

REPORT ON THE PROPAGATION AND DISTRIBUTION OF FOOD-FISHES.

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PROPAGATION OF FOOD-FISHES.

Fish-cultural work was conducted on the same general lines as in the past, but the results far exceeded those of any previous year. The total number of fish distributed was 1,164,336,754, an increase of about 100,000,000 over the output of the preceding year.

On the Pacific coast special attention was paid to the collection and hatching of quinnat-salmon eggs on the Sacramento River, in the Columbia River Basin in Washington and Oregon, and on the Rogue River. Owing to the excessive drought prevailing in California during the summer of 1899, the water was so low in Battle Creek that but few salmon ascended the stream, and the majority deposited their eggs on sand bars in the Sacramento. As a result only 1,600,000 eggs were taken at this point, where 20,000,000 were taken the previous year and 48,000,000 two years before.

At Baird station, on the McCloud River, a tributary of the Sacramento, where egg collections are made from both the summer and fall runs, the work was affected by the same cause. From the first run 6,228,260 were collected, and from the fall run 186,800, making in all 6,415,060. This was very discouraging, as over 16,000,000 had been taken the previous year with poorer facilities. The eggs were all hatched in California and the fry liberated in the Sacramento River and tributaries and in Eel River.

In the Columbia River Basin stations were operated on the Little White Salmon River in Washington and on the Clackamas River in Oregon; and though the run of salmon in the Columbia River was poor, 10,385,000 eggs were obtained on the Little White Salmon and 2,014,900 on the Clackamas, which resulted in the liberation of 10,997,947 fry in this region. Several hundred thousand of these were retained in Clackamas until they were from 4 to 6 inches long before being liberated.

On the Rogue River 4,364,800 quinnat-salmon eggs, 200,000 silver-salmon eggs, and 530,000 steelhead-trout eggs were collected. Of the quinnat-salmon eggs 1,800,000 were transferred to Wedderburn, Oreg.; the fry resulting were not planted until they were from 3 to 5 inches in length. They were fed on canned salmon, principally the backs of heads and the tails, which are of no commercial value. The

remainder were hatched at the station, and the 2,156,000 fry resulting were liberated in the Rogue River.

As the collection of steelhead-trout eggs on the Willamette the previous year had been very unsatisfactory, arrangements were made to collect on Crystal Creek, a tributary of the Rogue River, about 10 miles above the salmon station. This work proved fairly satisfactory, and it is believed, with the experience gained, that large numbers can be secured next season. The eggs were all forwarded to eastern stations, as plants previously made indicate that the steelhead is well adapted not only for the Great Lakes, but for lakes and streams in Montana and many of the Eastern States.

The propagation of the sockeye or blueback salmon, the most important commercial species on Puget Sound, was undertaken for the first time at Baker Lake, and as a result 10,683,000 fry were planted in Skagit River and the lake.

On the Great Lakes the white-fish and lake-trout work was the most satisfactory ever accomplished. Arrangements were made early in the fall for the collection of lake-trout eggs at Charlevoix, Beaver Island, and Manistique, Lake Michigan, near which are located the most important spawning-grounds of this species. Over 15,000,000 eggs were collected by November 10, but as only about 10 per cent were taken prior to November 1 the work would have been a complete failure under the old law, which provided for a rigid close season commencing on that date. On Lake Superior the season was very successful, over 12,000,000 being taken. The majority of the fry resulting from the total number collected, 27,000,000, were planted on the spawning-grounds of the Great Lakes. The white-fish work was energetically directed on Lake Erie; large numbers of adult fish were penned, as heretofore, at Put-in Bay, Ohio, and Monroe Piers, Michigan, which yielded 235,000,000 eggs. From the three fisheries on the Detroit River, operated as a result of arrangements made with the State commission, over 34,000 white-fish were penned, which yielded 224,000,000, making 459,000,000 eggs collected at the two stations. As a result of the year's work over 337,838,000 white-fish fry were liberated in the Great Lakes, more than double as many as in 1899.

The spring proved most unfavorable for the collection of pike-perch eggs on Lake Erie. Ice remained in the lake for weeks later than usual, so that by the time the fishermen were enabled to set their nets the season was actually over in the neighborhood of Port Clinton, Sandusky, Toledo, and the other important grounds. About 138,000,000 eggs were collected by the force of spawn-takers employed at Put-in Bay, but these were of poor quality and produced only about 57,000,000 fry, which were liberated in Lake Erie and some of the inland lakes of Ohio, Indiana, and Michigan. The collecting station on the Missisquoi River in Vermont, which had proved so promising the preceding year, was opened in April, but the immense amount of snow in the mountains at the headwaters of the Missisquoi melting

at that time caused freshets, which prevented the fish from ascending until April 14, and consequently shortened the season. The season here commenced April 22 and continued until the 31st, during which period 115,000,000 eggs were collected from 1,859 females; 85,225,000 eggs were transferred to Cape Vincent and the balance hatched and distributed under direction of the Vermont Commission. From the Cape Vincent hatchery 25,000,000 fry were distributed, making a total of 37,500,000 as a result of the season's work on the Missisquoi River.

It is difficult to account for the large loss that occurs in hatching pike-perch eggs, unless it is that they are unfertilized. Unfortunately the collecting stations are so distant from the regular station that we have been unable, up to this time, to make careful microscopic examinations to show whether this loss is due to the lack of fertilization or to injury in transportation. It is believed by the superintendent of the Cape Vincent station that very much better results would be secured if the eggs were eyed at the point where they are collected, and transferred afterwards. With a view to determining this matter definitely arrangements were made to erect a small hatchery at Swanton, but it was not only too small to handle the eggs collected, but the water supply was of such poor quality that it was necessary to keep men at work night and day clearing away the trash brought down by the melting snows; consequently the results were very unsatisfactory and no definite conclusions have yet been reached.

Early in October arrangements were made for the collection of brood cod for the Woods Hole station; also for the establishment of auxiliary collecting stations at Plymouth, Mass., and Kittery Point, Me., to supply the Gloucester and Woods Hole stations with eggs. The schooner *Grampus* during the months of October and November captured and delivered at Woods Hole 2,200 brood cod varying from 6 to 20 pounds. These commenced to spawn in November and yielded 103,440,000 eggs. In addition to these the station received from the spawn-takers stationed at Plymouth 71,275,000 cod eggs collected from fishing vessels which ply from that port. The work at Kittery was even more successful than in the past and the eggs collected were of superior quality, due largely to the exceptionally good weather which prevailed from November to February. From this point 180,230,000 cod eggs were shipped to Gloucester between November 28 and March 23, which, with the shipments from Plymouth, gave the station an aggregate of 198,880,000. As a result of the work at the two stations, 265,324,000 cod fry were liberated along the coast of New England from December to March. The results were very gratifying, being over 50,000,000 greater than ever before. The adult cod which survived the spawning operation were tagged and liberated from the Woods Hole station, as heretofore, with a view to getting additional data with reference to their migrations, rate of growth, etc; 1,311

were turned loose, and before the close of the year 11 were captured between Chatham and the New Jersey coast.

It was decided to take up the flat-fish work early in January, as past experience seemed to indicate that a large number of fish spawned during that month or early in February. The work was somewhat delayed by the presence of ice in the bays in which the nets were set, but the season proved very satisfactory; over 102,000,000 eggs were collected, which yielded 87,115,000 fry. In view of the fact that very unsatisfactory results had been secured during the past two or three years where the eggs had been artificially fertilized, it was determined this season to allow the fish to spawn naturally in the tanks at the station, and the results were most satisfactory.

Owing to the continued decrease of the lobster fishery, strenuous efforts have been made during the past two years to increase the output of lobster fry, but the scarcity of lobsters and the difficulties encountered in getting the egg lobsters from the fishermen, notwithstanding the cordial cooperation of State fish commissions throughout New England, has made this impossible. Arrangements were made during the winter months to collect all of the egg-bearing lobsters captured from Eastport to New York. The *Grampus*, assisted by a steam smack, plied along the coast of Maine, and visited all of the important fishing centers from early in April to July. Besides this, local agents were stationed from Kittery to New London, Conn., who purchased egg lobsters, not only from the fishermen, but also from the dealers in large towns. These were then transferred to Woods Hole and Gloucester by sail and steam boats provided for this purpose. Notwithstanding the efforts made, only 4,643 egg lobsters were secured north of Cape Cod. These yielded 63,335,000 eggs, from which were hatched 58,560,000 fry, which were deposited on suitable grounds along the coast. At Woods Hole only 28,140,000 eggs were secured and 22,643,000 hatched.

The propagation of shad was conducted as usual on the Albemarle Sound, the Potomac River, the Susquehanna, and the Delaware. The establishment of a new shad station at Edenton, N. C., obviated the necessity of our utilizing the *Fish Hawk* at that point. The season was very backward, and at one time it appeared as though the work would be materially reduced. The run of shad on the Potomac was seriously affected by the unfavorable conditions and work practically ceased by the middle of May, but operations were vigorously pushed until the end of the month on the Delaware and Susquehanna rivers. The number of eggs collected at the four stations aggregated 316,000,000, which produced 241,056,000 fry, an excess of about 6,000,000 over the previous season. The results secured on the Delaware were particularly gratifying. The run of shad was immense, the fish being caught in such large numbers that there was practically no sale. The *Fish Hawk* between April 27 and May 31, when operations ceased on account of lack of funds, had collected over 80,000,000 eggs.

The propagation of the basses and other fishes suitable for stocking inland lakes and streams was conducted as usual at the various stations provided for this purpose. The results were very gratifying. Notwithstanding the fact that there has been a large increase in the number of applications filed during the year, especially for the basses, all demands were met.

The following stations and auxiliary stations were operated during the year, and the work accomplished at each is reviewed in detail in the abstracts from the reports of the various superintendents:

Green Lake, Maine.	Detroit, Michigan.
Craig Brook, Maine.	Alpena, Michigan.
Grand Lake Stream, Maine.	Sault Ste. Marie, Michigan.
St. Johnsbury, Vermont.	Duluth, Minnesota.
Nashua, New Hampshire.	Quincy, Illinois.
Gloucester, Massachusetts.	Manchester, Iowa.
Woods Hole, Massachusetts.	Neosho, Missouri.
Cape Vincent, New York.	San Marcos, Texas.
Steamer <i>Fish Hawk</i> (Delaware River).	Leadville, Colorado.
Battery Station, Maryland.	Spearfish, South Dakota.
Fish Lakes, Washington, D. C.	Bozeman, Montana.
Central Station, Washington, D. C.	Baird, California.
Bryan Point, Maryland.	Battle Creek, California.
Edenton, North Carolina.	Clackamas, Oregon.
Wytheville, Virginia.	Rogue River, Oregon.
Erwin, Tennessee.	Little White Salmon, Washington.
Put-in Bay, Ohio.	Baker Lake, Washington.
Northville, Michigan.	

RESULTS OF FISH-CULTURE.

From correspondents in various sections of the country letters have been received from time to time showing the results of plants of brook trout, steelhead trout, rainbow trout, black bass, and crappie. The superintendent of Leadville station received numerous letters from individuals whose lakes had been stocked with brook trout and who, as a result, were engaged in fish-culture from a commercial standpoint. As illustrative of the scale upon which this work is being conducted in Colorado, 4,800,000 brook-trout eggs were collected by the superintendent during the past fall, all except about 250,000 being taken there from private lakes. The correspondence also shows that the brook trout is well established in public waters in various sections of the State, and this is of especial interest in view of the fact that there were no brook trout in the waters of Colorado a few years ago.

From Montana numerous letters have also been received from persons to whom fish had been furnished, and they all show the brook trout to be well adapted for the streams in that State. Mr. W. C. Gilmer, under date of March 24, 1900, reports the capture of a brook trout weighing $2\frac{1}{2}$ pounds, dressed, resulting from a plant made in August, 1897, in a stream tributary to the Madison River, near Ennis.

There is no doubt as to the success of the steelhead trout in some

of the streams and lakes of eastern Montana. During the spring of 1900 over 50,000 eggs were collected from fish taken in Bridger Creek, and Mr. J. A. Davies, of Butte, Mont., reports that steelheads from 9 to 12 inches long were taken from a mountain lake in Madison County which had been stocked the previous year.

A member of the Catlin Land and Live-stock Company, near White Sulphur Springs, Meagher County, writes as follows:

The 5,000 steelhead trout sent us in October, 1898, were put in our spring creek, grown up with watercress and containing a good supply of snails, water-bugs, and worms. This creek empties into a reservoir of 5 or 6 acres, 6 to 8 feet deep, from which we have caught several varying in length from 9 to 12 inches. The flesh is pink or salmon-colored, and of good quality.

As these fish were only a year old when caught, it would seem that they are admirably adapted to the waters of that section.

Henry Gilmer, of Lewisburg, W. Va., under date of June 19, reports the capture of a rainbow trout weighing a pound in Howard Creek, near Lewisburg, which stream was stocked by the Commission in 1898. Mr. A. H. Gibboney, of Marion, Va., captured a rainbow trout 23 inches long, weighing 4 pounds 9 ounces, in Staley Creek, in August, 1900, and he reports that several hundred have been captured by Dr. Z. V. Sherrell, of the same place, since April 15, some measuring 14 to 23 inches in length, and one weighing 3½ pounds.

It has been the general impression that rainbow trout will not thrive in New England waters, but Hon. H. O. Stanley, of the Maine Fish Commission, under date of June 26, 1900, reports that a large number of these fish entered the trap of the State hatchery at Lake Auburn the previous spring and that eggs were collected from them. They weighed from 6 to 9 pounds, and were supposed to have escaped into Lake Auburn from the State hatchery several years ago, when it had been supplied with eggs by the U. S. Fish Commission.

Mr. J. D. Patton, of Cleveland, Tenn., states that rainbow trout are found in Jack River and Mitchell Creek as a result of plants made in those waters. Mr. William G. De Witt, of the Adirondack League Club of New York, forwarded two specimens of Swiss trout on July 29, 1900, taken in a lake controlled by the club, which had been stocked with a consignment furnished by this Commission.

Reports have reached the Commission from time to time of the capture of quinnat salmon in Lake Ontario and its tributaries. During the past year two specimens have been secured and identified by Mr. Livingston Stone, superintendent of the Cape Vincent Station, one of which was ripe and weighed 12½ pounds, the capture being made near Tibbetts Point light-house in a sturgeon net.

Several years ago the Commission liberated in the tributaries of the Potomac River 200 crappie and 200 large-mouthed black bass, and as a consequence, from January 1 to August, 1900 (excluding April and May), 47,795 pounds of bass were sold in Washington from the Potomac

River. The crappie (an excellent food-fish), though not handled in large numbers in the markets, is also very abundant.

Mr. C. N. Ironsides, of New York, under date of January 10, writes:

Some four or five years ago, at my request, your Commission sent me 100 crappie to be planted in York Lake, Sullivan County. It gives me great pleasure to report to you that the planting was entirely successful. Ninety-eight were placed in the lake, and the catch last summer and fall was very large. The lake is now well stocked with crappie.

SPECIAL INVESTIGATIONS AND INSPECTIONS.

During December, at the request of the Fish and Game Association of the District of Columbia, arrangements were made to seine the Chesapeake and Ohio Canal just after the drawing down of the water for the winter, with the view to transferring the fishes remaining in the pools to the Potomac River. This work was directed by Mr. L. G. Harron, who between December 14 and 22 removed all the fish in the canal from Middlekauff's Mill to Great Falls, a distance of 92 miles. Over 4,000 small-mouthed black bass were saved, 410 rock bass, 610 crappie, 700 white perch, 3,800 sun-fish, and 3,400 cat-fish, besides 70,000 or 80,000 of the commoner varieties. Nearly 500 carp, weighing from 1½ pounds to 15 pounds, were also captured, but no small ones were seen, and it is supposed they had been eaten by bass and other fishes.

At the request of Mr. Moreton Frewen, of Innishannon, Ireland, arrangements were made in May to forward a consignment of shad eggs to Queenstown with the view to stocking some of the rivers of Ireland with this valuable food-fish. On May 15, Mr. J. F. Ellis, superintendent of the car and messenger service, delivered on board the *Oceanic*, of the White Star Line, 700,000 eggs which had been furnished from the steamer *Fish Hawk*. They were placed in the refrigerator and arrangements were made with the steward to have the temperature kept between 51° and 55°. It is to be regretted that on the arrival of the vessel at Queenstown the eggs were all dead. It is believed that, if an experienced messenger were sent, shad fry, and possibly eggs, could be successfully transported, as the vessels take only about 4½ days to make the trip and there would be no difficulty in obtaining fresh supplies of water and ice en route.

