....	52	3
Landlocked salmon	11,033	.....	.....	.....	1
Quinnat salmon	7,796	.....	.....	.....	.....
Brook trout	2,668	.....	.....	.....	.....
Rainbow trout	12,778	575	.....	.....	1
Scotch sea trout	.....	1,337	.....	.....	7
Lake trout	38,965	.....	.....	.....	.....
Swiss lake trout	46,796	27	.....	.....	.....
Von Behr trout	487	.....	.....	.....	.....
Steelhead trout	12,511	.....	.....	.....	.....
Total	377,439	1,939	451	306	12

During the year 21,610 pounds of butchers' offal, blood, beef, and horse carcasses were used as food, the original cost of which was $282.79. The additional expenses of freight and drayage makes the total cost of fish food at the station for the year $513.88.

Following is a record of the meteorological observations made at the station during the year:

Month.	Mean temperatures.						Rainfall.	Snow.
	Air.		Water.					
			Hatchery, west side.		Head of feed trough, north stand.			
	7 a. m.	2 p. m.	7 a. m.	2 p. m.	7 a. m.	2 p. m.		
1895.							*Inches.*	*Inches.*
July	61.73	72.74	67.71	70.84	62.90	67.42	3.45	.....
August	62.32	71.82	68.11	71.18	63.98	68.27	1	.....
September	55.55	67.88	62.90	66.65	60.10	64.82	1.1	.....
October	39.18	51.48	50.98	54.05	51.02	54.92	1.05	.....
November	32.95	43.13	43.37	45.57	44.85	47.65	0.75	1
December	21.89	32.18	36.03	37.43	39.23	41.10	3.15	14
1896.								
January	10.39	23.71	33.34	34.34	36.58	38	.....	7
February	13.19	27.81	32.84	33.86	35.45	37.10	2.8	13.5
March	19.72	33.02	33.81	35.71	35.27	38.34	5.15	23.5
April	35.02	52.07	38.05	43.57	39.92	46.45	.25	4
May	50.19	65.37	51.92	56.73	49.47	55.42	2.75	.....
June	55.55	72.48	61.03	46.05	56.77	61.72	3.5	.....
General means	38.33	51.18	48.45	51.25	50.19	51.80	30.95	63

ST. JOHNSBURY STATION, VERMONT (J. W. TITCOMB, SUPERINTENDENT).

At the beginning of the fiscal year the stock of fish on hand at the station consisted of 6,673 steelhead trout and 22,875 lake trout. The water supply to the hatchery at this time was taken from a small brook on the station property, supplied by springs, and varying in volume from 8 gallons of pure water to 100 of surface water. As it was conducted to the hatchery in an open ditch, it was subject to changes in temperature, and was therefore about the same as the temperature of the water in Sleeper River, from which the supply was taken later in the summer. In July all of the lake trout died, owing to the high temperature, which also caused a heavy mortality among the steelheads. During July and November plants of steelhead trout amounting to 4,777 were made in the tributaries of Lake Champlain, and on May 5 258 were deposited in the Merrimac River at Concord. At the close of of the year 90 yearlings were left on hand.

During the summer preparations were made to obtain spawn of the native brook trout from streams and ponds in various parts of the State, and the following collections were made at the six points selected: Darling Pond, Groton, 106,965; Pico Pond, Shrewsbury, 20,000; Caspian Lake, Greensboro, 602,990; Lakota Lake, Woodstock, 91,100; Lake Mitchell, Norwich, 111,281; Fairbanks Pond, St. Johnsbury, 35,000; total, 967,336.

The first eggs were taken on October 1 at Pico and the last on November 26 at Fairbanks. Owing to the different conditions existing in the various lakes, different methods had to be adopted in capturing the fish. At Pico, Sherburne, and Darling ponds, where the fish enter small tributary streams to spawn, V-shaped slat traps were

constructed in the brooks near their outlets, and the fish captured were held in slat pens in the streams above the traps until ripe. At Lakota the feeding streams were so small that the trout could only enter them during a heavy fall of rain. A pound net was placed in the pond near the outlet of the small stream, but the water was so shallow that very few fish were caught. At Lake Mitchell the trap was washed out by a heavy freshet, which undoubtedly reduced the output of that lake. At Fairbanks Pond and Caspian Lake the trout were taken by means of seines, and good results were also obtained at the latter point with dip nets, the spawning-grounds being first surrounded by a fine-meshed gill net. The work of collecting spawn was conducted both by day and by night, the fishermen being guided at night by the use of jack lights attached to the bows of the boats. The largest trout captured was 26 inches long. Those captured at Caspian Lake were larger than the ones taken at the other points, and averaged from 1½ to 2 pounds in weight.

In this lake they locate their spawning-beds in water from 1 to 6 feet deep, and it is not uncommon to see them working on them in water so shallow that their fins and tails are above its surface. Such beds become quickly covered with sediment after a storm, and as they are covered with ice in winter, much of the spawn must be destroyed. The lake is also full of suckers and minnows of large size, which prey upon the spawn and are often taken in the seines with the trout.

The first eggs taken were transferred on canton-flannel trays packed in moss, but later on, for convenience in handling, and in the belief that better results could be obtained, they were placed in tin lard-pails with perforated covers, and these packed in large wooden pails with moss all around them. The latter method is inexpensive, and it does not injure the eggs, as in traveling over rough roads the pails can be held by the messengers, thus breaking the jar of the wagon. It is proposed to try still another method next season, and that is to place the eggs on the wire trays on which they are to be hatched, packing them in light, portable cases with moss.

Of the eggs collected, 25,000 were shipped to A. M. Bigelow, Branchville, N. J., and the balance of the stock and an additional assignment of 20,000 received from Northville, Mich., were retained for hatching. Owing to the very unsatisfactory condition of the water supply, only 13,748 fry were available for distribution, 5,000 of which were shipped to Sherburne, Vt., for deposit in Pico Pond. The heavy loss of eggs and fry is attributed to the muddy condition of the water and to its very low temperature, which averaged 32½° from the middle of November to the middle of April. The water in the troughs would occasionally freeze over and ice form on the bottoms and sides. The eggs during this period developed very slowly, and the time of incubation varied from 176 to 198 days, very few hatching in less than 190 days. Both before and after the eggs were eyed and up to the time of hatching it was necessary to handle them almost daily to free them from

mud and sediment, as in some instances enough would collect in one night to entirely bury eggs and trays. It appears from experience gained during the past season that, although eggs may be successfully hatched in pure water of a temperature as low as that recorded at the station, in all instances the eggs should be eyed before subjecting them to it. The loss on the first lots taken was much less than on those which were not eyed at the time the temperature became so low. In addition to collections made in the vicinity of the station, consignments of Atlantic salmon and rainbow and lake trout were received from other stations.

Atlantic salmon.—In January 25,000 of these eggs were shipped from Craig Brook Station. They hatched about three months afterwards, the loss on them being 2,405. Of the fry, 19,000 were planted in Merrimac River at Concord and the balance were retained for rearing.

Rainbow trout.—Three consignments of rainbow-trout eggs, aggregating 75,000, were received from Wytheville Station. Though the first package was overheated, the eggs appeared to be in good condition; the second box had apparently been overturned, but the third showed no signs of rough handling. A very few days after the eggs were received white spots appeared on nearly all of them. The water at Wytheville was about 22° warmer than that at St. Johnsbury, and as the same trouble has been experienced at the Duluth Station under similar conditions of temperature it is inferred that the spots originate from the great difference in the temperature of the water. Of the 75,000 eggs received, there was a loss of only 3,341 after they were laid down in the troughs, but the fry were weak and only 26,700 were saved. These were planted at the following points: 10,000 to East Creek, Rutland County, Vt.; 8,000 to Isinglass River, Strafford County, N. H.; 8,000 to Great Brook, Rockingham County, N. H.; 700 retained at the hatchery.

Lake trout.—From eggs received from Northville, 93,698 fry were produced, most of them hatching during a period of freshets, when the water suddenly became warmer and was so muddy that the fry could not be seen in it for several days. The loss amounted to 39,524, and the remaining 54,174 were distributed to applicants in Massachusetts and Vermont.

During the winter the superintendent made a careful examination of the springs in the vicinity of the station with the view to increasing the water supply. Options were secured on a number of them, but the amount of water they were capable of furnishing was too small as compared with the expense that would have been incurred in their purchase and the piping of the water to the hatchery. The total supply from all the springs in the vicinity, 12 in number, would not have amounted to more than 125 gallons per minute, and even this amount was uncertain, as the investigation was made when the ground was covered several feet deep with snow. An appropriation was secured for the development of the spring water on the station property, and

also for the construction of a large settling reservoir and filter to be used in connection with the water taken from Sleepers River. During June plans were prepared with the view to carrying out this work.

The following table shows the stock of fish on hand at the close of the year:

Species.	Fry.	Yearlings.
Brook trout	8,748	.....
Rainbow trout	700	.....
Atlantic salmon	1,753	.....
Steelhead trout	.....	90
Lake trout	.....	5

GLOUCESTER STATION, MASSACHUSETTS (E. F. LOCKE IN CHARGE).

Upon the resignation of Capt. A. C. Adams, E. F. Locke was appointed fish-culturist of the station and took charge on July 1. During the summer necessary repairs were made to the wharf and the steam and water plant, and the hatchery was improved by the addition of four new windows. In July the assistant in charge and I. S. K. Reeves, consulting engineer, visited the station with the view to determining what improvements could be made in the method of hatching cod eggs.

The small output of the previous year, which was less than 13,000,000 fry, or about 16 per cent of the number of eggs collected, was attributed by Captain Adams chiefly to the condition of the water in Gloucester Harbor, which is highly charged with sediment. This attaches itself to the eggs, increasing their specific gravity and causing them to sink to the bottom of the box, where they die. The presence of crustaceans, jelly-fishes, and other animals in the water seriously interferes also with the working of the hatching apparatus. An examination of the harbor failed to show that these conditions could be bettered, and after careful consideration it was decided to continue the work on the same lines as heretofore, and to attempt, in addition, the hatching of cod eggs by means of air circulation, as tried at Central Station during the winter of 1893, and also with closed circulation of water. It had been demonstrated at Chicago that sea water could be kept indefinitely in a practically pure state with large numbers of fish or other animals living in it by means of aeration and circulation, and there appeared to be no reason why cod eggs could not be hatched under similar conditions.

The collection of eggs was directed by Capt. E. E. Hahn, who was stationed at Kittery Point, Maine, with a portion of the crew of the *Grampus*. The season lasted from November 29 to March 23, during which time 70,901,000 eggs were delivered at the station. From these, 24,859,000 fry were produced and liberated in waters in the immediate vicinity. All of the eggs, except those retained for hatching by means of aeration and closed circulation of water, were placed in the

McDonald tidal boxes. Those received previous to December 21 were of excellent quality and yielded fair results, but the shipments coming in after that date were very poor and were apparently imperfectly fertilized.

At the opening of the season the temperature of the water was 44°, but by December 12 it had dropped to 34°, and by January 6 it registered 31°. As this was too cold for hatching with good results, the water was heated artificially, and during the remainder of the season it was kept at from 35° to 37°.

Air circulation.—On the 16th of December 220,000 eggs were placed in two McDonald jars at midnight, the water temperature at the time being 35°; by the morning of the 17th it had risen to 51°, and, although changed frequently, it remained stationary until the 19th, by which time all of the eggs had died. The experiments were continued from time to time, with the view to keeping down the temperature of the water, but without success until the jars had been partially submerged in a packing of crushed ice and salt. On the 31st of January 380,000 cod eggs were placed in two jars and the temperature kept at 40°. On the fifth day it was noticed that minute bubbles had collected on the eggs in sufficient quantity to raise the top layer partly out of the water, where they remained without change. The water also commenced to emit a very offensive odor, notwithstanding the fact that it had been changed every 12 hours. Later on it was changed every 4 hours, but still continued to be offensive. The eggs commenced hatching on the fourteenth day, but the fry were crooked and weak, and of the 25,000 hatched only about 2,000 survived. On February 18 another experiment was tried with 580,000, the water temperature during the entire period of incubation being kept at 40°. The eggs commenced hatching on February 29, and about 10,000 fry were liberated from this lot. Further experiments were tried in March, but the results were practically the same.

Closed circulation.—To test this method of hatching, a cedar tank of 15,000 gallons capacity was placed at the northwest corner of the hatchery, so arranged that the water from the hatching-boxes could flow into it by gravity and from there be pumped to the pressure tank, located at the southwest corner. An air-pump was provided for aerating the water, and sand and gravel filters were placed between the hatching-boxes and the receiving reservoir, through which the water could be filtered each time it was used. It was intended to fill the tank with water comparatively free from sediment and to hold it for use when the water in the harbor became roily, using the reserve supply over and over until the harbor water became clear again. The stormy weather caused numerous delays in setting up the tank and it was not in working order until February 4. A test of this method was at once undertaken, but the experiment had to be discontinued on the 17th, owing to the bursting of some of the pipes by frost.

Another experiment was commenced on the 20th and continued until the 24th, when the fry began to die, owing to the fact that the water was becoming impure. A third attempt was made between February 25 and March 2, but no results were obtained. The experiments were then discontinued.

It would appear that this system can not be used longer than three days at a time with the apparatus now in use.

It is a question whether either of these methods has had a fair trial, as they were not undertaken until late in the season, when not only the quality of the eggs was poor, but the water in the harbor was at its most impure stage, owing to frequent storms. Further efforts in this line will be made next season.

Lobster.—Immediately after the close of the cod season on April 14 arrangements were made for the collection of lobster eggs from points between Boston and York, Me., the commissioners of the States of Massachusetts, Maine, and New Hampshire having granted permission to collect and pen egg-bearing lobsters. An agent was stationed at Kittery Point, Me., for the purpose of collecting eggs from lobsters caught by the fishermen between Rye, N. H., and York Harbor, Me.; he obtained, in addition, a number of egg-bearing lobsters which had been caught at the Isle of Shoals and shipped to Portsmouth, N. H. A small steamer was also chartered for the work and used for a month in visiting the lobstermen between Gloucester and Boston. The first eggs were received on April 22 and the last on July 13, when operations were discontinued. The 14,534,000 eggs obtained were hatched as usual in the McDonald universal hatching jar, and 13,050,000 fry were produced from them. Several shipments were sent to York Harbor, Me., Kittery Point, Me., and Newcastle, N. H., but the bulk of the stock was liberated between Marblehead and Gloucester. The poor results attained with this species were due to the fact that most of the territory was new, and the season was almost over before the fishermen became sufficiently interested in the work to save their egg-bearing lobsters for the Commission. The stormy weather prevailing during the early part of the season also tended to reduce the catch very materially.

Mackerel.—Arrangements were made during the latter part of April to collect eggs of this species from the traps fishing within 15 or 20 miles of Gloucester, also from the drag or drift nets; but the catch proved to be very light, 400 fish being the largest take. The first eggs were collected on June 27, and between that time and July 17, the close of the season, the total number taken was 1,720,000. The eggs were hatched in the McDonald tidal box, and the 897,000 fry produced from them were liberated in the harbor outside of Eastern Point. The results attained in this branch of the work were very discouraging, as operations were pushed energetically and visits were made to the traps in the harbor and to Magnolia and Manchester every morning between June 23 and July 17, when the weather permitted.

WOODS HOLE STATION, MASSACHUSETTS (JOHN MAXWELL AND ALEX. JONES, SUPERINTENDENTS).

The work was under the direction of John Maxwell until June 8, when he was relieved by Alex. Jones, fish-culturist, who acted as superintendent to the close of the year. During the summer the usual repairs were made to the launches, machinery, hatching apparatus, etc., and the pier wall and wharves were repaired under the direction of the Engineer Corps, United States Army, a specific appropriation of $5,000 having been made by Congress for this purpose. The basin used for housing the breeding codfish in winter was repaired and improved so as to protect the cars from being damaged by severe storms during the winter.

The following statement shows the kinds of fish propagated, number of eggs collected, and fry hatched and distributed:

Kind.	Eggs.	Fry.
Cod	70,844,000	41,353,000
Lobsters	90,000,000	83,707,000
Flatfish	11,008,000	8,472,000
Tautog	31,431,000	17,575,000
Mackerel	10,870,000	831,000
Total	214,153,000	151,938,000

Efforts were made at the beginning of the season to increase the production of cod; and with this object in view a larger number of brood fish than usual were obtained and placed in live-cars. Of the total number delivered at the station, 1,350 were collected by the schooner *Grampus*, under the direction of Captain Hahn; the balance, 2,486, were purchased from fishermen. The egg-collecting season commenced November 15 and continued until February 19, 415 brood fish yielding the entire supply. More females were secured, but many of them proved to be barren. The average yield per fish was 170,000, the largest in the history of the station. The number of eggs secured was disappointing in view of the fact that the number of brood fish carried was larger than in past years, but the small take was partly offset by the excellent quality of the eggs and fry, and by the unusual percentage of fry hatched. The apparatus used was the McDonald tidal box, as observations covering a number of years showed its effectiveness over the Chester jar. The fry were planted in the immediate vicinity.

During the time the brood fish were held in confinement an unusually large number of them were lost from disease. The weather at the time they were collected was rough and blustery, consequently those in the wells of the smacks necessarily experienced severe concussion by being forced against the sides of the well. Beyond the removal of the mucous covering, the bad results were not apparent immediately upon their delivery at the station, but subsequent losses showed the effects of such handling. The fish appeared to do well for a time, but many of them

developed sores, which apparently resulted from bruises on different parts of the head and body. This was not considered of much importance at the time, as the same thing had occurred before, but these on close examination proved to be of a gangrenous character, and by November 25 an unusual number had died. Even fish that had been hooked in the lip were affected in this way, and many were lost before their eggs could be collected. The water during the time was full of ctenophores, which may have prevented the healing of the affected parts by irritating and inflaming the exposed flesh, thus encouraging the growth of fungus and the formation of ulcers. In many instances on opening the dead fish the air bladder was found to be partially or entirely destroyed by ulcer, which gave off an offensive odor. Some were found with ruptured egg sac, which allowed the eggs to escape from the ovaries into the abdomen, and in other cases internal hemorrhage appeared to be the cause of death.

The quantity and quality of eggs that can be taken at a station of this character depends on the size of the parent fish, the number producing eggs, and the state of the weather. Some seasons there is a scarcity of males and at other times egg-producing females are in the minority, but it is difficult to avoid this, owing to the fact that when the fish are received it is impossible to tell from their condition whether or not they will produce eggs. No fish are received at the station which weigh less than 5 pounds.

The following table shows the number of brood fish from which eggs were collected, the number of ripe fish used, and the yield per fish for a series of years from 1889 to 1896:

Year.	Brood fish.	Eggs taken.	Ripe fish.	Eggs per fish.
1889-90	349	8,500,000	91	93,000
1890-91	3,000	67,600,000	587	115,000
1891-92	1,020	48,600,000	444	102,000
1894-95	3,320	85,500,000	1,107	71,000
1895-96	3,836	70,800,000	415	170,000

Flatfish (*winter flounder*).—The spawning season of this species varies according to the temperature of the water and the prevailing state of the weather, from February 10 to about the middle of April. This year the first eggs were taken on February 24, and the last on April 18. The fish were obtained from fyke nets set in Great Harbor and Waquoit Bay, and the 44 females stripped yielded 11,008,000 eggs, from which 8,472,000 fry were hatched and planted. The eggs of this species measure 30 to the linear inch, and are very glutinous. Heretofore it has been difficult to separate them, and it was only accomplished by thoroughly washing and stirring for some time, but this season starch was very effectively used in the same manner that it is employed in the fertilization of pike-perch eggs on the Great Lakes. It dissolved quickly and mixed readily with the salt water, coating the eggs and

preventing them from sticking together. The hatching was done in the modified McDonald tidal box.

Lobster.—The collection of egg lobsters commenced in the immediate vicinity of Woods Hole about April 10. As the season advanced the territory was extended, and the services of two fishing smacks were utilized, in addition to the launch *Cygnet.* Messengers were also sent to New Bedford, New London, Noank, and other points, where lobsters were held in live-cars by the fishermen. The collections at different points vary from year to year. The grounds on which the best collections were made four years ago yielded less this year than any of the others. The collecting season was continued to July 13, and resulted in a total take of 5,909 lobsters, which yielded 90,000,000 eggs. From these 83,707,000 fry were hatched and planted in the vicinity of New London, Noank, and Nantucket, also in Buzzards Bay, Vineyard Sound, and Great Harbor. The greater part of the lobsters secured after July 1 were from New London and Noank. It is recommended that regular collections be made next year at these two points, also at Westport, R. I., Nantucket, Block Island, and Plymouth. This would enlarge very materially the field of collection, and would probably result in doubling the output of the station.

Early in the season the eggs of the lobsters are hard and stand transportation well, but in advanced stages they are delicate and quickly affected by rough handling or sudden changes in temperature. Experiments were conducted in order to determine how soon after the new eggs are laid they can be taken from the parent lobster and hatched artificially. The observations were continued from the first appearance of the eggs in July until spring, and it was found that those removed before the latter part of October would not live. In November 15,000,000 were placed in jars and carried through the winter, and notwithstanding the many difficulties experienced, 50 per cent of them hatched.

Tautog.—The first eggs were taken on June 8, and by the close of the season (July 1) 31,431,000 had been secured. They were hatched in the McDonald hatching-box, and yielded 17,575,000 fry, which were liberated in Vineyard Sound and Great Harbor one or two days after hatching. The eggs of these fish measure 26 to the linear inch, and the average yield is about 150,000, though one specimen, weighing 9¾ pounds, yielded 1,142,624, and an examination of the fish after death showed this to be only about one-half of what were contained in the ovaries. The eggs develop quickly and hatch in from two to three days in a temperature of about 69°. When the fish are first caught they will not give down their eggs, and experiments were tried in retaining them in the cars for a time. The best results were obtained with eggs taken from two to six hours after capturing. The eggs from fish held longer than that were very hard to fertilize, and those taken from fish held over night proved to be entirely worthless.

Mackerel.—With the view to collecting large numbers of mackerel eggs the schooner *Grampus* was detailed to assist in the work, and reported at Woods Hole early in May. Small numbers of eggs had been collected and hatched at the Gloucester and Woods Hole stations in past years, but the handling of them in quantity was a new departure. Arrangements were made for collecting eggs from the traps and pounds south of the cape, and between May 24 and June 19 there were secured 10,870,000, from which 861,000 fry were produced.

The first eggs were received from the *Grampus* on May 24. They were placed in the McDonald hatching-box on the same day, and development progressed until the forming of the embryo, 5 days after fertilization. The following night a heavy thunderstorm occurred, and immediately afterward all the eggs in the house began to assume a sickly appearance, and in 48 hours all were dead. Whether or not this was due to the thunderstorm can not be definitely determined, but it is well known that eggs of other animals have been killed in this way.

From the 9,936,000 collected by the *Grampus*, which was stationed off Chatham, Mass., only 210,000 fry were produced. The balance of the output was hatched from a lot of 828,000 eggs taken from a trap at Squipnocket on June 3.

During the season various forms of apparatus were tried in hatching eggs, but they failed to produce any better results than the McDonald tidal box. At first it was thought that the poor percentage of fry hatched was due to imperfect fertilization, as the wet method was used, but as the season advanced it became evident that the failure was due not so much to the methods employed, but to the fact that the eggs were not healthy when taken, the parent fish having been held in the nets too long. The pound nets are the only apparatus in the vicinity from which spawning fish can be secured, and it is customary to overhaul these only once in 24 hours. The 828,000 eggs referred to above were transported over 14 miles of rough road, being over 4 hours en route, but, notwithstanding this, 75 per cent of them hatched.

Though the dry method of fertilization was used on them, the good results are attributed to the fact that the fish had been in the nets only a few hours. The eggs of the mackerel are very small and measure 24 to the linear inch. They are kept afloat by a large oil globule for the first 24 hours. After that they leave the top and remain in suspension for a short time, when they sink to the bottom, remaining there until they hatch or die.

Scup and sea bass.—Arrangements were made for collecting scup and sea-bass eggs at Hyannis and other points, but none were secured, owing to the total failure of the fishery on the coast this spring.

The station was visited several times during the spring by Commissioner Brice, who personally directed the lobster and mackerel work and arranged for the collection of scup, sea bass, and tautog eggs.

The following table shows the temperature and density of the water at the station from November 1 to June 30:

Temperature and density of water at Woods Hole Station, 1895–96.