In August the Fish Commission stations at Wytheville, Va., and Erwin, Tenn., were inspected by the assistant in charge of the Division of Fish Culture. The construction work accomplished at Wytheville during the past year was excellent, but in order to make the station efficient it will be necessary to build additional bass ponds and make a number of improvements, which, it was estimated, will cost about \$2,500. At the Erwin station the pond system for the propagation of trout was practically completed, but the grounds were in an unfinished condition owing to lack of funds, and it is estimated that it will require about \$500 to put them in good shape. The Crow

tract, lying due south of the présent site and containing about 40 acres, on which the Commission had secured an option with the view to purchase, was carefully examined, and it was recommended that it be devoted entirely to the propagation of bass and crappie, the ponds to be supplied with water from Indian Creek or the stream running through the station grounds. It is recommended that an appropriation of \$5,000 be obtained for this purpose.

Between November 16 and 23 the stations at St. Johnsbury, Nashua, East Orland, Green Lake, and Woods Hole were inspected and conferences held with the various superintendents with reference to the conduct of fish-cultural work. The St. Johnsbury station had been materially improved by the construction of additional rearing-ponds, but the water supply was still inadequate. Plans for the construction of a large reservoir were under consideration, and an estimate of the cost will be submitted with the view to obtaining a special appropriation. The collection of trout eggs, which had just been completed, was very unsatisfactory, owing to the drought which was then prevailing throughout New England and which had caused the destruction of thousands of adult fish by the drying up of streams.

Owing to the incomplete condition of the Nashua Station and to the fact that the superintendent had had no opportunity to establish auxiliary stations, very little fish-cultural work had been done at that point. A few thousand eggs had been collected at Dublin Pond, and it was decided to purchase from commercial hatcheries a sufficient number for supplying applicants in the State. A number of rearing and brood ponds had been completed, but after a careful examination of the station it was decided that it would require from \$5,000 to \$6,000 to put the station in thorough working order.

The spawning season of the Atlantic salmon at Craig Brook closed on November 20, two days before the assistant's visit. Although the number of fish purchased for this work was larger than in past years, on account of their smaller size the output was less. The land-locked salmon work at Grand Lake Stream was unfavorably affected by the drought. The grounds and buildings at this station were in fair condition and the work was in general satisfactory.

At Green Lake egg collections were still in progress, but the indications here, as at other stations, pointed to a shortage on account of the excessive drought. In many lakes the water was so low that salmon and trout could not enter the streams to deposit their eggs.

As the water supply has not been satisfactory for rearing trout, the superintendent submitted a plan for increasing and improving the supply by raising the dam at Rocky Pond. The suggestion seemed practicable, and it was recommended that a special appropriation be asked for this purpose.

At the time of the assistant's visit to Woods Hole there were on hand over 2,000 brood cod, weighing 6 to 20 pounds, which had been captured by the *Grampus* and placed in live-boxes at the station. The

question of opening the Plymouth and Kittery Point auxiliary stations was thoroughly canvassed with Capt. E. E. Hahn and arrangements made to commence work in November. The steam launch *Blue Wing* was then being overhauled and put in readiness for the work. The buildings and grounds had been much improved during the year, but the wharf was incomplete owing to lack of funds. An additional appropriation of \$2,000 was recommended for this purpose.

Late in November, at the request of the superintendent of the Northville station, the assistant in charge visited the Detroit hatchery and the three white-fish fisheries which were then in operation on Belle and Grassy islands. The hatchery at that time contained about 500 jars of eggs, and 15,000 adult white-fish were held in pens on the islands. As it appeared that the hatchery would be overcrowded, arrangements were made with the Michigan Fish Commission for the utilization of the Sault Sainte Marie hatchery, and Alpena was reopened. On the return trip from Detroit a stop was made at Monroe Piers, where the superintendent of the Put-in Bay station met the assistant with the steamer *Shearwater* and took him to the station. The work at Monroe Piers was well organized under direction of Mr. J. C. Fox, the foreman. The crates contained about 10,000 fish. At Put-in Bay there were over 100,000,000 eggs in the hatchery, besides 27,000,000 which had been shipped to Cape Vincent. There were also four or five thousand fish in the crate, and it looked as though from 240,000,000 to 250,000,000 white-fish eggs would be obtained.

The Edenton station was visited in December for the purpose of conferring with the superintendent with reference to the sinking of artesian wells for supplying the bass ponds. The appearance of this station as approached from Edenton is exceedingly attractive, and especially the hatchery, which is not only one of the most artistic ever put up by the Commission, but is also well adapted for the purpose for which it was built.

During the spring months the shad stations on the Potomac, Susquehanna, and Delaware rivers were visited from time to time for the purpose of conferring with the superintendents with reference to the proper conduct of the work. Inspections were also made of the lobster work in progress at Woods Hole and Gloucester, and a careful examination was made, in company with the superintendent, Mr. C. G. Atkins, of the auxiliary station for collecting Atlantic salmon at the headwaters of the Penobscot at Mattagamom. The rack was then being constructed, and it was thought a considerable number of salmon would be secured. En route from Bangor a stop was made at Cape Vincent, as this station had not been inspected for several years. It is very attractive and well equipped throughout. The fish-cultural work was about to close, the pike-perch and brook-trout fry having all been hatched and partly distributed. A conference was held with the superintendent relative to the pike-perch work at Swanton and the taking up of the sturgeon work on Lake Champlain.

STATION REPORTS.

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

As the water in Green Lake has been very low for several summers, and particularly low during the past season, it became necessary to construct a floating wharf at Mann Brook as a landing. A scow 26 feet long was also built for transporting fish from the station to the railroad station at Green Lake, the spawning-house which had been used at Great Brook was removed to the station and fitted up as a residence for one of the laborers, and the old hatchery building, which had been removed from the head of the lake to the station in 1898, was remodeled and fitted up as a cottage. A large amount of miscellaneous work was also accomplished by the station force, including repairs to the hatchery, ponds, foreman's residence, and the steamer *Senator*.

The fish on hand at the beginning of the year are shown by the following table:

Species.	Calendar year in which hatched.			
	1899.	1898.	1897.	1896.
Landlocked salmon.....	811,123	397		277
Steelhead trout.....		5,126	500	
Brook trout.....		829		

The young landlocked salmon were carried through the summer in troughs and ponds with remarkable success; the distribution made during August and September amounted to 309,274, showing a loss of 1,849, or less than 0.5 per cent of the number on hand at the beginning of the year. These fish were fed chiefly on beef liver, purchased in Bangor and shipped to the station by express three times a week. When the landlocked salmon of 1898 were again counted in November there were found to be 301, of which 176 were albinos; 50 were furnished in February to the Boston Sportsmen's Association, and at the end of the year only 24 of the lot remained. Of those hatched in 1896 but one was lost during the year. They were held in the south reservoir and made a fine growth, measuring from 12 to 14 inches in length. It is hoped that they will yield eggs next season.

The brook trout retained from the hatch of 1898 are held in one of the small ponds at the rear of the hatchery, and though apparently healthy, they have grown very slowly. During the summer 349 of them died on account of the high temperature of the water.

The two lots of steelhead trout resulting from eggs hatched in 1897 and 1898 have done very well since they were transferred from the shallow ponds to the reservoir, where there is a considerable depth of water; of the younger lot 3,653 were liberated in Rocky Pond in November, and at the close of the year there were on hand 493 of the hatch of 1897 and 1,368 of the hatch of 1898. They were examined in April and the males were found to be well developed, about 75 per

cent of them being ripe, though no ripe females were found. It is expected that they will produce quite a number of eggs next season.

Early in September arrangements were made for the collection of brook-trout, lake-trout, landlocked-salmon, and golden-trout eggs at the various field stations operated in previous years. The outlook was very discouraging, on account of the protracted drought, the water in all the surrounding ponds and streams being very low.

The following table shows the field stations operated, number of fish captured, and yield of eggs from the various sources:

Stations.	Species.	Males.	Females.	Total.	Yield of eggs.
Winkempaugh Brook.....	Brook trout.....	34	71	105	100,500
Do.....	Landlocked salmon.....	38	54	92	191,000
Patton Pond.....	Brook trout.....	78	60	138	118,000
Do.....	Landlocked salmon.....	.....	2	2	.....
Flood Pond.....	Brook trout.....	40	11	60	12,500
Do.....	Golden trout.....	43	21	64	10,000
Cold Stream Pond.....	Lake trout (togue).....	457	511	968	750,000
Do.....	Landlocked salmon.....	37	36	73	60,000
Green Lake.....	Brook trout.....	4	8	12	13,000
Do.....	Landlocked salmon.....	47	48	95	93,000

The fish captured at the various auxiliary stations were liberated as soon as stripped, with no loss. The eggs collected at Winkempaugh, Flood Pond, and Patton Pond were transferred to the station as soon as fertilized, and arrived in fair condition, the losses averaging from 7 per cent to 14 per cent. Those from fish penned at Great Brook were delivered without loss. The eggs collected at Enfield were eyed at the State hatchery and then transferred, the lake-trout eggs arriving on November 28 and the salmon eggs in February.

The water supply at this station was very unsatisfactory throughout the winter. The temperature of the water dropped in November from 45° to 32½°, and it remained intensely cold until spring. This seriously retarded the development of the eggs, those of the brook trout being in the water 125 days and of the salmon 132 days before showing the eye-spots. These unfavorable conditions caused serious losses.

In addition to the eggs collected in Maine, 300,000 lake-trout eggs were received from Northville and 200,000 brook-trout eggs were purchased from dealers in Massachusetts. The latter arrived in excellent condition, the entire loss on the 200,000 being about 13 per cent. Of the lake-trout eggs collected at Cold Stream Pond, 350,000 were turned over to the State of Maine.

The fry commenced hatching early in March, and in April and May 587,000 lake-trout, 323,644 brook-trout, and 6,990 golden-trout fry were distributed. At the close of the year the following were on hand:

Species.	Calendar year in which fish were hatched.			
	1900.	1898.	1897.	1896.
Landlocked salmon.....	188,077	149	.....	270
Steelhead trout.....	.....	1,308	403	.....
Brook trout.....	.....	448	.....	.....

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

The fishes handled at this station during the year were Atlantic salmon, landlocked salmon, quinnat salmon, steelhead trout, rainbow trout, brook trout, Scotch sea trout. On July 1, 1899, there were on hand nearly a million fish, as indicated in the following table:

Species.	Calendar year in which fish were hatched.					
	1899.	1898.	1897.	1896.	1895.	1894 or earlier.
Atlantic salmon	658,860					* 408
Atlantic salmon, domesticated						2
Landlocked salmon	+ 220,459	3,887				
Quinnat salmon			157			
Steelhead trout	1,647	287		186		
Rainbow trout	4,829	9				
Scotch sea trout	56,551				513	10
Brook trout	6,800					
Total	949,146	4,183	157	186	513	420

* Wild fish inclosed.

† 130,580 at Grand Lake Stream.

The large stock of young Atlantic salmon hatched the previous spring were fed as usual upon chopped food, mainly hog-plucks, though the flesh of old horses and other domestic animals formed a very considerable item. They were carried until autumn with fair success, when 542,849 were liberated, over 521,000 being planted in the upper waters of the Penobscot and its tributaries; the balance were deposited near Craig Brook. It is thought that fry liberated well up the river have a better chance of life than those planted below Bucksport.

In October and November the adult fish impounded at Dead Brook the previous June yielded 1,881,608 eggs. Of these, 1,854 were lost in incubation and 550,000 were shipped to State fish commissions and other applicants. The U. S. Fish Commission received 1,500,267 eggs as its share of the collections at this point, but in April the Maine commission returned its proportion, amounting to 187,533. The hatching was done at Craig Brook, and 1,135,946 strong, healthy fry were produced. They suffered very little during the sac stage, and of the total number hatched only 13,867 were lost. In June 908,073 were planted in the upper waters of the Penobscot at Brownville, Grindstone, and Oakfield, leaving 194,572 on hand at the end of the year, which will be carried until fall and distributed in the same waters.

The superintendent visited the upper waters of the Penobscot several times during the year, with the view to determining how many salmon reach the natural spawning grounds, and whether it would be possible to obtain eggs from this source in sufficient numbers to permit the discontinuance of operations at Dead Brook. As a result of these investigations it was decided to reduce the scale of operations materially at Dead Brook and to establish an auxiliary station on the east branch of the Penobscot River at Mattagamom, in township 3, range 7 west from the east line of the State, by river about 20 miles

above Medway, where the east and west branches unite, about 150 miles above Bucksport, and $7\frac{1}{2}$ miles from Staceyville, on the Bangor and Aroostook Railroad. The temporary camp and works are located on the west side of the river at the entrance to a cove known as "Hunt Logan," formed by an ancient river bed from which the stream has by natural causes been partially diverted, though the connection between the old bed and the new is still maintained.

After careful consideration it was estimated that about 200 salmon had passed over the dams to the upper waters of the Penobscot and spawned the previous summer, but the nests are scattered over about 50 miles of stream, and unless the fish can be captured and held at one point it would be impossible to collect any considerable number of eggs. It was therefore necessary to select a site where all the fish ascending the stream could be captured and held until September or October, and for this reason "Hunt Logan" was selected. By means of a weir across the river, it is proposed to turn all the fish into the mouth of the "Logan" and then into a trap without any handling whatever. The problem of constructing a weir that would give passage to boats and logs, which are floated down past this point in July, and still maintain itself and its efficiency without interrupting the work, has been a very difficult one, but an attempt will be made to meet it in the following manner: A leader will be run diagonally across the river, with pounds for entrapping the salmon at the upper or western end, and from these pounds the fish will be admitted to the inclosure in the "Logan." The pounds will be made by driving stakes in the bottom, but the leader which spans the river will consist of a series of small peeled, seasoned, and buoyant poles, anchored by attaching one end to a heavy chain cable, about 1 foot apart, and allowing the other end to swing free in the current, which will permit them to rise aslant to the surface and keep them swaying constantly to and fro. This weir is now in course of preparation.

During the months of May and June 212 adult salmon were purchased at the mouth of the river and impounded at Dead Brook, so that in the event of failure at the head of the river it will still be possible to collect a fair number of eggs.

The landlocked salmon on hand at the beginning of the year at Craig Brook and Grand Lake Stream were carried through the summer with slight losses, and during the fall months 70,836 were distributed from Craig Brook and 111,787 from Grand Lake Stream. The loss at the latter point during the summer amounted to 18,799, most of which probably escaped through the foot screens in the troughs into Grand Lake Stream.

The trap for the capture of adult salmon was completed on October 28, and fishing commenced immediately and continued uninterruptedly until November 20. The water in the stream was unusually low, but the fish commenced running in large numbers and 541 had been penned by November 3. The run stopped abruptly at this time, and though

operations continued for over two weeks the total catch amounted to only 371 females and 256 males. Of the females 24 proved barren; the others yielded 242,559 eggs, of which 182,300 were eyed and half of them transferred to Craig Brook. The balance were held at Grand Lake Stream and hatched. The fry did well until June 27, when they were suddenly attacked by an epidemic which carried off a third of them in three days, so that 53,715 remain at the close of the year. Of those transferred to Craig Brook 75,000 were shipped to State fish commissions and private applicants; the balance were hatched, producing 15,944 fry. Of these, 10,000 were distributed in the spring and 5,092 remain at the close of the year.

In one of the deep ponds 166 steelhead trout have been held for several years for experimental purposes, and from these 42,000 eggs were collected during the spring of 1900. They were of very poor quality, however, and only 33,275 fry were hatched from them. Of these, 9,000 were distributed and there are on hand 21,092.

During the spring of 1897 a number of adult rainbow trout were turned loose in Alamoosook Lake. The following spring and each spring thereafter, though in decreased numbers, the survivors of the fish have entered Craig Brook to spawn. Some eggs have been taken from them each season, but mostly of poor quality. During the past spring 12,600 eggs were obtained from this source.

The two adult broods of Scotch sea trout on hand are the result of eggs imported from Scotland in 1891, the oldest brood being the result of the eggs imported, and the other their first descendants. Eggs were collected from both broods this spring, and though not of first-class quality they were no worse than the average eggs from domesticated fish. In fact this species stands at the head of all the *Salmonidæ* reared at Craig Brook for vigor and hardiness in the face of unfavorable influences. Of the 144,145 eggs collected 10,000 were shipped, and the balance were hatched at the station, producing 98,575 fry; 35,000 were liberated in May, and on June 30 there remained on hand 6,416.

The food consumed at this station during the year was as follows: 3,574 pounds of beef liver, 22,234 pounds of hogs' plucks, and 8,560 pounds of horse flesh, in all 34,368 pounds, costing \$449.57, in addition to \$56.04 for freight, \$71.26 for drayage, and \$37.80 for ice and its preservation, making the total cost of fish food for the year \$614.67.

Following are the fish on hand at the close of the fiscal year:

Kind.	Calendar year in which fish were hatched.						Wild fish in-closed.
	1900.	1899.	1898.	1897.	1896.	1895 or earlier.	
Atlantic salmon	194,572	523					210
Quinnat salmon				78			
Landlocked salmon	58,807	984	803				
Scotch sea trout	6,416	273				218	
Steelhead trout	21,092	974			165		
Brook trout	211	283					
Rainbow trout	4,404	299					
Total	283,562	3,330	803	78	165	218	210

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

The fish on hand at the beginning of the year were as follows:

Species.	Calendar year in which fish were hatched.				
	1890.	1898.	1897.	1896.	1895.
Rainbow trout	310			310	
Steelhead trout	4,335	07			20
Brook trout	7,665				
Landlocked salmon	42,329				
Hybrids (female brook trout crossed with lake trout)	2,241				
Grayling	8,000				
Total	64,880	07		310	20

The rainbow-trout fry on hand on July 1 were obtained from fish hatched at the station in 1896, but only 77 of them lived to the close of the year. From the 256 adults available in the spring 58,574 eggs were taken, but many of them were shotty and hard, so that only 48,740 were placed in the troughs; and though these appeared to be of good quality, only 6,000 of the fry hatched from them survived to the close of the year. These are apparently strong and healthy. The first eggs taken were laid down in cold water in the hatchery; later on troughs were set up at the source of a spring and these eggs were transferred to them, as well as all eggs subsequently taken, and it was found that the eggs which had been carried in cold water for a few weeks eyed about as well as the others, though most of them burst before hatching. It is estimated that only 10,000 of the total take were actually fertilized.

Of the 4,335 steelhead-trout fry on hand at the beginning of the year, 3,340 were reared to the fingerling stage and 2,200 of them were planted. The others were retained for domestication, but by the last of the year their number had been reduced to 348. As the pond in which they were held during the winter was covered with ice 2 feet thick, it is impossible to assign any reason for so large a loss.

Of the 7,665 brook-trout fry on hand at the first of the year, 6,310 were distributed as fingerlings and the balance retained; 470 of them survived the winter.

The landlocked salmon suffered extremely during the hot summer months, and in the fall only 17,260 remained for distribution. In order to keep landlocked salmon in a healthy condition it is necessary to salt them thoroughly at least three times a week.

The hybrid trout obtained by crossing the *fontinalis* with the *namaycush* were carried without difficulty for several weeks, when 100 were delivered to Prof. W. J. Moenkhaus, of Harvard College, and 1,859 were planted in Caspian Lake.

The 8,000 grayling fry resulting from a shipment of eggs from Bozeman dwindled rapidly after the absorption of the sac, but the few strong ones among them took food readily and made a more rapid growth than any other variety of fish ever hatched and reared at this

station. Another peculiarity in connection with them was the remarkable variation in the size of the fingerlings. They were fed on an emulsion of liver, obtained by grinding it as fine as possible, straining, then mixing with water and allowing it to stand for the coarser portions to settle. The liquid portion of the food thus obtained was fed to the grayling and the settlings utilized as food for the trout fry. At the close of the year 73 of this lot remained.

During the summer and fall field collecting stations were established at Darling Pond, Groton; Lake Mitchell, Sharon; Lake Dunmore at Salisbury, Big and Little Ponds in Averill, and also at the State hatchery, Roxbury.

Darling Pond, where operations have been successfully conducted for several years, changed ownership recently, and a contract was made with the present owners whereby they are to receive one half the eggs taken there and the Fish Commission the other half. The trap was put in place on July 25, but at that time the stream feeding the pond was nearly dry on account of the long-continued drought. The catch of fish was far below that of any previous season, and many that were taken in nets below the trap appeared to be clearing off spawning-beds. The total number of eggs secured was 390,828, of which 172,828 were lost in incubation. Half the balance were turned over to the owners of the lake and the remainder were shipped to St. Johnsbury. Besides reducing the catch, the drought tended to impair the quality of the eggs secured. Its effects were very noticeable on the spawning fish, whether detained in pens or having free range. Trout will not spawn naturally when the water is low. A few stragglers ascend the stream, and if caught and retained in the pens they will ripen in time, but the percentage of eggs saved is never large. The majority of the fish swim around the mouths of the streams awaiting an opportunity to ascend on a rise of water. If a sudden rain falls and causes even a temporary rise it will start them, and apparently has an immediate effect upon the eggs and milt.

At the field stations, for rough measurement, an 8-ounce tin dipper is used, it being necessary to establish a measure for each stripping, owing to the great variation in the size of the eggs. The largest ones are obtained at the first stripping and the smallest at the last. At Darling Pond the first stripping yielded 2,800 eggs to the ounce and the last 4,500, the intermediate ten strippings varying between these two measures, the number per ounce becoming greater at each consecutive stripping.

The work at Lake Mitchell was very satisfactory and more eggs were taken than in any previous season, notwithstanding the excessive drought. The good results of stocking this lake were very apparent this year in the largely increased take of fish, 3,136 being captured, 1,691 being females. During the season 726,649 eggs were obtained from 1,339 females; 355,649 died during incubation or were not fertilized, and the remaining 371,000 were transferred to St. Johnsbury.

It was noticed that the number of females exceeded the number of males, and to such an extent at times that it became impossible to secure an adequate amount of milt. At Quimby mill-pond, 4,000 eggs were fertilized with milt taken at Lake Mitchell (about 2 miles distant) several hours earlier. On November 24 the traps and racks were removed and the fish liberated. It was then found that most of the males were ripe, just twenty-five days after the last female had been stripped. This peculiarity was attributed to the drought.

Lake Dunmore is in the town of Salisbury and has an area of about 3,000 acres, one-half of which is suitable for lake trout and bass. The other half is shallow and is inhabited by pickerel and other coarse varieties. An examination of the spawning-grounds in 1898 seemed to indicate that a large number of lake-trout eggs could be secured, consequently on October 16 a field station was established and a careful watch of the spawning-beds was kept. A camp was started, troughs set up and connected with a spring, and a trap was set near the spawning-grounds off White Rocks. No fish were caught and the position of the net was changed, but with no better success. On the 25th of October 208 lake trout were captured by using a 200-foot gill net as a seine off Birch Point, about a half mile from White Rocks, the catch being made between 8 p. m. and 5 a. m. As soon as it was discovered that they could be taken in apparatus of this character a 40-rod seine was used and 761 were captured by the 14th of November, 639 being males. Of the females 102 were ripe and yielded 212,000 eggs. The fish averaged $3\frac{1}{2}$ pounds in weight, though the largest weighed nearly 15 pounds. Difficulty was also experienced here in securing milt, in one instance over 100 males being handled in order to obtain enough to fertilize the eggs from 12 females. Only about 84.5 per cent of the eggs taken were successfully eyed. The station was closed on December 20 and the eggs transferred.

A field station was established at the Averill ponds, principally for the collection of golden trout (*aureolus*) and incidentally for brook trout, both species being abundant there, but no ripe fish of either species were captured, though an assistant was kept at the ponds throughout the spawning season.

Arrangements were made with the State Commission to collect at Roxbury, and as a result 340,000 eyed eggs were secured.

The total collections of eyed eggs transferred from all points to St. Johnsbury amounted to 820,000 of the brook trout and 212,000 of the lake trout. In addition to these, 30,000 rainbow-trout eggs were transferred from Manchester, 40,000 landlocked-salmon eggs from Maine stations, 55,000 steelhead-trout eggs from Clackamas, and 72,000 grayling eggs from Bozeman, all arriving in excellent condition except the rainbows. These came in two lots and were transferred from a temperature of 42° to 33° . The losses on both lots occurred chiefly about a month after their receipt and just as they commenced to hatch, only about 800 fry resulting from the two consignments.

During December and January 314,000 brook-trout eggs were shipped to State fish commissions and private applicants, including one shipment to Scotland. The lake-trout fry hatched in March and April, producing 180,000, which were distributed in suitable waters in Vermont, Connecticut, and Massachusetts. The distribution of the brook trout commenced in April and was completed the last of June, 534,100 being distributed during that period by employees of the station.

At the close of the year there were on hand the following:

Species.	Calendar year in which fish were hatched.				
	1900.	1899.	1898.	1896.	1895.
Rainbow trout	5,411	77		245	
Steelhead trout	23,981	348	39		9
Brook trout	10,018	470			
Hybrid brook and lake trout		13			
Grayling	3,550	73			
Landlocked salmon	30,014				
Total	70,874	981	39	245	9

It has been found here that brook trout thrive best in a temperature ranging from 55° to 60° and grayling in a temperature from 65° to 70°. Both grayling and trout have been tested in temperatures ranging from 48° to 70° during the last two months of the year, and from the observations it has been possible to make with the varying conditions it is believed that landlocked salmon, steelheads, and rainbow trout all do best in temperatures most favorable to the brook trout, while grayling thrive best in water somewhat warmer. One trough of grayling kept in spring water at 48° (the same in which they were hatched) did not take food readily and nearly all of them died. While the landlocked salmon have endured the highest temperature of any variety tested, they do not take food readily in water above 70°.

NASHUA STATION, NEW HAMPSHIRE (W. F. HUBBARD, SUPERINTENDENT).

On July 1 the personnel provided for by Congress, consisting of a superintendent, a fish-culturist, and two laborers, was appointed. The superintendent relieved Mr. W. F. Page, who had been in charge of the construction work, on July 12.

During the summer, with the assistance of a temporary force, considerable work was done on the grounds and ponds. All of the ponds were dried, the mud removed, and the bottoms covered with sand. Eleven wells were driven on the south side of the hatchery building to furnish water. These are of 2-inch iron pipe, driven from 14 to 20 feet deep, and when completed, in August, they furnished 192 gallons of water per minute, or an average of 17½ gallons per well. The wells discharge into a wooden flume on the outside of the building, which connects with the hatching-troughs by means of iron pipes through the sides. The grounds around the hatchery and the walks between the ponds were graded and sown with grass, and various other minor improvements were made.

In September the adult trout, numbering 114, were transferred from the stock pond to one of the smaller ponds, where they could be more easily handled during the spawning season. The first eggs were collected on October 20 and the last on November 29. An auxiliary station for the collection of eggs of the native brook trout was also established at Dublin Pond, New Hampshire; but only a small number of eggs were secured, and at the close of operations there the 240 adult fish that had been stripped were transferred to ponds at the station.

Owing to the unprecedented drought prevailing all through New England, the water supply from the wells was seriously affected in the fall and it became necessary to use water from the western reservoir.

In January 350,000 brook-trout eggs were received from the New Hampshire commissioners to be hatched at the station, and the fry resulting were returned to them in May and June. In February 358,000 brook-trout eggs were purchased from Mr. L. B. Handy, of South Wareham, Mass., but they proved to be of very poor quality and produced only 223,750 fry. Of these 113,000 were distributed in May and June to applicants in Massachusetts, New Hampshire, and Rhode Island, together with 284,630 lake-trout fry resulting from a shipment of 300,000 eggs received from Duluth in March. On the 11th of May 50,000 grayling eggs arrived from Bozeman in excellent condition, and were hatched without any appreciable loss, though quite a loss occurred just after the absorption of the sac. They were transferred at this time from troughs in the hatchery, where the temperature of the water was 48°, to some of the outside troughs, where the water temperature was 60°. After that there was comparatively no loss, and on June 30 there were 29,785 fingerlings on hand.

The superintendent received from the New Hampshire Commission a large number of adult lake trout, landlocked salmon, and golden trout, which were held in the ponds from November until February for the Boston Sportsmen's Association.

A contract for the construction of the superintendent's cottage was made in December, and by May 31 the building was completed. It is a frame building 30 by 38 feet with cellar. The first floor consists of a hall, parlor, dining room, pantry, and kitchen, with four bedrooms and a bathroom on the second floor, and an attic extending over the entire house above.

The following table shows the number of fish and fry on hand at the close of the year:

Species.	1896.	1897.	1898.	1899.	1900.
Brook trout.....	104	* 198	08	206	128, 630
Steelhead trout.....			77		
Rainbow trout.....			92		
Landlocked salmon.....					
Grayling.....					29, 785

* Dublin pond trout.

WOODS HOLE STATION, MASSACHUSETTS (E. F. LOCKE, SUPERINTENDENT).

In October the *Grampus* commenced the collection of brood-cod, as usual, and by November 18 had delivered at the station 2,200, varying in weight from 6 to 20 pounds; 152 were also purchased from one of the commercial fishermen, making a total of 2,352. These fish yielded 103,444,000 eggs. Of these 630 died from natural causes during the season and 1,311 barren and spent ones were tagged and released, and by the close of the year 11 of them had been reported captured between Chatham, Mass., and the New Jersey coast.

The Plymouth auxiliary station was opened in November under direction of Capt. E. E. Hahn, Mr. G. F. O. Hanson, mate of the *Grampus*, being placed in immediate charge of the work with a force of spawn-takers. The first eggs at that point were obtained on November 28, and by the 17th of February 71,275,000 had been transferred to Woods Hole, bringing the total for the season to 174,719,000. The quality of the eggs was excellent and the fry from them were apparently strong and healthy. As a result of the season's work 126,921,000 fry were liberated in Vineyard Sound, near Gay Head. It is recommended that this work be extended and that at least 3,500 brood cod be provided for next season.

As the experience of past years has shown that a majority of the flat-fish had spawned before the work was undertaken, arrangements were made this year, early in January, to set fyke nets in Woods Hole Harbor, but no fish were captured until the end of that month. On January 30 nets were also sent to Waquoit Bay, but could not be set until February 7 on account of the large amount of ice in the harbor. From these two fields 250 adults were secured, 29 of which died from natural causes before spawning. The spawning lasted from January 31 to April 18, during which time 102,381,000 eggs were secured, 47,069,000 being obtained from fish caught in Woods Hole Harbor and 55,312,000 from those caught at Waquoit Bay. It is worthy of remark that the Woods Hole fish yielded more eggs per fish than those from Waquoit, the average of the former being 475,000 per fish and of the latter 357,000. This is the reverse of the experience of past years.

As great difficulty had been experienced in the past two years in artificially fertilizing the eggs, the plan was adopted this year of holding the brood-fish in live-boxes and allowing them to spawn naturally. The results were very gratifying. But few unfertilized eggs were observed, and the output of fry was the largest in the history of the Commission, the plants in Waquoit Bay and Woods Hole Harbor amounting to 87,115,000.

Although every effort was made to enlarge the lobster work, the season was very discouraging. Early in April arrangements were made for collecting egg-lobsters at Plymouth and Scituate, and also from fishermen operating in Buzzards Bay and Vineyard Sound. Subsequently a sailing smack was employed to attend the pots in the

vicinity of Noank and Stonington, and Block Island and Newport. Early in May, when the majority of the lobsters are usually caught, the coast was swept by high easterly winds, causing heavy seas, which interfered materially with fishing operations. In addition to this, lobsters were scarcer than ever before in the history of the fishery, and in many localities operations were abandoned entirely and the fishermen engaged in other pursuits. This was particularly noticeable at Noank and Block Island. At the former place, where there are usually 40 fishermen, only 10 set pots, and even these discontinued work on June 9, on account of the poor results attained and loss of gear. At Block Island the conditions were even worse; where 15 or 20 men usually engaged in this fishery, only one set pots this year, and he abandoned them later to go cod-fishing. The same conditions existed to a certain extent at New Bedford, Buzzards Bay, and elsewhere. From New Bedford, which has been in the past one of the most productive fields, and which yielded last year 347 egg-lobsters, only 26 were secured. The season closed on June 27, the take amounting to 28,142,000 eggs, from which 22,463,000 fry were hatched and planted or turned over to Dr. H. C. Bumpus for experiment, with the view to feeding them in pens until after the fourth molting.