November.			December.			January.			February.		
Date.	Temp.	Density.	Date.	Temp.	Density.	Date.	Temp.	Density.	Date.	Temp	Density.
1	52	.....	1	47	1,025.4	1	38	1,025.8	1	32	1,026
2	52	.....	2	47	1,025.4	2	38	1,025.8	2	32	1,026
3	51	.....	3	46	1,025.4	3	38	1,025.8	3	32	1,026
4	50	.....	4	45	1,025.4	4	36	1,026.2	4	32	1,025.8
5	51	.....	5	42	1,025.4	5	35	1,026.2	5	32	1,025.8
6	51	.....	6	42	1,025.4	6	34	1,026.4	6	33	1,025.4
7	51	.....	7	42	1,025.6	7	32	1,026.4	7	34	1,025.2
8	51	.....	8	42	1,025.8	8	32	1,026.4	8	34	1,025.8
9	52	.....	9	42	1,025.8	9	32	1,026.4	9	34	1,025.8
10	52	.....	10	41	1,025.6	10	32	1,026.4	10	33	1,025.8
11	51	.....	11	40	1,025.6	11	32	1,026.4	11	32	1,025.8
12	50	.....	12	38	1,025.6	12	32	1,026.4	12	32	1,026
13	49	.....	13	37	1,025.6	13	32	1,026.2	13	32	1,026
14	40	.....	14	37	1,025.6	14	32	1,026.2	14	32	1,025.8
15	40	1,025.4	15	36	1,025.4	15	32	1,026.2	15	32	1,025.8
16	40	1,025.3	16	36	1,025.4	16	31	1,026.2	16	32	1,025.8
17	40	1,025.4	17	36	1,025.4	17	31	1,026	17	30	1,026
18	50	1,025.4	18	37	1,025.4	18	32	1,026	18	30	1,026
19	50	1,025.2	19	38	1,025.4	19	32	1,026	19	32	1,026
20	50	1,025	20	38	1,025.6	20	32	1,026	20	31	1,026
21	49	1,025.2	21	38	1,025.6	21	32	1,026	21	30	1,026
22	46	1,025.4	22	37	1,025.6	22	32	1,026	22	30	1,026
23	48	1,025.4	23	38	1,025.6	23	32	1,026	23	30	1,026
24	48	1,025.4	24	39	1,025.6	24	32	1,026	24	31	1,026
25	47	1,025.4	25	39	1,025.6	25	32	1,026	25	31	1,026
26	48	1,025.8	26	39	1,025.8	26	32	1,026	26	31	1,026
27	48	1,025.4	27	39	1,025.8	27	32	1,026	27	31	1,026
28	48	1,025.4	28	38	1,025.8	28	32	1,026	28	31	1,026
29	47	1,025.4	29	38	1,025.6	29	32	1,026	.....	.....	.....
30	47	1,025.4	30	38	1,025.6	30	32	1,026	.....	.....	.....
.....	.....	.....	31	38	1,025.6	31	32	1,026	.....	.....	.....
.....	49.5	1,025.37	.....	39.7	1,025.5	.....	32.8	1,026.1	.....	32.3	1,025.9

March.			April.			May.			June.		
Date.	Temp.	Density.	Date.	Temp.	Density.	Date.	Temp.	Density.	Date.	Temp.	Density.
1	32	1,026	1	36	1,025.8	1	46	1,025	1	60	1,024.5
2	33	1,026	2	36	1,025.8	2	46	1,025	2	60	1,024.5
3	33	1,026	3	35	1,025.8	3	47	1,025	3	61	1,024.5
4	32	1,026	4	35	1,025.8	4	48	1,025	4	62	1,024.5
5	31	1,026	5	35	1,025.8	5	49	1,025	5	63	1,024.5
6	31	1,026	6	36	1,025.6	6	49	1,025	6	63	1,024.5
7	31	1,026	7	36	1,025.6	7	50	1,025	7	62	1,024.5
8	32	1,026	8	36	1,025.6	8	50	1,025	8	62	1,024.5
9	33	1,026	9	37	1,025.6	9	50	1,025	9	62	1,024.4
10	32	1,026	10	38	1,025.6	10	51	1,025	10	62	1,024.3
11	32	1,026	11	38	1,025.6	11	52	1,025.2	11	62	1,024
12	32	1,026	12	38	1,025.6	12	53	1,025.2	12	61	1,024
13	31	1,026	13	39	1,025.6	13	53	1,025.2	13	62	1,024
14	31	1,026	14	39	1,025.6	14	53	1,025	14	62	1,023.8
15	31	1,026	15	40	1,025.6	15	54	1,024.6	15	60	1,023.8
16	31	1,026	16	42	1,025.6	16	55	1,024.4	16	61	1,023.8
17	31	1,026	17	44	1,025.6	17	56	1,024.4	17	62	1,023.6
18	32	1,026	18	44	1,025.8	18	57	1,024.2	18	64	1,023.6
19	32	1,026	19	44	1,025.8	19	57	1,024.8	19	66	1,024
20	33	1,026	20	44	1,025.8	20	57	1,024.8	20	65	1,024
21	32	1,026	21	44	1,025.8	21	56	1,024.8	21	65	1,024
22	33	1,026	22	44	1,026	22	54	1,024.8	22	66	1,024
23	33	1,026	23	44	1,026	23	55	1,024.8	23	66	1,024
24	33	1,026	24	44	1,026	24	56	1,024.8	24	67	1,024
25	33	1,026	25	44	1,025.8	25	55	1,024.6	25	66	1,024
26	34	1,026	26	44	1,025.8	26	55	1,024.6	26	65	1,024
27	34	1,026	27	45	1,025.6	27	55	1,024.5	27	66	1,024
28	34	1,026	28	46	1,025.6	28	56	1,024.6	28	66	1,024
29	34	1,025.8	29	46	1,025.4	29	58	1,024.6	29	66	1,024
30	34	1,025.8	30	46	1,025.2	30	59	1,024.8	30	66	1,024
31	35	1,025.7	.....	.....	.....	31	59	1,024.5	.....	.....	.....
.....	32.5	1,026	.....	40.5	1,025.7	.....	53.3	1,024.8	.....	63.3	1,024

CAPE VINCENT STATION, NEW YORK (H. D. DEAN, SUPERINTENDENT).

H. D. Dean was appointed superintendent of this station on July 1 and shortly afterwards the work of remodeling the old planing-mill and fitting it up as a hatchery was commenced, under the general direction of I. S. K. Reeves, consulting engineer of the Commission, and G. E. David, who directed the installation of the machinery and the carpenter's work. By the latter part of October the hatchery, though not entirely completed, was in readiness to receive whitefish and lake-trout eggs, being equipped as follows: The basement of the building was fitted with 36 troughs for hatching brook trout and salmon, giving a capacity for about 4,000,000 eggs. A battery of 600 jars for hatching whitefish and pike-perch eggs was erected on the second floor, and the third floor was fitted up as offices for the superintendent and bedrooms for the employes.

The question of procuring an adequate supply of eggs for this station is a serious problem, as the laws of the State of New York prohibit fishing with nets within 1 mile of the shores, which practically includes all of the spawning-grounds except Chaumont Bay, where net fishing is allowed all the year round, but where few spawning whitefish or lake trout are ever found. As large numbers of both species are caught in Canadian waters during the close season, it was intended to make an effort to cooperate with the fishermen, but before arrangements could be completed the project was abandoned, as it was intimated that the Canadian authorities would object. Arrangements were then made with the Lake Ontario Fish Company to operate two pound nets by permission of the State Fish Commission on the spawning-grounds between the St. Lawrence and Stony Point, which is within the mile limit. It was proposed to catch the fish in October and November and hold them in pounds until they matured, the Commission furnishing the apparatus and receiving all the ripe fish, while the company was to set the pounds and operate them, receiving as compensation all fish caught after the Commission had stripped them. Owing to delays in securing the necessary apparatus, however, and the difficulty in obtaining a permit to use the company's steamer in American waters, on account of its being a Canadian bottom, this plan also had to be abandoned.

Lake trout.—During the early fall the superintendent visited the fishermen at various points in Lake Ontario on the American and Canadian sides, and arranged for the collection of eggs on Charity Shoals and Pigeon Island, but owing to the very rough weather prevailing during the spawning season, which lasts but a short time in this vicinity, only 54,000 eggs were secured. These were taken during the latter part of October. In November two consignments, aggregating 3,600,000, were transferred from the Northville station. The first arrived in good condition and yielded excellent results, but the last, numbering about 2,600,000, received November 26, were very poor and

HATCHERY AT CAPE VINCENT, NEW YORK, FROM MAIN STREET.

only about 30 per cent of them hatched. This was probably due to the fact that the eggs had been held longer than usual on the shipping trays, and also because they were shipped before the eye-spots appeared. The total output of lake trout fry during the season was 1,650,000. Of these, 53,000 were furnished to applicants in New York and the balance were planted in Lake Ontario and its tributaries.

Whitefish.—Arrangements were made to collect eggs at Chaumont Bay, but the catch of fish at that point was so small that less than 1,000,000 eggs were secured. During the month of November 26,500,000 eggs were sent from the Put-in Bay Station; they arrived in excellent condition, especially one lot of 5,000,000, which had been shipped from Toledo by messenger. The loss on these shipments during the winter amounted to 25 per cent, and in April the 20,000,000 fry resulting from them were deposited in the St. Lawrence River and Lake Ontario in the vicinity of Grenadier Island and Tibbits Point.

Rainbow trout.—The rainbow-trout eggs received from Wytheville arrived in good condition, apparently, but they soon commenced dying and only 6,600 fry were produced from them for distribution. It is probable that the change in temperature proved injurious to them, as the water from which they were taken averaged 54°, whereas the temperature at this station was scarcely above the freezing-point throughout the winter.

Brook trout.—From the 25,000 eggs received from Northville, 22,100 fry were hatched and distributed to applicants in New York.

Atlantic salmon.—The Atlantic salmon eggs received from Craig Brook Station on January 30 were hatched with slight loss, but owing to an accident, whereby the water was turned off the troughs for 12 hours, they were all lost on May 24. During the winter considerable difficulty was experienced with roily water, and at times slush ice was forced around the suction pipe so that no water could be pumped. It is recommended that this pipe be protected by crib-work before next season opens. Owing to the difficulties encountered in procuring an adequate supply of suitable water, it is urged that arrangements be made with the Cape Vincent Waterworks Company to supply the station from the city works.

STEAMER FISH HAWK (LIEUT. FRANKLIN SWIFT IN CHARGE).

The steamer *Fish Hawk* left Washington on April 28, arriving at Gloucester, N. J., on the 30th, where a steam launch, spawning boats, and hatching apparatus, which had been shipped from Woods Hole, Mass., were taken on. Permission having been obtained from Capt. N. H. Farquhar, U. S. N., the vessel then proceeded to League Island navy-yard and moored alongside the wharf in an advantageous position for receiving a good supply of water for hatching purposes. This point was selected as headquarters, as it was believed that the water there was as good if not better than that at Gloucester, where operations had previously been conducted, and because it was nearer to

the collecting field. The facilities for shipping the fry were also much better. In addition to the regular crew of the vessel, a number of spawn-takers were transferred from other stations to assist in the work. The hatching apparatus was arranged as usual on the main deck, Mate James A. Smith having charge of it. The collection commenced on May 4th, 697,000 shad eggs being secured on that date from the seine at Howell Cove and from gillers in the vicinity. The work was prosecuted successfully from that time until May 21, by which time 20,930,000 eggs had been collected.

Shortly after the eggs were placed in the jars there appeared to be an undue percentage of loss, and many of the fry in the aquaria settled to the bottom, apparently not having enough vitality to sustain themselves. Since the hatching apparatus was identically the same as in former years, it became evident that the cause of loss must be looked for in the water supply. It was apparently much freer from sediment than that at Gloucester, yet it was suspected to contain oily residue from the petroleum refineries at Point Breeze on the Schuylkill and sulphurous or ammoniacal solution from the gas works on the river. It is also possible that an abnormal condition of the water might have been produced by the stirring of mud by the dredge operating along the water front of a portion of the yard. It was thought advisable to transfer the vessel to Gloucester, and the change was made on May 21. From this point the work of collection was resumed and continued until June 16, resulting in a total collection of 37,874,000 eggs, which produced 22,056,000 fry. In addition to this, 1,183,000 eggs were furnished to car No. 2 for hatching and liberating at Sanford, Fla.

Of the eggs collected, 12,134,000 were obtained from gillers, 580,000 from Gloucester Point, 6,500,000 from the seine at Bennett's shore, and 18,660,000 from the Howell Cove seine. It was impracticable to attend the seines above Philadelphia, owing to their distance from the vessel, and it is recommended than an additional launch be provided next season for the purpose of attending the fishing shores above that city, as many million eggs might be obtained there. The method of collecting was the same as in former years, the steam launch leaving the vessel each afternoon with five spawn-takers and returning during the night or early next morning.

It is recommended that the vessel make its headquarters in Howell Cove, at Washington Point, next season, as it is the center of the spawning-grounds below Gloucester, and more than half the eggs secured this year were collected in its immediate vicinity. In addition to this, the water there is more suitable for hatching purposes than at Gloucester or League Island, as two large fresh-water streams flow into it above and below. It also possesses good railroad facilities and has excellent means of communication with Philadelphia.

During the season 12 Atlantic salmon were taken by the seine at Howell Cove, and the capture of a large number was reported from seines above Philadelphia.

The following table shows the number of shad eggs collected, fry hatched and planted, and temperature of the water:

Date.	Shad.		Number of eggs.	Date of hatching.	Number hatched.	Temperature.	
	Males.	Females.				Air.	Water.
1896.							
May 4	17	17	697,000			68	62
5	50	50	1,876,000			68	63
6	34	34	1,606,000			70	63
7	46	46	2,122,000			60	63
8	30	30	1,340,000			78	64
11	54	54	2,302,000			78	66
12	38	38	1,612,000	May 10-12	2,279,000	80	68
13	14	14	622,000			67	68
14	37	37	1,575,000			70	69
15	49	49	2,036,000			74	70
16	7	7	239,000	May 12-17	5,130,000	74	71
18	67	67	2,584,000			76	72
19	22	22	861,000			73	72
20	26	26	1,468,000			59	70
21	30	30	1,427,000			61	70
22	39	39	1,739,000	May 18-24	2,319,000	68	70
25	42	42	2,048,000			60	69
26	35	35	1,675,000			72	69
27	34	34	1,648,000			71	70
28	8	8	286,000			69	70
29	24	24	1,235,000			69	70
June 1	42	42	1,970,000	May 25, June 1	5,807,000	66	70
2	28	28	1,419,000			68	70
3	14	14	571,000			66	70
4	19	19	966,000			67	70
5	16	16	649,000			74	73
9	11	11	294,000	June 3-8	5,071,000	73	74
11	13	13	550,000			69	74
12	8	8	387,000			69	73
15	2	2	79,000	June 9-15	1,450,000	68	72
	856	856	37,874,000		22,056,000		

At the close of the fishing season on the Delaware the vessel was instructed to proceed as soon as possible to Casco Bay via Woods Hole, to take up the mackerel and lobster work. It left Philadelphia on June 18, and arrived at Woods Hole on the afternoon of the 20th, where it remained long enough to take on the apparatus necessary to conduct operations with those species. Orr Island, in Casco Bay, was selected as headquarters, as it is in easy communication with Portland and Boothbay. It was also the headquarters of a large number of the mackerel drag-net fishermen. Operations were commenced at once, the regular crew being detailed as spawn-takers to go out with the drag-net boats and to attend the traps in the vicinity. The schooner *Grampus*, which had been detailed to assist in the work, was stationed at Small Point, Me., for the purpose of attending the traps in that locality, the steam launch transferring the eggs daily to the *Fish Hawk*.

It was soon found that while the traps about Cape Small took quite a number of spawning mackerel, those in the central part of the bay took scarcely any, and it became necessary for the crew to rely entirely on the drag-netters for eggs. The great majority of spawning mackerel taken in these nets died before the eggs could be secured, and those which were alive produced but few, having no doubt emitted the greater part of the ripe ones on account of worry consequent on capture. The same was found to be true of the fish taken in the traps.

Although the season was quite far advanced when the work was undertaken, it is doubtful whether any better results could have been attained had operations been commenced earlier, as the small number of eggs was not due to the fact that the fish had spawned at an earlier date, but that the fish died before they could be handled by the spawn-takers. As this work was in the nature of an experiment, three forms of apparatus were used in hatching—the McDonald jar, with bottom feed and overflow through cheese-cloth at the top; the McDonald tidal box, and the Chester cod box. The McDonald box gave the best results. The first eggs were taken on June 24, and by the end of the month 6,935,000 had been secured. A few additional collections were made early in July, and operations were discontinued on the 13th, the total number of fry hatched and liberated being only 213,000. At the beginning of the season the eggs were fertilized by the wet method, and as it was thought that the lack of success might be due to this fact, careful experiments were conducted with both the wet and the dry methods, but without affecting the result. Later in the season the dry method was adopted for general use.

As already stated, it seems probable that the poor results were due more to the conditions under which the eggs were collected than to the methods employed in hatching them. When received at the vessel they were apparently all impregnated, and development proceeded normally for two or three days, by which time the embryo would be perfectly formed. In some cases a small proportion of the fish would hatch and live from 6 to 8 hours, but the rate of development was usually as follows: The embryo was first noticeable 48 hours after placing in the jars; after 60 hours it would be well formed, and at the end of 72 hours development stopped, the eggs dying by the end of the 84th hour. In cases where they hatched, the length of time required was 5 days, in an average temperature of 58°. It soon became evident that the fry hatched could not be retained, and they were liberated at once in Merryconeag Sound.

The nets producing the fish from which most of the eggs were secured were set from 5 to 10 miles offshore. They were examined regularly at sunset and again the next morning, the best eggs being obtained from the fish taken at sunset.

It is recommended that the work be undertaken earlier next season, and that Casco Bay be made the headquarters for mackerel operations, as large numbers of pounds and traps are fished there, and because of its facilities for communication with other parts of the State.

Lobster.—Permission having been granted by the Maine Commission of Sea and Shore Fisheries to collect and hold egg-bearing lobsters, Mr. M. B. Spinney, of Small Point, Me., was engaged during the mackerel season to interview the lobster men operating between Portland and Boothbay with the view to arranging for the collection of seed lobsters, he having been in the business for a number of years and being well acquainted along the coast. By the 30th of June 100,000

eggs had been collected at Orr Island. At the close of the mackerel season the vessel left Casco Bay and established headquarters at Boothbay, the *Grampus* being stationed at Rockland, in the vicinity of the large lobster pounds. By this arrangement it was expected to cover the entire coast of Maine. The owners of the large pounds in the vicinity of Vinal Haven, Westport, and Boothbay, and also the dealers in Portland, agreed to notify Lieutenant Swift whenever they received seed lobsters, and permission was obtained to overhaul the lobsters already impounded. Large numbers were examined daily, but only one or two out of a thousand were found with ripe eggs, and it appeared that operations were commenced too late and that the spawning season of the lobster on the Maine coast occurs about the same time as on the Massachusetts coast. Large numbers were brought from Nova Scotia to the various pounds, but no ripe ones were secured, though many of them had young eggs.

Operations were continued till August 3, the season's work resulting in the collection of 654,655 eggs, from which 322,000 fry were hatched. These were liberated in the immediate vicinity of the vessel as soon as hatched. Though the results were poor, it is thought that the work can be made successful next year by establishing the headquarters of the vessel at either Boothbay or Orr Island. The lobster men have been initiated and thoroughly understand the work, and are willing to cooperate with and assist the Commission in its future efforts. It is recommended that arrangements be made next year as early as March or April, and that men be employed to commence the collection of seed lobsters and hold them in suitable pounds along the coast. Large numbers could undoubtedly be obtained from the large pound-owners, who sometimes have from 60,000, to 150,000 on hand.

On August 3 the *Fish Hawk* returned to Woods Hole and the *Grampus* to Gloucester.

Battery Station, Maryland (W. P. Sauerhoff in charge).

The station was closed and under the charge of the custodian, Mr. Charles Healey, from July 11 to March 23, when J. J. Glennan reported and commenced repairing and fitting up the launches and machinery. On March 31 W. P. Sauerhoff arrived and began fitting up the hatchery and getting the necessary collecting and hatching apparatus in order for the season's work. By April 17 the station was thoroughly equipped and operations were commenced with a force of 36 men. The collection of eggs was continued to June 4, the total receipts for the season being 45,893,000. From these, 36,117,000 fry were hatched and planted and 1,165,000 eyed eggs were shipped. Arrangements were made to collect eggs at all of the floats and shores, but, with the exception of the seine at Carpenter Point, none were received from that source, although spawn-takers attended the haulings regularly from the beginning of the season to the 10th of May. The gillers took more interest than ever

before in the work of the Commission and furnished one-fifth of the season's take, for which they were paid at the rate of $20 per 1,000,000.

The following table shows in detail the number of eggs taken and fry hatched and distributed during the season:

Summary of shad eggs taken, fry hatched, and fry and eggs distributed during the season of 1896 at Battery Station, Maryland.

Date.	Eggs taken.	Eggs lost during hatching.	Eggs shipped.	Fry hatched.	Fry distributed.
1896.					
Apr. 17	60,000	40,000		20,000	
18	755,000	392,000		363,000	
19	1,055,000	400,000		655,000	
20	300,000	22,000		278,000	
21	210,000	115,000		95,000	
22	505,000	106,000		399,000	
23	428,000	103,000		325,000	
24	570,000	98,000		472,000	
25	440,000	37,000		403,000	20,000
26	2,195,000	327,000		1,868,000	
27	4,390,000	652,000		3,738,000	
28	2,140,000	315,000		1,825,000	200,000
29	2,483,000	472,000		2,011,000	818,000
30	3,350,000	568,000		2,782,000	
May 1	3,290,000	644,000		2,646,000	
2	1,800,000	160,000		1,640,000	823,000
3	1,130,000	125,000	685,000	320,000	
4	444,000	129,000	315,000		900,000
5	1,130,000	134,000	165,000	831,000	450,000
6	1,945,000	219,000		1,726,000	450,000
7	2,298,000	223,000		2,075,000	3,000,000
8	1,060,000	107,000		953,000	2,500,000
9	970,000	248,000		722,000	930,000
10	2,138,000	470,000		1,668,000	3,000,000
11	1,224,000	301,000		923,000	4,150,000
12	835,000	317,000		518,000	450,000
13	690,000	138,000		552,000	2,759,000
14	805,000	177,000		628,000	1,827,000
15	452,000	122,000		330,000	1,000,000
16	170,000	30,000		140,000	2,900,000
17	820,000	300,000		520,000	1,668,000
18	670,000	253,000		417,000	450,000
19	403,000	92,000		311,000	991,000
20	55,000	7,000		48,000	
21	300,000	23,000		277,000	730,000
22	567,000	89,000		478,000	450,000
23	690,000	133,000		557,000	450,000
24	523,000	112,000		411,000	
25	675,000	80,000		595,000	450,000
26	630,000	116,000		514,000	500,000
27	580,000	80,000		500,000	540,000
28	115,000	15,000		100,000	
29	20,000	2,000		18,000	
30					750,000
31	230,000	65,000		165,000	688,000
June 1	135,000	10,000		125,000	706,000
2	25,000	5,000		20,000	1,014,000
3	45,000	5,000		40,000	118,000
4	148,000	33,000		115,000	
5					200,000
8					175,000
Totals	45,893,000	8,611,000	1,165,000	36,117,000	36,117,000

The indications at the opening of the season seemed favorable for a large collection, and the eggs taken up to May 8 were exceptionally good, very small losses occurring. This was probably due to the low and uniform temperature of the water, which ranged from 58 to 63 degrees from April 22 to May 9, also to the absence of sediment, the water being discolored only once or twice, and then but slightly. The catch fell off greatly about May 11, however, and, though the station was kept in operation until June 4, only twice did the night's collections

exceed 800,000. The weather as a rule was unfavorable, easterly winds prevailing most of the time, and, although no freshets occurred during the season, frequent and violent thunderstorms at sunset often prevented the gillers from fishing. On May 31 all but six of the spawn-takers were discharged. These were retained until June 6 for the purpose of deciding whether it was advisable to keep the station open after the end of May. For many years past, after the station had been closed, rumors became current regarding the large quantities of shad eggs which might have been secured had the station been in operation. The experience gained this year, however, showed that few gillers fish after that time and that the supply of eggs is not sufficiently large to warrant the expense of keeping the station open.

During the season an effort was made to obtain striped-bass eggs, but without success. Few striped bass were caught in the vicinity during the spring, and it is doubtful if any eggs could have been secured from those taken in trammel nets, as the nets are anchored out during the night and when taken up the next day most of the fish are dead.

During the run of herring in April 10 cases, containing twenty-four 2-pound cans each of roe, were put up and shipped to Craig Brook and Wytheville stations, to be used as trout food.

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

The fish-cultural operations included, as in former years, the distribution of the year's production of the fish ponds in Washington and the hatching of shad eggs collected on the Potomac River. In addition to this, 812,000 yellow-perch fry were produced and distributed, and three consignments of trout eggs (lake, rainbow, and Von Behr), transferred from Northville, Wytheville, and Green Lake stations, were hatched and planted. The following table shows the number of eggs hatched at the station and the number of fish distributed:

Species.	Number received.	Number hatched.	Number distributed.
Shad	44,174,000	36,520,000	36,529,000
Yellow perch	812,000	812,000	812,000
Lake trout	10,000	8,947	8,947
Rainbow trout	15,000	12,540	12,540
Von Behr trout	10,000	8,422	8,422

Yellow perch.—In March 600 adult yellow perch, collected in the Potomac River by Mr. L. G. Harron, were placed in the aquarium and held until the middle of April, when they yielded 812,000 eggs, which were hatched in the McDonald jars without loss. The results attained were disappointing, as the fish handled at the station in 1889 produced a much larger number of eggs. This was probably due to the fact that this season's fish were smaller than those.

Shad.—Consignments of shad eggs from Bryan Point were received daily from April 22 to June 17, with the exception of May 17 and 30

and June 7 and 14. During this period 44,174,000 eggs were handled, from which 36,529,000 fry were hatched and distributed. Though the output was in excess of any previous year's production excepting those of 1887, 1888, and 1895, the results were disappointing, inasmuch as the collections on the Potomac amounted to more than 64,000,000 eggs.

The large loss in hatching, amounting to 17 per cent, was due not only to the poor quality of the eggs when received, but also to the stoppage of the water supply for twelve hours, which caused a loss of about 3,000,000 eggs and fry. This occurred when the station was in full operation. It was apparently caused by a large quantity of material in the water, resembling rotten wood, bark, and leaves, and as the water was received and discharged through closed piping it was impossible to filter it.

Repairs and improvements.—The interior of the station was painted during the summer, and the equipment was enlarged by the addition of a can-cleaning apparatus and a steam air-pump. The can-cleaner consists of a flexible shafting, encased in leather and geared to the machine-shop shafting by belting. A brush attached to the free end revolves rapidly, cleaning and polishing the tin. It fails to remove rust, however, even with the aid of pumice stone. The pump was purchased to provide against losses of fish held at the station in case of stoppage of the water supply, as occurred on December 9, when, by order of the District authorities, the supply was diverted from the building on account of street improvements. The fish were saved on that occasion by using ice and aerating the water by hand.

Aquarium, Central Station (L. G. Harron in charge).