During the summer all of the buildings were painted inside and out, the old plumbing in the residence was replaced with new, and the whole system of water-pipes was overhauled. In many instances the old pipes, which had been in use for a number of years, were so badly corroded that more than three-fourths of the opening was closed. In the hatchery and laboratory a number of additional bedrooms were provided. Work on the wharf commenced in the fall, but it was not completed owing to lack of funds. The old boiler and engine in the launch *Blue Wing* were condemned and new machinery installed, the main boiler being also repaired and the old tubes removed. The engines in the launch *Cygnets* were also overhauled and repaired.

GLoucester Station, MASSACHUSETTS (C. G. CORLISS, SUPERINTENDENT).

Operations at this station were confined to cod and lobsters. During the summer no fish-cultural work was in progress, but the station force was fully occupied in making repairs to the buildings and getting the hatching apparatus ready for fall work. The old wharf, which had been practically destroyed by the storms of the previous winter, was removed and a new one 155 feet long by 16 feet wide, with a T at the outer end 42 feet by 16 feet, was constructed, in accordance with plans prepared by the architect of the Commission. As soon as it was finished the suction box, which extends from the hatchery to the end of the wharf, was replaced and the suction pipe laid into it, packed in sawdust to prevent its freezing in winter.

By November 15 the station was in thorough order, but no eggs were received until the latter part of the month, when Captain Hahn with the crew of the *Grampus* commenced collections at Kittery. At

the same time another force, under the direction of Mr. Hanson, began work at Plymouth, Mass. The first eggs were received at the station on November 28, and collections continued uninterruptedly until March 23, during which period 180,230,000 were obtained at Kittery and forwarded to Gloucester, besides 17,792,000 from Plymouth and 858,000 from local fishermen, making a total of 198,880,000 for the season.

The number of eggs collected was larger than usual, and of excellent quality, which was due to a large extent to the favorable weather throughout the winter. As a result of the season's work, 135,693,000 fry were hatched and planted along the Massachusetts coast from Rockport to Beverly, and 3,000,000 were deposited in the Chesapeake Bay as an experiment.

As soon as the last of the fry were distributed arrangements were made to commence the collection of egg lobsters. The *Grampus* proceeded early in April to the coast of Maine, and with the steam smack collected from all points between Portland and Eastport, shipping the lobsters to the station. Arrangements were also made—at Kittery, Cohasset, Boston, and all points in the vicinity of the station—with fishermen for holding their egg lobsters. By the middle of May the receipts from Massachusetts were very satisfactory and the prospects seemed good for a large season's work, but about this time the catch decreased steadily to the end of the season. On the Maine coast the season opened badly and the collections were smaller than usual, no lobsters being received from Nova Scotia. Between April 1 and the 10th of July 4,643 egg-bearing lobsters were purchased, which yielded 63,335,000 eggs.

The following table shows the number collected in the various localities and the yield of eggs from same:

Locality.	Egg lobsters.	Eggs.
Gloucester, Mass., and vicinity	555	7,813,000
Boston, Mass., and vicinity	1,461	20,044,000
Kittery Point, Me., and vicinity	1,483	4,687,000
Maine coast, schooner <i>Grampus</i>	1,044	25,791,000
Total	4,643	63,335,000

Dr. H. C. Bumpus, at Woods Hole, was supplied with 1,300,000 eggs for experimental purposes. The balance yielded 58,560,000 fry, which were planted as shown in the table of distribution.

The lobster eggs shipped from Maine and other points arrived in much better condition than in the past, consequently the loss in hatching was small and the fry were strong and healthy. In accordance with an agreement made with the Maine Fish Commission the fry hatched from eggs collected on that coast were distributed in the waters of the State. They were shipped both by the schooner *Grampus* and by messenger and were planted in fine condition. The adults

were all liberated in the waters of the State from which they were obtained, care being taken to plant them well out at sea so that they would not be recaptured immediately. .

As in previous seasons large numbers of dead lobster fry were sometimes found in the cans, special attention was paid to this matter on each trip, and on the completion of the work the messenger in charge reports that there was practically no loss. The new eggs made their appearance fully two weeks in advance of any previous year, which was attributed to the mild winter and to the fact that the water offshore during the winter and spring was several degrees warmer than has been the case for several years.

CAPE VINCENT STATION, NEW YORK (LIVINGSTON STONE, SUPERINTENDENT).

During July and August a part of the force was engaged at Swanton, Vt., in cleaning up the fishing-grounds preparatory to collecting pike perch there the following spring. Early in April operations were commenced on the Missisquoi River 3 miles below Swanton. A substantial shed 11 by 27 feet, with a platform 17 by 27 feet, was constructed on the river bank as a spawning-house, and three pens for holding fish were placed in the river near by. In the middle of the spawning-shed, and running lengthwise of it, a trough 12 feet long and 15 inches wide, divided into two compartments, was provided for holding ripe fish. This was supplied by a constant stream of water from tanks located on the platform. Fishing commenced April 14, but no ripe fish were found until the 22d, when they began coming on in large numbers, and from that time to the end of the month operations were pushed vigorously and large numbers captured, as many as 657 male pike perch being landed at one haul of a seine 22 rods long; 1,859 spawning fish were taken, which yielded 130,300,000 eggs, according to measurements made on the grounds, although when remeasured at the hatchery there were less than 116,000,000. Of these 85,225,000 were transferred to Cape Vincent and 30,500,000 were hatched at Swanton for distribution in Vermont waters, producing 12,600,000 fry, or about 41 per cent of the number of eggs retained. The fry were planted under the direction of the Vermont Fish Commission during June.

The hatchery is a small wooden building located near the Missisquoi River, in the town of Swanton. It was fitted with a battery of two tiers, containing 28 jars each, and a tank for the reception of the fry. The building was provided with heat and light and was leased at a small rental, the water supply being furnished by the village of Swanton at the rate of \$1 per day. It was very unsatisfactory, however, as it was filled with sediment washed down from the mountains in which the river rises, and though two men were kept busy night and day changing the filters and cleaning the jars, very heavy losses ensued. It is believed that under ordinary conditions a much larger percentage of fry would have been hatched.

The eggs forwarded to Cape Vincent were packed on cotton-flannel trays and sent in charge of a messenger. The first two shipments, forwarded on April 27 and 28, arrived in good condition, but the third and fourth, transferred on April 30 and May 1, turned out very badly, though there was no evidence to show that they were injured by transportation. They were probably of inferior quality. The eggs commenced hatching late in May and finished early in July, producing 25,400,000 fry, or a little over 30 per cent of the eggs received at Cape Vincent. The distribution was made with comparatively small losses in lakes and streams in western New York.

In October arrangements were made as usual for the collection of lake-trout eggs in Lake Ontario in the vicinity of Cape Vincent and in Lake Erie at Dunkirk, N. Y. The results at both places were unsatisfactory, only 47,800 being obtained from Lake Ontario and 126,000 from Dunkirk, although the spawn-takers remained on the collecting-grounds for nearly a month. The failure at both points was due to the fact that storms continued almost uninterruptedly during the fishing season, destroying nearly all of the nets. Early in December 2,000,000 lake-trout eggs arrived from Northville in excellent condition, and were hatched in the Stone salmon baskets placed in Williamson troughs, the losses being comparatively light. The fry, amounting to 1,875,800, were distributed in February and March, except a few thousand which were planted in May.

As there are no fields in the vicinity from which brook-trout eggs can be collected, arrangements were made to purchase a supply from dealers in New England, and during the early part of September 360,000 were obtained in this way. They were hatched in ordinary trout troughs, and the 280,500 fry resulting were planted in May and June, immediately after the absorption of the sac.

No attempt was made to collect white-fish eggs on Lake Ontario this year, as repeated efforts in that field in past years had proved fruitless; and as the collections on Lake Erie were larger than ever before in the history of the Commission, 34,560,000 eggs were transferred from Put-in Bay. They arrived in good condition, and 75 per cent were hatched in the McDonald jars. It is worthy of remark that during the distribution no white-fish fry died in the tanks or in the cans in transit. It seems extraordinary that in the process of handling and shipping so large a number not a single dead fish should have been found. A plant of 400,000 was made in Lake Champlain at the request of the Vermont Commission.

It was hoped that some effort would be made this year to continue the experimental sturgeon work undertaken the previous season, but lack of funds prevented. Through the efforts of Mr. Myron Green, a temporary employee, and several fishermen, however, over 70 sturgeon-caught on the Missiquoi River were confined in pens and examined from time to time for ripe eggs. A few were found in one partly spent fish and were hatched at Swanton in the ordinary jars. A small

number of the fry produced were transferred to Cape Vincent. Much interest is manifested in this work, and it is hoped that some practical results may be secured next season.

The following table shows the number of eggs handled and the fry distributed during the year:

Species.	Eggs handled.	Fry distributed.
Brook trout	380,000	280,500
Lake trout	2,178,000	1,875,800
White-fish	34,580,000	27,400,000
Pike perch	85,225,000	38,000,000
Total	122,321,000	67,556,300

STEAMER FISH HAWK (JAMES A. SMITH, COMMANDING).

On April 23 the vessel left Baltimore for the Delaware River, arriving there April 26. The crew were at once employed in getting the hatching apparatus in order, and arrangements were made with the fishermen to supply eggs on the same terms as heretofore, namely, \$10 per million. Mr. W. H. Johnson and G. L. Hopper were placed in charge of the hatchery and the crew were utilized as spawn-takers. The first eggs were collected on April 27, and collections continued uninterruptedly until the close of the season on May 31. During this period the work was most successful; 80,559,000 eggs were secured, from which 47,975,000 fry were hatched; 6,006,000 eggs were transferred to the Pennsylvania State Fish Commission hatchery at Bristol, and 8,332,000 were deposited on the spawning-grounds in Howell Cove and near Bennett's fishery, owing to the fact that the hatching facilities of the vessel were overcrowded. In addition to this 700,000 eggs were shipped to New York for transshipment to Ireland.

As in former seasons the Howell Cove fishery yielded the largest number of eggs, 36,194,000 being taken at that point, 16,035,000 from Bennett's Fishery, and 5,515,000 from Cramer Hill. The balance, 22,815,000, were collected from the gill-net fishermen off Billingsport, N. J. There is little doubt but that if funds had been available and the work could have been continued as heretofore until June 10, the collections would have reached 100,000,000.

The gill-net fishermen in the vicinity captured 7 Atlantic salmon, weighing from 10 to 15 pounds, during the season.

On June 4, the last of the fry having been planted, the hatching apparatus was dismantled and the vessel shortly after proceeded to Woods Hole.

BATTERY STATION, HAVRE DE GRACE, MD. (J. N. WISNER, JR., SUPT.).

On March 12 the superintendent opened the station with a force of six men and began fitting up the launches and placing the hatchery in condition for work. The mess-room, which had been much crowded in the past two years, was enlarged and repairs were made to the cottages occupied by the machinist in charge and the superintendent.

By April 15 the launches had been thoroughly overhauled and the hatching apparatus tested. The force was increased and vessels hired and stationed at various points to receive eggs from the fishermen.

The season was late, no eggs being collected until the 19th, on which date the water temperature registered 54°. As heretofore, arrangements had been made with all the gillers fishing from Battery station, and within a radius of from 8 to 10 miles, to furnish eggs at the rate of \$20 per million, and 20 spawn-takers and assistants were employed for the purpose of attending the floats and doing other work.

The nightly collections were small (not exceeding 2,000,000) until April 26, when 4,900,000 were secured. They increased materially from that time, reaching a maximum of 16,332,000 on May 2. The season continued uninterruptedly until May 30, the total collections aggregating 167,582,000.

During the latter part of May ripe females were taken in large numbers, but male fish were very scarce. On one night 12,000,000 eggs were brought in, but the next day only 3,000,000 of them were found to be impregnated. On June 2 the water became so salt that operations were discontinued and the force dismissed. The season's work, though not as great as in the past two years, was exceedingly satisfactory. Of the eggs collected 17,711,000 were planted on the spawning-grounds in the vicinity of the station, as the hatchery was overcrowded; 12,040,000 were shipped to Central station, Washington, D. C., and to the Maryland Fish Commission in Baltimore, and 87,518,000 fry were hatched and planted in the Chesapeake Bay and its tributaries and in the Hudson River.

The following shows the number of eggs collected during April, May, and June, with the average temperature of air and water:

Month.	Eggs taken.	Average temperature.	
		Air.	Water.
April.....	43,484,000	°F. 56	°F. 55
May.....	122,093,000	63	62.2
June.....	2,005,000	72.3	71
Total.....	167,582,000		

On May 19 the temperature fell very suddenly from 70° to 64°, and on the following day it was noticed that many of the fry had bubbles of air in the sac. A large percentage of them exhibited this phenomenon in the next five days, the bubbles being easily discernible with the naked eye and so large as to cause the fry to float. This has been noticed before, but there are no data to show that it followed a sudden fall in temperature. Many theories might be advanced to cover this peculiar occurrence, but no definite conclusions have been reached.

During the spring 100,000 striped-bass eggs were received at the station, but as no apparatus had been prepared for hatching them,

the results secured were poor. A number of methods were tried and a few eggs hatched by each, and there seems to be no doubt that if many eggs were collected, apparatus could be devised for hatching them as successfully as the eggs of the shad. The eggs hatched in forty-four hours, and it was noticed that immediately after hatching the eye-spot could not be seen with the naked eye; but a small sac of oil was noticed at the head of the fish. Under the microscope the bubble of oil proved to be just under the head of the fish, apparently at its mouth. With a strong quarter-inch lens the pupil of the eye was discernible as a clear circle within another circle of greater density. The oil-sac gradually decreased in size, the eye becoming plainer until the third day, when it disappeared entirely and the eyes could be seen without the aid of the microscope. Attention is called to this, as the eye-spots of other fishes usually become visible about the middle of the period of incubation. It was proved that a large number of striped-bass fry may be retained a considerable length of time in a vessel of water without changing. This would indicate that they can be transported with great ease.

BRYAN POINT STATION, MARYLAND (L. G. HARRON, SUPERINTENDENT).

The station was opened on March 20 and a small force employed to make the necessary repairs and improvements preparatory for the coming season's work. The launch *Blue Wing* also arrived from Gloucester on that day and was utilized in carrying supplies and material from Washington and Alexandria to the station until the spawning season commenced, after which she was engaged in collecting eggs from the seines and gill nets. Spawning fish having been observed on April 15, the regular force was taken on the next day and active operations commenced. An additional steam launch was chartered for a month to assist in attending the gillers between Alexandria and Bryan Point and to carry supplies to the station.

Commencing April 17, eggs were collected each day until May 15, 67,904,000 being secured, all of which were hatched at the station, except 1,023,000 transferred to Central Station. Of the fry hatched (55,702,000, or 83 $\frac{1}{2}$ per cent of the eggs retained) 6,065,000 were delivered on board the Fish Commission cars at Alexandria for shipment to streams in South Carolina, Georgia, and Florida, and the balance planted in the Potomac between Broad and Occoquan creeks.

The outlook at the beginning of the season indicated a very large collection, over 49,000,000 eggs being taken between April 16 and 30, but in May the catch of fish declined so rapidly that all of the seine fishermen suspended operations and the gillers became indifferent on account of the small returns and would not fish regularly. Frequently no fishermen were operating on many of the important fishing-grounds. On May 19, all of the eggs being hatched and the fry planted, the *Blue Wing* was transferred to Gloucester, Mass., and on the 25th the station was closed and left in charge of a watchman.

FISH LAKES, WASHINGTON, D. C. (RUDOLPH HESSEL, SUPERINTENDENT).

During the summer 43,844 black bass were removed from the breeding-ponds to retaining-tanks. Of these 32,967 were carried through the summer in the rearing-pools and distributed in October and November, when they varied in size from 3 to 6 inches. The large loss of young fish is attributed to some extent to their being held for several weeks in the retaining-tanks, at which time the water was constantly roiled. In one of the smaller ponds 200 small-mouth bass were reared and distributed with the large-mouth bass during the fall. During the winter the west pond, which covered an area of $6\frac{1}{2}$ acres, and which had been devoted for a number of years to the rearing of shad, was divided by means of a partition (397 feet long) into two ponds, one to be devoted to the rearing of bass and the other to shad.