From August 1, 1895, to January 4, 1896, the superintendent was stationed at Atlanta, Ga., having been detailed for duty in connection with the Cotton States and International Exposition. He was again detached from the aquarium on April 1, and assigned to duty in connection with shad propagation on the Potomac River at Bryan Point, Maryland, where he remained until the middle of June.

During the summer the grotto was closed on account of the high temperature and the consequent difficulty of maintaining the supply of fishes. In October collections of marine specimens were transferred to Washington from Old Point, Virginia, and from time to time consignments of sea-anemone, starfish, and lobsters were sent from Woods Hole and Gloucester stations by express.

In addition to these collections, 160 marine specimens that had been exhibited in the Atlanta Aquarium were transferred to Central Station aquarium on January 5. A few of these survived to the close of the year, but the majority died during the spring, owing to high temperature of the water. The salt water for the marine species is about half natural and half artificial, the supply being kept up by shipments

from the Chesapeake Bay and by the use of Turks Island salt and fresh water.

Most of the fresh-water fishes exhibited during the year were collected at various points on the Potomac, though several consignments were received from the stations in Washington and Wytheville, Va.

The only marine fish observed to spawn in the aquarium during the year was a flounder. This occurred on April 28. The eggs were placed in a small aquarium fitted with air circulation, but they failed to hatch, probably on account of imperfect fertilization.

The only fresh-water species that spawned were two small yellow perch—on April 1 and 2. The eggs were placed in the McDonald jars and hatched without difficulty.

It is deemed worthy of mention that so few fresh-water fishes have ever spawned in the aquarium. The reason for this is attributed to the use of alum in filtering the water, since the fishes that have spawned had been held in the water only a few months, and though some of them lived for three years afterwards, they never spawned a second time. Apparently there is no filter in the market that will provide a sufficient amount of water for the aquarium except those requiring the use of alum as a coagulator. If a sufficient supply of cool water could be obtained from a well, thus obviating the necessity for a filter, there would be no difficulty in maintaining an excellent exhibit throughout the year. With the present equipment the fishes can be held only from October to the end of June.

Following is a list of marine and fresh-water fishes shown during the year:

List of species of fishes, crustaceans, etc., exhibited at Central Station aquaria during the fiscal year ending June 30, 1895.

Species.	No.	Species.	No.	Species.	No.
Salt-water:		Salt-water—Continued.		Fresh-water—Continued.	
Pinfish	34	Sea raven	2	Mirror carp (adult)	4
Pigfish	43	Sea robin	1	Golden ide (adult)	4
Croaker	30	Sea trout	11	Golden tench (adult)	8
Sea bass	46	Mummichog	30	Common tench (adult)	12
Red drum	7	Sea anemone	100	Yellow perch (adult)	50
Burfish	25	Scup	4	White perch (adult)	12
Spots	31	King crab	4	Sunfish	50
Sheepshead	20	Blue crab	30	Rock bass (adult)	10
Striped mullet	13	Spider crab	10	Rock bass (yearling)	30
Black grouper	4	Lobsters	6	Mill roach (adult)	20
Red grouper	2	Fresh-water:		Fresh water smelt (adult)	30
Red snapper	7	Rainbow trout (adult)	14	Chub sucker (adult)	6
Filefish	6	Rainbow trout (yearling)	40	Yellow catfish (adult)	10
Black drum	1	Brook trout (yearling)	120	Channel catfish	13
Tautog	28	Von Behr trout (yearling)	79	Goldfish	50
Swellfish	3	Black bass (L. M. adult)	19	Lace-fin dace	30
Toadfish	12	Black bass (S. M. yearling)	100	Crappie	3
Rockfish	3	Black bass (L. M. yearling)	100	Paradise fish	20
Flounder	6	Leather carp (adult)	6	Dogfish	13
Pompano	4	Scale carp (adult)	4	Common eel	20
Hog-choker	20			Fresh-water terrapin	6
Stingray	2			Snapping turtle	4
Yellow-tail	20				
Young shad	300				

CARP PONDS, WASHINGTON, D. C. (RUDOLPH HESSEL, SUPERINTENDENT).

Following is a summary of the kinds and number of fish furnished by this station for distribution during the year: Carp, 91,105; goldfish, 2,137; black bass (large-mouth), 5,959; black bass (small-mouth), 1,208; tench, 50,363; golden tench, 44; golden ide, 87; shad, 1,000,000.

The carp furnished were of three varieties, leather, scale, and blue. The Commissioner having decided to discontinue the distribution of this fish, arrangements were made during the spring of 1896 to hatch and rear large numbers of them for food for the young bass, and it is estimated that about 600,000 were used for this purpose during the months of May and June, the ponds west of Seventeenth street producing 300,000 and the tanks 300,000. They were fed to the bass as soon as they had attained a length of from one-fourth to 1 inch.

The distribution of tench and goldfish having been discontinued, efforts were made to rear only a sufficient number for stocking the ponds and fountains in the public parks of Washington.

Rock bass.—The 39 brood fish from Wytheville, which had failed to spawn during the season of 1895, were placed in the new pond between the Monument and west pond early in April, 1896. They spawned in May, and while it is impossible to give the exact number of young fish on hand at the close of the year, it is estimated that there are several thousand in the pond, varying in length from one-half to three-fourths inches.

Large-mouthed black bass.—The north pond, having an area of 4½ acres, was devoted to the rearing of this species. When drawn down in November, 1895, it was found to contain 6,000 fish from 3 to 6 inches long. These were transferred to Central Station for distribution to applicants in the East, and the pond was laid bare for the winter and an effort made to remove the poisonous grasses and insects by scraping the bottom. Early in April, 1896, 23 spawners were placed in the main body of the large pond and 17 in a small portion partitioned off at its southwestern end. Ponds 5 and 6 were were also stocked with 12 spawners each at about the same time. On April 25 the bass were observed preparing nests, and by the 26th a few were completed. These continued to increase in numbers, and the first eggs were discovered on the 28th.

In order to simplify the handling of the young fish 24 artificial nests were constructed and placed in the ponds. They were circular in form, 2 feet in diameter and 3 inches deep, made of cement, and covered while fresh with a layer of fine gravel. Although they resembled the natural nests very closely and were placed in favorable locations, no results were obtained from them. The experiment will be tried again next year, however, as the failure is thought to have been due to the fact that they were placed in the ponds late in the season. As the bass spawn late in the afternoon or very early in the morning, the process was observed only once.

On May 12, the first young fish were noticed, and from that time the number increased daily. Up to the age of eight days the ponds afforded them an abundance of natural food, consisting principally of species of *Rotatoria*, *Hydatina*, and *Euchlanis*. These constituted the first food of the young fish, as disclosed by microscopic examination of the contents of the enlarged pharynx. After the eighth day that class of food apparently proved to be insufficient, as they appeared to be looking for more substantial matter. At the age of two weeks carp, from 8 to 11 days old, were supplied and were eagerly eaten by the young bass. The carp were fed them until some time in June, when finely chopped fish were substituted.

Owing to the fact that the young fish attain different sizes and prey upon each other, the output from the ponds heretofore has been very small, and it was determined this season to attempt the rearing of them in small ponds and tanks located on the terrace in front of the cottage. Between the 1st and 12th of June 5,000 were transferred to the tanks and held for a few days, when they were assorted according to size and placed in small rectangular ponds. They were fed regularly on chopped fish, and as the ponds were well stocked with plants they also obtained a certain amount of natural food.

During the first two weeks the losses in the tanks were heavy, but this was accounted for by the high water-temperature, which ranged from 92° to 95°, and by its muddy condition. The sudden change from the comparatively clear water of the ponds to the hydrant water greatly impaired the health of the young fish, as the organs of respiration were visibly affected, even after a very short stay in the tanks. The epithelium of the lamellæ of the gills would become covered with a slimy, veil-like scum, and those so affected usually died during the second or third night. As many as 30 or 40 dead ones were frequently taken from tanks containing 500, and at one time the death rate reached nearly 60 per cent. Thus from lots of 500 each from 150 to 200 or more perished in a few days after being transferred from the ponds, and the total loss amounted to about 2,000. The transfer of the second lot was made under more favorable conditions, the temperature being lower and the hydrant water clearer. Only about 12 per cent of this lot were lost, and the loss on the third lot amounted to only 3 per cent. At the close of the year 12,270 had been transferred from the north pond to the tanks and small ponds, and indications point to successful results. No difficulty was experienced in keeping from 2,000 to 3,000 in ponds varying from 2,000 to 3,000 square feet in area. They soon learned to take the chopped fish from the feeding boards, and apparently thrived on the food. It is difficult to give even an idea of the number of young bass left in the north pond, on account of the dense vegetation.

Small-mouthed black bass.—When the south pond, containing the small-mouthed bass, was drawn down it was found to contain only about 1,200 yearling fish, which were distributed as usual during the month of December. At the same time the large-mouthed bass were placed

in the north pond 30 breeders were put in a small section of the south pond, which had been partitioned off as a spawning-bed. They commenced building nests on April 25, and young bass were noticed on May 13. Although every effort was made to secure good results from this species, the indications are that the total output will not exceed two or three thousand. Attempts were made to remove the young fish from the ponds by the same method employed with the large-mouthed species, that is, with fine-meshed seines, but up to the close of the year only a few specimens had been caught. It is thought that the poor success with this species was due to the high temperature of the water. They were fed on the same material as the large-mouthed bass, namely, natural food in the ponds during the first stages, then young carp, and afterwards finely chopped fish.

Shad.—During the latter part of October the shad fry which had been placed in the west pond in April, 1895, were liberated. It is impracticable to count these fish, but the number liberated was estimated at 1,000,000. They had attained a length of from 3 to 5 inches and were apparently strong, healthy fish, having had an abundance of food throughout the summer. In liberating them in the Potomac they were permitted to pass out the gates gradually at night, as it is believed that they would be destroyed by the immense schools of white and yellow perch lying outside the gate if liberated during the day. The pond was left bare during the winter in order to destroy noxious weeds and plants.

Between April 25 and 28, 1896, 2,333,000 fry were introduced into the pond. At the close of the year large numbers could be seen, though they had not attained as large size as in past seasons.

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

With the view to increasing the output of shad fry, the allotment for the propagation of that species on the Potomac was increased from $4,000 to $6,000, and arrangements were made to push the work to its utmost capacity. L. G. Harron, superintendent of the aquarium, was detailed to assist in the work, and reported for duty on April 1.

In addition to the launch *Petrel*, which was utilized between Bryan Point and Alexandria, a steam tug was chartered, which, with a large force of spawn-takers, attended the gillers and seines between Gunston and Freestone Point, commencing April 20, and covering daily about 15 miles, until May 23, when the vessel was released and the spawn-takers attached to it discharged.

The returns from this section of the river were disappointing in view of the fact that more than a third of the funds available were expended here, while the collections amounted to only 15½ per cent of the total take. A like result may be experienced any season, however, as the spawning-grounds of the shad vary with the condition of the river and the lateness of the season. This year, owing to absence of rain, the fresh water diminished and the salt water backed far up the river.

The collection of eggs commenced in April and ended on June 17, resulting in the procurement of 64,362,000. This exceeded the take of any previous year excepting 1888 and 1895, when the collections amounted to 81,179,000 and 66,055,000, respectively. The quality of the eggs was exceedingly poor, however, probably because of the high temperature of the water which prevailed throughout the season. They were derived from 5 haul seines and 121 gill nets, the seines producing 8,477,000. Of eggs collected from shad caught in gill nets, 33,234,000 were taken by 8 gillers, an average of 4,154,000 to each man. The other gillers employed averaged only about 204,000. These men operated within sight of the station and within a radius of 2 miles.

The eggs were held at Bryan Point from 12 to 36 hours and then packed on wire trays overlaid with wet cloths and shipped to Central Station by the Washington and Mount Vernon boat. Transfers were made daily from April 22 to June 17, except on May 17 and 30 and June 7 and 14. The shipments in April amounted to 19,817,000; in May 31,572,000, and in June 13,399,000, an average of 2,202,000 per day in April, 1,018,000 in May, and 788,000 in June.

The force was reduced on May 23, when the services of the tug were discontinued, and again on the 29th, only a sufficient number of men being retained to store the property and attend the gillers operating within easy distance of the station; that is, between Mount Vernon Pier and River View.

The cost of making collections this season amounted to only $47 per 1,000,000, whereas the average cost in previous seasons has been about $80 per 1,000,000.

The eggs during the entire season were poor in quality, and were inferior to any taken in previous years. Only 44,000,000 of those collected were delivered at Central Station, and the total loss, amounting to 43 per cent, was increased by the accidental destruction of 3,000,000 eggs and fry in Central Station. From 1885 to 1892 the difference between the eggs collected and the output from Central Station ranged from 11.44 to 41 per cent, the average loss being 25.47 per cent. Of this, 14.94 per cent represented the loss from time of collection to delivery at Central Station, and 10.53 per cent the subsequent loss in hatching. The bulk of the run of shad appeared on a rapidly ascending temperature, and it is probable that the eggs were of poor vitality when taken, as the rise in temperature was greater than had been recorded in 11 years preceding. The temperature of the water at the station registered 46° on April 10, 48° on the 12th, and on the 21st, when large collections were being made, it reached 71°, a rise of 25° in ten days. Though the catch of shad was enormous up to and including April 21, after which it commenced falling off, the total catch probably fell short 50 per cent, the season being one of the most unprofitable ever known on the upper river to the fishermen. Seines which took 150,000 shad in 1895 took only 30,000 in 1896.

During the season an examination was made for a new site for a shad station, but no place was found to possess superior advantages over Bryan Point.

For the successful operation of this station in future it is recommended that two suitable launches be provided in order that all of the seines and gill nets fishing between Alexandria and Freestone Point may be attended; also that the daily shipments of eggs to Washington be made by launch instead of by steamboat, as heretofore.

Following is a record of the air and water temperatures at Bryan Point during the months of April, May, and June:

Record of air and water temperatures at Bryan Point.

Date.	Air.				Water.			
	6 a. m.	Noon.	6 p. m.	Mean.	6 a. m.	Noon.	6 p. m.	Mean.
April 1	55	58	48	53⅓	46	46	46	46
2	46	51	45	47	46	47	47	46⅓
3	33	41	39	37⅓	46	46	46	46
4	38	45	40	41	45	45	45	45
5	37	50	46	44	44	45	45	44⅓
6	42	56	46	48	45	46	46	45⅓
7	35	45	39	39⅓	46	46	45	45⅓
8	34	49	42	41	46	46	47	46
9	34	50	48	44	46	46	47	46⅓
10	42	45	45	44	46	46	46	46
11	45	50	50	48	46	46	47	46⅓
12	45	62	67	58	47	48	49	48
13	55	86	72	71	48	50	52	50
14	62	82	79	74	51	54	55	53
15	60	82	80	74	52	55	56	54
16	59	84	82	75	55	57	58	56⅓
17	63	83	85	77	59	61	64	61
18	62	85	85	77	62	63	66	63⅓
19	69	91	81	80	64	68	68	66⅓
20	68	81	81	77	66	68	68	67⅓
21	71	79	75	75	68	71	71	70
22	54	70	66	63	66	68	69	67⅓
23	45	61	60	55	66	68	69	67⅓
24	56	63	61	60	67	69	69	68⅓
25	56	58	58	56⅓	66	66	67	66⅓
26	52	58	60	56⅓	64	66	66	65⅓
27	46	68	62	58⅔	61	65	66	65
28	55	69	71	65	64	65	66	65
29	58	70	74	67	64	67	67	66
30	61	66	56	61	64	67	67	66
May 1	57	58	58	57⅔	63	64	64	63⅓
2	63	68	67	66	63	64	65	64
3	64	72	68	68	64	65	66	65
4	63	71	75	69⅔	64	66	67	65⅔
5	63	88	78	76	64	68	68	66⅓
6	62	74	70	68⅔	64	68	68	66⅓
7	55	67	62	68	64	66	66	65⅓
8	45	63	64	57	63	66	66	65
9	56	72	87	71⅓	67	68	69	68
10	64	80	87	77	68	69	71	69⅓
11	64	87	86	79	69	71	72	70⅓
12	67	86	77	76⅔	69	73	72	71
13	69	86	78	77	70	73	74	72
14	68	80	78	75	71	73	74	72⅓
15	72	80	80	77	72	74	74	73⅓
16	55	74	80	69⅔	72	74	75	73⅓
17	68	89	86	81	74	75	76	75
18	63	90	84	79	74	75	77	75⅓
19	66	92	82	80	75	76	77	76
20	65	60	60	61⅔	75	74	75	74⅓
21	60	65	70	65	74	74	75	74⅓
22	69	82	70	76⅓	74	75	76	75
23	68	76	74	72⅔	74	75	75	74⅓
24	65	68	70	67⅔	74	74	74	74
25	64	74	68	68⅔	72	73	73	72⅓
26	70	82	74	75⅓	73	74	74	73⅓
27	68	85	84	79	73	74	75	74
28	67	85	73	75	74	74	74	74
29	61	75	78	71	72	73	74	73
30	60	84	77	73⅓	72	74	74	72⅓
31	74	88	78	80	73	74	75	74

Record of air and water temperatures at Bryan Point—Continued.

Year.	Air.				Water.			
	6 a. m.	Noon.	6 p. m.	Mean.	6 a. m.	Noon.	6 p. m.	Mean.
June 1	64	83	74	73⅜	72	74	74	73⅓
2	62	80	75	72⅔	73	74	74	73⅝
3	60	82	74	72	73	74	73	73⅓
4	64	70	66	66⅝	73	73	73	73
5	66	88	76	76⅝	73	74	74	73⅜
6	68	84	76	76	73	75	75	74⅓
7	68	85	79	77⅓	75	76	76	75⅝
8	68	87	75	76⅔	76	77	77	76⅓
9	70	81	74	75	77	78	78	77⅝
10	69	79	68	72	77	77	78	77⅓
11	62	74	80	72	77	77	77	77
12	70	76	78	74⅜	77	78	78	77⅝
13	72	86	66	74⅝	77	77	76	76⅜
14	60	68	73	67	75	75	76	75⅓
15	62	79	69	70	75	75	75	75
16	65	79	68	70⅔	74	74	74	74
17	70	86	72	76	74	74	74	74
18	68	86	71	75	74	75	75	74⅔
19	70	92	82	81⅓	74	75	76	75
20	76	92	86	84⅜	75	76	77	76
21	76	94	81	83⅜	76	77	78	77
22	76	82	81	79⅜	77	78	79	78
23	76	86	76	79⅓	78	79	79	78⅜
24	72	78	76	75⅔	78	78	78	78
25	70	71	72	71	77	77	77	77
26	74	90	75	79⅜	77	78	78	77⅓
27	68	90	76	78	77	78	79	78
28	75	89	76	80	78	79	79	78⅜
29	75	88	82	81⅓	78	79	79	78⅝
30	68	81	70	73	78	78	78	78

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

The following table shows the number of fishes of various species on hand at the beginning of the fiscal year:

Species.	Calendar year in which hatched.				
	1895.	1894.	1893.	1892.	1891.
Rainbow trout	82,950	700	890	1,965	600
Black-spotted trout			120		62
Carp	5,000				50
Goldfish	1,000				10
Tench	3,000		45		
Black bass	5,000			24	
Rock bass	20,000				142

The work of distributing the year's production of fish was commenced October 9 and continued until December 28, the total output consisting of 74,695 rainbow trout, 13,205 rock bass, and 1,460 large-mouthed black bass.

Rainbow trout.—The rainbow trout were held in troughs and in the five rearing-ponds below the hatchery until fall, being fed as usual on mush and liver. The season's supply of eggs, amounting to 980,700, were obtained from 1,156 females, 660 male fish being used to fertilize them. The trout commenced spawning on November 10, and eggs were obtained from that time to the end of February, the collections by months being as follows: November, 67,000; December, 647,500; January, 246,500; February, 19,700. The increased number and the

unusually fine quality of eggs obtained this season were attributed to the changes made in the spawning-ponds. Of the 980,000 collected, 380,000 were retained at the station and produced strong healthy fry, but owing to the muddy condition of the water in March, when the fish were very small, the losses were heavy, amounting in all to about 75,000. As the facilities at the station were inadequate for carrying over 125,000 to the yearling stage, 112,000 were distributed as fingerlings during the month of April to applicants in Virginia and Tennessee, and at the close of the year there remained on hand 117,300.

The following table shows the shipments of eggs made to other stations of the Commission, State fish commissions, and foreign applicants:

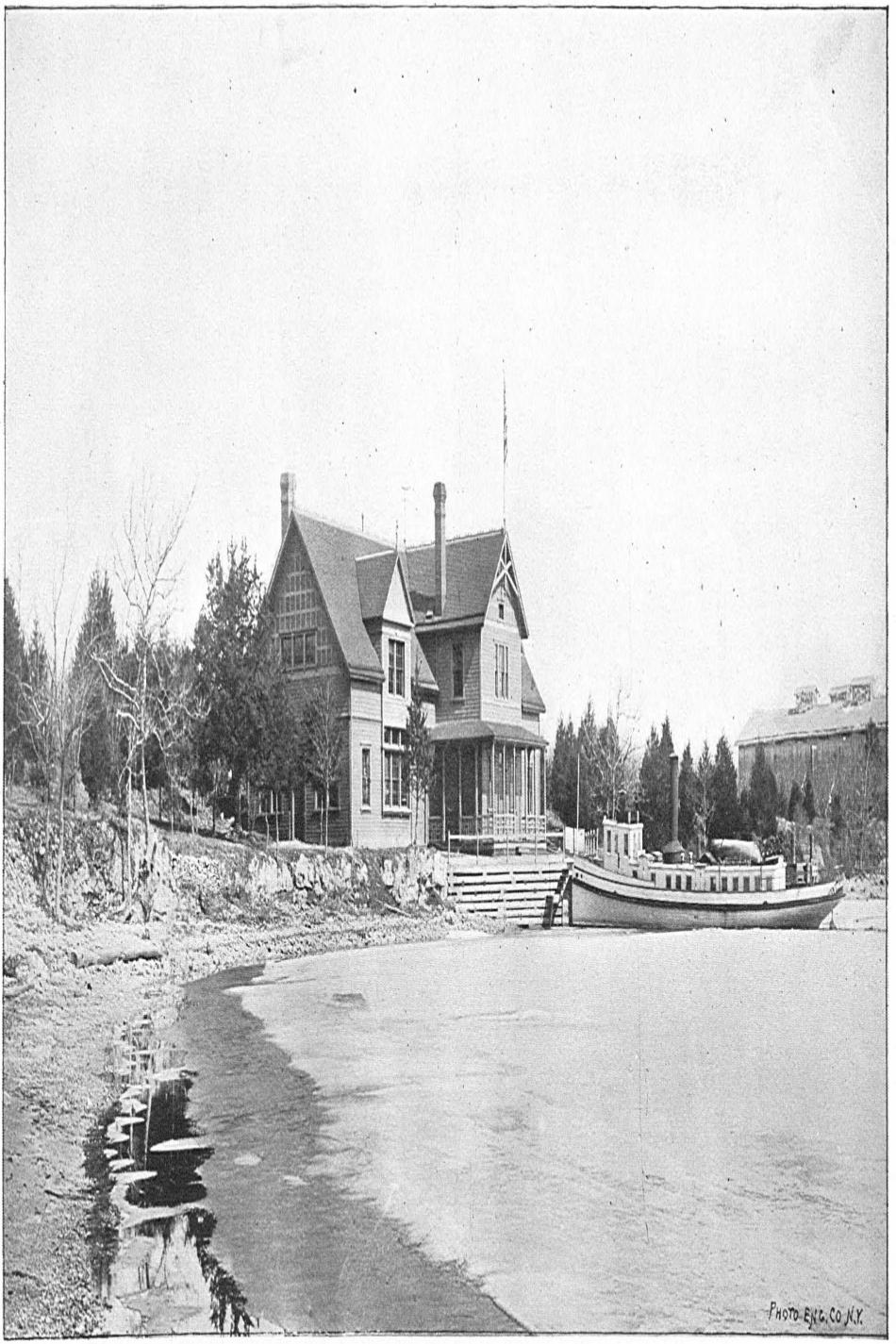
Applicant.	Number.	Applicant.	Number.
Dr. E. G. Shortlidge, Wilmington, Del...	10,000	J. T. Newton, New Haven, Conn.....	25,000
U. S. F. C. Station, East Orland, Me.....	25,000	U. S. F. C. Station, Cape Vincent, N. Y	25,000
Société Nat. d'Acclimatation, Paris, France.....	50,000	U. S. F. C. Station, Washington, D. C...	15,000
Maj. J. W. Turner, Bertrix, Belgium....	50,000	New Hampshire Fish Commission, Manchester, N. H.....	25,000
M. Raveret-Wattel, Fécamp, France....	25,000	U. S. F. C. Station, Northville, Mich....	25,000
U. S. F. C. Station, St. Johnsbury, Vt....	75,000		

Black bass and rock bass.—Early in the spring the adult bass were placed in the breeding-ponds and artificial nests were introduced. These consisted of wooden boxes, 20 inches square by 2 inches deep, with flaring sides, filled with gravel. Chestnut was selected for the boxes, as that wood quickly changes when wet to a color which closely resembles the bottom of the pond. The nests were marked by stakes extending a foot or more above the surface of the water, and with the object of protecting the parent fish from the sun and also from enemies, a wooden hood, 15 inches by 20 inches, was attached to each of these stakes below the water surface. The nests were examined once a week and those containing eggs were transferred to the rearing-ponds. Very satisfactory results were attained with the rock bass, but they were only partially successful with the black bass. The nests for the rock bass were the same as those for the black bass except that they were 15 inches by 15 inches in size.

With suitable ponds and with the experience gained this season in making these nests, there is little doubt but that they can be successfully used with the black bass next year. At the close of the year indications point to a large crop of rock bass and a fairly good output of black bass, though it is doubtful whether the final results will be any better than in past years, owing to the condition of the ponds, which leak so badly that it is difficult to keep them even half filled with water.

Black-spotted trout.—As these fish had been held at the station for a number of years without producing eggs, they were transferred to Atlanta in December for exposition purposes.

Other fishes.—The propagation of carp, goldfish, and tench for distribution having been discontinued, the ponds heretofore devoted to that



HATCHERY, WITH STEAMER SHEARWATER AT DOCK, PUT-IN BAY STATION, OHIO.

purpose will be repaired and utilized in future for rearing the basses. Most of the young goldfish and tench and a number of the carp on hand at the beginning of the year were transferred to Atlanta for exposition purposes. The adult goldfish were liberated in Tate Run, and the brood carp and tench were retained at the station.

During the year the commissioners of the State of Virginia expended, under the direction of the superintendent, $250 of the rent paid by the Government for this station in making the most necessary repairs.

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

During the summer hatching batteries similar to those in use at the Duluth and Detroit stations were installed, thereby increasing the capacity of the hatchery from 700 to 1,000 jars. By this system of batteries the water is used over eight times, which results in the saving of about one-half in the amount of coal consumed, as it requires only 300 gallons of water per minute for 1,000 jars, whereas under the old system 800 gallons per minute were required for 700 jars.

Whitefish.—The usual arrangements were made during the month of October for the collection of eggs from all of the pound and gill net fishermen at the western end of Lake Erie. The first eggs were taken on November 4, one day earlier than ever before at this station, and by the 25th of November 188,163,000 had been secured from the following points: Port Clinton, Ohio, 92,403,000; Toledo, Ohio, 25,029,000; Put-in Bay Island, 15,615,000; North Bass Island, 27,540,000; Middle Bass Island, 13,284,000; Kelley Island, 9,441,000; Catawba Island, 4,104,000; West Sister Island, 333,000; other sources, 414,000.

The usual system was employed in making the collections. The spawn-takers stationed at the different points visited the pound and gill nets of the fishermen every day when fished and the eggs obtained were brought to the station in wooden kegs or transportation cans by the steamer *Shearwater*. Eggs collected at Toledo and other distant points were packed on canton-flannel trays, inclosed in wooden boxes, and shipped to Port Clinton by rail, thence by the *Shearwater* to the station. These boxes are provided with hinged doors, and each of them is capable of carrying about 750,000 eggs.

The take this season was not only the largest ever secured, but the eggs were of excellent quality. This was partly due to the fine weather prevailing during November, but the good results are to be mainly attributed to the fact that trained spawn-takers were hired, whereas in past years the fishermen collected most of the eggs.

Shipments of eggs were made during the months of November and December as follows: Cape Vincent, N. Y., 26,540,000; Duluth, Minn., 10,000,000; Alpena, Mich., 5,000,000.

Car No. 3 also transported 3,000,000 to Bear Lake, Idaho, where 2,940,000 fry were hatched from them and liberated in the lake.

The eggs retained at the station commenced hatching early in April, and 120,950,000 fry, produced from them, were liberated at the following points:

Point of deposit.	Number.	Point of deposit.	Number.
Peach Point Reef, Ohio	1,400,000	Middle Bass Island, Ohio	5,670,000
Rattlesnake Island Reef, Ohio	22,620,000	Niagara Reef, Ohio	11,080,000
Ballast Island Reef, Ohio	7,300,000	Buckeye Island	5,670,000
North Bass Island Reef, Ohio	23,460,000	West Sister Island	4,200,000
Green Island Reef, Ohio	6,400,000	Toledo Field, Ohio	3,300,000
Starve Island Reef, Ohio	5,600,000	Monroe Field, Mich	3,300,000
Port Clinton Field, Ohio	13,280,000	Turkey Lake, Syracuse, Ind	2,000,000
Kelley Island, Ohio	5,670,000		

During the period of incubation the water in the lake became so low, on account of a southwest gale, that the suction pipe was above the surface of the water, and the supply to the hatchery was cut off for six hours. The closed circulation was used without apparent detriment to the eggs during this period.

The use of air jets in keeping the screens in the fry tanks clean and free from shells has proved a success. The screens now require little or no attention, whereas, under the old plan, it took the services of several men to keep them clear when the fry were coming out rapidly. It is also believed that under the old system the fry suffered more or less from coming in contact with the screens. As now arranged, the jets coming up from the bottom on the inside produce active currents of water, which prevent the fry and shells from touching the screens. The fry are also kept from collecting in large numbers at the bottom and smothering, and they are undoubtedly made active and healthy by the thorough aeration of the water.

Lake herring.—The collection of eggs of this species, although pushed earnestly, was almost a complete failure, as very few herring were captured this season. From the 1,200,000 eggs secured, 696,000 fry were hatched and liberated at North Bass Island Reef.

Lake trout.—During December 1,000,000 lake-trout eggs were received from Northville, from which 685,400 fry were hatched and planted on Rattlesnake and Ballast Island reefs.

Black bass.—During the spring attempts were made to hatch the eggs of the small-mouthed black bass by artificial fertilization. Male and female fishes, apparently in the act of spawning, were taken from their beds, but in only one instance were fry hatched from eggs collected in this way. The eggs were forced from the female with great difficulty, and in no instance could milt be obtained from the male; hence it became necessary to open the fish and remove the spermaries, which were then cut up and mixed with the eggs, a little corn starch being added to prevent adhesion. The eggs were then placed in the McDonald jar and worked as usual. They showed little tendency to adhere to each other or to the jar any more than is usual with whitefish or pike-perch eggs. On the following day they were taken from the

jar, counted, and examined under the microscope, when it was found that 85 per cent of them were impregnated, the form of the embryo showing plainly. The water temperature at the time was 63°, and the eggs developed rapidly, hatching on the 12th, four days after being taken. A dram of the eggs were counted and they were found to measure 100,096 to the fluid quart. The ovaries of one female, weighing 1½ pounds, were removed and found to contain 4,011 nearly mature eggs, or 2,674 to a pound of fish. Eggs collected from fish caught at the Put-in Bay dock and at North Bass Island were impregnated as described above. Apparently these were as good as the first ones taken, but fungus set in within twenty-four hours and all of them died, notwithstanding they had received careful handling.

As it is believed that a large proportion of bass eggs are destroyed by storms, it was determined to experiment with artificial nests, the object being to remove the eggs to the station as soon as practicable after the fish deposited them. Two hundred nests were made of Portland cement and sand, 14 inches across the face, one-half inch thick, and slightly dished in the center. While the cement was still plastic small-sized gravel was imbedded therein so that it would resemble the natural nests. About half the nests were placed in depressions in the gravel and rock in the bay adjacent to the station and the rest of them on mud and sand bottom, being slightly sunk below the natural surface and covered about an inch deep with selected gravel of the size of chestnuts. On the morning of the 7th many bass were observed on the natural nests, but only one of the artificial nests was occupied. In many instances the bass first selected the artificial ones, but after fanning them off with their tails, according to their habit, they deposited the spawn on larger gravel in the immediate vicinity. As soon as this was noticed the nests were covered with gravel as large as hens' eggs and more or less angular in shape. This remedied the difficulty, and although most of them had already selected their beds, thirteen established themselves on the artificial nests. Four of the nests left in the lake in front of the hatchery after the black-bass season closed were afterwards found to be occupied by rock bass.

Owing to the high temperature prevailing the experiments were unsuccessful. On May 10 the water temperature rose from 64° to 69°, and on the morning of the 12th it was found that every nest in the bay, both natural and artificial, contained fungussed eggs. The artificial nests containing eggs were at once removed to the fry tanks at the station, running water turned on, and the temperature was lowered gradually to 65° by means of ice. This stopped the death rate and a few hundred fry were hatched; they were very weak, however, and survived only a few days. It is believed that very successful work can be done with artificial nests in future, and it is recommended that arrangements be made with this object in view.

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

As in past years, the fish-cultural work at the Michigan stations was directed by Mr. F. N. Clark, the Northville Station being utilized for hatching trout eggs and Alpena for whitefish. In August the superintendent, accompanied by the foreman at Alpena, visited the important fisheries on Lakes Huron and Michigan and arranged for collecting lake-trout and whitefish eggs. He also made preparations to establish a field station for collecting brook trout on Au Sable River at Stephan Point, about 8 miles from Grayling.

During the months of July and August the station force was employed as usual in repairing the ponds, improving the grounds, and overhauling and repairing the hatching apparatus. The spring furnishing the main portion of the water for hatching operations has been failing for two years, and owing to protracted drought the water was lower this summer than ever known before. As a result of this the losses of fish held at the station were very heavy, the wild trout collected from the Au Sable suffering most severely.

Lake trout.—The first consignment of lake-trout eggs was received from Alpena on October 27 and the last on December 5, the total collections amounting to 11,122,000, over 3,000,000 in excess of any previous year's take. Owing to the limited capacity of the hatching-house it became necessary to ship 5,750,000 of them, and they were consigned as follows:

Consignee.	Number.	Consignee.	Number.
U. S. F. C. Exhibit, Atlanta, Ga	35,000	Ed. Jefferson, Mammoth Springs, Ark.	5,000
U. S. F. C. Station, Cape Vincent, N. Y.	3,600,000	Swiss Department of Agriculture, Berne, Switzerland	50,000
U. S. F. C. Station, Washington, D. C.	10,000	Henry Studor, White Lake Corners, N. Y	200,000
U. S. F. C. Station, Put-in Bay, Ohio	1,000,000	Nebraska Fish Commission, South Bend, Nebr	200,000
U. S. F. C. Station, St. Johnsbury, Vt.	100,000	Vermont Fish Commission	300,000
U. S. F. C. Station, Bucksport, Me	50,000		
Wyoming Fish Commission, Laramie, Wyo	200,000		

Of these eggs, 4,600,000 were shipped in the green stage and 1,150,000 after the eye-spots appeared. From those remaining at the station, 1,295,000 fry were hatched and distributed during the months of April and May, plants amounting to 400,000 being made in Lake Huron, 750,000 in Lake Michigan, and 100,000 in the Straits of Mackinac. The remaining 45,000 were distributed to private individuals for stocking inland lakes.

Brook trout.—Arrangements having been made with Mr. H. Stephan for the lease of 4 acres of land on a brook flowing into the Au Sable, a field station was established and the collection of fish commenced on August 26. Operations were continued until November 10, during which time 6,453 trout were caught and confined in a pond prepared for them. During the early part of the season the collections were made with rod and line, but after October 1 a seine was used with

TROUT PONDS, NORTHVILLE, MICH.

excellent results, a 20-foot minnow net bringing in at each haul from 5 to 75 trout. The largest catch in any one day was over 600. The first ripe fish were found on October 3, and by the close of the season 386,807 eggs had been secured. From the experience gained this year, there is no doubt that much better results can be secured, and at reduced cost, as it is unnecessary to establish the station before the end of September.

A number of experiments were made during the season in transferring eggs before they were eyed from the field stations to Northville. Fourteen shipments of eggs were made, varying in age from 1 to 22 days, and it was found that they could be moved successfully up to and including the eighth day; between the eighth and the eighteenth days the losses were much heavier, in some cases being as high as 50 per cent.

The mortality among the wild brook trout taken from the Au Sable early in the summer was very heavy, and only 233,928 eggs were secured from them. From the domesticated stock 46,710 eggs were taken from 78 spawners. Of 667,445 brook-trout eggs obtained from all sources during the season, 75,000 were transferred to the U. S. Fish Commission stations at St. Johnsbury, Cape Vincent, and Duluth; 20,000 were furnished to the Minnesota Fish Commission, and 20,000 to applicants in Ohio. From the remaining stock, 210,000 fry were hatched and furnished in March and May to applicants in Michigan. Iowa, Wisconsin, and Ohio, for planting in public waters.

Von Behr trout.—Of the brood stock on hand, 132 females spawned during the season, producing 60,400 eggs. The first were taken on November 6 and the last on January 7. They commenced hatching in February and the 30,000 fry resulting from them were distributed with the brook and lake trout during the month of May.

Loch Leven trout.—Most of the eggs secured from this species were taken from 3-year-old fish, as only 23 females of the older brood stock spawned. The total number of ripe fish used was 262, and the number of eggs obtained from them was 132,000. Of these, 20,000 were assigned to the Nebraska and Minnesota Fish Commissions, and 17,000 fry were hatched from the balance and distributed to applicants in Michigan and Indiana.

Steelhead and rainbow trout.—On April 5 a consignment of 75,352 steelhead trout eggs was received from Fort Gaston Station. The eggs were en route twelve days and only 3,363 dead ones were picked out on arrival. The 55,000 fry resulting from them were planted early in May, deposits being made in Tawas and Pine rivers, emptying into Lake Huron, and Maple River, Straits of Mackinac. From a consignment of 25,000 rainbow trout eggs shipped from Wytheville Station, 20,000 fry were hatched and distributed during the spring.

Black bass—The small-mouthed black bass transferred from Put-in Bay showed no inclination to spawn this season. This was probably due to the fact that they were confined in small shallow ponds, and it is recommended that a pond at least an acre in area, with the necessary

spawning-beds, be built south of the reservoir. With the view to increasing the supply of water for the hatchery a 3-inch artesian well was sunk during the month of April. At a depth of 96½ feet a flow of 14 gallons per minute was obtained, the temperature being 50°. There has been no opportunity to test the value of this water for hatching purposes, but it was tried on a trough containing 23 brook trout for one week. During this time the fish did not thrive. Their gills became affected and they refused to take food. Whether this was due to the fact that the temperature of the water was much lower than that of the spring water, or to the presence of injurious foreign matter, can not be determined. The water had a slight taste of iron, but a chemical analysis developed the fact that it was not in sufficient quantities to prove injurious. By mingling it with spring or creek water good results were secured.

An appropriation of $13,000 having been made by Congress for the construction of a new hatchery, a dwelling for the superintendent, and the increase of the spring-water supply, the superintendent was instructed in June to submit the necessary plans and specifications.

At the close of the year the stock of fish on hand was as follows:

Species.	Calendar year in which hatched.				
	1896.	1895.	1894.	1893.	1892.
Brook trout	17,000	90			
Wild brook trout				675	215
Von Behr trout					230
Loch Leven trout				512	85
Black bass					20
Total	17,000	90		1,187	550

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

The foreman of the station, Mr. H. D. Dean, having been appointed superintendent of the station at Cape Vincent, N. Y., the position thus made vacant was filled by the promotion of S. W. Downing, fish-culturist. Arrangements were perfected during the month of August for the collection of lake-trout and whitefish eggs, and in October a large force of spawn-takers was employed and stationed at all of the important fishing-grounds in the upper waters of lakes Huron and Michigan.

Lake trout.—Favorable weather and an unusually large run of trout permitted the collection of over 7,000,000 eggs at Charlevoix and Beaver Island, an excess of 4,000,000 over the previous year's take at these points. On account of the frequent storms prevailing at the Caribou Islands and Detour, where collections in the past have usually been large, the nets could not be lifted regularly, consequently most of the fish taken from them were unfit for use. The eggs secured from the fish caught in Lake Michigan were forwarded to the field foreman at Charlevoix, and from there they were shipped by rail to Northville.

SELECTING AND STRIPPING RIPE TROUT, NORTHVILLE, MICH.

They were transported as usual on canton-flannel trays packed in boxes, and the majority of them arrived in excellent condition. The season closed on December 5 with a total collection of 11,122,000 from the following points: Caribou Islands, Lake Superior, 450,000; Manistique, Lake Michigan, 1,500,000; Beaver Islands, Lake Michigan, 4,634,000; Charlevoix, Lake Michigan, 2,552,000; Detour, Lake Huron, 468,000; Alpena, Lake Huron, 1,518,000.

Whitefish.—The collection of whitefish eggs commenced November 2 and continued until December 17, during which time 44,420,000 were secured from the following points:

Lake Huron: Alpena, Mich., 15,070,000; Hammond Bay, 5,000,000; Oscoda, Mich., 1,200,000.

Lake Michigan: Manistique, Mich., 14,500,000; Beaver Island, 4,500,000; Naubinway, Mich., 2,500,000; Warehouse Point, Michigan, 1,200,000; Epoufette, Mich., 450,000.

In addition to these, a consignment of 5,000,000 was transferred from Put-in Bay hatchery. Two lots of eggs were shipped, one consignment of 50,000 being sent to the Japanese Imperial Government, and another of 800,000 to Atlanta for exhibition purposes; the balance were retained for hatching and 35,850,000 fry were produced from them. The percentage of fry hatched this year was much better than that of the previous year, owing to the fact that most of the eggs were obtained from fish captured in pound nets. The experiment of penning whitefish was made at North Point, near Alpena, and although it was not so successful as anticipated, 4,000,000 eggs were secured from the 500 fish confined, and it is believed that from 20,000,000 to 25,000,000 can be secured next season in this manner, at an expense of $1,000. The fish were transferred from the pounds to the live-cars and thence to the crates without injury, though a few of them hardened afterwards and produced no eggs. This was attributed to the fact that the crates were located in very shallow water, the most difficult part of the undertaking being to find a place where they could be anchored securely in deep water.

Duluth Station, Minnesota (S. P. Wires, Superintendent).

During the summer the force of the station was employed in repairing the hatching apparatus and painting the buildings. The main flume which supplies the hatchery with water was repaired and painted and the boiler and pump overhauled, preparatory to the opening of the spawning season.

Lake trout.—Early in September arrangements were made with the fishermen on Lake Superior for collecting lake-trout eggs. The season opened September 18 and continued to November 5, eggs being obtained at the following points: Port Arthur, Ontario, 1,675,000; Grand Portage, Minnesota, 250,000; Bayfield, Wisconsin, 1,998,000; Isle Royale, Michigan, 1,392,000; total, 5,315,000.

The eggs were forwarded to Duluth by steamer and arrived in excellent condition, considering the fact that it was frequently necessary to hold them on trays in the transportation boxes from 10 to 12 days before shipping, and in one instance they were held as long as 30 days, though it is not usually considered safe to hold them longer than 20 days. The fish from which these eggs were collected were caught in small gill nets set in shallow water on reefs near the shore.

As soon as the eggs were fertilized they were placed on canton-flannel trays 18 inches square, about three layers deep, and then packed in cases holding 20 trays each. Early in the season, when the weather was warm, the bottoms of the cases were covered with wet moss and crushed ice, and a tray filled with wet moss was placed on top of that. The trays containing eggs were then packed one above the other, and at the top was placed another tray filled with wet moss and crushed ice. As the weather became colder the ice was omitted. The eggs were removed from the cases every 24 hours, thoroughly sprinkled with cold water by means of a sprinkling pot or whisk broom, and after being well drained were returned to the cases. A consignment of 50,000 was shipped to Mr. G. F. Mills for the Nevada Fish Commission. From the balance, 4,400,000 fry were hatched and distributed during May and June, 130,000 being furnished to applicants in the States of Minnesota and North Dakota. The remainder were deposited in the vicinity of the fishing-grounds from which the eggs were obtained. The total loss of eggs and fry amounted to 867,000.

Whitefish.—The fishing operations at Basswood Lake, Minn., and Whitefish Lake, Ontario, were seriously interfered with by severe storms and cold weather early in the season; hence the collections at those two points amounted to only 7,000,000. As this number was inadequate for stocking public waters, a consignment of 10,000,000 was transferred to Duluth from Put-in Bay Station. The eggs commenced hatching about the middle of April and fry resulting from them were liberated in Lake Superior between April 20 and May 8 at the following points: Iron River, Wis., Isle Royale, Mich., Bayfield and Raspberry, Wis. The loss of eggs and fry to the time of planting amounted to 7,000,000.

Steelhead trout.—In order to test the adaptability of steelhead trout to the waters of the Great Lakes, a consignment of 150,000 eggs was forwarded from the Fort Gaston, Cal., station during the month of April, and the 135,000 fry resulting from them were planted, between June 4 and 15, at the following points: Washington River, Isle Royale, Mich., 30,000; French River, Minn., 20,000; Brule River, Wis., 20,000; Split Rock River, Minn., 20,000; Poplar River, Minn., 20,000; Baptism River, Minn., 10,000; Sucker River, Minn., 15,000.

Consignments of brook and rainbow trout were also received from Neosho and Northville stations, from which 16,000 rainbow trout and 3,200 brook trout were hatched and distributed to applicants in Minnesota and North Dakota during the month of May.

UNITED STATES FISH COMMISSION PONDS, MEREDOSIA, ILL.

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

At the beginning of the year the prospects for a good season's work were poor, as the lakes and sloughs from which supplies of fish were ordinarily secured dried up during the preceding year and the usual spring rise occurred too late to permit of their being used for spawning-grounds. The station was thus left dependent on a few large flat lakes connected with the river, which had become thoroughly stocked with bass. From these a number of young fish were collected for immediate distribution, and 50,000 additional were transferred to a pond near Meredosia, leased from Mr. F. H. Ray, who had constructed it for the purpose of storing temporarily the fish caught for market by his men. A number of breeding bass had also been introduced into this pond, and the number of fry resulting from them was estimated to be about 50,000.

The distribution made early in the year was fair, but about the end of July a series of unprecedented storms occurred. A cloud-burst caused the river to rise 6 feet in a few hours, overflowing the dam and permitting the escape of all but 2,000 of the 100,000 fish in the pond. About 26,000 young bass were gathered from overflowed points near Quincy, and as it was thought to be unsafe to keep them in live-boxes, arrangements were made with the city authorities for the use of a fountain basin, 50 feet in diameter and 3½ feet deep, supplied with water from the city reservoir. The fish were held for six weeks, during which time a quantity of ground liver and 300,000 river minnows were fed them, but notwithstanding the efforts made to feed them to their fullest capacity, the larger fish devoured the smaller ones to such an extent that when the basin was drawn down only 2,482 were found.

Late in August collections were again undertaken, and, although many fish were secured, the greatest difficulty was experienced in transporting them from the places of collection to the live-boxes at Meredosia and Quincy. They seemed to be in a diseased condition when taken, and frequently the entire catch was lost en route. All along the Mississippi and Illinois rivers the fish died by thousands, and even in the deeper, larger lakes, where they live in an ordinary season until there is scarcely enough water left to cover them, the bottoms were covered with dead ones. In Spring Lake, which covers several thousand acres and is fed mostly by springs, fish of all kinds and sizes floated dead on the surface several times during the season. Various theories were advanced to account for this unusual occurrence, the most probable one attributing it to the poisoning of the waters by decayed vegetation, which had sprung up during the preceding season, when the lakes were dry, or partially so. The refuse from the cities above also polluted the waters greatly. Taken altogether, the season was without a precedent. Squatters planted turnip patches in many places where carloads of fish had been taken without difficulty two seasons before, and in several of the large flat lakes good crops of corn

were raised and harvested. In September a carload of bass, crappie, and other fishes indigenous to the Mississippi River were collected and shipped to Atlanta for exhibition in the United States Fish Commission aquarium. The other cars engaged in the distribution from Quincy were ordered to Neosho and Leadville, and the work of collection was discontinued until the following spring.

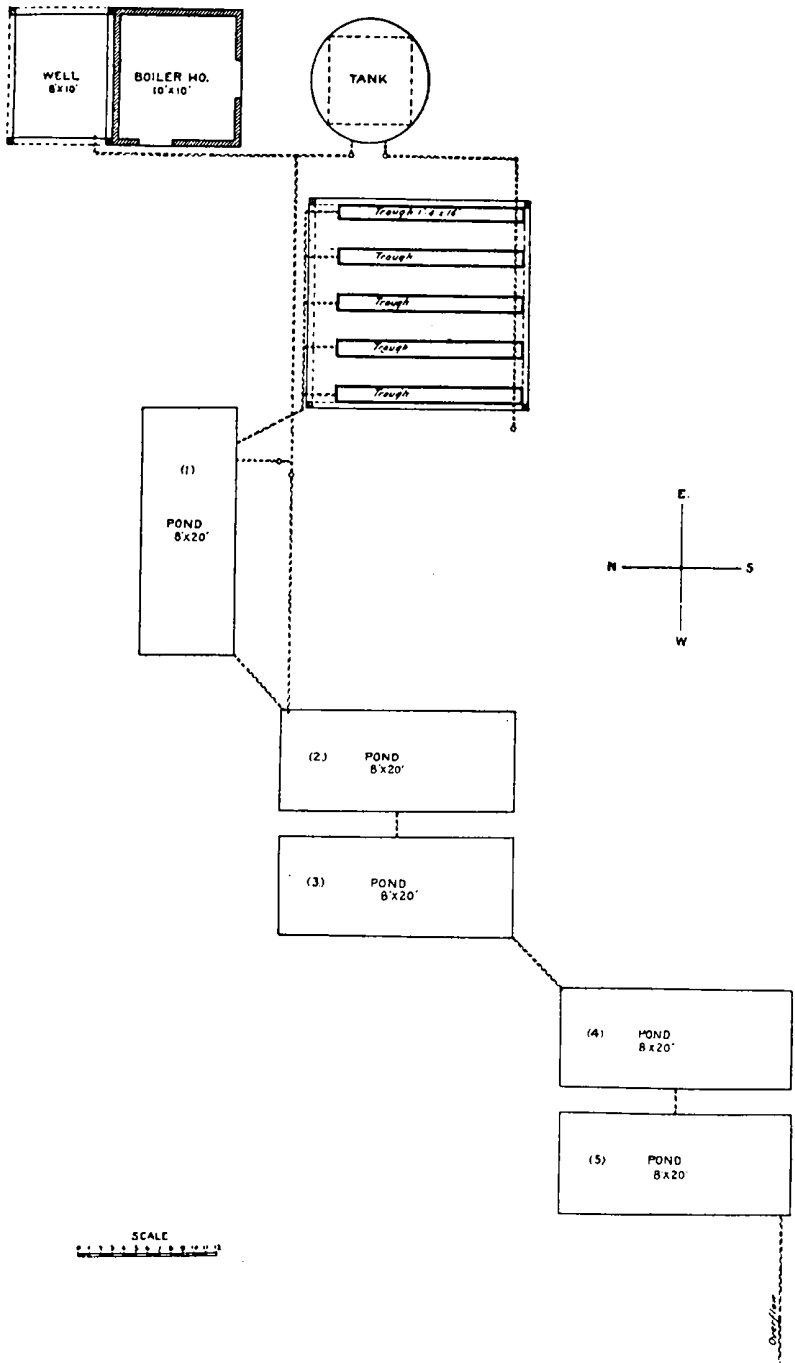
During the month of June, 1896, 7,750 black bass were collected and distributed to applicants in Wisconsin and Michigan. During the fiscal year the station furnished for distribution the following:

Species.	Fry.	Yearlings.
Black bass		18,637
Crappie		51
Warmouth bass		200
White bass	20,000	
Yellow perch		3,100
Pickerel		1,550
Carp		7,008
Total	20,000	30,546

In addition to these, large numbers of carp, buffalo, sunfish, perch, etc., were taken from the drying ponds and liberated in the river near the points where the men were working. During the very hot weather, when it was impracticable to carry the bass to the live-boxes, entire days were devoted to the saving of these coarser fishes.