In April the adult black bass were placed as usual in the partitions in the north and south ponds and in that part of the west pond devoted to their culture, but owing to the low temperature prevailing in the spring months they did not commence spawning until about the middle of May. A number of nests were observed about the 20th and one pair spawned on the night of May 23 in the Eagle Pond, where an excellent opportunity for watching the development of the eggs was afforded. On May 25 the dark spots indicating the eyes were conspicuous, and on the fourth day the fry burst from the shell. They seemed to lie motionless at the bottom of the nest until the 29th, when they rose a few inches in the water but did not leave the nest until the following day, when they began to take on a darker color. Another nest in the south pond was first noted on the 25th. Two days afterwards the first fry appeared, and by the 28th the entire brood was hatched. They remained on the nest until June 1, when they commenced to rise in a similar manner to those observed on the first nest. A number of other nests were noticed on the 26th and 29th of May, and it was observed that the eggs remained 4 to $4\frac{1}{2}$ days before they hatched, the fry rising from the nests 3 to 5 days later. The period of incubation depends on the temperature of the water.

A series of temperatures taken at 7 o'clock in the evening from May 23 to June 2 was as follows, the mean being 73° :

Date.	Temp.	Date.	Temp.
	$^{\circ}F.$		$^{\circ}F.$
May 23.....	74	May 29.....	70
May 24.....	73	May 30.....	72
May 25.....	70	May 31.....	76
May 26.....	67	June 1.....	81
May 27.....	73	June 2.....	77
May 28.....	72		

As soon as the spawning season was over the adults were removed from the spawning partitions and the young were allowed to pass into the main body of the pond, which had been thoroughly stocked with

aquatic plants and water lilies, where they found an abundance of natural food. In addition to this several hundred thousand carp were liberated in the pond, which fell victims to the young bass in two or three weeks.

During the fall 400 crappie were distributed as the result of the season's spawning. In the spring of 1900 the adults were again placed in two small ponds and, though no definite estimate can be made as to the number of fish on hand, it is believed that the pond will yield several thousand in the fall.

When making collections of food-fish in the Potomac River a number of sun-fish, *Lepomis pallidus*, were captured. These spawned in the spring, and as a result 850 young fish were available for distribution in the fall. This fish was undoubtedly introduced from the Mississippi River, as it is not indigenous to the Potomac. It is believed that it will be well adapted for stocking small inland ponds.

As in previous years, hundreds of thousands of carp were raised as food for the bass. Some little attention was also paid to the rearing of yellow and green tench for stocking public parks and lakes.

During September the shad which had been placed in the ponds the previous April were liberated. It is estimated that about 2,000,000 passed into the Potomac River. In the following spring 2,849,500 shad fry were placed in this pond. They are apparently doing well and will be liberated in the fall.

CENTRAL STATION, WASHINGTON, D. C. (J. E. BROWN IN CHARGE).

Work at this station has been conducted on the same lines as heretofore, the most important being the distribution of the output from the fish ponds, which amounted to 32,967 young black bass, 400 crappie, and 500 sun-fish. These were distributed without loss. There were also received from Wytheville, Va., 600 rock bass and 2,839 yearling rainbow trout, and from Erwin 4,931 brook trout.

During the fall and winter months consignments of landlocked salmon and white-fish eggs were received from various stations of the Commission and hatched for the purpose of illustrating fish-cultural methods. Consignments of shad eggs were also received from Battery and Bryan Point. The following table shows the number of eggs of various kinds received and fry hatched and distributed:

Species.	No. of eggs received.	No. of fry hatched and distributed.
Rainbow trout.....	9,285	8,000
White-fish.....	475,000	258,000
Lake trout.....	10,000	8,308
Landlocked salmon.....	4,000	3,850
Shad.....	7,800,000	7,898,000
Total.....	8,304,285	8,170,218

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

During the summer the aquaria were thoroughly overhauled, broken glass replaced, and the slate and iron work of the salt-water tanks painted with asphaltum to prevent rust; a new trough for carrying off the overflow from the salt-water tanks to the filter was built, and the salt-water supply, amounting to about 5,000 gallons, was renewed.

In September the superintendent, assisted by Mr. W. T. Lindsey, commenced the collection of marine specimens at Willoughby Spit, Va., near Fortress Monroe, where the shipping facilities are good, and by the end of that month 549 specimens, representing 30 species, had been collected and transferred without loss to Washington. In October 319 specimens, representing 11 species, including two tropical fishes—the snowy grouper and the big-eye—were brought from Woods Hole, Mass. These with the addition of sea-anemone and starfish from Gloucester, filled all the available space. The salt-water fishes were carried without loss until February, but at that time the water temperature became too low for them, due to inability to circulate it fast enough through the heaters to produce the desired warmth. Aside from this there was little mortality until May, when the death-rate increased on account of the rapid rise in temperature, though a number of specimens, representing 12 species, were on hand at the close of the year.

As usual, a good exhibit of fresh-water fishes was kept during the summer, consisting principally of species indigenous to the Potomac River and the Chesapeake Bay, with the various ornamental fishes. Most of these specimens have been kept in the aquarium from two to four years. Consignments of brook trout, rainbow trout, steelheads, Atlantic and landlocked salmon transferred from Wytheville, Va., and Craig Brook, Me., in October, were exhibited in the aquarium until May, when the temperature rose above 70; they were then planted in suitable streams in the vicinity. While in the aquarium they grew very rapidly, and when disposed of were more than twice as large as when received from the stations.

Two species spawned in the aquarium during the year—four yellow perch and two yearling brook trout—but none of the eggs hatched.

The food used during the year consisted chiefly of beefsteak, beef liver, clams, oysters, and minnows, the principal articles being steak and liver. The meat is prepared for them by first removing the fat and then cutting it in pieces according to the size of the fish. Clams, oysters, and minnows are fed only to such fishes as will not take meat when first captured, but all of them learn to eat beef after being in captivity for some time.

As the water pressure is not sufficient in extremely cold weather to operate the salt-water pump fast enough to keep the temperature where desired, it is recommended that a small engine be installed for this purpose.

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

Salt-water fishes: Pig-fish, pipe-fish, toad-fish, file-fish, sea trout, pin-fish, sea bass, gray snapper, black drum, croaker, spot or goody, hog-choker, pompano, flounder, tautog, lizard-fish, yellow-tail, spade-fish, sea-robin, jumping mullet, striped bass, sea anemone, bur-fish, skate, sculpin, cunner, big-eye, snowy grouper, scup, remora, chaetodon, stickleback, mummichog, blue crab, lobster, hermit crab, spider crab, shrimp, horseshoe crab.

Fresh-water fishes: Brook trout, Atlantic salmon, steelhead trout, rainbow trout, quinnat salmon, Scotch sea trout, landlocked salmon, large-mouth black bass, small-mouth black bass, rock bass, pickerel, gar pike, common tench, golden tench, golden ide, gold-fish, crappie, common suckers, sun-fish, yellow perch, white perch, mill roach, paradise-fish, common eel, yellow cat-fish, channel cat-fish, salamander, terrapin, snapping turtle.

The following shows the salt-water and fresh-water temperatures:

Month.	Fresh-water temperatures.		Month.	Salt-water temperatures.	
	Max.	Min.		Max.	Min.
July.....	82	70	September.....	69	54
August.....	82	70	October.....	69	52
September.....	78	71	November.....	64	51
October.....	66	60	December.....	60	45
November.....	60	40	January.....	58	44
December.....	46	34	February.....	68	42
January.....	38	34	March.....	60	48
February.....	38	34	April.....	68	48
March.....	42	35	May.....	72	54
April.....	63	42	June.....	80	62
May.....	71	62			
June.....	78	68			

During the summer and fall 26 fry-collector aquaria were built under the direction of the superintendent of the aquarium for use at the Bryan Point, Battery, and Edenton stations. These were made with glass sides and ends, slate bottoms, and galvanized iron frames, the dimensions being 48 inches by 18 inches by 16 inches. The lowest bid received for their construction from private firms was \$40.77 each, and the actual cost of building them, exclusive of labor of regular employees, was \$13.62 each.

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

The number of fish on hand at the beginning of the year is shown by the following table:

Species.	Calendar year in which fish were hatched.					
	1899.	1898.	1897.	1896.	1895.	1894 or earlier.
Rainbow trout.....	128,360	3,008	2,972	511	647	512
Black bass (small-mouth).....		26	21		5	
Black bass (large-mouth).....			37	36	18	
Crappie.....			12			
Rock bass.....			32		80	
Quinnat salmon.....			100			
Carp.....					20	
Total.....	128,360	3,034	3,174	547	770	512

The distribution commenced in September and continued until December 21, and included 96,965 yearling and 1,074 adult rainbow trout, besides 16,147 brook trout transferred to Wytheville from Erwin, Tenn., 4,400 rock bass and 8,540 black bass, of which 6,569 were reared at the fish ponds in Washington.

The food used in the summer consisted as usual of beef liver and mush boiled in varying proportions, according to the size of the fish.

The stock of breeding rainbow trout on hand at the commencement of the spawning season numbered about 5,000, ranging in age from 1 to 10 years old, though fish under 3 years of age are not apt to produce many eggs. The spawning season opened November 6 and lasted to February 12, during which period 990,000 eggs were taken from 998 fish, an average of 992. The number of male fish used was about 800. The variation in the size of the eggs taken was unusually great, and was no doubt caused by the great difference in the age and size of the spawners. They ran from 312 to 445 to the ounce, the average for the season being about 387. The eggs from all of the fish were smaller than they have ever before averaged at this station, and there appears to have been a decided change in the habits of the fish for the past two years as regards the time of spawning. Formerly at least 80 per cent of the eggs taken were secured at night, but this season and last 50 per cent or more have been collected during the day. This change is thought to be due to modification in the shape of the spawning-ponds, the new ones being diamond-shaped and offering a more inviting entrance to the raceways. Of the eggs collected 174,500, or a little over 17 per cent, were unfertilized or lost during incubation, 377,000 were hatched, and 438,500 were shipped to other stations and to foreign applicants. The consignments to Ireland and England reached destination in excellent condition, although en route from 10 to 12 days. The fry hatched did well through the sac stage, and are being reared in indoor troughs and ponds outside for distribution in the fall.

For the purpose of introducing new blood in the brood stock, a consignment of 20,000 rainbow-trout eggs collected from wild fish in California were shipped here by the California Fish Commission in April. They had been packed by Mr. W. H. Shelby at Sisson, Cal., and arrived in good condition, considering the distance traveled and the warm weather at the time. They were at once transferred to hatching-troughs and produced 16,500 fry, 3,500 of which died in a few days, having hatched prematurely. The balance were on hand at the close of the year and in excellent condition.

A consignment of 38,400 brook-trout eggs was received in February from Massachusetts, but they were of inferior quality and hatched slowly and unsatisfactorily, thousands dying before leaving the shell. By the time the yolk-sac was absorbed over 22,000 had been lost, and on June 30 there remained about 14,000 fingerlings. A few brook trout were retained from the hatch of last year and are now being

held in the ponds as an experiment. They have grown well so far and it is hoped they will spawn next season.

Owing to the unsatisfactory condition of the ponds the black-bass work at this station has not been successful in the past, but it is hoped, with the improvements made during the past year, that better results will be secured hereafter. Early in the spring the brood stock, consisting of 82 large-mouth and 47 small-mouth bass, was transferred to the breeding-ponds. Large beds of clean creek gravel were provided for nest building, and by June a number of nests containing young fish and eggs had been observed. The fry will be transferred to rearing-ponds as soon as they are large enough and every effort will be made to rear a good crop.

For the reasons given above rock-bass culture has been a failure during the past few years. The brood stock has been increased and there are now 190 on hand. These were placed in the ponds in the spring and artificial portable nests (heretofore described) provided for them. Nearly all the 100 nests put in the ponds have been occupied, and a number of fry have been noted, though it is impossible to give an estimate at this season of the number on hand.

About 20 adult carp are kept at the station. In May they are placed in the trout ponds for the purpose of cleaning out foreign matter and for destroying the lime plant, algae, etc. As soon as they spawn the fry are transferred to the bass ponds as food for young bass.

In December, 1896, about 4,000 eggs of the quinnat salmon were received from the Cape Vincent station. The eggs were hatched and a part of the fry were distributed at the age of one and two years, about 1,000 being retained for further developments. From the time of hatching up to the yearling stage these fish made a very fine growth, but in the spring of the third year they began to grow weak and to lose their sight. The disease continued through the summer and fall, and but few of them were alive by the following winter. The balance were planted in the spring, as it was feared they would all die in the ponds. The water in the pond in which they were confined was less than 4 feet in depth, and it is supposed this was the cause of the failure to acclimatize them.

EDENTON STATION, NORTH CAROLINA (S. G. WORTH, SUPERINTENDENT).

Mr. S. G. Worth was appointed superintendent on July 1 and took charge of the station on the 14th, relieving Mr. G. A. Schneider, who had been directing the work of construction.

Notwithstanding the incomplete condition of the station, steps were taken early in March to organize a force for the collection and hatching of shad eggs. There were no trained spawn-takers available in the vicinity, as the fish-cultural work in recent years has been conducted by the steamer *Fish Hawk*; consequently it became necessary to transfer a few from Havre de Grace and Washington to be used as a nucleus in training new men. In addition to other drawbacks the

season proved two or three weeks later than usual, the weather being very unfavorable, and though all the seines, nets, and traps within a radius of 10 to 15 miles were visited daily the new men had little chance to gain experience, and as a consequence became despondent. When the water attained the right temperature for the shad to spawn they came on so suddenly that the apprentices were helpless, having had no opportunity of acquainting themselves with the work. Toward the end they became efficient and sufficiently interested to insure their being reliable spawn-takers in the future, but many eggs were lost in the meantime. Work was pushed vigorously, however, night and day, so that we succeeded in enlisting the sympathy and active cooperation not only of fishermen operating on well-known spawning-grounds, but new fields were developed in the Roanoke River and at Skinner Point, several miles east of Edenton.

The grounds on the Roanoke are virtually confined to the drift gill-netters, who operate very short nets, but they catch ripe shad and in such a way that all of the eggs can be saved. It required unremitting personal effort to enlist their interest, but another year will find them anxious to save the eggs. Their nets were operated mainly within 3 miles of the river mouth, making them easy of attendance and much more profitable than the seines on the upper river, which capture large numbers of fish but furnish very few eggs. It has also been found that numbers of eggs can eventually be secured from trap nets. A number of ripe fish were reported from Mackayes Ferry, but owing to lack of experienced men the nets there could not be attended.

In the shallow waters around the mouth of the Roanoke and Cashie rivers the cooperation of the stake-net gillers was secured and a few eggs obtained. An excellent spawning-ground was developed at Hornblower or Skinner Point, 4 miles below Edenton, one trap net yielding over 800,000 eggs. There is no doubt that this will prove a valuable field next season, but the most important spawning-grounds in the vicinity are on the Chowan River. Unfortunately, no gill-net fishing is done here, but the four seines operated will undoubtedly yield large numbers of eggs. It is also hoped that additional eggs will be received from the traps, large numbers of which are fished on the river. The area covered embraces about 86 square miles, and it is urged that a first-class steamer, capable of running in all kinds of weather, be provided as a part of the permanent equipment of the station. A second boat should also be available for a month or six weeks during the season.

The following table shows the number of eggs collected by localities:

Collected by--	Roanoke River.	Chowan River.	Albemarle Sound.	Totals.
	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>
Gill-nets.....	2,089,000		1,800,000	4,049,000
Seines.....	353,000	4,319,000	173,000	4,844,000
Traps.....		107,000	803,000	910,000
Total.....	3,342,000	4,426,000	2,636,000	10,404,000

The collecting season lasted from April 25 to May 10, and the 6,590,000 fry hatched were distributed by May 15 in the Albemarle Sound and tributaries. The loss during incubation was 3,814,000, or about 36 per cent. In view of the fact that there were only four trained spawn-takers available for work, and of the incomplete condition of the station, the results are considered very satisfactory. Moreover, there is no question as to the entire suitability of the water of Pembroke Creek for hatching purposes; the only possible objection that could be made to it is that it is rather warm, making it risky to hold the fry, but this is unnecessary, and it need not be considered an adverse factor. The water was clear throughout the season, without a trace of sediment.