From experience gained in past years it has been demonstrated that to conduct work successfully at this station it is necessary to provide a number of ponds not liable to overflow, in order that collections of bass and crappie may be made early in the spring, as soon as the water begins to recede, and held therein for distribution during the summer and fall. The fish, particularly the bass, should be carefully assorted as to size, as the sizes vary greatly, and when kept together in a limited space the smaller ones invariably fall a prey to the larger ones.

In August the superintendent was authorized to construct five ponds at Meredosia, on land leased from Mr. Ray. The site selected was on a hill about 40 feet above the level of the river, its base being 500 feet distant from Meredosia Bay. The excavations were made 2 feet greater than the dimensions of the finished ponds, which were 20 by 8 by 6 feet deep. The sides were lined with well-dressed cypress 2 inches thick, and filled in with black dirt from an Indian mound near by. The dirt was deposited in layers 4 inches thick, being well puddled and tamped; the bottom was treated in the same manner to a depth of 8 inches, and on this 2 inches of clear sand and 6 inches of screened gravel were spread. The sides and ends of the lining were securely fastened to posts which had been coated with coal tar. Evidently the dirt from the mound had originally been taken from the lake, as it resembled cement in its action, becoming so hard when wet and tamped that it was difficult to cut. The water for the ponds was obtained at a depth of 35 feet in pure sand, being forced into the tanks 8 feet above



PUMPING STATION, UNITED STATES FISH COMMISSION, MEREDOSIA, ILL.

The fall from pond 1 to 2 is 18 inches, and about the same from 2 to 3; from 3 to 4 the fall is about 14 inches, and from 4 to 5 it is 18 inches. These are about 2 feet of earth between ponds 2 and 3 and also between ponds 4 and 5.

the ground by means of a pump driven in a well 16 feet deep. Connected with the pump is a 10-horsepower boiler, which is covered, together with the well, by a neat shed. A small shed was also erected and a number of troughs constructed for holding bass intended for immediate shipment and for assorting bass before putting them in the ponds. The pumping plant is so arranged that the water can be forced into the ponds direct, or into the tanks, the ponds being supplied by gravity, or it can be introduced into the ponds and tanks at the same time. The pumping apparatus and the buildings were erected during May.

With the present facilities the chief difficulty in holding fish for distribution is eliminated, as there is little danger of their dying from fungus with the new water supply, it being as clear as spring water and almost chemically pure. If the fish reach the station in good condition, the percentage of loss from any cause will be slight. As already stated, they are first carefully assorted as to size, and those showing any injury are placed by themselves; twenty-four hours determines which ones are unfit for transportation, and these are returned to the river. The fish seem to harden by keeping, and when taken from warm water their color becomes much darker in a few days. In past seasons the greatest losses occurred in the live-boxes, where the temperature of the water frequently ranged from 90° to 100°, but since completing the ponds and obtaining the new water supply the loss in holding has decreased perceptibly.

The cost of constructing the ponds, including the purchase of the pumping plant and erection of sheds and troughs, was less than $700, exclusive of services of regular employees, who were utilized in this work when not otherwise engaged.

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

During the year considerable work was done at the station in the way of painting and repairs to buildings and fences; various improvements were also made to the ponds and the conduits; outlets and inlets of the trout pools, originally made of oak, were replaced by terra-cotta gutter pipe.

The following tables show the total precipitation during the year and the maximum, minimum, and mean air temperatures by months:

Month.	Mean.	Maximum.	Minimum.	Precipitation.	Snow.
1895—July	82.1	104	59	7.52	.....
August	82.3	104	62	4.76	.....
September	76.4	95	32	11.24	.....
October	54.3	81	20	.41	.....
November	44.4	75	11	4.16	4.50
December	38.3	66	2	a 11.21	1.25
1896—January	30	64	3	1.11	3.50
February	39.7	73	10	1.08	1.50
March	43.5	81	10	2.37	2.50
April	64.8	91	20	3.62	.....
May	69	96	32	11.91	.....
June	73.5	96	48	7.18	.....
	58.7	.....	.....	66.57	13.25

a Rain gauge overran in the storm of December, and the amount was calculated from other data.

The year was marked by four unusually severe storms, occurring on July 7, September 8, December 17, and May 30, all of which did much damage to the station. The storms of December and May washed over the north end of grounds, damaging walks, fences, roads, and pond banks.

The theory set forth in a previous report that crawfish would not enter or live in a pond the banks of which were planted with mint, was proved this year to be untrue, as the experiment was tried and it was found that the crawfish were not affected by the mint.

The following list shows the number of enemies of fish killed during the year: Kingfishers, 19; ducks, 25; grebes, 2; water hens, 10; bitterns, 18; fishhawks, 4; herons, 2; terns, 12; owls, 4; turtles, 20; snakes, 22; frogs, 3; muskrats, 20; water rats, 6; crawfish (pounds), 1,385.

Black bass.—The output of black bass for the year was 9,338, which was 50 per cent in excess of the number distributed in any previous year. As in preceding seasons, the ponds were drawn frequently and the fish carefully assorted according to size. The increased output is attributed in a large measure to the fact that most of the fry were transferred to hatching-troughs during the summer and fed on grated crawfish, it having been found after a few days' trial that young bass could be taught to take this food readily.

In the spring of 1896 ponds Nos. 10 and 11 were, as usual, selected as breeding-ponds, 15 brood fish being put in No. 10 and 29 in No. 11 on April 3. On April 16 the first nest was observed, and the first young fish were noted on the 25th. Several thousand of them were at once transferred to the troughs and an effort made to raise them, but it resulted in failure. About the middle of May 12,000 fry were taken out of pond No. 11 to troughs in the hatching-house, and no difficulty was experienced in training them to take artificial food. About the middle of June both ponds were drawn down and the remainder of the crop, amounting to 9,761, transferred to the troughs. At the close of the year the average loss of fry from the time of their transfer to troughs was about 2 per cent a month. At this rate the total loss to the time of general distribution will be 10 per cent. Under the old system of rearing in ponds the total loss frequently ran as high as 50 per cent, and sometimes higher. It appears from this season's experience that the fry of the black bass should not be transferred to the troughs until two or three weeks old.

An effort was made this season to artificially spawn the black bass, and with this object in view a number of wild adults were taken from Shoal Creek in April and confined in the east pool. They were held until the close of the season, but failed to produce any eggs. This can only be accounted for on the supposition that the water in the pond selected was too cold. Its temperature averaged 57°, 3° lower than that in which the regular brood stock spawned. Efforts were also made to collect young bass from the natural nests in Shoal and Hickory creeks, but the roiling of the streams from excessive rains made the experiment unsuccessful.

Strawberry bass.—On December 1, 1895, 51 strawberry bass (*Pomoxis sparoides*) were received from Quincy station. These were wintered with a loss of only 5, and early in the spring were transferred to one of the breeding-ponds. Although no nests or spawning were observed at any time, a number of fry have been seen in the pond. A number of them accidentally caught in the net early in June died before they could be removed. It seems doubtful if the young of this species can be handled in midsummer like the rock bass and black bass.

Rock bass.—The total output of yearling rock bass, amounting to 25,248, was less than half the output of the previous year. The cause of this decrease is unknown. It was found to be an easy matter to carry the fry in troughs for several weeks by feeding on coriza and grated crawfish. In the spring the usual arrangements were made for breeding and rearing the new crop, and judging from indications at the close of the fiscal year the output will be very fair.

Tench.—The work with this species was a failure, owing partly to the accidental introduction of black bass into the pond, and partly to the fact that the ponds containing the fry were flooded on May 30. After the water subsided it was observed that nearly all of these fish had escaped.

Goldfish.—The total distribution of goldfish during the year was 994. During the winter the Commissioner decided to discontinue the propagation of this species, and the brood stock on hand were liberated in Hickory Creek.

Rainbow trout.—During the fall 81,507 yearlings were distributed from eggs taken at the station and 7,426 yearlings from eggs shipped from California. In July and August two severe epidemics prevailed among the 16-months red-banded rainbows. When the first one appeared it was thought to be due to the feed water being overtaxed by passing over 21,000 rock bass in the hatching-house and 32,000 trout in the east pool, but at the time of the August epidemic these conditions did not exist. The fish remaining after the second loss were placed in the pond with the old brood stock, and at the close of the year only 487 survived of the 1,450 on hand at the beginning of the season.

The spawning season commenced December 17 and lasted until February 20, during which time 614,887 eggs were collected; 74 per cent, or 456,110, proved to be impregnated. Shipments amounting to 313,851 were made during the fall to other hatcheries, 12,732 of the balance died in incubation, and 11,139 fry were lost in the troughs, leaving on hand 118,388 fry. Of this number, 30,940 were distributed and 87,448 were retained for rearing to the yearling stage. The eggs shipped from the station this year were packed in sphagnum moss collected in Maine, and the results so far reported are more satisfactory than in any previous season.

The early distribution of the trout in the fall of 1895 made it possible to use the old series of trout pools for holding brood stock during

the spawning period. By this arrangement it became much easier to handle the fish and to segregate the sexes and the spent from the unripe fish.

The following tables show the loss of eggs and fry in the hatchery, the percentage of fry transferred to the rearing-ponds, and the maximum and minimum temperatures of water to which the various species were subjected during the year:

Number of eggs retained.	Eggs lost in incubation.	Fry lost in troughs.	Fry counted out into pools.	Per cent of loss.
13,129	1,450	1,574	10,105	23
8,016	810	776	6,430	19
6,302	555	422	5,325	15
11,044	915	760	9,369	15
14,021	1,380	745	11,946	14
13,298	1,280	1,124	10,894	18
13,147	1,828	595	10,724	18
9,602	824	718	8,060	16
16,560	1,360	815	14,385	13
15,695	1,245	1,240	13,210	16
21,445	1,135	2,370	17,940	16
142,259	12,732	11,130	118,388	16

Summary of temperatures to which the various species were subjected.

Species.	Maximum.	Minimum.
Trout, rainbows, fry to 6 years old	67	48
Black bass, fry to 6 years	70	33
Rock bass, fry to 6 years	76	36
Strawberry bass, fry to adults	67	39
Tench, fry to 6 years	77	34
Goldfish, fry to adults	75	47

In view of the success attained in the rearing of black bass and rock bass in the troughs and hatching-house, it is recommended that the hatching facilities be doubled. At present there are only eleven troughs, which are entirely inadequate for the needs of the station.

LEADVILLE STATION, COLORADO (E. A. TULIAN, SUPERINTENDENT).

The Government having acquired the right to use the water of Rock Creek and Evergreen Lakes, operations were commenced in June, 1895, with the view to increasing the water supply to the hatchery. A solid riprap dam was built in Rock Creek above the head of Evergreen Lakes ditch, and a wooden pipe was laid at an elevation of 9,918.66 feet, to connect the intake crib with an intermediate crib 1,644 feet distant. The intermediate crib was connected with Evergreen Lakes by a 16-inch overflow flume, and an 8-inch outlet pipe was laid to a lower crib, 2,258 feet distant. This lower crib was provided with an 8-inch outlet pipe and an overflow flume 10 by 16 inches, the elevation at the overflow being 9,706.85 feet. The 8-inch pipe conveys the water to the hatchery reservoir, 451 feet distant; it also supplies the house and stables, and has hydrant connections at other points.

On August 9 the water was turned into the pipe, and the flow into the intermediate crib was found to be 2,350 gallons per minute, and

1,500 per minute into the hatchery reservoir. Of this amount 500 gallons are required for the hatchery, and the balance is fed into the ponds. The temperature of the new water supply is 10° colder in midsummer and 1° warmer in winter than that which flows through the lakes to the hatchery.

Brook trout.—At the beginning of the year 112,000 were reported to be on hand, but this estimate proved erroneous, as the total output in the fall numbered 47,800, and the losses to the time of distribution amounted to only 16,000. Arrangements were made to collect eggs from various points in the vicinity of Leadville, and at the close of the season 360,900 had been secured at Wellington Lake, 179,900 at Uneva, 43,100 at Gales, 65,200 at Nasts, 47,000 at Twin Lakes, and 404,800 from brood stock at the station and in Evergreen Lakes, making a total of 1,100,900.

With the view to simplifying the work of capturing ripe fish in Evergreen Lakes, a spawning-race, 100 feet long, 4 feet wide, and 3 feet deep, was placed at the head of the lake early in the season, and a flow of water 2 feet deep turned through it. The result was disappointing, as very few fish were captured by means of it. This may have been because the flume was new, but it has since been observed that very few brook trout enter the cold mountain streams emptying into lakes in Colorado for the purpose of spawning.

The work at Wellington Lake extended from November 12 to December 14, being conducted under very unfavorable circumstances, owing to severe weather and lack of suitable facilities for capturing fish and taking spawn. The lake was frozen over solid, and as the fish entered the inlets in very small numbers, it became necessary to catch them by seines fished through holes in the ice. This work, ordinarily tedious, was rendered more so from the fact that the thermometer ranged from zero to 10° below every night, making it necessary to cut the ice out each day. The fish had to be stripped in the open air, and several lots of eggs were taken with the temperature ranging from zero to 16° above. As a result of the severe weather 160,000 of the 360,900 died in incubation. That the mortality was due to the intense cold is made evident by the fact that the loss on eggs taken when the temperature was above 32° ranged from 9 per cent to 16 per cent; of those taken in a temperature of 15° to 20° below freezing point, about 42 per cent succumbed, and on two lots taken at a temperature of zero over 80 per cent died, notwithstanding the fact that the fish from which they were taken were in better condition than those on which the smaller losses occurred. Arrangements have been made to erect a spawning-house at this point before the next season opens.

The Uneva Lake collections were not as large as anticipated, and owing to scarcity of male fish the loss of eggs from imperfect fertilization was considerable. The season lasted from October 29 to December 2, and on May 1 there were 143,740 fry on hand as a result of the collections made at that point. The collections at Gale's Pond were also

very poor, owing to the fact that the fish were too fat. Several of them were opened and the vent was found to be so nearly closed that the eggs could not be forced out. Operations were discontinued on January 17, although there were on hand 80 large ripe females. The work at Nast's Lake, though small, was satisfactory. Half of the eggs collected at that point were turned over to the owner of the lake, and from the balance 26,000 healthy fry were produced, the loss in incubation being a little over 20 per cent. The result at Twin Lakes was discouraging, as it was not only an expensive field to operate, but 27,000 of the eggs secured were lost, owing to low temperature and rough handling in transportation.

The brood stock commenced spawning on October 5, the collections continuing until January 3. These eggs were of excellent quality, the loss in hatching being only 22 per cent, and in May, when the distribution of fry was undertaken, there were 314,000 in stock.

The first fry were hatched on January 5, 91 days after the spawning season commenced, and began taking food on February 20, at the age of 47 days. In May 332,000 of the fry on hand were distributed to applicants in Colorado, Wyoming, and South Dakota, and 170,520 were turned over to the owners of Wellington and Uneva lakes and Gale's Pond; the balance were retained to be reared and distributed as yearlings.

Loch Leven trout.—The first eggs of this species were obtained on October 24, and by January 18, the close of the season, 81,260 had been secured from brood stock at the station and wild fish in Uneva and Twin lakes. Three consignments of 10,000 each were shipped to Hon. G. Schnitger, fish commissioner of Wyoming, Hon. Lewis Miller, Laramie, Wyo., and Austin C. Tubbs, of California. From the balance 23,000 fry were hatched, 11,780 of which were on hand at the close of the year.

Rainbow trout.—As a result of eggs collected the preceding spring, there were 4,260 rainbow trout available for distribution in October. Of these, 900 were deposited in Evergreen Lakes and the balance were liberated in other waters. In February, 55,000 eggs were received from the Neosho, Mo., Station, and later in the spring collections aggregating 85,500 were secured at Uneva and Twin lakes. The eggs received from Neosho commenced hatching February 20 and finished March 16, yielding 52,800 fry. Of these, 32,300 were lost; the balance were distributed in May. From the collections made in the vicinity of the station there remained on hand at the close of the year 24,500 fry and 44,900 eggs.

Native trout.—From the 11,300 eggs of the yellow-finned trout on hand at the beginning of the fiscal year, 7,700 fingerlings were planted in Evergreen and Twin lakes in October. The following spring the first eggs were taken on May 12, at Twin Lakes, and the collection for the season amounted to 21,200. The loss to July 1 was 6,100, about 29 per cent.

The collection of black-spotted trout eggs commenced at Twin Lakes on May 14 and continued until June 24, the total number secured being only 207,000. The results were very discouraging, as operations had been conducted not only with the Government trap constructed the previous year, but the State trap and hatchery, which had been turned over to the Commission, were also used. It is believed that the presence of large numbers of suckers was the main cause of failure. They entered Lake Creek in such numbers that they crowded each other partly out of the water, and each morning from 500 to 1,000 pounds of dead ones were taken from the Government trap, and a ton or more of live fish were turned loose. But few suckers were caught at the State trap, and the results there would undoubtedly have been much better, but the trap was destroyed on the night of May 27 by persons in the neighborhood, who objected to its being operated, as it prevented the trout from running out of the lower lake into Lake Creek and thence into the Arkansas River.

At the time the trap was destroyed 600 native trout had been taken and the spawning season had not commenced. From the eggs obtained 25,000 were shipped to the Michigan Fish Commission; the balance were hatched at the station and at the close of the year there remained on hand 44,900. The large loss in incubation was no doubt due to the poor quality of the males used.

Under ordinary conditions the eye-spots appeared in the rainbow, yellow-finned, and black-spotted trout eggs collected during the spring in about 20 days, and the eggs commenced hatching in 45 days, though the last ones taken frequently hatched in 30 days or less, according to the temperature of the water. Feeding commenced after the absorption of the sac, which required from 20 to 30 days.

At the beginning of the fiscal year there were on hand 36,580 black-spotted trout eggs; 10,000 of these were shipped to the Michigan Commission and arrived in excellent condition, notwithstanding the fact that the temperature was over 100° in the shade during the four days the consignment was en route. From the balance, 6,000 yearlings were reared and distributed in the month of October to applicants in Colorado and Wyoming, and 5,600 were deposited in Evergreen and Twin Lakes.

The stock of fish remaining on hand at the close of the season was as follows:

Species.	Calendar year in which fish were hatched.		Eggs.
	1896.	1892.	
Brook trout	137,000	666	.....
Loch Leven trout	11,780	118	.....
Rainbow trout	24,600	.....	44,900
Black-spotted trout	20,000	40	57,900
Yellow-finned trout	.....	.....	15,100

BAIRD STATION, CALIFORNIA (LIVINGSTON STONE, SUPERINTENDENT).

At the beginning of the year a rack was constructed across McCloud River to prevent the ascent of salmon. Several additional piers were rendered necessary by the constant widening of the river. After the completion of this work the old wornout flatboats supporting the current wheel were removed, and two substantial piers were erected in place of them. Seining operations for the summer run of salmon were commenced August 26, and the first eggs were collected the following day. The season lasted a month, and the results attained were unusually large, the yield of eggs amounting to 7,747,600. Operations were resumed on October 30, when the fall run of salmon appeared, but owing to low water in the river very few fish were captured, and only 1,915,400 eggs were secured, making a total of 9,663,000 for the season.

As in past years the bulk of the season's collection was transferred to the California State Fish Commission, to be hatched at the Sisson Hatchery and planted in the public waters of the State. Of the stock remaining 2,674,000 were transferred to Clackamas Station; 10,000 were sent to Craig Brook Station, and 40,000 to Atlanta for hatching in the United States Fish Commission exhibit. In addition to these shipments the following assignments were sent to applicants in foreign countries:

Consignee.	Number assigned.
S. Jaffé, Sandfort, Osnabruck, Germany	25,000
Gen. Reuben Alonzo, Leon, Nicaragua	20,000
R. L. Moore, Belleek, Ireland	50,000

The balance of the eggs, amounting to 768,200, were retained at the station, and of the 650,000 fry resulting from them 400,000 were deposited in McCloud River in February and March. The remaining 250,000 were kept in troughs at the hatchery, being fed on chopped liver, venison, and such other fresh meat as could be secured. When they were liberated in the Sacramento River, on May 12, they were strong, healthy fish, ranging in length from 1½ to 2½ inches. These fish were kept during the winter without expense, except the cost of the food, as the water used was supplied by gravity through the aqueduct from Wiley Creek, which was completed during the summer. The hatching apparatus used was the Williamson trough and the Stone salmon basket, a full description of which is given in the report for 1895.

During the year the superintendent visited Battle Creek and made a report on the advisability of either acquiring the salmon-hatching station recently established there by the California Fish Commission, or opening an auxiliary station in connection with Baird, since the conditions existing on the creek indicated that immense numbers of eggs could be collected annually, the California Commission having taken over 10,000,000 during a period of less than one month.

Table of temperatures at Baird Station.

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

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

Date.	Salmon caught.			Eggs collected.	Date.	Salmon caught.			Eggs collected.
	Male.	Fem.	Ripe.			Male.	Fem.	Ripe.	
1896.					1896.				
Aug. 26	343	171	19		Oct. 21	13	13	9	
27	619	288	19	79,000	22	8	4	4	
28	303	270	16	65,500	23	7	2	2	
29	201	151	12	93,600	28	23	31	16	
30	283	171	21	57,500	29	35	24	34	
31	310	139	28	83,400	30	15	9	7	178,500
Sept. 1	97	53	15	137,000	31	33	27	10	
2	433	240	56	221,000	Nov. 1	33	29	11	189,100
3	308	181	56	283,800	2	22	39	21	
4	403	178	66	278,800	3	29	31	12	
5	270	143	50	277,900	4	27	20	12	148,200
6	386	153	47	294,100	6	22	14	10	
7	368	196	82	265,500	7	25	27	15	95,200
8	329	169	63	335,700	9	6	6	3	
9	357	154	84	517,000	11	46	37	14	
10	695	357	113	345,800	12	51	41	23	168,300
11	565	364	86	542,000	13	22	25	19	120,700
12	279	122	33		15	14	21	10	
13	362	311	64	709,800	16	12	22	12	192,100
14	467	243	57	308,500	19				125,800
16	395	183	116	657,000	21				126,600
17	188	105	65		25	2	5	5	54,400
18	89	45	26	503,800	26	2	3	2	
19	115	87	57		27	7	5	4	
20	157	105	79	545,400	29	36	39	28	68,800
21	56	46	22	240,800	30	8	9	6	91,800
23	44	29	23		Dec. 2	8	19	12	85,000
24	46	57	47	329,400	3	3	6	4	
25	25	44	36		4	6			85,500
26	15	30	28	307,600	5	6	5	5	
27	77	24	20	200,000	6	16	8	7	
28	2	2	2		7	4	4	4	131,400
30	3	4	2	66,800	11	2			
Oct. 18	11	13	10		14				54,000
19	17	14	8		Total	9,320	5,512	1,951	9,663,000
20	13	11	9						

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

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

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

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

Shipments of steelhead-trout eggs.

Consignee.	Number.
New York Fish Commission, Caledonia, N. Y.	75,000
U. S. F. C. Station, Northville, Mich.	100,000
U. S. F. C. Station, Duluth, Minn.	150,000
U. S. F. C. Station, Cape Vincent, N. Y.	50,000
U. S. F. C. Station, East Orland, Me.	160,000
Japanese Minister of Agriculture and Commerce, Niigata Ken, Japan.	75,000
New York Fish Commission, Cold Spring Harbor, N. Y.	25,000
Total	635,000

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

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

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

CLACKAMAS.

Acting on information contained in the report of Prof. Barton W. Evermann, on his investigation of the headwaters of Columbia River Basin, the superintendent was instructed not to attempt collections on the Clackamas River, but to arrange for the operation of a field station at some point on Snake River in Idaho. Accordingly, a survey of the grounds was made during the early summer, and it was decided to locate the station near Weiser, as a larger number of fishermen operated in that vicinity than at any other point on the river. On August 12 the superintendent transferred the regular force from Clackamas, together with the necessary supplies and apparatus, and arranged for establishing the station on an island in the river 7 miles below Weiser. This island was owned by Mr. T. L. Westlake, who permitted the use of the land without charge. A small channel which divided the island was inclosed in wire netting for the purpose of penning the fish taken, and a current wheel was erected in order to supply water for hatching operations. Considerable difficulty was experienced in procuring the necessary lumber and other material for erecting the wheel and troughs, owing to the isolated situation of the island, but by August 28 ten troughs 12 feet long had been constructed and a flume provided for conducting the water furnished by the wheel. It was the original intention to use the wheel simply as motive power for operating a Chinese pump, but, as this plan proved to be impracticable, the pump was discarded and the water was raised from the river by buckets attached to the paddles of the wheel.