ERWIN STATION, TENNESSEE (ALEXANDER JONES, SUPERINTENDENT).

On July 3 Mr. S. G. Worth was transferred to Edenton, N. C., as superintendent, and Mr. Alexander Jones was appointed in his place, with Mr. J. E. Guard as fish-culturist. During the summer the balance of the special appropriation was expended in the erection of a five-room cottage on the northwest corner of the reservation for the occupancy of the fish-culturist, and other minor improvements were undertaken, the most important of which was the laying of a 12-inch terra-cotta pipe in the south berm ditch to carry off the waste water from the depression at the back of the residence. This added materially to the effectiveness of the station and improved its appearance.

At the beginning of the year there were on hand the following fish:

Species.	Calendar year in which hatched.			
	1900.	1899.	1897.	1896 or earlier.
Brook trout	70,588	991	.....	800
Rainbow trout	48,545	2,975	704	.....

These were kept in troughs and ponds during the summer as usual and fed on ground beef-liver and mush made from wheat shorts; herring roe being also used for feeding the fry. The rainbows are especially fond of this, taking it greedily from the beginning, but the brook trout do not seem to relish it, preferring the beef-liver.

In August the distribution of rainbow trout commenced and was continued until the 9th of December, 43,110 in all being shipped. Of the brook trout on hand at the beginning of the year 31,126 were available for distribution. These were shipped to applicants in Virginia and Tennessee. From the beginning of July to the time of distribution the death-rate was exceedingly heavy, both in ponds and troughs; a great portion of the loss was due to popping of the eyes, though snakes and frogs destroyed quite a number of the fry.

The brook trout spawned from October 27 to December 16, yielding 79,100 eggs. As these fish refused to ascend the raceway it was

necessary to resort to seining to secure their eggs. At first this was done once a day and later twice a day as long as it was necessary. Of the eggs collected 48,000 were hatched, but most of them were affected during the embryo stage and developed white spots on the sac. The death-rate became heavier daily, and it was deemed advisable to plant the remainder at once. Accordingly 9,380 were deposited in streams in the vicinity of the station.

On the 6th of February 145,000 brook-trout eggs were received from Mr. L. B. Handy, of Massachusetts, but they were in very bad condition on arrival, many having hatched in transit, and proved a total loss. On account of the poor success attained with brook trout at this station it has been determined to abandon that work entirely, and the adult fish on hand have been turned over to Mr. B. F. O'Bryant, county fish commissioner, for stocking streams in this county.

The spawning season of the rainbow trout extended from October 25 to January 27, and resulted in the collection of 110,800 eggs from the 3-year-old fish and 30,000 from the 2-year-olds. In addition to these, 238,000 were received from Wytheville and 34,600 from Neosho. The eggs taken at the station yielded 53,570 fry, those from Wytheville 216,137, and from Neosho, 25,912, giving a total of 296,137. At the close of the season there were 130,560 on hand. They were held in troughs in the hatchery until April, when most of them were transferred to the small ponds.

During the fall 15 black bass were purchased and placed in ponds at the station; 9 of them died during the winter; the other 6, 3 of which were females, accepted the artificial nests that had been prepared in pond 31, and about May 20 deposited their eggs, which produced about 25,000 fry. These are on hand at the close of the year. As soon as the schools began to break up the parent fish were removed from the pond, as this was better than to remove the fry.

Natural enemies, such as predatory birds, muskrats, frogs, etc., are very abundant. Those killed during the year comprised 115 snakes, 25 muskrats, 4 Indian hens, 3 wild ducks, 30 kingfishers, 1 osprey, 2 minks. Snakes and frogs are regarded as the most destructive. One of the snakes had 24 young fish in its stomach.

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

During the summer a new storehouse, 20 by 30 feet and 14 feet high, was built at an expense of \$331. The steamer *Shearwater*, which had been in use for a number of years, was thoroughly repaired, so that it is now in serviceable condition and will last for several years. The 10-inch suction pipe running into the lake to the westward of the station, which had been carried away by ice in 1899, was replaced by the station force at an expense of less than \$100. The lowest bid received for the performance of this work by contract was \$750.

The white-fish season opened unfavorably and was peculiar in certain important particulars; the temperature of the water during

November was very warm, closing at 44°, the lowest point reached during the month. The season was consequently very late and short, lasting only about fifteen days, the first eggs being taken from the nets on November 17 and the last on the 30th. It was also remarkable from the fact that not a single gale or storm occurred during the month to interfere with operations.

The methods followed were the same as heretofore; that is, in addition to the eggs collected directly from fish caught in pounds and gill nets, a large number were penned at Put-in Bay and Monroe Piers, Michigan. From the pound and gill nets 94,843,000 eggs were secured, 54,639,000 from fish penned at Put-in Bay, and 86,688,000 from those at Monroe Piers. The difference in the expense of collecting at the various points and by the various methods was as follows: Eggs furnished by fishermen, 60 cents per quart; those collected at Put-in Bay, 58 cents; from Monroe Piers, 69 cents.

The loss of fish by disease in the live-boxes was very slight. Of the 14,706 placed in the subnets and transferred to crates, 13,257 were returned to the fishermen, 233 died, and 1,216 escaped through accidents which could not be foreseen. The total number of females stripped from the pens was 4,432. The average yield of eggs at Put-in Bay was 36,547 per fish, and at Monroe Pier 23,387. The total cost of collection at both points was \$3,995.

Of eggs collected at Monroe Piers 35,000,000 were shipped to Cape Vincent and 21,000,000 to Duluth. The balance were transferred to the Put-in Bay hatchery and later in the season 5,832,000 were assigned to the Pennsylvania Commission and shipped to their Erie station; 10,000,000 were also assigned to the New York Fish Commission. The remainder were hatched, and produced 109,890,000 fry, which were planted in April on the spawning-grounds in Lake Erie.

During the winter a series of experiments was carried on with the view to determining whether fertilization takes place when the eggs and milt are brought together without the admixture of water. On three successive days, December 17, 18, and 19, several lots of eggs and milt were so held, great care being exercised to prevent the admixture of any water. They were kept twenty-four hours in corked glass jars submerged in running water, and at the end of this period lots of 100 each were examined separately under the microscope. The first series showed an average of 16 per cent where the second cleavage was complete. About one-third of the rest were in all stages of development, from those where the disk was forming to those where the second cleavage was well under way. After these eggs had been twenty-four hours longer in running water, about half of them showed the second cleavage complete, and the rest were more or less advanced in development. The temperature of the water while the experiments were being made was from 36° to 37°.

A series of experiments was also conducted to discover, if possible, the causes of monster embryos in fish eggs, especially those partaking

of the twin character or having more than the normal number of organs. It is conceded that monsters can be produced in the eggs of chickens by injury to the eggs at a certain critical period, but it is held by some embryologists that they are also likely to be produced by more than one spermatozoon entering the egg through the micropyle at a time when sufficient water has entered the egg through its membranes to lift them from the disk.

The first experiments were with the view to producing monsters by injury to the egg. For this purpose a half ounce of eggs from a given lot was placed in a strong 4-ounce glass jar, which was then half filled with water and securely corked. It was then dropped ten times into a wooden pail, half filled with water, from a height of 4 feet, striking the bottom of the pail with considerable violence. Nine lots were subjected to this treatment, commencing with the first lot half an hour after impregnation, the second lot an hour later, and from then once an hour until they had all been handled. After the eggs had been forty-eight hours in running water, 100 of each of the nine lots were examined under the microscope, and only one twin disk was found, and that not well defined, showing that injury had not caused the monstrosity to any extent. The experiment resulted, however, in what to the writer was a most startling discovery. Five lots of 100 each, taken from the same lot from which eggs for the experiments had been procured, showed but 3.4 per cent unimpregnated eggs and but few ruptured yolks, while those subjected to the injury process showed large numbers that appeared unimpregnated, the disk being hemispherical, semitransparent, amber-colored, and devoid of all appearance of segmentation. It is certain that all of these eggs were dead.

The following table shows the number appearing normal, number with ruptured yolks, and number having the appearance of being unimpregnated:

Character.	30 min-utes.	1½ hours.	2½ hours.	3½ hours.	4½ hours.	5½ hours.	6½ hours.	7½ hours.	8½ hours.
Eggs, normal	36	53	61	64	68	65	66	89	88
Eggs, ruptured yolk	57	36	27	15	12	0	8	3	3
Eggs, unimpregnated	7	11	12	21	22	26	20	8	9
Twin disks							1		

One twin disc was also found among the five lots of eggs which had not been submitted to the injuring process. In another experiment eight lots of eggs were given ten shakes each with as uniform force as possible with the right arm. The results were substantially the same as in the above, with the exception that there were more ruptured yolks than in the former case. There is obviously but one conclusion to be drawn from these experiments, and that is that the larger portion of the eggs which seemed under the microscope to be unimpregnated were really fertilized, but that segmentation had been arrested as a result of the injuries received. If this be true, it demonstrates that in many instances where eggs have been thought to be unfertilized they

were impregnated, but segmentation had been stopped on account of injury to the disc, and as this loss often runs up to one-third of the whole number in the case of pike-perch eggs, it is apparent that much care should be exercised in handling them up to the point where they are fully cushioned with water. This view was fully sustained during the season of 1899, in the case of several lots of eggs taken from the boats of the fishermen in the immediate vicinity of the station and manipulated with great care on the floor of the hatching-house. These eggs, some twenty jars in all, yielded from 80 to 90 per cent of fry, and were by far the best in the house.

Four lots of eggs were held for a short time in a weak solution of common salt before applying the milt, it being maintained by some biologists that the brine would tend to weaken the resistive power of the egg, and that therefore more than one spermatozoon might enter the micropyle. One lot was held 3 minutes in a $2\frac{1}{2}$ per cent solution, washed for 1 minute with several changes of water, the milt then being applied. In the next lot a 5 per cent solution was used, the eggs remaining in it for 3 minutes before washing, and with the next two lots $2\frac{1}{2}$ and 5 per cent solutions were employed, the eggs remaining therein for 4 minutes. Not a twin disc was found among 2,000 eggs so treated and examined.

It seems remarkable that this treatment did not appear to materially injure the eggs. Only in the lots where they were held in the solution for a period of 4 minutes was there any perceptible difference, the percentage of unfertile eggs being greater in these than in the lot normally treated from which they were taken, but this was doubtless owing to the length of time that elapsed between the taking and the fertilizing of the eggs.

On the 1st of April Mr. Stranahan was appointed superintendent of the Bullochville station, and pending the arrival of Mr. S. W. Downing, who had been appointed superintendent at Put-in Bay, the pike-perch work was directed by the foreman, Mr. J. C. Fox. The season was late. The ice did not disappear until the latter part of March, and by the time the fishermen got their nets set a large proportion of the fish had spawned. In fact, there was apparently no run of spawning fish, only a few scattered ripe ones being found.

As the experiment of penning pike perch had been very unsatisfactory the previous season, it was not attempted this year. The first eggs were received from the Port Clinton field on the 19th of April, and the last from the same point on April 28. Spawn-takers were also stationed at Monroe, Mich., Toledo, North Bass Island, and Put-in Bay, the collections from all points aggregating 138,900,000 eggs. These were of such poor quality that only 57,000,000 of them were eyed, of which number 25,000,000 were transferred to the Michigan Fish Commission, at Detroit. The balance were hatched and distributed, 20,500,000 being planted on the spawning-grounds in Lake Erie and 6,500,000 sent to applicants in Ohio and Indiana for inland lakes.

NORTHVILLE AND SUBSTATIONS IN MICHIGAN (F. N. CLARK IN CHARGE).

The results attained at Northville and auxiliary stations in Michigan the past year have been most satisfactory, the output far exceeding that of any previous year. The failure of the State legislature to provide the necessary funds made it impossible for the Michigan Commission to propagate any of the commercial fishes of the Great Lakes; hence arrangements were made early in the year for the U. S. Fish Commission to operate the Detroit white-fish hatchery, including fishing rights on Belle and Grassy islands, and later on it was also decided to utilize the State hatchery at Sault Sainte Marie for hatching a part of the eggs collected at Detroit.

Under the provisions of the Milliken act, passed by the Michigan legislature the previous year, the U. S. Fish Commission was authorized to collect lake trout and white-fish during the close season, which extends from November 1 to December 15. Although fishermen from all parts of the lakes applied to the agent of the Commission for permission to fish during the close season, he determined, after careful consideration, to confine lake-trout operations to three important spawning-grounds in Lake Michigan—Charlevoix, Beaver Island, and Manistique. It was feared that this decision would arouse the enmity of influential fishermen in other sections of the State, but the difficulty was overcome by a candid statement of the facts by the superintendent, and the pleasant relations which have always existed between the U. S. Fish Commission and the lake-trout fishermen of Lakes Michigan and Huron still continue.

The agreement entered into with the fishermen provided that after October 30 they should fish under the direction of the superintendent, at such times and points as he might designate, they to pay the expenses of the men and furnish tugs and fishing paraphernalia, receiving all of the fish taken, while the Commission was to have the eggs free of expense. About the middle of October, Mr. B. G. Filkins proceeded to Charlevoix and arranged with the fishermen for fishing and spawning operations at that point. After getting everything in satisfactory condition there, the work was left in charge of Mr. R. K. Robinson, and Mr. Filkins went to Beaver Island to make similar preparations. The fish at the latter point commenced spawning on October 24, but only 10 gallons of eggs were taken during the balance of that month. The fishing was continued until November 10, and resulted in the collection of over 7,000,000 eggs. Of the total number secured here only about 700,000, or 10 per cent, were taken during the open season; consequently the work would have been a failure had operations ceased on October 31.

At Charlevoix the fish were very late in making their appearance on the spawning-grounds and no eggs were collected until after November 1. From that time to the 8th, 1,842,000 were obtained, and on that date Mr. Robinson was directed to discontinue fishing in view of the fact that large numbers of eggs were being taken at other points.

Mr. George Platts, who has been in the employ of the Commission for a number of years, was placed in charge at Manistique, and as the fish had been observed to spawn there in the past much earlier than at any other point in Lake Huron or Lake Michigan, it was supposed large numbers could be collected during the open season, but none were taken until October 26. From that time to November 10, when work was discontinued, over 6,000,000 were secured.

As the result of operating at these three points 15,250,000 lake-trout eggs were obtained and shipped to Northville, packed as usual on canton-flannel trays, the first shipment reaching the station on November 2 and the last November 13. From Northville 1,500,000 were transferred to the State Fish Commission, 1,000,000 were sent to Alpena, and 4,117,000 were consigned to other stations of the Commission, State fish commissions, and private applicants, leaving 8,633,000 to be hatched. These produced about 7,000,000 fry, 6,535,000 of which were planted in Michigan waters in February, March, and April. The balance were retained and at the close of the year they number about 145,000. They are between 2 and 3 inches long and are apparently healthy and strong.

Although the hatchery was overcrowded with eggs, no heavy losses occurred from disease or other causes. On December 21, the creek water ceased to flow about 5 o'clock in the morning, but the incident was promptly discovered by the watchman and the spring water turned on. There were a great many eggs in the house at the time, and but for his prompt action heavy losses would have ensued.

The wisdom of limiting the work to the three points mentioned was clearly demonstrated by the results, the eggs being collected and delivered at Northville for less than \$700, or about 5 cents per 1,000.

To guard against all of the eggs hatching at once and overcrowding the hatchery, the development of a part of them was retarded by the use of creek water, which is colder than that from the spring, the creek water at this time averaging about 35° and the spring water 45°. In this way the distribution was extended from the middle of February until April, whereas had the warmer water been used they would all have come out at the same time, and it would have been impossible to have handled them. The first eggs hatched on January 17 and the last on March 8, a difference of fifty-one days.

At the beginning of the year there were 90,000 lake-trout fry on hand; when distributed in August they numbered 88,000, and ranged from 3½ to 4½ inches in length.

On July 1, 1899, there were on hand at Northville 31,493 brook trout. These were held in ponds which had been lined with stone cement, but they commenced dying in July, though special attention had been given them and the ponds had been kept perfectly clean and were exposed to the sun and air before they were introduced. On August 7, when the distribution commenced, there were only 8,000 fingerlings,

1,100 two year olds, and 154 two and three year olds. These were distributed in New York with the exception of the 154, which were liberated in Sturgeon River, Michigan. In the winter 368,710 brook-trout eggs were purchased from one of the commercial hatcheries in Massachusetts. On their arrival at the station 9,675 were dead. The balance hatched in March, producing 333,518 fry, or 93 per cent of the good eggs received. They were hatched in spring water between March 7 and 28, and the fry commenced feeding April 10. Half of them were fed on beef liver and the remainder on carp. Those fed on the liver were in better condition at the close of the year than the others, being larger and healthier, though it seemed at first that the carp-fed fry would be superior. The poor results attained with the latter are attributed to the fact that the use of carp as food pollutes the water, discoloring it and leaving an oily scum on the surface. This difficulty is not encountered to any extent in using liver.

On April 12 the distribution of the fry was commenced, and by the 25th of May 257,500 had been liberated.

For purposes of experiment 1,000 grayling fry were held over from the hatch of the previous year and fed on finely pulverized liver, the size of the pieces increasing with the growth of the fish. On July 31 the largest of them were an inch long and by the end of August $1\frac{1}{2}$ inches. In September, when they were counted and transferred from the troughs to Pond Q, they numbered 585. They grew slowly during the winter, but increased in size very perceptibly during the spring months, and at the close of the year the remaining 300 measured from $3\frac{1}{2}$ to 7 inches in length. On the 11th of June 70,000 eggs arrived from Bozeman. The temperature at the top of the case on arrival was 52° , but in the center it registered 47° . The eggs showed evidence of great care in packing, and about 25 pounds of ice remained in the case. They measured 810 to the fluid ounce. The hatching was done on trout trays with spring water, the first fry appearing on June 13 and the last on the 23d. When first hatched the fry lay on the bottom from two to four days, until the sac was absorbed. They then rose to the surface and appeared to be vigorous and active. From the 70,000 eggs received 56,000 fry were planted in the various branches of the Rifle River, Pere Marquette River, and Baldwin Creek.

During February 13,650 rainbow-trout eggs arrived from Manchester in very bad condition, and though they yielded 12,860 fry they were so weak that 7,000 of them died before the absorption of the sac. The 385 rainbow trout hatched at the station several years ago were given to private applicants in August, it having been decided to discontinue the rearing of these fish at Northville.

Of the 3-year-old Loch Leven trout, 195 females spawned in November and December, which is much later than usual. The older fish also produced a few eggs, but they were of no value, 50,950 being secured from the entire stock. When they were sufficiently developed for shipment, 20,000 were sent to the New Hampshire Commission and

6,000 to Prof. W. A. Lacy of the Northwestern University, Evanston, Ill., for experimental work. The balance were hatched in February, and after being fed for several weeks 8,000 of the fry were distributed, and there remained on hand at the close of the year 8,590.

Of the 5,000 steelheads on hand from the hatch of June, 1899, 4,500 were planted in September in Baldwin Creek. In May, 1900, the 2-year-old steelheads numbered 1,633 and the 3-year-olds 469. These fish showed no signs of spawning.

The hatchery at Detroit, which was turned over to the Fish Commission, is located in the center of the city and is a frame structure 80 feet long by 40 feet wide, with a wing 48 by 36 feet. The building belongs to the Michigan Fish Commission, and the grounds on which it is located to the estate of John Pridgeon, the rental being \$425 per annum. The hatchery is equipped with 1,000 Chase jars, which have a capacity for about 162,000,000 eggs, estimating 162,000 per jar. The water, which is well adapted for this work, is furnished by the Detroit Board of Water Commissioners, at the rate of $1\frac{3}{4}$ cents per 1,000 gallons. Its average temperature in March was 33°, and in April it ranged from 33° to 50°, reaching that point on the day the hatching was completed.

The three fisheries included in the transfer are the East Point, Willis Ground, and Grassy Island, the two former being located on Belle Island, and the other on an island about 8 miles southwest of Detroit in the Detroit River. At the time of the transfer the hatchery was in only fair condition, as new sills had to be put in two sides of the building, the floor needed repairing, and the tanks painting.

To simplify the work arrangements were made with the Wolverine Fish Company, of Detroit, to operate the fisheries and to receive as compensation the fish captured after the eggs had been stripped and turned over to the Commission. Fishing commenced in October and continued to December 20, resulting in the capture of 33,112 white-fish. Of these 6,046 undersized ones were liberated, and the balance were held in live-cars until ripe. The apparatus used at all of the fishing-grounds was the ordinary haul seine, operated by means of capstans and horsepower. Fishing was conducted night and day by separate crews, and the catch was unprecedented, the most successful work ever recorded before only aggregating about 14,000, less than half the number captured this year. This is believed to be attributable to the large plants of white-fish fry made in past years by the National and State Fish Commissions in Lake Erie and the Detroit River.

The fish caught at East Point were transferred to the Willis Ground fishery, where the live-boxes and ponds were established. The live-car was a boat about 14 feet long, 3 feet wide, and 14 inches deep, pointed at both ends, with slats on the bottom running lengthwise. Two water-tight bulkheads were fitted in either end to keep the water from rushing through and crowding the fish into the rear end and smothering them. One of these boats can safely carry 200 fish from

2½ to 3 pounds in weight, and as many as 270 have been brought down on one trip. At first only 100 were placed in the boat, but on arrival at destination many of them were found to be badly bruised, and after that they were packed in tightly, so that they would be unable to move around and injure themselves. The experiment was successful, and thereafter all fish were transferred packed in as closely as possible.

Owing to the warm weather a great many of the females became plugged early in November, 105 being removed at one time. This condition was believed to be also due to some extent to their confinement in the crates. A pond, 16 feet by 40 feet, was therefore constructed in water 3 feet deep, by sharpening 6-inch boards and driving them into the river bottom, which was covered with 3 inches of soft mud, with gravel underneath. In this inclosure 2,200 male and female white-fish were placed, and at the end of 3 days it was noticed that they had whipped off all the mud, the gravel being plainly in sight. Commencing a week later, all of the females except 173 were stripped, and only 10 plugged fish were found. The 173 were transferred to a crate, and though apparently in perfect health, in less than a week half of them were plugged. It would thus appear that it is better to hold the fish in ponds constructed in the river, though at Grassy Island the percentage of plugged females was less than at Willis Ground, although the fish were held altogether in crates. The process followed in stripping the eggs was practically the same as in past years, all of the fertilizing being done by the dry method, though the milt was taken before the eggs.

Fishing commenced at Grassy Island on October 7 and closed the 3d of December, 4,563 male and 5,870 female fish being taken. The spawning season here lasted until the 19th of December, 4,460 of the females crated, or about 76 per cent, yielding 108,288,000 eggs.

At the other two points fishing commenced on October 23 and continued to the end of November, resulting in the capture of 7,323 females and 9,310 males. 4,905 females yielded 137,952,000 eggs, an average of 28,124 per fish.

All of the eggs collected were transferred promptly to the Detroit hatchery, where they were either placed in jars or reshipped to other stations. During the season 2,508 hauls of the seine were made. The average number of white-fish taken per haul (including also immature specimens) was 13, the catch of mature white-fish per haul averaging 11.

The total number of eggs collected was 246,240,000, of which 48,020,000 were transferred to the Alpena hatchery, 40,732,000 to the Sault Ste. Marie, 22,220,000 to Duluth, and 2,379,000 to other stations and private applicants. The balance were hatched at Detroit and distributed in April, by tugboats, in the Detroit River, Lake St. Clair, and Lake Michigan, near Frankfort, Charlevoix, and Beaver Island, most of them being liberated in Detroit River and Lake St. Clair.

As the Detroit hatchery was overcrowded, the Alpena station was

opened on November 27, on which date 47,520,000 white-fish eggs were received. Later on 500,000 more were transferred. The eggs were hatched in the Chase and the McDonald jars and produced 36,500,000 fry, or about 76 per cent of the number of eggs handled. These eggs were green, having been transferred direct from the seining-grounds, consequently the percentage hatched was better than would at first seem. In April the fry were distributed by tugboats in Lake Huron and tributaries, inside a radius of 50 miles from the station.

The water supply for the Alpena station is pumped from Thunder Bay and is quite clear and pure. When the eggs were first received its temperature was 42°, but by December 13 it had fallen to 34°, where it remained until February, when it registered 33°. In March it ranged from 33° to 35°, and in April averaged 41°.

On February 15th 1,000,000 eyed lake-trout eggs were transferred from the Northville hatchery. They hatched with practically no loss and all of the fry were planted in Lake Huron during April, with the exception of 100,000 deposited in Beaver Lake. The plants were made with tugboats loaned by the fishermen.

To further relieve the Detroit hatchery it was arranged to transfer a part of the eggs to the State hatchery at Sault Ste. Marie, and 40,732,000 were sent to that point in December, January, and March. In December the water was cut off from the hatchery for 11½ hours by the formation of anchor ice and the freezing of the wheels belonging to the electric power company. The eggs were at once placed on flannel trays and the temperature kept down to 34°. No further trouble was experienced, but it is probable that the eggs then in the hatchery were slightly damaged by this accident. The temperature of the water reached 32° by December 24 and remained at 32° until April 13, when it ranged from 33° to 43° until May 1, when the last of the fry were planted. From the eggs transferred 25,000,000 fry were hatched, 10,000,000 being planted in Lake Huron, off Detour, and 15,000,000 in Lake Superior and tributaries.

The Commission is indebted to A. Booth & Co. for transferring fry without expense; also to fishermen at Detour for similar courtesies. The work at this point was under the immediate direction of H. H. Marks, of the Michigan Commission. At the close of the season the hatchery was cleaned up and turned over to the State Fish Commission.

The following table shows the total number of eggs collected during the year, eggs shipped, and fry distributed:

Species.	Eggs collected.	Eggs shipped.	Fry distributed.
White-fish	248,240,000	24,001,000	163,500,000
Lake trout	16,250,000	5,617,000	7,530,000
Brook trout	350,035	.....	257,500
Loch Leven trout	50,950	20,000	8,000
Rainbow trout	13,050	.....	8,000
Grayling	70,000	.....	50,000
Total	261,083,035	30,244,000	171,854,500

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

Species.	Calendar year in which fish were hatched.				
	1900.	1899.	1898.	1897.	1894 or earlier.
Steelhead trout			1,630	400	
Loch Leven trout	8,400		244	677	50
Lake trout	145,000				
Grayling		292			
Brook trout	15,000				
Total	168,400	292	1,874	1,137	50

DULUTH STATION, MINNESOTA (S. P. WIRES, SUPERINTENDENT).

In the summer arrangements were made for collecting lake trout and white-fish in the vicinity of Port Arthur, Ontario; Grand Portage, Minn., and at Isle Royale, Ontonagon, Houghton, Keystone, and Montreal River, Michigan. Lake trout commenced spawning in the vicinity of Port Arthur and Isle Royale about September 20 and in Michigan during October. The collections were unusually large, and could have been greatly increased had it not become necessary to discontinue fishing in compliance with the closed-season laws of Michigan and Canada. The total collections aggregated 12,400,000, as follows: Rossport and Port Arthur, Ontario, 4,177,000; Houghton, Keystone, and Montreal River, Michigan, 2,076,000; vicinity of Isle Royale, Michigan, 3,758,000; vicinity of Ontonagon, 2,100,000; Grand Portage, Minn., 289,000. During January and March 1,550,000 eyed eggs were shipped to the commissioners of New York, Utah, and Wyoming, and 300,000 transferred to Nashua station; from the balance 9,047,000 fry were hatched and planted during April, May, and June. The total loss of eggs and fry during the season was 1,503,000.

As white-fish had just commenced spawning in the vicinity of Rossport and Port Arthur when the closed-season law took effect, only 200,000 eggs were collected, but in December 44,222,000 were transferred from Put-in Bay and Detroit. The Michigan eggs arrived in very poor condition, and the losses among them were very heavy. In April and May 20,000,000 white-fish fry were liberated.

At the beginning of the fiscal year there were 14,000 grayling fry on hand. These were planted in August in Baptism River, Minnesota. On the 12th of the following May 72,000 grayling eggs arrived in excellent condition from Bozeman; they were placed in McDonald hatching-jars, 36,000 to the jar, and sufficient water was turned on to give them a gentle motion. They commenced hatching on the 19th and finished in four days. As the current of water in the jar was not strong enough to carry the fry out, they were permitted to remain in the jars until all of them had been hatched, when they were transferred to an ordinary trout trough 14½ feet long, 10 inches deep, and 2 feet wide, well supplied with fresh water. They remained on the bottom of the trough, acting very much like lake or brook trout, for from 36 to 40 hours, after which they began swimming near the surface

and commenced feeding. Beef liver chopped very fine and strained through a cheese-cloth bag was given them four times a day. The fry appeared healthy until May 29, when they commenced to drop back in the troughs in an exhausted condition and died rapidly. This was due to the rapid rise in the temperature of the water, which varied from 60° to 72°. Had they been a week or ten days older when the warm weather commenced it would not have affected them seriously, as grayling fry were held the previous summer in warmer water without loss. Plants aggregating 34,000 were made during the spring in suitable waters in Minnesota and Wisconsin.

All of the steelhead trout on hand at the beginning of the year were planted in July in streams in Minnesota and Michigan. On the 17th of May 100,000 eggs arrived from Clackamas, Oreg., in fine condition. These commenced to hatch on the 28th, and by June 5 a large proportion were feeding; by the 10th all of them were taking food nicely. To all appearances the steelhead trout are exceptionally hardy and grow rapidly at this station, and, judging from reports received from streams already stocked, are well adapted for the waters of Minnesota. During the year 148,500 were planted in waters in Minnesota, Michigan, and Wisconsin.

The 100,000 brook-trout eggs received from Colorado in March were hatched late in April and retained in troughs and fed until June, when 91,000 were planted, the total loss of eggs and fry being less than 9,000. At this station brook-trout fry are brined once a week from the time the sac is about one-fourth absorbed until they are distributed.

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

The season opened very favorably, young bass being plentiful all along the shores, though the water was too high to work the overflows and ponds. When it receded it was found that the weeds and grass had grown so rapidly that it would be impossible to collect from some ponds which had heretofore yielded large numbers. The bass handled during the summer were much larger than usual, the bulk of them having been hatched the previous year. A large number of adults were captured and shipped.

Crappie were very abundant, but owing to the difficulty in transporting these fish from the fishing-grounds to the station only a limited number were handled until fall. The catch of all kinds of fishes in the river has been larger than for many years, especially of the commoner species, hundreds of thousands of which are saved annually by the Commission.

As a result of the season's work 36,248 yearlings and adult bass were distributed, 9,260 crappie, 2,100 sun-fish, and 22 warmouth bass, besides 4,480 rock bass transferred from Neosho.

The station was reopened in June, 1900, and many thousands of young fish captured, and by the close of the year there were over 18,000 on hand for distribution.

MANCHESTER STATION, IOWA (R. S. JOHNSON, SUPERINTENDENT).

The construction work in progress at the close of the year was completed during the summer and a considerable number of improvements were made by the station force, the most important being the construction of a frame building, 14 by 21 feet, to be used as a fuel-shed and store-room. The roadways around the 80-foot ponds were graded and graveled, and the land behind the stone protection-wall from the upper spring reservoir was filled in and graded; the walls of the kitchen, mess-house, boiler-house, office, reception-hall, and stairway in the hatchery building were given a coat of paint, and all of the hatching apparatus was thoroughly overhauled and repaired; the rearing-ponds, which were damaged by frost during the winter, were torn out and rebuilt, and considerable repairing was done to the stone protection-wall and dam, which had been injured by the ice-gorge.

Fish-cultural operations were conducted on the same lines as in the previous year, ponds Y, Z, and V being used for the propagation of large-mouth black bass and rock bass. The propagation of crappie was abandoned, as they do not do well at the station, and it is possible to collect large numbers at small expense from overflowed lands at the substation at Bellevue.

In the summer and fall of 1899 a very peculiar disease appeared among the adult and 2-year-old brook trout in the 80-foot ponds, which resulted in the almost total loss of the younger fish and a large number of the adults. It first appeared among a lot of 2-year-old fish during the summer and gradually spread until late in the fall, the greatest loss occurring just before and during the spawning season. The symptoms varied greatly, some of the fish being attacked with inflammation of the gills, some with a slimy skin disease, some with tumorous sores, while many died without any outward sign to indicate the trouble. The majority that died, though, were affected with the sores, which seemed to originate from some internal cause, first appearing as a knotty substance under the skin and gradually enlarging and breaking out in a running sore. The sores were not confined to any particular part of the fish, but were distributed over the entire body, sometimes appearing on the head and back, and at other times on the abdomen and tail. The development of the disease was rapid, death taking place two or three days after it appeared. When the epidemic began every effort was made to check it by the liberal use of salt and clay baths, a change of food, and the transferring of the diseased fish to isolated ponds, but all remedies proved unavailing, and it continued until all the brook trout at the station were more or less affected.