Arrangements were made with the fishermen in the vicinity to purchase all of the female salmon and an equal number of males at 40 cents each, the fish to be delivered at the station. From the reported catch of the previous year it was thought that no difficulty would be experienced in obtaining all of the brood fish desired, but as the season advanced it became apparent that, owing to low water in the river, very few fish would be caught. Mr. William O'Brien, whose fishery is on the Oregon side about 2½ miles above the station, and who expected to furnish at least 2,000, delivered by September 12 only 50. These were transported to the station in live-boxes, and though in good condition apparently when received, they soon developed sores and fungus, and many of them became blind. They commenced dying shortly afterwards, and by October 1 forty-one of them had been lost. The water in the river at this time was very warm, its temperature at noon ranging from 70° to 80° It was then arranged with Mr. O'Brien to pen the fish at his fishery, and although they did better at first than those transferred to the station, they also became fungussed in a short time and many died. Most of the quinnat salmon were taken during September, the catch being at its best about the middle of the month. The total number furnished by Mr. O'Brien was 161, and the majority of them were males. During the month of October 64,000 eggs were secured

from the fish surviving at the pound and those at the O'Brien fishery, the last lot being taken on the 1st of November. After that date arrangements were made to close the field station, and the eggs were packed in moss and ice and shipped by express to Clackamas.

As only a few of the eggs were eyed at the time of shipment, a large number were lost in transit, and but 19,000 fry were hatched from them, 17,000 of which survived and were liberated in Clear Creek on February 14. On October 16 a shipment of 1,534,000 quinnat salmon eggs was received from Baird Station. The fry resulting from them were held until the sac was absorbed, when plants aggregating 1,236,072 were made in Clackamas River and Clear Creek. The balance of the fry hatched from the consignment, amounting to 79,746, were retained in the troughs and fed until May 21. These fish when liberated averaged 2⅞ inches in length, and the loss amounted to only 2,147. The adipose fins of 5,000 of them were cut off before planting, with the view to identifying them later on if practicable. On December 18 another shipment of 1,000,000 eggs arrived from Battle Creek, Cal., and a third consignment of 1,140,000, transferred from Baird Station, was received January 22, making a total of 3,674,000 transferred to Clackamas from California stations. The loss on these shipments was very small, and the fry resulting from them were also liberated in Clackamas River and Clear Creek as soon as the sac was absorbed, with the exception of 481,635, which were retained in the hatchery until May 21.

The following table shows the number of fry liberated at the various points, and dates of deposit:

Waters stocked.	Date of deposit.	Number deposited.
	1895.	
Clackamas River, at Clackamas, Oreg	Dec. 19	239,240
Do	Dec. 20	239,240
Do	Dec. 26	239,240
Clear Creek, at Clackamas, Oreg	Dec. 28	358,860
Clackamas River, at Clackamas	Dec. 31	159,492
	1896.	
Clear Creek, Clackamas	Feb. 14	17,000
Clackamas River and Clear Creek, Clackamas	Mar. 9	600,000
Clear Creek, Clackamas	Mar. 24	370,078
Clackamas River and Clear Creek, Clackamas	Mar. 27	400,000
Do	Mar. 28	200,000
Clear Creek, Clackamas	May 21	278,575
Do	May 22	278,575
Total		3,389,300

Repairs and improvements.—During the year a new barn, 34 by 30, was constructed by station employees, and a new suction pipe was laid to Clear Creek. A flume was constructed to convey water by gravity from a small brook, 80 rods distant, to the hatchery, thus making it unnecessary to operate the pump during the winter months. The hatchery was supplied with water from Clear Creek until December 6, when the gravity supply was utilized to the end of the season. The gravity supply is available only during the winter and spring months, as the brook dries up in summer.

DISTRIBUTION.

During the year the cars were occupied as usual in making the distribution of trout, salmon, whitefish, shad, black bass, rock bass, carp, and tench, traveling 93,436 miles. In addition to this, 93,591 miles were traveled by detached messengers. The total number of fish handled by the cars and messengers was as follows:

Species.	Fry.	Fingerlings and yearlings.
Trout	1,864,000	319,334
Landlocked salmon	67,000	37,382
Whitefish	39,000,000	.....
Shad	78,000,000	.....
Black bass	.....	35,931
Rock bass	.....	35,581
Carp and tench	.....	131,152
Total	118,931,000	559,380

Two distributions of trout were made during the year, one in the fall when the yearling fish—that is, fish resulting from the previous year's product—were distributed, and again in the spring, when the lake-trout fry were planted, and part of the brook and rainbow trout fry from some of the stations where the stock was too large to be carried through the summer.

The distribution of yearlings commenced in September and continued until December 15, and, with the exception of the loss of two carloads of yearling rainbow trout from Neosho Station, it was very successfully accomplished. The losses referred to occurred during the month of September, when the temperature of the air inside the car registered 101° and 106° F., respectively. Efforts were made to keep the water temperature down to 50° by the liberal use of ice, but this did not apparently reduce the death rate. Large losses have occurred heretofore under somewhat similar conditions, but it was thought they killed themselves by jumping, attributed to fright. In this instance they did not jump.

The landlocked salmon at Green Lake, Maine, were distributed with the trout in September and October, and in June.

The water used in the transportation of salmon and trout varied in temperature from 34° to 69°, its average being 43°. They were carried in square galvanized iron tanks of 50 gallons capacity, and in the regular round-shouldered cans of 10 gallons, both air and water circulation being used, except in the case of car No. 4, which had been fitted for the transportation of marine fishes, with air circulation alone. Most successful results were attained in carrying rainbow trout on this car, the fish being transported in round-shouldered cans, which were connected with the air pump by means of half-inch rubber tubing. The air passed into the cans through air-liberators attached to this tubing.

In March 3,000,000 whitefish eggs were shipped from Put-in Bay Station on car No. 3 to Bear Lake, Idaho, where they were hatched and liberated; 34,000,000 fry were also deposited in Lakes Huron, Superior, Michigan, and in Turkey Lake, Indiana, during the months of April and May, with a loss of only 50,000. The average temperature of the water in which they were transported was 37°. Air circulation was used in the distribution of whitefish and resulted in doubling the capacity of the cars, over 4,000,000 being taken on some trips.

The black bass and rock bass produced at Neosho and Wytheville and the Washington Fish Ponds were distributed at the same time as the yearling rainbow trout. The distribution from Quincy was made during summer. Little difficulty was experienced in transporting these species (the losses not exceeding 6 per cent); they were carried as usual in square galvanized-iron tanks with a temperature ranging from 55° to 60°. Large numbers of rock bass were shipped with satisfactory results in carp pails, about 30 to each pail, on trips not requiring more than 24 hours' time. This method of shipment reduced very materially the expense of distribution and also saved much time. It was tried with the black bass for short shipments, but with only moderate success.

During the fall carp and tench numbering 131,152 were distributed, the cars engaged in the work traveling 9,836 miles, with a loss of only 8,459 fish. In the spring two of the cars, with the aid of three additional messengers, planted 78,000,000 shad fry in rivers along the Atlantic coast from Florida to Massachusetts. They were transported in the regulation round-shouldered cans, in water of a temperature ranging from 62° to 68°.

In addition to the regular work the car and messenger service was called upon to transport the fish exhibited by the Commission at the Cotton States and International Exposition, Atlanta, Ga. Car No. 4 was specially fitted for the transportation of marine fishes with an air-circulating plant similar to that used in transporting salt-water fishes to Chicago for the World's Columbian Exposition, rectangular tanks with submerged covers being used instead of the circular ones, as it was found that the fish carried much better in them.

As many of the railroads refused to haul the cars unless fitted with quick-action air brakes, Nos. 1 and 2 were equipped during the year as required, but, owing to its construction, No. 3 could not be equipped in this manner.

In January when No. 2 was sent to the railroad shops at Altoona, to have the quick-action air brake put on, it was discovered that the main timbers were much decayed, and further examination showed the car to be so unsafe that arrangements were at once made to rebuild it, using as much of the old material as practicable. It was completed in March, at an expense of about $4,000, and was then taken to Central Station, where the boilers, pumps, hatching apparatus and circulating pipes were replaced by the engineer force of the Commission.

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

State or Territory.	Species.	Eggs.	Fry.	Adults and yearlings.
Alabama	Carp			590
	Tench			554
	Goldfish			12
	Rainbow trout			3,600
	Black bass (large mouth)			400
Arizona	Rock bass			900
	Tench			95
Arkansas	Rock bass			93
	Goldfish			10
	Carp			258
	Tench			650
	Rainbow trout	17,550	9,940	16,620
	Von Behr trout			1,000
	Brook trout			350
	Lake trout	5,000		
	Black bass (large mouth)			275
California	Rock bass			500
	Quinnat salmon	6,075,800	465,700	250,000
	Steelhead trout		107,808	
	Loch Leven trout	10,000		
	Rainbow trout	30,000		
Colorado	Von Behr trout	10,000		
	Rainbow trout		5,900	4,530
	Black-spotted trout		8,600	
	Yellow-finned trout		7,700	
	Brook trout		250,500	19,800
	Rock bass			100
Connecticut	Black bass (large mouth)			150
	Goldfish			24
	Shad		6,362,000	
	Atlantic salmon	50,000		
	Rainbow trout	25,000		2,870
	Brook trout			7,130
	Black bass (large mouth)			300
	Lobster		10,138,000	
Delaware	Carp			1,000
	Tench			224
	Golden tench			12
	Shad	1,165,000	3,881,000	
	Rainbow trout	10,000		
District of Columbia	Carp			5,646
	Tench			1,524
	Goldfish			113
	Golden tench			24
	Golden ide			8
	Rainbow trout		3,500	298
	Shad		9,390,000	1,000,000
Florida	Black bass (large mouth)			100
	Carp			2,070
	Tench			505
	Shad		4,674,000	
Georgia	Carp			14,104
	Tench			11,426
	Goldfish			330
	Golden tench			9
	Shad		4,593,000	
	Landlocked salmon			69
	Rainbow trout			1,533
	Black-spotted trout			17
	Brook trout			38
	Lake trout		9,000	
	Yellow perch			60
	Black bass (large mouth)			1,007
	Black bass (small mouth)			100
	Sunfish			35
Idaho	Rock bass			1,549
	Carp			490
	Tench			758
	Brook trout			1,475
	Whitefish		2,940,000	
	Yellow perch			400
Illinois	Black bass (large mouth)			270
	Carp			50
	Tench			680
	Goldfish			20
	Black bass (large mouth)			950
Indiana	Rock bass			600
	Carp			90
	Tench			185
	Loch Leven trout		4,000	
	Rainbow trout		7,500	3,761
	Brook trout		7,000	
	Whitefish		2,000,000	
	Black bass (large mouth)			1,800
	Rock bass			885

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

State or Territory.	Species.	Eggs.	Fry.	Adults and yearlings.
Indian Territory	Carp			760
	Rainbow trout			2,400
	Black bass (large mouth)			75
	Rock bass			300
Iowa	Carp			2,371
	Tench			500
	Rainbow trout		1,000	1,500
	Brook trout		20,000	
	Yellow perch			550
	Pickerel			50
	Black bass (large mouth)			1,625
	White bass		19,500	
	Rock bass			900
Kansas	Carp			2,290
	Tench			2,321
	Goldfish			20
	Rainbow trout			8,361
	Black bass (large mouth)			750
	Rock bass			4,935
Kentucky	Carp			360
	Tench			360
	Rainbow trout			1,250
	Black bass (large mouth)			1,910
	Rock bass			2,675
Louisiana	Carp			101
	Tench			30
	Goldfish			727
	Rainbow trout			1,000
	Black bass (large mouth)			300
	Rock bass			63
Maine	Carp			30
	Atlantic salmon			151,676
	Landlocked salmon		59,525	34,482
	Steelhead trout		43,907	
	Rainbow trout			48
	Brook trout	40,000	24,565	10,913
	Lake trout			1,000
	Golden trout		21,700	10
	Scotch sea trout			1,376
	Lobster		759,000	
	Mackerel		213,500	
Maryland	Carp			5,560
	Tench			512
	Shad		26,653,000	
	Rainbow trout		4,600	5,150
	Von Behr trout		8,422	
	Yellow perch		812,000	
	Black bass (large mouth)			315
	Black bass (small mouth)			400
	Rock bass			600
Massachusetts	Carp			671
	Tench			115
	Shad		1,490,000	
	Atlantic salmon	20,000		
	Rainbow trout			1,000
	Brook trout		3,000	2,800
	Lake trout		14,000	
	Black bass (large mouth)			333
	Cod	840,000	65,300,000	
	Flatfish		8,472,000	
	Lobster		80,032,000	
	Tautog		17,575,000	
	Mackerel		1,728,000	
Michigan	Carp			420
	Goldfish			12
	Steelhead trout		85,000	
	Loch Leven trout		13,000	
	Rainbow trout		5,000	
	Von Behr trout		20,000	
	Black-spotted trout	35,000		
	Brook trout		158,000	300
	Lake trout		2,490,000	
	Whitefish		43,100,000	
	Black bass (large mouth)			2,650
Minnesota	Carp			3,100
	Steelhead trout		85,000	
	Loch Leven trout	10,000		
	Rainbow trout		13,000	
	Brook trout	20,000	3,100	
	Lake trout		1,240,000	
	Whitefish		250,000	
	Black bass (large mouth)			200
Mississippi	Carp			145
	Tench			235
	Goldfish			12

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

State or Territory.	Species.	Eggs.	Fry.	Adults and yearlings.
Mississippi	Black bass (large mouth)			1,250
Missouri	Rock bass			1,150
	Carp			179
	Tench			1,204
	Goldfish			968
	Rainbow trout	20,475	21,000	21,024
	Black bass (large mouth)			489
Montana	Rock bass			1,400
	Carp			705
	Brook trout			2,205
	Yellow perch			500
Nebraska	Black bass (large mouth)			650
	Carp			541
	Tench			1,100
	Goldfish			312
	Loch Leven trout	10,000		
	Rainbow trout	65,740	900	1,500
	Brook trout			750
	Lake trout	200,000		
Nevada	Rock bass			590
	Rainbow trout	61,739		
New Hampshire	Lake trout	50,000		
	Atlantic salmon	50,000	10,000	
	Landlocked salmon		3,000	
	Steelhead trout			258
	Rainbow trout	25,000	15,800	2,000
	Brook trout	25,000	9,750	2,300
	Black bass (large mouth)			100
New Jersey	Lobster		150,000	
	Carp			120
	Goldfish			12
	Shad	63,000	8,698,000	
	Landlocked salmon	2,000		
	Rainbow trout			3,000
	Brook trout	25,000		495
	Black bass (large mouth)			685
New Mexico	Rock bass			400
	Carp			900
	Tench			1,040
	Rainbow trout			2,420
	Black bass (large mouth)			650
New York	Rock bass			700
	Carp			650
	Shad		5,495,000	
	Atlantic salmon	50,000		
	Landlocked salmon	2,000	2,000	14,300
	Steelhead trout	100,000		
	Rainbow trout		2,200	475
	Von Behr trout		2,000	
	Brook trout		22,100	3,665
	Lake trout	200,000	1,642,000	
	Scotch sea trout	5,100		
	Whitefish		20,000,000	
	Black bass (large mouth)			350
	Black bass (small mouth)			358
North Carolina	Rock bass			550
	Carp			1,405
	Tench			1,178
	Shad		1,744,500	
	Rainbow trout			7,665
	Black bass (large mouth)			350
North Dakota	Rock bass			1,550
	Carp			610
	Rainbow trout		8,000	
	Brook trout			1,830
	Lake trout		30,000	
	Yellow perch			200
Ohio	Black bass (large mouth)			400
	Carp			60
	Tench			892
	Goldfish			70
	Rainbow trout		6,500	660
	Von Behr trout	15,000	10,000	
	Brook trout	20,000	5,000	
	Lake trout		685,400	
	Whitefish		115,650,000	
	Lake herring		690,000	
	Black bass (large mouth)			1,365
Oklahoma	Rock bass			1,550
	Carp			9,744
	Tench			2,397
	Goldfish			16
	Rainbow trout			700
	Black bass (large mouth)			300
	Rock bass			1,500

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

State or Territory.	Species.	Eggs.	Fry.	Adults and yearlings.
Oregon	Carp			60
	Tench			50
	Quinnat salmon		2,832,150	557,150
	Black bass (large mouth)			175
Pennsylvania	Carp			380
	Tench			3,680
	Goldfish			121
	Shad		7,125,000	
	Atlantic salmon	100,000		
	Rainbow trout		18,000	25,415
	Lake trout		16,947	
	Black bass (large mouth)			1,120
Rhode Island	Von Behr trout	10,000	3,705	
	Brook trout			498
	Landlocked salmon		3,000	
South Carolina	Carp			12,872
	Tench			1,700
	Goldfish			42
	Shad		400,000	
	Black bass (large mouth)			208
	Black bass (small mouth)			57
	Rock bass			510
South Dakota	Carp			1,978
	Rainbow trout		11,000	
	Brook trout		51,000	7,955
	Yellow perch			75
	Black bass (large mouth)			1,524
Tennessee	Carp			6,530
	Tench			2,823
	Goldfish			30
	Rainbow trout		46,000	11,407
	Black bass (large mouth)			2,050
	Rock bass			1,899
Texas	Carp			1,715
	Tench			6,188
	Goldfish			24
	Rainbow trout			1,400
	Black bass (large mouth)			3,000
	Rock bass			5,900
Utah	Carp			90
	Tench			90
	Rainbow trout		10,000	
	Brook trout		20,000	4,050
	Rock bass			190
Vermont	Steelhead trout		4,000	777
	Rainbow trout		9,950	2,000
	Von Behr trout	10,000	13,590	
	Brook trout		4,965	5,400
	Lake trout	800,000	38,671	1,000
Virginia	Carp			4,514
	Tench			570
	Shad	1,000,000	9,748,000	
	Rainbow trout		38,968	9,077
	Black bass (large mouth)			900
	Rock bass			2,000
Washington	Tench			850
	Yellow perch			450
	Black bass (large mouth)			625
West Virginia	Carp			240
	Tench			123
	Rainbow trout			2,670
	Rock bass			200
Wisconsin	Carp			10,320
	Tench			90
	Steelhead trout		20,000	
	Brook trout		12,000	
	Lake trout		1,625,000	
	Whitefish		5,750,000	
	Pickerel			1,350
	Black bass (large mouth)			3,585
Wyoming	Carp			400
	Loch Leven trout	20,000		
	Rainbow trout	57,190	1,000	
	Black-spotted trout		3,000	
	Brook trout		10,000	4,225
	Lake trout	200,000		
	Black bass (large mouth)			500
Foreign countries	Quinnat salmon	95,000		
	Steelhead trout	75,000		
	Rainbow trout	125,000		
	Lake trout	50,000	198,000	
	Whitefish	50,000		
	Totals	11,460,594	484,579,053	2,448,021

Details of distribution.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Carp:			
Applicants in Alabama			599
Arkansas			258
Delaware State Fish Commission			1,000
Ponds in Zoological Park, District of Columbia			500
Potomac River near Washington, D. C			4,090
Applicants in District of Columbia			156
Florida			2,079
Georgia			1,274
Etowah River near Canton, Ga			1,000
Flint River near La Grange, Ga			3,000
Savannah River near Augusta, Ga			5,830
Satilla River near Waycross, Ga			3,000
Applicants in Idaho			496
Illinois			50
Indiana			90
Indian Territory			700
Iowa			371
Iowa State Fish Commission			2,000
Applicants in Kansas			2,290
Kentucky			360
Louisiana			161
Maine			30
Maryland			560
Maryland State Fish Commission			2,000
Susquehanna River near Havre de Grace, Md			1,000
Perryville, Md			2,000
Applicants in Massachusetts			671
Michigan			420
Minnesota			100
Minnesota State Fish Commission			3,000
Applicants in Mississippi			145
Missouri			57
Hickory Creek near Neosho, Mo			122
Applicants in Montana			705
Nebraska			541
New Jersey			60
Musconetcong River near Rahway, N. J			60
Applicants in New Mexico			900
New York			650
North Carolina			1,405
North Dakota			610
Ohio			60
Applicants in Oklahoma			2,744
Oregon			60
Pennsylvania			380
South Carolina			1,872
Cape Fear River near Fayetteville, S. C			3,000
Pee Dee River near Pee Dee, S. C			3,000
Edisto River near Pon Pon, S. C			3,000
Ashepo River near Ashepo, S. C			2,000
Applicants in South Dakota			1,078
Tennessee River near Loudon, Tenn			2,500
Knoxville, Tenn			300
East and west fork of Stone River near Murfreesboro, Tenn			500
Boone and Cherokee creeks near Jonesboro, Tenn			3,000
Applicants in Tennessee			230
Texas			1,715
Utah			90
Virginia			1,852
Cripple Creek near Ivanhoe, Va			100
Rappahannock River near Elkwood, Va			500
James River near Richmond, Va			2,000
Tate Run near Wytheville, Va			62
Applicants in West Virginia			240
Wisconsin			320
Wisconsin State Fish Commission			10,000
Applicants in Wyoming			400
Tench:			
Applicants in Alabama			554
Arizona			95
Arkansas			650
Delaware			24
Appoquinnick River near Middletown, Del			200
Pond in Zoological Park, District of Columbia			500
Potomac River, Washington, D. C			1,024
Applicants in Florida			505
Etowah River near Jasper, Ga			1,000
Long Swamp Creek near Jasper, Ga			1,000
Tate Pond near Jasper, Ga			1,000
Flint River near La Grange, Ga			4,000
Savannah River near Augusta, Ga			60

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Tench—Continued.			
Applicants in Georgia			4,366
Diamond Lake near Newport, Idaho			500
Applicants in Idaho			258
Des Plains River near Des Plains, Ill			500
Applicants in Illinois			180
Indiana			185
Upper Iowa River near Chester, Iowa			500
Brickner River near Jetmore, Kans			100
Applicants in Kansas			2,221
Kentucky			360
Louisiana			30
Youghiogheny River near Oakland, Md			150
Applicants in Maryland			362
Massachusetts			115
Mississippi			235
Flat Creek near Verona, Mo			200
Hickory Creek near Neosho			64
Applicants in Missouri			940
Nebraska			100
Nebraska State Fish Commission			1,000
Applicants in New Mexico			1,040
North Carolina			1,178
Ohio			692
Tinker Creek near Bedford, Ohio			200
Eastern Branch of Kingfisher Creek near El Reno, Okla			100
Applicants in Oklahoma			2,297
Alden Springs near Laurel, Oreg			50
Brandywine Stream near Reading, Pa			3,000
Jacobs Creek near Mount Pleasant, Pa			150
Mendenhall Lake near Mendenhall, Pa			30
Conodoquinnette Creek near Carlisle, Pa			150
Tributary of Susquehanna River near Selinsgrove, Pa			200
Applicants in Pennsylvania			150
Broad River near Blacksburg, S. C			500
Applicants in South Carolina			1,200
Cove, Hickory, Dairs, and Indian creeks in Campbell County, Tenn			300
Tennessee River near Loudon, Tenn			300
Knoxville, Tenn			200
Lamberton and Cherokee creeks near Jonesboro, Tenn			300
East and West Fork of Stone River near Murfreesboro, Tenn			200
Harpeth River near Newsom, Tenn			200
North Fork of Forked Deer River near Trenton, Tenn			300
Jellico Creek near Gumfork, Tenn			300
Applicants in Tennessee			723
Palestine Fishing Club Lake near Palestine, Tex			1,800
Trinity River near Fort Worth, Tex			1,800
Applicants in Texas			2,588
Utah			90
Crab Creek near Wytheville, Va			150
Applicants in Virginia			420
Washington			150
Fourth of July Lake near Sprague, Wash			200
Applicants in West Virginia			123
Wisconsin			90
Goldfish.			
Applicants in Alabama			12
Arkansas			10
Connecticut			24
Ponds in Zoological Park, D. C			56
Fountain in front of Treasury Department, D. C			25
Applicants in District of Columbia			32
Georgia			330
Illinois			20
Kansas			20
Louisiana			112
Fountains in city parks, New Orleans, La			615
Applicants in Michigan			12
Mississippi			12
Hickory Creek, near Neosho, Mo			8
Lakes in Forest Hill Cemetery, Kansas City, Mo			960
Applicants in Nebraska			12
Nebraska State Fish Commission, South Bend, Nebr			300
Pond in City Park, Paterson, N. J			12
Applicants in Ohio			20
University Lake, Columbus, Ohio			50
Applicants in Oklahoma			16
Pennsylvania			121
South Carolina			42
Tennessee			30
Texas			24

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Golden tench:			
Delaware State Fish Commission			12
Applicants in District of Columbia			24
Georgia			9
Golden ide:			
Fountain in front of Treasury Department, D. C.			8
*Shad:**			
Connecticut State Fish Commission ponds, Joshuatown, Conn.		6,302,000	
Delaware State Fish Commission	1,165,000		
Mispillion River near Milford, Del.		625,000	
Smyrna River near Smyrna, Del.		575,000	
Jones Creek near Dover, Del.		575,000	
Murderkill Creek near Felton, Del.		625,000	
Nanticoke River near Seaford, Del.		375,000	
Leipsic River near Leipsic, Del.		250,000	
Broadkiln River near Milton, Del.		100,000	
Indian River near Millsboro, Del.		750,000	
Potomac River near Washington, D. C.		5,027,000	1,000,000
Eastern Branch of Potomac River near Benning, D. C.		4,363,000	
St. Johns River near Sanford, Fla.		4,224,000	
Crane Creek, tributary of St. Lucie River, near Stuart, Fla.		450,000	
Savannah River near Augusta, Ga.		1,703,000	
Ogeechee River near Midville, Ga.		400,000	
Ocmulgee River near Macon, Ga.		400,000	
Altamaha River near Doctortown, Ga.		545,000	
Satilla River near Waycross, Ga.		545,000	
Withlacoochee River near Quitman, Ga.		500,000	
Allapaha River near Stockton, Ga.		500,000	
Chesapeake Bay near Battery Island, Md.		15,142,000	
Patapsco River near Relay Station, Md.		894,000	
Patuxent River near Laurel, Md.		1,281,000	
Bush River near Bush River Station, Md.		2,250,000	
Gunpowder River near Gunpowder Station, Md.		2,250,000	
Potomac River near Point of Rocks, Md.		2,952,000	
Tuckahoe River near Queen Anne, Md.		375,000	
Chester River near Chestertown, Md.		375,000	
Monocacy River near Dickerson Station, Md.		759,000	
Wicomico River near Salisbury, Md.		375,000	
Wankinquoi River near Wareham, Mass.		200,000	
Connecticut River near Springfield, Mass.		1,290,000	
Delaware River near Woodbury, N. J.		450,000	
Milford, N. J.		1,350,000	
Lambertville, N. J.		5,011,000	
Gloucester, N. J.	63,000	547,000	
Timber Creek near Woodbury, N. J.		440,000	
Little Egg Harbor near Egg Harbor, N. J.		450,000	
Dividing Creek near Dividing Creek Station, N. J.		450,000	
Hudson River near Newburg, N. Y.		2,167,500	
Albany, N. Y.		427,500	
Delaware River near Callicoon, N. Y.		450,000	
Port Jervis, N. Y.		450,000	
New York State Fish Commission		2,000,000	
Yadkin River near Salisbury, N. C.		400,000	
Pasquotank River near Elizabeth City, N. C.		438,500	
Rockfish River near Wallace, N. C.		452,000	
Neuse River near Goldsboro, N. C.		454,000	
Susquehanna River near Peach Bottom, Pa.		1,725,000	
Fites Eddy, Pa.		1,800,000	
Columbia, Pa.		450,000	
Delaware River near Delaware Water Gap, Pa.		2,700,000	
Lackawaxen, Pa.		450,000	
Catawba River near Catawba, S. C.		400,000	
Mattaponi River near Milford, Va.		857,000	
Chappawansie River near Quantico, Va.		867,000	
Rappahannock River near Fredericksburg, Va.		911,000	
Rockfish River near Rockfish Station, Va.		894,000	
Little River near Taylorsville, Va.		1,009,000	
Cedar Run near Catletts, Va.		898,000	
Meherrin River near Belfield, Va.		457,000	
Rapidan River near Rapidan, Va.		450,000	
Occoquan River near Woodbridge, Va.		912,000	
Otter River near Evington, Va.		446,000	
Tye River near Tye River Station, Va.		450,000	
Nansemond River near Suffolk, Va.		445,000	
Potomac River near Widewater, Va.		612,000	
Roslyn, Va.		540,000	
Dan River near Danville, Va.			
Quinnat salmon:	1,000,000		
McCloud River near Baird, Cal.		400,000	250,000

* 2,333,000 fry were released for rearing in fish ponds, Washington, D. C., but these figures are not to be included in the summations.

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Quinnat salmon—Continued.			
Bair Ranch Creek, tributary to Redwood Creek in Humboldt County, Cal	.....	65,700	.....
Clackamas River near Clackamas, Oreg	.....	1,477,212	.....
Clear Creek, tributary to Clackamas River, near Clackamas, Oreg	.....	1,354,938	557,150
California State Fish Commission	6,075,000	.....	.....
S. Jaffé, Sandfort, Osnabruch, Germany	25,000	.....	.....
General Reuben Alonzo, Leon, Nicaragua	20,000	.....	.....
R. L. Moore, Cliff Belleek, Ireland	50,000	.....	.....
Atlantic salmon:			
Connecticut State Fish Commission	50,000	.....	.....
W. L. Hadaway, Chiltonville, Mass	25,000	.....	.....
Joseph R. Neal, Boston, Mass	4,000	.....	.....
New Hampshire Fish Commission	50,000	.....	.....
New York Fish Commission	50,000	.....	.....
Pennsylvania Fish Commission	100,000	.....	.....
Merrimac River near Concord, N. H	.....	19,000	.....
Toddy Pond near Orland, Me	.....	.....	134,306
Alamoosook Lake near Orland, Me	.....	.....	12,307
Heart Pond near Orland, Me	.....	.....	3,063
Little Tunk Pond near Orland, Me	.....	.....	2,000
Landlocked salmon:			
E. M. Robinson, Bevans, N. J	2,000	.....	.....
Tuxedo Club, Tuxedo Park, N. Y	2,000	.....	.....
George Pond near Liberty, Me	.....	2,760	.....
Donnells Pond near Franklin, Me	.....	3,000	.....
Lake George near Skowhegan, Me	.....	2,760	.....
Long, Flanders, and Little Tunk Pond near Sorrento, Me	.....	3,000	.....
Moose Pond near Hartland, Me	.....	5,520	.....
Great Embden Pond near North Anson, Me	.....	2,760	.....
Swan Lake near Belfast, Me	.....	2,760	.....
Clearwater and Varnum Pond near Farmington, Me	.....	2,760	.....
Great Brook near Green Lake, Me	.....	2,500	.....
Webb Pond near Ellsworth, Me	.....	3,000	.....
Patten Pond near Ellsworth, Me	.....	2,965	.....
Great Brook near Otis, Me	.....	10,000	.....
Branch Pond near Dedham, Me	.....	4,000	.....
Floods Pond near Otis, Me	.....	3,000	.....
Cathance Lake and Dennys River near Calais, Me	.....	3,000	.....
Green Lake near Green Lake, Me	.....	2,740	.....
Long Pond near Bar Harbor Me	.....	3,000	.....
Penacook Lake near Concord, N. H	.....	3,000	.....
Lake in Tuxedo Park, N. Y	.....	2,000	.....
Applicants in Rhode Island	.....	3,000	.....
Applicants in Georgia	.....	.....	69
Embden Pond near North Anson, Me	.....	.....	2,000
Swan Lake near Belfast, Me	.....	.....	2,000
Woods Pond near Blue Hill, Me	.....	.....	3,000
China Lake near East Vassalboro, Me	.....	.....	2,500
Hadlock Pond near North East Harbor, Me	.....	.....	1,000
Waterworks Pond near Belfast, Me	.....	.....	2,000
Moose Pond near Hartland, Me	.....	.....	4,000
Varnum Pond near Farmington, Me	.....	.....	1,500
Clearwater Pond near Farmington, Me	.....	.....	1,500
Whites Pond near Penobscot, Me	.....	.....	2,000
Green Lake near Dedham, Me	.....	.....	6,000
Duck Lake near Winn, Me	.....	.....	1,250
Junior Lake near Winn, Me	.....	.....	1,250
Toddy Pond near Orland, Me	.....	.....	4,225
Green Lake near Green Lake, Me	.....	.....	257
Lake Ozonia near St. Regis Falls, N. Y	.....	.....	1,300
Owasco Lake near Union Springs, N. Y	.....	.....	1,000
Lakes in Tuxedo Park, N. Y	.....	.....	2,000
Lake George near Caldwell, N. Y	.....	.....	5,000
Polfershire Brook, tributary Lake Champlain, near Port Henry, N. Y	.....	.....	1,250
Senteen Brook, tributary Lake Champlain, near Port Henry, N. Y	.....	.....	1,250
Mullen Brook, tributary Lake Champlain, near Port Henry, N. Y	.....	.....	1,250
Grove Brook, tributary Lake Champlain, near Port Henry, N. Y	.....	.....	1,250
Steelhead trout:			
Bair Ranch Creek near Bair Ranch, Cal	.....	107,808	.....
Pleasant River near Brownsville, Me	.....	6,433	.....
Todd Brook near Brownsville, Me	.....	4,800	.....
Salmon Brook near Sebec, Me	.....	5,200	.....
Baker Brook near Milford, Me	.....	2,000	.....
Brick Stream near Milford, Me	.....	2,000	.....
Sunkhaze Stream near Greenfield, Me	.....	1,951	.....
Burnt Bridge Brook near Enfield, Me	.....	1,600	.....
Darling Pond near Enfield, Me	.....	1,000	.....

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Steelhead trout—Continued.			
Webb Brook near Lowell, Me		10,000	
Moosehorn Stream near Bucksport, Me		1,600	
Smith Brook in Hancock County, Me		1,600	
Brook near New Boston, Hancock County, Me		3,747	
Comstock and Meduxnikeag Rivers near Caribou, Me		1,976	
Silver Creek near East Tawas, Mich		20,000	
Pine River near East Tawas, Mich		15,000	
Boardman River near Mayfield, Mich		10,000	
Maple River near Pellston, Mich		10,000	
Washington River, off Washington Harbor, Mich		30,000	
French River near Duluth, Minn		20,000	
Sucker River in St. Louis County, Minn		15,000	
Split Rock River near Two Harbors, Minn		20,000	
Poplar River near Grand Marais, Minn		20,000	
Baptism River near Grand Marais, Minn		10,000	
Merrimac River near Concord, N. H			258
New York Fish Commission	100,000		
Browns River near Jericho and Essex, Vt		2,500	
Pond Brook near Walcott, Vt		500	
Lee River, near Jericho, Vt		1,000	
Lake Champlain off Burlington, Vt			777
Rule River near Rule, Wis		20,000	
Minister of Agriculture, Japan	75,000		
Loch Leven trout:			
Country Club, San Francisco, Cal	10,000		
Tributaries of Sylvan Lake near Rome City, Ind		4,000	
Sanborn Creek near Baldwin, Mich		10,000	
Little Rocky Run near Marcellus, Mich		3,000	
Minnesota Fish Commission	10,000		
Nebraska State Fish Commission	10,000		
Wyoming State Fish Commission	10,000		
Louis Miller, Laramie, Wyo	10,000		
Rainbow trout:			
Dog River and tributaries near Venitin, Ala			2,900
Little Cahawba River near Brierfield, Ala			500
Lookout Pond near Gadsden, Ala			200
Mammoth Springs, Mammoth Springs, Ark			200
Sulphur Springs Lake near Sulphur Springs, Ark			3,000
Flint Creek near Gentry, Ark			700
Illinois River near Siloam Springs, Ark			3,000
Barren Fork Creek near Siloam Springs, Ark			3,000
Spavinaw River near Gravett, Ark			5,120
Applicants in Arkansas			1,000
Flint Creek, near Siloam Springs, Ark		9,940	
Applicants in Arkansas	17,550		
Country Club, San Francisco, Cal	30,000		
Eagle River and tributaries near Berry Station, Colo			3,330
Middle Evergreen Lake near Leadville, Colo			900
Applicants in Colorado			300
Rock Creek near Glenwood Springs, Colo		900	
Applicants in Colorado		5,000	
Fillows Brook near South Norwalk, Conn			300
Norwalk River near South Norwalk, Conn			300
Norwalk River and tributaries near Norwalk, Conn			1,100
Barnum Brook near Norwalk, Conn			300
Stony Brook near Norwalk, Conn			370
Whitlock Branch, Norwalk, Conn			250
Lockwood Branch, Norwalk, Conn			250
J. T. Newton, New Haven, Conn	25,000		
Delaware State Fish Commission	10,000		
Applicants in District of Columbia	3,500		298
Taccoa River near Mineral Bluff, Georgia			500
Tallulah River near Tallulah Falls, Georgia			498
Cartecay Creek near Ellijay, Ga			500
Applicants in Georgia			35
Spring Brook near La Porte, Ind			982
Allison Creek near La Porte, Ind			982
Upper Lost River near Orleans, Ind			1,497
Applicants in Indiana			300
Johnson Creek near Westville, Ind		5,000	
Lake Renner near Renner, Ind		1,000	
Applicants in Indiana		1,500	
Ballard Creek near Stilwell, Ind. Ter			2,000
Applicants in Indian Territory			400
Spitznoggle Lake near Wapello, Iowa			1,000
Applicants in Iowa			500
Turkey Pond near Baxter, Iowa		1,000	
Walnut Creek near Great Bend, Kans			900
Smoky River near Presley, Kans			980
Applicants in Kansas			6,475
Kentucky			1,250

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Rainbow trout—Continued.			
Applicants in Louisiana			1,000
Great Brook near Green Lake, Me			48
Western Run near Glyndon, Md			1,000
Hamilton and Bellevue Brooks near Hagerstown, Md			1,000
Spring Branch near Reisterstown, Md			1,000
Streams near Finksburg, Md			700
Indian Springs near Frederick, Md			150
Applicants in Maryland		4,000	1,300
Michaels Pond near Barnstable, Mass			1,000
Sturgeon River near Gaylord, Mich		3,000	
Sturgeon River near Vanderbilt, Mich		2,000	
Wiscoi Creek near Winona, Minn		3,000	
Spring Creek near Northfield, Minn		5,000	
Applicants in Minnesota		5,000	
Five Mile Creek near Hornet, Mo		2,000	
Crane Creek near Crane, Mo		6,000	
Flat Creek near McDowell, Mo		9,000	
Applicants in Missouri		4,000	
Zoo Park Lake, Springfield, Mo			1,000
Mahaska Creek near Bourbon, Mo			1,000
Spring River near Aurora, Mo			2,000
Verona, Mo			2,000
Grove Creek near Webb City, Mo			2,000
Indian Creek near Lanagan, Mo			1,000
Elk (or Cowskin) River near Noel, Mo			2,000
James River near Turner, Mo			2,000
Piney Creek near Cabool, Mo			1,000
Potter Creek near Cabool, Mo			1,000
Jacks Fork of Current River near Mountain View, Mo			4,000
Grove Creek, Jasper County, Mo			135
Barbers Lake near Ritchie, Mo			113
Applicants in Missouri			500
State Fish Commission, Missouri	10,400		1,876
Applicants in Missouri	10,075		
Nebraska State Fish Commission	65,740		
White Clay Creek near Rushville, Nebr		900	
Spring Brook Ponds near Omaha, Nebr			1,500
Nevada State Fish Commission	61,739		
New Hampshire State Fish Commission	25,000		
Great Brook near Greenland, N. H		7,950	
Isinglass River near Dover, N. H		7,940	
Green Hill Brook near Dover, N. H			1,000
Isinglass River near Dover, N. H			1,000
Musconetcong River near Washington, N. J			1,000
Paulins Kill River near Blairstown, N. J			500
Pequest Creek near Belvidere, N. J			500
Cedar Lake near Blairstown, N. J			500
Applicants in New Jersey			500
Eagle Creek near White Oaks, N. Mex			470
Bluewater Creek near Fort Wingate, N. Mex			500
Applicants in New Mexico			1,450
Black River reservoir near Honnedaga, N. Y			175
Applicants in New York			300
Page Brook near Chenango Forks, N. Y		2,200	
Cullowhee Creek near Hillsboro, N. C			637
Linville River near Linville, N. C			800
Big Buck Creek near Marion, N. C			425
Little Buck Creek near Marion, N. C			425
Licklog Creek near Marion, N. C			425
Mill Creek near Marion, N. C			425
Little River near Brevard, N. C			765
North Fork of Swannanoa River near Black Mountain, N. C			850
Applicants in North Carolina			2,913
Forest River near Inkster, N. Dak		3,000	
Blue Ditch near Richmond, Ohio		2,000	
Applicants in Ohio		4,500	660
Applicants in Oklahoma			700
Half Mile Run near Gaines, Pa			300
Letort Stream near Carlisle, Pa			900
Big Wapwallopen Creek near Nanticoke, Pa			800
Bengully Run near Gaines, Pa			300
Gall Run near Gaines, Pa			300
Lamb Creek near Mansfield, Pa			300
Piney Creek near Altoona, Pa			255
Middle Branch near Nanticoke, Pa			300
Cotter Creek near Nicholson, Pa			300
Benscoter Run near Nanticoke, Pa			300
Mill Run near Gaines, Pa			600
Roaring Brook near Nanticoke, Pa			300
Blue Run near Gaines, Pa			300
Calin Run near Mansfield, Pa			300

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Rainbow trout—Continued.			
Cedar Run near Gaines, Pa			600
Crooked Creek near Mansfield, Pa			300
Pog Hunter Creek near Nanticoke, Pa			300
Thompson Run near Gaines, Pa			300
Fades Creek near Nanticoke, Pa			300
Martin's Mill Pond near Wayne, Pa			300
Creeks near Crossroads, Pa		4,800	
Stevens Run near Nicholson, Pa		4,700	
Tunkhannock Creek near Nicholson, Pa		2,200	
Applicants in Pennsylvania		2,200	
Laurel Run near Nicholson, Pa		4,700	
Trout Run near Tobyhanna, Pa			300
Tobyhanna Creek near Tobyhanna, Pa			300
Middle Creek near Hawley, Pa			300
Two Mile Run near Wetmore, Pa			300
Tributary of Tobyhanna Creek near Tobyhanna, Pa			300
Delawanna Lake near Thornhurst, Pa			300
Maplecraft Run near Charlestown, Pa			300
Tobyhanna Creek near Tobyhanna, Pa			300
Clover Creek near Williamsburg, Pa			340
Montgomery Creek near Clearfield, Pa			510
French Creek near Kimberton, Pa			300
Roaring Springs near Altoona, Pa			340
Painter Run near Gaines, Pa			300
Elk Run near Mansfield, Pa			300
Hickson Run near Mansfield, Pa			300
Mountain Run near Nanticoke, Pa			300
Lines Creek near Carlisle, Pa			300
Little Sandy Creek near Punxsutawney, Pa			335
Muddy Run near Greencastle, Pa			300
Toms River near Lockhaven, Pa			900
Sugar Run near Lockhaven, Pa			900
Cedar Run near Lockhaven, Pa			900
Plum Run near Lockhaven, Pa			900
Chatham Run near Lockhaven, Pa			1,200
Sugar Creek near Troy, Pa			400
Leonard Creek near Troy, Pa			600
Spring Brook near Pittston, Pa			750
Tributaries to Tioga River near Farmington, Pa			300
Roaring Creek near Shamokin, Pa			300
Eagle Run near Shamokin, Pa			300
Brush Valley Creek near Shamokin, Pa			300
Taylor Run near Nicholson, Pa			300
Applicants in Pennsylvania			3,685
Streams on Indian reservation, Pine Ridge Agency, S. Dak		900	
Spring Creek near Whitewood, S. Dak		5,000	
Applicants in South Dakota		6,000	
Duck River near Normandy, Tenn		5,000	
Tellico River near Athens, Tenn		6,000	
Flint River near Fayetteville, Tenn		7,900	
East Fork of Stone River near Murfreesboro, Tenn		6,000	
Smith Fork near Brushcreek, Tenn		4,000	
Conasauga River near Cleveland, Tenn		8,000	
Mossy Creek near Mossycreek, Tenn		8,000	
Applicants in Tennessee		2,000	
Cane Creek near Hohenwald, Tenn			464
Big Creek and French Broad River near Delrio, Tenn			500
Big Pigeon River near Newport, Tenn			500
Roaring Creek and Hampton Creek near Elizabethton, Tenn			1,000
Clark Creek near Jonesboro, Tenn			1,000
Jack River near Cleveland, Tenn			2,000
Horsey Creek near Hickory Ridge, Tenn			500
Pigeon River near Sevierville, Tenn			2,000
Ellejoy Creek near Maryville, Tenn			500
White Oak Creek near Sunbright, Tenn			493
Lake Watauga near Johnson City, Tenn			300
Tellico River near Mount Verd, Tenn			500
Applicants in Tennessee			1,050
Amarillo Creek near Amarillo, Tex			800
Paluxy Creek near Glenrose, Tex			400
Applicants in Texas			200
Utah			
East Creek near Rutland, Vt		10,000	
Onpompanoosuc River near Ely, Vt		9,950	
Applicants in Vermont			1,000
Robinson River near Somerset, Va			1,000
North Fork of Shenandoah River near Staunton, Va		5,000	
Calvin Run near Hunters Mills, Va		4,990	
Mud Run near Hot Springs, Va		4,000	
Cowardin Run near Hot Springs, Va		5,000	
Rubins Healing Stream near Hot Springs, Va		5,000	
		9,978	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Rainbow trout—Continued.			
Reed Creek near Wytheville, Va		5,000	
Travis Mill Pond near New London, Va			500
South Fork of Powell River near Big Stonegap, Va			1,275
Dry River near Mount Clinton, Va			850
Broad Run near Thoroughfare, Va			940
St. Clair Creek near St. Clair Bottom, Va			500
North Fork of Holston River near Ceres, Va			200
Big Cedar Creek near Honaker, Va			850
St. Clair Creek near Grosses, Va			500
Buck Creek near Springwood, Va			500
Tate Run near Wytheville, Va			787
Cripple Creek above Pierce's mill-dam near Cripple Creek, Va			370
Applicants in Virginia			1,805
Lake Terra Alta near Terra Alta, W. Va			425
Cold Run near Berkeley Springs, W. Va			425
Willow Springs near Shenandoah Junction, W. Va			300
Cat-tail Run near Millville, W. Va			425
Applicants in West Virginia			1,095
Wyoming State Fish Commission	57,190		
De Lacey Lake near Mammoth Hot Springs, Wyo		1,000	
Société d'Acclimatation, Paris, France	50,000		
M. Raveret-Wattel, Fécamp, France	25,000		
Major W. Turner, Bertrix, Belgium	50,000		
Von Behr trout:			
Mammoth Springs near Mammoth Springs, Ark			1,000
California State Fish Commission	10,000		
Streams near Brooklandville, Md		8,422	
Pine River near West Harrisonville, Mich		10,000	
South Branch of Tobacco River near Farwell, Mich		5,000	
Sanborn Creek near Nirvana, Mich		5,000	
Ellerslie Lake near Rhinecliff, N. Y		2,000	
King Creek near King Creek, Ohio		4,000	
Cedar Run near Bowlusville, Ohio		4,000	
Taylor Run near Bowlusville, Ohio		2,000	
Applicants at Bedford, Ohio	15,000		
Queen and Beaver rivers near Usquepaugh, R. I		3,705	
Rhode Island State Fish Commission	10,000		
Beaver Pond near Proctor, Vt		4,300	
Big Fish Pond near St. Johnsbury, Vt		4,290	
Haystack Pond near Wilmington, Vt		5,000	
Vermont State Fish Commission	10,000		
Black-spotted trout:			
Twin Lakes in Lake County, Colo		5,000	
Middle Evergreen Lake in Lake County, Colo		3,600	
Applicants in Georgia			17
Michigan State Fish Commission	35,000		
Spring Creek near Laramie, Wyo		2,000	
Sweetwater Creek near Newcastle, Wyo		1,000	
Yellow-fin trout:			
Twin Lakes near Twin Lakes, Colo		4,700	
Middle Evergreen Lake near Leadville, Colo		3,000	
Brook trout:			
Mammoth Springs near Mammoth Springs, Ark			350
Spring Brook near Iowa Gulch, Colo			2,000
North Branch of St. Vrain River near Lyons, Colo			2,000
Eagle River near Wolcott, Colo			7,000
Tributary of Black Squirrel Creek near Eastonville, Colo			2,000
Upper Evergreen Lakes in Lake County, Colo			5,000
Applicants in Colorado			1,800
Twin Lakes in Lake County, Colo		5,000	
Box Creek near Leadville, Colo		5,000	
Eagle River near Minturn, Colo		10,000	
Headwaters of Arkansas River in Lake County, Colo		10,000	
Mountain Lake near Granite, Colo		5,000	
North Fork of South Platte River near Estabrook, Colo		10,000	
Brush Creek near Eagle, Colo		10,000	
Naylor Lake near Georgetown, Colo		10,000	
Frying Pan River between Novice and Castle, Colo		40,000	
North Fork of South Platte River near Chaseville, Colo		3,000	
Slaghts, Colo		3,000	
Bailey, Colo		3,000	
Pine Grove, Colo		3,000	
Dawson, Colo		3,000	
Chalk Creek near Northrop, Colo		5,000	
Silver Creek near Shirley, Colo		4,917	
East River near Crested Butte, Colo		4,917	
Elk River near Cebolla, Colo		4,917	
Soap Creek near Sapinero, Colo		4,917	
Alder Creek near Alder, Colo		4,915	
Goose Creek near Wagonwheel Gap, Colo		4,917	
Eagle River near Mitchell, Colo		5,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Brook trout—Continued.			
Jennie Creek near Central City, Colo		5,000	
Mammoth Creek near Central City, Colo		5,000	
North Boulder Creek near Central City, Colo		10,000	
South Boulder Creek near Central City, Colo		10,000	
Tributaries of Twin Lakes in Lake County, Colo		25,000	
Applicants in Colorado		36,000	
Duchess Brook near Pomfret, Conn			300
Eastern Branch of Farmington River near New Hartford, Conn			600
Lawson Brook near Wilton, Conn			300
West Norwalk Stream near South Norwalk, Conn			300
Blackberry River near Canaan, Conn			300
Comstock Brook near Wilton, Conn			300
Pennel Stream near Norwalk, Conn			300
Five Mile River near South Norwalk, Conn			300
Wheeler Stream near South Norwalk, Conn			300
Poorhouse Brook near New Canaan, Conn			300
Mill River near Southport, Conn			300
Barnum Brook near Norwalk, Conn			300
Stony Brook near Norwalk, Conn			30
Guthrie Brook near Norwalk, Conn			300
Whitlock Brook near Norwalk, Conn			300
Norwalk River near Norwalk, Conn			600
Comstock Hill Brook near Norwalk, Conn			300
Five Mile River near Norwalk, Conn			300
West Branch of Norwalk River near Norwalk, Conn			300
Gregory Brook near Norwalk, Conn			300
Silver River near Norwalk, Conn			200
Barratt Brook near Wilton, Conn			300
Applicants in Connecticut			300
Georgia			38
Spring Creek near Beaver Canyon, Idaho			1,475
Little Kankakee Creek near Laporte, Ind		5,000	
Applicants in Indiana		2,000	
Spring Creek near Osage, Iowa		10,000	
Riceville, Iowa		5,000	
Canoe Creek near Decorah, Iowa		5,000	
Megunticook Lake near Camden, Me		1,500	
Long Pond near Sorrento, Me		1,000	
Little Tunk Pond near Sorrento, Me		1,000	
Flanders Pond near Sorrento, Me		1,000	
Anasaguntieook Lake near Canton, Me		2,000	
Cathana Stream near Topsham, Me		1,950	
Swan Lake near Belfast, Me		2,000	
Reservoir at Belfast, Me		2,000	
Great Brook at Green Lake, Me		4,500	
Webb Pond near Ellsworth Falls, Me		3,000	
Green Lake at Dedham, Me		115	
Applicants in Maine		4,500	
Maine State Fish Commission	40,000		
Swan Lake near Swanville, Me			2,000
Studly Pond near Waldoboro, Me			1,000
Goose River near Waldoboro, Me			1,000
Belfast Waterworks Pond near Belfast, Me			2,000
Clearwater Pond near Farmington, Me			1,500
Varmin Pond near Farmington, Me			1,500
Jordan Pond near Bar Harbor, Me			1,000
Moose Lake near Hartland, Me			1,000
Craig Pond near Orland, Me			2,913
Eagle Lake near Bar Harbor, Me			3,000
Lake Pearl and Archer Pond near North Attleboro, Mass		1,950	
Baker Brook near Pembroke, Mass		1,050	
Spring Brook near Marion, Mass			500
Rehoboth Creek near Attleboro, Mass			300
Cobb Brook near Princeton, Mass			1,000
Brook near Lowell, Mass			500
Applicants in Michigan			300
Tributary of Traverse Bay near Traverse, Mich		5,000	
Au Sable River near Grayling, Mich		100,000	
Schimnemous Creek near Coldwater, Mich		3,000	
West Branch of Big Creek near Grayling, Mich		5,000	
Bruce Brook near St. Johns, Mich		5,000	
Swan Creek near Coldwater, Mich		5,000	
Beitner Creek near Beitner, Mich		5,000	
Dodd, Clifford, and Sherwood creeks near Allegan, Mich		5,000	
Norris Creek near Cloverville, Mich		5,000	
Paint Creek near Ypsilanti, Mich		5,000	
Little South Branch of Baldwin Creek near Baldwin, Mich		10,000	
Cedar River near Harrison, Mich		5,000	
Minnesota State Fish Commission	20,000		
Pickwick Creek near Winona, Minn		200	
Burnside Lake near Ely, Minn		2,900	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Brook trout—Continued.			
Box-elder Creek near Havre, Mont			735
Sullivan Creek near Cascade, Mont			735
Rock Creek Lake near Deer Lodge, Mont			735
Spring Brook Ponds near Omaha, Nebr			750
New Hampshire State Fish Commission	25,000		
Streams near Grafton, N. H		1,950	
Concord, N. H		1,950	
Ammonoosuc River near Faybans, N. H		1,950	
Bicknell Brook near Enfield, N. H		1,950	
Mascoma River near Lebanon, N. H		1,950	
Crystal Lake near East Enfield, N. H			800
Hurricane Brook near Harrisonville, N. H			1,500
Applicants in New Jersey	25,000		495
Godfrey Run near De Ruyter, N. Y		4,500	
Page Brook near Chenango Forks, N. Y		4,100	
Oriskany Creek near Utica, N. Y		4,500	
Moyer Creek near Frankfort, N. Y		4,500	
Oquaga Creek near Deposit, N. Y		4,500	
Peterskill Creek near St. Josen, N. Y			500
Tioughnioga River near De Ruyter, N. Y			1,000
Otego and Charlotte creeks near Oneonta, N. Y			818
Perkinsville Creek near Perkinsville, N. Y			409
Hansome Brook near Sherburne, N. Y			500
Madison Square Garden Aquarium, New York			30
Applicants in New York			408
Turtle Lake near Bismarck, N. Dak			1,830
Cold Creek near Castalia, Ohio		5,000	
Applicants in Castalia, Ohio	20,000		
Rhode Island			498
North Branch of Little Rapid Creek near Deadwood, S. Dak			720
Medary Creek near Brookings, S. Dak			1,200
Little Spearfish Creek near Spearfish, S. Dak			5,750
Applicants in South Dakota			285
Rapid Creek near Rapid City, S. Dak		15,000	
Evans Lake near Hot Springs, S. Dak		5,000	
False Bottom Creek near St. Onge, S. Dak		20,000	
Applicants in South Dakota		11,000	
Utah		20,000	
Ice Pond near Pleasant Valley, Utah			1,800
Ogden River near Ogden, Utah			1,125
Big Cottonwood Creek near Salt Lake City, Utah			1,125
Forest and Stream Club Pond near Wilmington, Vt			1,000
Caspian Lake near Greensboro, Vt			1,500
Beaner Pond near Proctor, Vt			1,450
Pico Pond near Proctor, Vt			1,450
Lake Pico near Sherburne, Vt		4,965	
Wausaukee River near Amberg, Wis		7,000	
Lake Junior near Necedah, Wis		5,000	
Labonte Creek near Douglass, Wyo		10,000	
Spring Creek near Laramie, Wyo			1,475
Dome Lake near Sheridan, Wyo			2,100
Beaver Creek near Newcastle, Wyo			650
Lake trout:			
Troutdale Fish Farm, Mammoth Springs, Ark	5,000		
Applicants in Georgia		9,000	
Sweets Pond near Farmington, Me			1,000
Mashpee Lake near Mashpee, Mass		9,725	
Applicants in Massachusetts		4,875	
Kilpatrick Lake near Woodland, Mich		10,000	
Portage Lake near Grayling, Mich		10,000	
Lake Michigan near Charlevoix, Mich		300,000	
Manistique, Mich		190,000	
Lake Huron near East Tawas, Mich		200,000	
Cheboygan, Mich		100,000	
Alpena, Mich		200,000	
Lake Superior near Isle Royal, Mich		740,000	
Duncan Bay, Isle Royale, Mich		100,000	
Fish Island, Isle Royale, Mich		100,000	
Rock Harbor, Isle Royale, Mich		40,000	
Tobin Bay, Isle Royale, Mich		100,000	
Fishermans Home, Isle Royale, Mich		200,000	
Todd Harbor, Isle Royale, Mich		200,000	
Lake Lizzie near Pelican Rapids, Minn		50,000	
Eagle Nest Lake near Ely, Minn		5,000	
Burnside Lake near Ely, Minn		45,000	
Lake Superior near French River, Minn		100,000	
Two Harbors, Minn		100,000	
Beaver Bay, Minn		100,000	
Poplar River, Minn		50,000	
Duluth, Minn		120,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Lake trout—Continued.			
Lake Superior near Grand Marais, Minn		430,000	
Chicago Bay, Minn		200,000	
St. Louis County, Minn		40,000	
Nebraska State Fish Commission, Nebr	200,000		
Nevada State Fish Commission	50,000		
New York State Fish Commission	200,000		
Otsego Lake near Cooperstown, N. Y		25,000	
Trout Lake near St. Regis Falls, N. Y		20,000	
Lake Ontario off Stony Island, N. Y		200,000	
Grenadier Island, N. Y		975,000	
Pillar Point, N. Y		200,000	
Tibbetts Point, N. Y		200,000	
Cape Vincent, N. Y		22,000	
Devil Lake near Devil Lake, N. Dak		30,000	
Lake Erie off Rattlesnake Island Reef, Ohio		685,400	
Hoodley Lake near Waymart, Pa		4,447	
Lake Minola near Scranton, Pa		4,500	
Mountain Lake near Troy, Pa		8,000	
Vermont State Fish Commission	300,000		
Lake Champlain near Isle La Motte, Vt			1,000
Willoughby Lake near Westmore, Vt		37,000	
Caspian Lake near Greensboro, Vt		1,671	
Fountain and other brooks near New Lisbon, Wis		5,000	
Lake Superior near Bayfield, Wis		1,150,000	
Oak Island near Bayfield, Wis		200,000	
Rice Island near Bayfield, Wis		50,000	
Cranberry, Wis		50,000	
Lake Mary near Genoa Junction, Wis		20,000	
Lake Michigan near Sheboygan, Wis		150,000	
Wyoming State Fish Commission	200,000		
Lake Superior off Port Arthur, Canada		198,000	
Department of Agriculture, Berne, Switzerland	50,000		
Scotch sea trout:			
Craig Pond near Orland, Me			1,376
New York State Fish Commission, Caledonia, N. Y	5,100		
Golden trout:			
Green Lake at Ellsworth, Me		10,200	
Flood Pond near Otis, Me		11,500	
Great Brook near Green Lake, Me			10
Yellow perch:			
Applicants in Georgia			60
Idaho			200
Newman Lake near Hauser, Idaho			200
Cedar River near Cedar Rapids, Iowa			400
Storm Lake near Storm Lake, Iowa			50
Applicants in Iowa			100
Toms Creek near Emmittsburg, Md		812,000	
Deep Creek near Great Falls, Mont			200
Applicants in Montana			300
North Dakota			200
Sioux River near Sioux Falls, S. Dak			75
South Palouse River near Guy, Wash			200
Loon Lake near Tacoma, Wash			50
Lake St. Clair near Tacoma, Wash			100
Silver Lake near Castlerock, Wash			100
Pickerel:			
Cedar River near Cedar Rapids, Iowa			50
Phantom Lake near Mukwonago, Wis			700
Cedar Lake near Schleisingerville, Wis			650
Whitefish:			
Government of Japan	50,000		
Bear Lake near Fishhaven, Idaho		2,940,000	
Turkey Lake near Syracuse, Ind		2,000,000	
Lake Huron near East Tawas, Mich		2,000,000	
Oscoda, Mich		4,000,000	
North Point, Mich		5,000,000	
Alpena, Mich		1,850,000	
Sturgeon Point, Mich		2,000,000	
Scarecrow Island, Mich		3,000,000	
Lake Michigan near Frankfort, Mich		2,000,000	
Epoufette, Mich		2,000,000	
Naubinway, Mich		2,000,000	
Manistique, Mich		2,450,000	
Lake Erie near Monroe, Mich		3,300,000	
Lake Superior near Washington Harbor, Mich		2,000,000	
Isle Royale, Mich		2,000,000	
Detour Passage near Detour, Mich		4,000,000	
Straits of Mackinac near Mackinaw City, Mich		4,000,000	
Whitefish Lake near Corinne, Mich		1,500,000	
Lake Superior near Duluth, Minn		250,000	
St. Lawrence River near Cape Vincent, N. Y		500,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Whitefish—Continued.			
Lake Ontario off Grenadier Island, N. Y		5,500,000	
Tibbetts Point, N. Y		14,000,000	
Lake Erie off Rattlesnake Island Reef, Ohio		22,620,000	
North Bass Island Reef, Ohio		23,460,000	
Ballast Island Reef, Ohio		7,300,000	
Port Clinton, Ohio		13,280,000	
Kelley Island Reef, Ohio		5,070,000	
Middle Bass Island Reef, Ohio		5,070,000	
Toledo Field, Ohio		3,300,000	
West Sister Island Reef, Ohio		4,200,000	
Starve Island Reef, Ohio		5,600,000	
Niagara Reef, Ohio		11,080,000	
Buckeye Island Reef, Ohio		5,070,000	
Green Island Reef, Ohio		6,400,000	
Peach Point Reef, Ohio		1,400,000	
Lake Superior near Bayfield, Wis		5,750,000	
Lake herring:			
Lake Erie near Put-in Bay, Ohio		696,000	
Large-mouthed black bass:			
McCullough Creek near Venitia Station, Ala			200
Black Creek near Gadsden, Ala			50
Applicants in Alabama			150
Clear Creek near Alma, Ark			100
Spadra Creek, near Clarksville, Ark			100
Applicants in Arkansas			75
Colorado			150
Connecticut			100
Horseneck Brook near Greenwich, Conn			200
Applicants in District of Columbia			100
East Lake near Atlanta, Ga			100
Lake Demorest near Demorest, Ga			100
Talking Rock River near Talking Rock, Ga			100
Applicants in Georgia			707
Newman Lake near Hauser, Idaho			60
Applicants in Idaho			210
Paris Reservoir, Paris, Ill			300
Bangs Lake near Wauconda, Ill			200
Applicants in Illinois			450
Twin Lake near Lima, Ind			100
Still Lake near New Carlisle, Ind			50
Upper Long Lake near Albion, Ind			300
Bass Lake near Bass Lake, Ind			100
White River near Richmond, Ind			150
Lake Kurtz near Riley, Ind			100
Clear Lake near Westville, Ind			100
Muscatatuck River, North Vernon, Ind			150
Yellow Lake near Cloverland, Ind			50
Hilladale Park Lake near Newcastle, Ind			100
Hunt Lake near Laporte, Ind			50
Applicants in Indiana			550
Indian Territory			75
Storm Lake near Storm Lake, Iowa			175
Upper Iowa River near Chester, Iowa			100
Turkey River near West Union, Iowa			100
Des Moines River (above the dam) near Des Moines, Iowa			200
Des Moines River near Fort Dodge, Iowa			100
Iowa State Fish Commission			300
Cedar River near Cedar Rapids, Iowa			500
A., T. & S. F. R. R. Co., Hospital Pond near Fort Madison, Iowa			100
Applicants in Iowa			50
Slate Creek near Wellington, Kans			200
Strawberry Lake near Fort Scott, Kans			100
Lake View at Lake View, Kans			150
Applicants in Kansas			300
Green River near Moreland, Ky			140
Falling Fork Creek near Louisville, Ky			140
Salt River near Harrodsburg, Ky			140
Eagle Creek near Williamston, Ky			75
Kentucky River near Winchester, Ky			100
Dix River near Danville, Ky			140
Licking River near Mount Sterling, Ky			140
Kentucky River near Irvine, Ky			100
Lake Ellerslie near Lexington, Ky			140
Ludlow Lagoon near Ludlow, Ky			100
Applicants in Kentucky			695
Choplins Dam near Natchitoches, La			100
Applicants in Louisiana			200
Patapsco River near Woodstock, Md			90
Potomac River near Cabin John Bridge, Md			75
Applicants in Maryland			150
Lake Gardner near Amesbury, Mass			100

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Large-mouthed black bass—Continued.			
Curtis Lake near North Dana, Mass			100
Applicants in Massachusetts			133
Little Brooks Lake near Newaygo, Mich			240
Big Brooks Lake near Newaygo, Mich			240
Hersy Lake near Lawton, Mich			145
Little Brown Lake near Rockford, Mich			180
Carp Lake near Traverse, Mich			60
Clear Lake near Sidnaw, Mich			100
Mill Lake near Wingleton, Mich			160
Kalamazoo River near Marshall, Mich			120
Duck Lake near Springport, Mich			120
Fish Lake near Wexford, Mich			240
Donaldson Lake near Kendall, Mich			120
Clear Lake near Beaver Lake, Mich			120
Crab Lake near Traverse, Mich			120
Rust Dam near Alger, Mich			60
Strawberry Lake near Evart, Mich			300
Frains and Murray lakes near Ypsilanti, Mich			120
Yellow Lake near Buchanan, Mich			205
Eagle Nest Lake near Tower, Minn			200
Estelle Lake near Penn, Miss			100
Horticultural Pond near Oktibbeha, Miss			100
Spring Lake near Canton, Miss			100
Round Lake near Canton, Miss			200
Applicants in Mississippi			750
Missouri State Fish Commission			100
Moreau Creek near Jefferson City, Mo			150
Williams Lake near Webb City, Mo			30
Applicants in Missouri			200
Missouri River near Great Falls, Mont			75
Lake Hagan near Butte, Mont			75
Johnson Lake near Elliston, Mont			75
Tributary of Missouri River near Townsend, Mont			100
Applicants in Montana			325
New Hampshire			100
Ramapo River near Mahwah, N. J			200
Pohatcong Lake near Tuckerton, N. J			185
Stafford Lake near Manahawkin, N. J			50
Applicants in New Jersey			250
Laguna Grande near Las Vegas, N. Mex			200
Reservoir, Springer, N. Mex			200
Lake McMillan near Eddy, N. Mex			250
Susquehanna River near Binghamton, N. Y			100
Hurlbut pond near Clymer, N. Y			50
Damon Pond near Clymer, N. Y			100
Scholarie Creek near Central Bridge, N. Y			100
Ararat River near Mount Airy, N. C			150
Yadkin River near Wilkesboro, N. C			100
Applicants in North Carolina			100
Spirit Wood Lake near Jamestown, N. Dak			225
Fish Lake near Jamestown, N. Dak			100
Applicants in North Dakota			75
Scioto River near Delaware, Ohio			110
Prospect, Ohio			40
Indian River near Portsmouth, Ohio			50
Tinker Creek near Bedford, Ohio			25
Branch of Mahoning River near Newton Falls, Ohio			25
Grand Reservoir near Celina, Ohio			25
Little Miami River near Xenia, Ohio			100
Olentangy River near Waldo, Ohio			40
Scioto River near Batavia Junction, Ohio			100
West Fork of Beaver River near East Liverpool, Ohio			50
Grand River near Eagleville, Ohio			100
Horseshoe Lake near Kenton, Ohio			50
Applicants in Ohio			650
Hog Creek near Guthrie, Okla			100
Applicants in Oklahoma			200
Dover Lake near Salem, Oreg			75
Mill Creek near Salem, Oreg			25
Big Creek near Waldport, Oreg			75
West Branch of Perkman Creek near Colebrookdale, Pa			100
Quittapahilla Creek near Annville, Pa			250
Kreiders Dam near Annville, Pa			140
French Creek near St. Peters, Pa			100
Sherman Creek near Carlisle, Pa			100
Branch of Juniata River near Bedford, Pa			145
Washington Lake near Schohala, Pa			50
Applicants in Pennsylvania			235
Goose Creek near Otranto, S. C			138
Applicants in South Carolina			130
Cascade Creek near Cascade, S. Dak			40

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Large-mouthed black bass—Continued.			
Lake Creek near Pine Ridge Agency, S. Dak			300
Canyon Lake near Rapid City, S. Dak			40
Lake Edgemont near Edgemont, S. Dak			41
Wall Lake near Sioux Falls, S. Dak			50
Sioux River near Sioux Falls, S. Dak			1,012
Applicants in South Dakota			41
Forked Deer River near Trenton, Tenn			150
Hiawassee River near Higdon, Tenn			100
Cane Creek near Hohenwald, Tenn			100
Tellico River near Mount Verd, Tenn			100
Duck River near Shelbyville, Tenn			100
Elk River near Estill Springs, Tenn			200
Nolachucky River near Chucky Valley, Tenn			100
Sole Creek near Chickamauga, Tenn			200
North White Creek near Glenmary, Tenn			100
Doe River near Elizabethton, Tenn			200
Chickamauga Lake near Chickamauga, Tenn			400
Applicants in Tennessee			300
Palestine Lake near Palestine, Tex			200
Lake McDonald near Austin, Tex			100
Graham Creek near Mobeetie, Tex			200
Cheyenne Creek near Channing, Tex			100
Hurst Lake near Fort Worth, Tex			100
Lake Hunter near Thurber, Tex			200
Applicants in Texas			2,100
Smith River near Martinsville, Va			100
Forest Hill Park Lake near Richmond, Va			100
Robinson River near Somerset, Va			100
Falling River near Appomattox, Va			100
Rapidan River near Rapidan, Va			100
Occoquan Creek near bridge over Bull Run, Va			100
South Anna River near Ashland, Va			150
Applicants in Virginia			150
Lover Lake near Tacoma, Wash			100
Lake Cavanaugh near Seattle, Wash			75
Silver Lake near Castlerock, Wash			50
Welty Lake near Northport, Wash			100
Lake St. Clair near Tacoma, Wash			150
Clear Lake near Bucoda, Wash			100
Applicants in Washington			50
Rock River near Mayville, Wis			200
Pine Lake near Jeffries, Wis			85
Phantom Lake near Mukwonago, Wis			1,500
Lemonweir River near Mauston, Wis			100
Cedar Lake near Schleisingerville, Wis			1,200
Elbow Lake near Amburg, Wis			100
Lake Como near Lake Geneva, Wis			300
Applicants in Wisconsin			100
Lakes in Yellowstone National Park, Wyoming			500
Small-mouthed black bass:			
Swift Creek near Higgston, Ga			50
Applicants in Georgia			50
Headwaters of Quantico Creek near Hebron, Md			100
Potomac River near Little Falls, Md			100
Great Falls, Md			150
Applicants in Maryland			50
Merriwold Lake near Gilman, N. Y			50
Kinderhook Lake near Niverville, N. Y			108
Lake Huntingdon near Coshocton, N. Y			50
Applicants in New York			150
Goose Creek near Otranto, S. C			57
Sunfish:			
Applicants in Georgia			35
Rock bass:			
McCullough Creek near Venitia Station, Ala			400
Fossil Pond near Hillman, Ala			100
Applicants in Alabama			400
Arizona			95
Clear Lake near Mayflower, Ark			300
Applicants in Arkansas			200
Colorado			100
Crawfish Spring Lake near Chickamauga, Ga			300
Tate Pond near Jasper, Ga			300
Atherton Pond near Jasper, Ga			200
Applicants in Georgia			749
Illinois			600
Yellow Lake near Cloverland, Ind			300
Cypress Bend near Booneville, Ind			155
Bear Lake near Albion, Ind			230
Applicants in Indiana			200
Osceola Lake near Bluejacket, Ind. T			300

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Rock bass—Continued.			
Cedar River near Cedar Rapids, Iowa			200
Applicants in Iowa			700
Mulberry Creek near Ford, Kans			250
Crystal Lake near Dodge City, Kans			200
Sappa Creek near Colby, Kans			185
Applicants in Kansas			4,300
Kentucky River near Winchester, Ky			300
Clear Creek near Shelbyville, Ky			300
Lake Reba near Richmond, Ky			300
South Licking River near Cynthiana, Ky			300
Salt River near Taylorsville, Ky			400
Valley Creek near Elizabethtown, Ky			75
Applicants in Kentucky			1,000
Louisiana			63
Maryland			600
Yazoo River near Yazoo City, Miss			200
Applicants in Mississippi			950
Zoo Park Lake near Springfield, Mo			200
Moreau Creek near Jefferson City, Mo			400
Applicants in Missouri			800
Nebraska State Fish Commission			300
Crystal Lake near Alliance, Nebr			100
Applicants in Nebraska			100
New Jersey			400
Lake McMillan near Eddy, N. Mex			300
Applicants in New Mexico			400
Tuscarora Creek near Addison, N. Y			150
York Lake, Sullivan County, N. Y			200
Applicants in New York			200
Cane Creek near Melvane, N. C			150
Maple Creek near Shelby, N. C			150
Waterworks Lake at Henderson, N. C			130
Applicants in North Carolina			1,120
Bull Creek near New Waterford, Ohio			270
Brush Creek near Hillsboro, Ohio			400
Applicants in Ohio			880
Kingfisher Creek near Kingfisher, Okla			150
Skelton Creek near South Enid, Okla			150
Applicants in Oklahoma			1,200
Applicants in South Carolina			510
Little River near Maryville, Tenn			300
Mossy Creek near Mossy Creek, Tenn			200
Big Lake near Kenton, Tenn			150
Barren Fork of Collins River near McMinnville, Tenn			150
Pigeon River near Sevierville, Tenn			300
Big Pigeon River near Newport, Tenn			200
Stone River near Murfreesboro, Tenn			200
Applicants in Tennessee			399
Amarillo Creek near Amarillo, Tex			300
Fountain Lake near Waco, Tex			200
Lake McDonald near Austin, Tex			200
Leon River near Gatesville, Tex			150
Clear Fork of Trinity River near Fort Worth, Tex			200
Dillon Lake near Amarillo, Tex			200
Squaw Creek near Glenrose, Tex			300
Lake Hunter near Thurber, Tex			200
Applicants in Texas			4,150
Bear River near Salt Lake City, Utah			100
Smith River near Montreal, Va			200
Bannister River near Franklin, Va			150
Rapidan River near Rapidan, Va			200
Blackwater River near Rocky Mount, Va			150
Four Mile Run near Bull Run, Va			200
South Anna River near Ashland, Va			300
Applicants in Virginia			1,400
Sandy Creek near Newbury, W. Va			200
White bass:			
Cedar River near Cedar Rapids, Iowa		19,500	
Cod:			
Buzzards Bay off Woods Hole, Mass		17,549,000	
Vineyard Sound		21,106,000	
Great Harbor off Woods Hole, Mass	846,000	1,792,000	
Boston Bay off Gloucester, Mass		18,394,000	
Gloucester Harbor off Gloucester, Mass		6,465,000	
Mackerel:			
Merryconeag Sound off Orr Island, Me		213,000	
Boothbay Harbor off Boothbay Harbor, Me		500	
Vineyard Sound off Woods Hole, Mass		210,000	
Buzzards Bay off Woods Hole, Mass		621,000	
Boston Bay off Gloucester, Mass		747,000	
Gloucester Harbor off Gloucester, Mass		150,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Tautog:			
Vineyard Sound near Woods Hole, Mass		7,650,000	
Great Harbor off Woods Hole, Mass		9,925,000	
Flatfish:			
Vineyard Sound near Woods Hole, Mass		7,580,000	
Great Harbor near Woods Hole, Mass		892,000	
Lobster:			
Long Island Sound near Noank, Conn		2,588,000	
Long Island Sound near New London, Conn		7,550,000	
Piscataqua River near Kittery Point, Me		283,000	
York River near York, Me		154,000	
Merryconeag Sound off Orr Island, Me		151,000	
Mouth of Limkins Bay off Ocean Point, Me		40,000	
Damariscotta River off Little Heron Island, Me		35,000	
Boothbay Harbor off Big Cove Island, Me		36,000	
Burnt Island, Me		10,000	
Sheepscott River off Isle of Springs, Me		50,000	
Vineyard Sound off Woods Hole, Mass		34,303,500	
Buzzards Bay off Woods Hole, Mass		6,013,000	
Goslin, Mass		22,112,500	
Great Harbor off Woods Hole, Mass		10,660,000	
Nantucket Harbor off Nantucket Island, Mass		480,000	
Marblehead Harbor off Marblehead, Mass		450,000	
Massachusetts Bay off Rockport, Mass		398,000	
Boston Bay, Mass		1,935,000	
Gloucester Harbor, Mass		8,772,000	
Massachusetts Bay off Gloucester, Mass		714,000	
Sandy Bay, Mass		65,000	
Ipswich Bay, Mass		126,000	
Piscataqua River near Castle, N. H		150,000	