It is questionable whether the disease was infectious, for, while it spread to all of the ponds, they all have independent water supplies and drains, none of the water being used more than once. In addition to this, the rainbow trout, confined in the same kind of ponds

and fed on the same food and under the same conditions, were not diseased in any way. The superintendent is unable to account for its appearance. The ponds used were 80 feet long, perfectly new, and, so far as known, the water supply is absolutely pure. As a result of this epidemic 457 adults and 4,450 2-year-old fish were lost. It appeared again during the spring of 1900 and caused the loss of 3,470 yearlings that were held for brood stock.

At the beginning of the year there were on hand 63,000 fry hatched the previous spring. Of these, 55,565 were distributed to applicants and planted in public waters during the fall, and 5,270 were held for rearing, the loss during the summer amounting to 2,165.

The stock of breeders at the commencement of the spawning season consisted of 5,250 two-year-olds and 957 adults. The first eggs were taken on November 8, and collections continued daily till January 15. From the 1,331 ripe females, 513,080 eggs were secured, an average of 385 per fish. Of this number 348,930 fry, or about 80 per cent, were hatched, and 75,000 eyed eggs were shipped to other stations. The fry were of low vitality and died in great numbers during the sac stage, only 55,800 healthy ones resulting from the season's work. Of this number, 25,000 were planted in public waters in the vicinity of the station, and 30,800 are held for distribution in the fall.

The stock of rainbow trout on July 1 consisted of 2,500 three-year-olds, 4,200 two-year-olds, and 1,900 fry. The three-year-old fish commenced to spawn on December 30 and continued until March 24, only 216 of them yielding eggs. These produced 132,225, of which 45,000 were shipped to other stations and 65,450 fry were hatched. The eggs appeared to be in good condition, the percentage of fertilization being 84, but the fry, like those of the brook trout, were of low vitality, and only 15,500 healthy ones resulted. The two-year-old fish yielded no eggs.

On the 1st of July 1,840 fry, hatched the previous winter, were on hand. Of this number 1,700 were planted in the public waters in the vicinity of the station during the fall, the loss during the summer being 140. At the beginning of the year the brood stock consisted of 45 adult fish. The spawning season extended from November 18, to December 6, resulting in the collection of 9,100 eggs. Eight thousand of these eggs were hatched, but losses during the summer reduced the number of fry to 3,000, which are now held at the station for distribution in the fall.

The grayling resulting from eggs hatched in June, 1898, were kept in ponds at the station with a loss of 626, leaving at the end of the year 824 two-year-olds, which should produce eggs next season. On the 12th of May 50,000 eggs were received from Montana in good condition, the loss on arrival amounting to only 3,100 and subsequent losses to 6,450. The fry hatched, numbering 40,450, were liberated with the exception of 5,000, which will be held.

The breeding-ponds contained large numbers of young bass in June, but during the next month natural food became so scarce that the

loss from cannibalism was large. Late in July the ponds were drawn and the fry placed in troughs, where they were fed on live maggots. Though large numbers of them died on account of weakness and insufficient nourishment while in the ponds, their improvement after being transferred to the troughs was marked. As an article of food the maggots proved far superior to anything ever used at this station. They remain alive a long time after being placed in the water, thereby attracting the notice of the young bass, which snap them up greedily. It is believed they will also prove a most economical food, as they can be produced in large quantities from the refuse of livers, at little cost. As a result of the work with this fish, 4,300 were distributed in the fall and 200 were held for brood stock.

The rock-bass work has not been as successful as was anticipated, due to low temperature of water and lack of natural food in the ponds. The construction of a new pond will permit the extension of this work, and it is believed that large numbers can be reared in the future.

At the close of the year there were on hand the following fish:

Species.	Calendar year in which fish were hatched.				
	1890.	1899.	1898.	1897.	1896.
Brook trout	30,800	1,810			500
Rainbow trout	15,500		3,600		1,340
Grayling	5,000		824		
Loch Leven trout	3,000			16	
Black bass					140
Rock bass					58
Total	54,800	1,810	4,424	16	2,038

Investigations made during the spring of 1899 indicated that large numbers of fish could be collected in the vicinity of Bellevue, Iowa, from the overflowed lands of the Mississippi River, as it is the center of a vast territory extending on the Illinois side of the river from Galena to a point 22 miles south, and on the Iowa side from Dubuque to the mouth of the Maquoketa River. Bellevue was also selected on account of the good railroad facilities and its excellent water supply. The preparatory work of fitting up a small temporary station was commenced on July 14 and completed on the 25th. The equipment consisted of four wooden retaining-tanks, 12 feet by 4 feet by 3 feet, set up on the levee in front of the city, the city council having granted permission to use the ground free of charge. The tanks were supplied with water from the city works through a half-inch galvanized-iron pipe, under pressure of 100 pounds, and escaped into the tank through a one-fourth-inch pet-cock, which reduced the volume but caused it to flow into the tank with great force, taking with it large quantities of air. The average number of gallons of water used in each tank per day was 2,000. This water was furnished at a cost of 10 cents per 1,000 gallons. A light wooden frame was constructed above the tanks, over which was stretched a canvas cover to protect the fish from strong sunlight. The daily collections were held in these tanks

until ready to be distributed. In one tank 2,500 bass, from 2 to 5 inches long, were held for ten days without loss except by cannibalism, and in the latter part of the season, when the weather was cool, 1,200 crappie, 3 inches long, were held in one tank for two weeks without loss. The tanks were kept clean, the fish assorted according to size, and no food given, and to this was attributed, to a great extent, the success met with in holding them. Of the 95,260 placed in the tanks during the season not over 100 were lost by fungus, and the loss from cannibalism was very small.

A gasoline launch 26 feet long, 4 feet beam, with 3-horsepower engine and twin screws, was purchased for \$300 and used for towing live-boxes and flatboats from the lakes to the retaining-tanks at Bellevue. The live-boxes were 5 feet by 2½ feet by 2 feet. There was also a flatboat, with a capacity for carrying 15 round-shouldered cans, which was used for transporting fish in rough weather when it would have been impossible to tow the live-boxes.

The fish were captured by means of seines, which were operated under the direction of Mr. Charles Hruby, assisted by five laborers. Operations commenced on July 25 and continued to November 10, during which time 95,260 black bass and 41,364 crappie were taken from lakes and bayous in the vicinity of Bellevue, where they would certainly have died, and were transferred by the cars to various parts of the country.

While making the collections of bass and crappie for distribution large numbers of fish, which it was impossible to hold, were liberated in the Mississippi River. As it was impracticable to count these they were handled in galvanized-iron bushel baskets, and on the counts of individual baskets it was estimated that there were thus transferred 5,000 black bass, 100,000 crappie, 5,000 pike, 8,000 yellow perch, 50,000 bream, 4,000 cat-fish, 15,000 carp, and 20,000 buffalo—a total of 207,000. This represents a very small percentage of the fish in the lakes and bayous in the vicinity of Bellevue that died when the waters dried up. There is little doubt but that the number would run up into the hundreds of thousands, if not millions.

The total cost of operating this station for the season was \$1,387.98. Of this amount \$536.51 was used for the purchase of apparatus and equipment, leaving the actual cost of collection a little over \$851.47.

The following table gives the mean temperatures of the air during the year, arranged by months. The water temperature was stationary at 50 degrees.

Month.	Mean minimum.	Mean maximum.	Mean average.	Month.	Mean minimum.	Mean maximum.	Mean average.
1899.	°F.	°F.	°F.	1900.	°F.	°F.	°F.
July	71	88	81	January	-3	42	27
August	70	90	82	February	-2	37	19
September	37	98	68	March	3	52	33
October	42	77	61	April	29	74	57
November	31	59	45	May	52	83	68
December	-2	44	25	June	66	86	76

SAN MARCOS STATION, TEXAS (J. L. LEARY, SUPERINTENDENT).

During the summer a pond 1 acre in area was constructed on a triangular space lying between the roadways and the circular ponds. This was built particularly for the propagation of crappie, and receives its water supply from the current wheel through a 6-inch pipe. Concrete walks were laid around the office and artesian well, the office and buildings were painted, and 200 loads of gravel were procured for improving the bottoms of the ponds.

The weather conditions during the year were very favorable for work until January 15, when tremendous rainfalls commenced and continued until the middle of April, causing floods in many parts of the State and doing a great deal of damage. On April 7 the San Marcos River overflowed its banks, flooding the entire pond system supplied by the artesian well and causing the loss of all the black bass that were ready for distribution and a large number of brood-fish, besides destroying many nests of eggs by depositing on them a heavy coat of sediment. Over 10,000 fry had been counted out into one of the ponds for distribution, and it is estimated that the loss of fish between 2 and 3 inches long was over 50,000. Fortunately the overflow occurred during the day, and by stretching a seine across Pond H as the water receded a part of the brood stock was saved. The rainfall has been of decided advantage, though, in increasing the water supply, the well now flowing 1,000 gallons per minute. The winter was mild, the lowest temperature being 16° above zero on February 18. June 22 was the hottest day of the year, the thermometer registering 102 in the shade. The temperature of the water from the well is stationary at 73° the year round. The average temperature in the ponds is about 69°.

The methods employed in the propagation of black bass, crappie, rock bass, and bream, were practically the same as in the past, the increase in pond area permitting the utilization of additional ponds for black bass, the most important fish handled at the station. The spawning season began on February 2, seven days earlier than usual, and it was noticed that more fish used gravel for their nests than ever before. As the winter was mild the young fish grew rapidly and were large enough to be distributed by April 1, but the work had to be deferred until May on account of the freshet. As heretofore, the young bass were transferred from brood-ponds to rearing-ponds when from 1 to 1½ inches in length, the seine used for the purpose being of bobinet, 40 feet long, 5 feet deep, supplied with the usual float and lead lines. As many as 2,500 were moved at one haul of the seine.

The method of feeding is the same as in the past, chopped fish and crawfish being used to a great extent, in addition to live food. The distribution was commenced as soon after the subsiding of the water as possible, and resulted in the shipment of 110,455 bass, 5,690 rock bass, 3,195 crappie, and 300 bream, to applicants in Texas.

The calico bass, rock bass, crappie, and bream spawned as usual in

the spring, and though the brood stock was small, it is believed that considerable numbers of young fish will be available for distribution in the fall. The crappie have done particularly well, and the new pond constructed for them promises to yield a large crop. In order to keep the water of this pond stirred up 26 large carp have been kept in it, as it has been found by experience that crappie do not thrive in clear water at this station. Although much difficulty has been experienced in distributing this fish during the warm months, 125 crappie over 2 inches in length were shipped late in June and were carried for 36 hours without any loss, though the air temperature on the trip was over 100°. Ice was, of course, used for keeping the water cool.

Carp and mud shad are propagated for supplying live food for the bass and crappie, and answer the purpose well. In one of the ponds 75 adult mud shad were introduced with the bass, and from this pond 27,000 young bass were taken. Occasionally a young mud shad was captured with them, showing that the bass had eaten nearly all of them.

Salamander and shrimp continued to come up from the artesian well until the overflow in April, but since that time none have been seen. A female salamander which showed well-developed eggs was kept in a can, to see if it would produce young. It seemed to do well for 41 days, but then died without spawning. As heretofore, schools of science have been furnished with salamander and shrimp.

Very few aquatic birds have been killed during the year, showing that the warm weather carried them further south or that they are becoming less numerous. Turtles and snakes, however, are on the increase, but it is not believed that they are especially harmful to the young fish, as an examination of their stomachs showed that they consume large numbers of frogs and tadpoles, only a few fish being found.

NEOSHO STATION, MISSOURI (H. D. DEAN, SUPERINTENDENT).

The output of fish in the fall was not so large as that of the preceding year, but it is believed that the improvements now going on will enable us to increase very materially the effectiveness of this station in future. Of the rainbow trout on hand at the beginning of the year, 57,525 were distributed during the fall, and 2,500 kept for brood stock—94 per cent of the number on hand July 1. The fish were held in ponds and troughs as heretofore, and fed on a mush made of liver and shorts. The new ponds, Nos. 17 and 18, were used for spawning and proved a great convenience, the only difficulty being to give them a full supply of water when the small ponds were filled with young trout. For this reason they could not be used until the distribution was nearly over, it being December 7 before the fish were assorted and placed in them. The spawning season extended from December 13 to March 2, and though the brood-fish seemed to be in fine condition, of the 397,649 eggs collected from the older fish only 212,616, or 53 per cent, were eyed. The 2-year-old fish produced 99,048, of which 49 per cent were eyed. Assignments amounting to

99,600 were shipped to private applicants and other stations, and the balance were retained for hatching. The first of the fry made their appearance on January 2, and although the eggs had apparently been of poor quality, the fish were strong and healthy, and at the close of the year there were 97,000 on hand. The eggs from the 2-year-old trout were kept separate and hatched about the same percentage as the others, the fry from them being as strong as those from the older fish, and the losses among them no heavier.

There were no epidemics of any kind during the year and no losses of old trout except in one instance, where 425 of the 2-year-old fish were lost during the night. There is no accounting for this except on the theory that the water supply was cut off in some way in the night, though it was running in the morning.

The black-bass ponds were drawn as usual in July and the young transferred to troughs and supplied with water from pond 5. The loss during the summer was much larger than usual, and of the 15,145 placed in the troughs only 8,765, or about 58 per cent, remained in the fall when the distribution was undertaken. In the spring the brood-fish were again placed in ponds 4, 10, and 11, and though there appear to be many young fish in them, no estimate can be made as to the exact number. Several thousand, three-fourths of an inch long, were taken from pond 11 and transferred to Nos. 9 and 16, where they have grown rapidly. Observations this season seem to indicate that there is a much longer period of time between the hatching of the young bass and the absorption of the sac than has generally been supposed. It is believed at this station that it does not disappear in less than ten days and sometimes lasts two weeks.

One of the ponds which had been set aside for the rearing of strawberry bass was drawn on July 24 and 25, but owing to heat and the difficulty encountered in handling the young fish it was decided, after 5,000 had been taken out, to allow the pond to fill and leave the balance of the fish until cooler weather. On September 11 it was again drawn and 6,000 young transferred to the troughs. From all of the ponds 17,279 were taken, but the fish were so frail and so hard to feed that only 7,804 were distributed. It is noted that the young of this species are more liable to attacks of fungus than any of the other basses. The breeders were placed in ponds 3 and 7, but it has been impossible to make any observations of their spawning habits, owing to the unusual roiliness of the water; but this feature is favorable to the production of young, and it is thought there will be a good crop when the ponds are drawn in the fall. It is believed that these fish are very prolific and could be distributed in large quantities were it possible to handle them in the summer like the other basses.

It had been determined not to draw down the ponds containing the young rock bass until cool weather, but in order to supply applicants from Quincy it became necessary during a very warm spell to remove them from the pond. The results were very disappointing, as

only 12,582 were obtained as against 31,000 the previous year. From one pond that had yielded 20,000 the preceding year only 90 young fish were found. No explanation of this can be given unless it be that they were smothered by confervæ, which appeared in this pond in large quantities during the season and entirely stopped the growth of vegetation. Of the fish taken from the ponds 10,500, or 83 per cent, were successfully distributed. From observations made it is obvious that it takes fourteen days for the absorption of the sac—that is, two weeks from hatching to scattering—with a daily water temperature ranging from 62° to 75°.

Nearly 2,000 pounds of crawfish were removed from the ponds during the year and fed to the bass. No special effort has been made to exterminate them, as it is thought their value as food for the fish more than counterbalances the damage they cause to the pond banks, etc., and with proper care in drawing the ponds it is not probable that their presence is detrimental to the young fish.

The following shows the fish on hand at the end of the year:

Species.	Calendar year in which fish were hatched.				
	1900.	1899.	1898.	1897.	1896 or earlier.
Rainbow trout	97,000	2,500	1,375	370	30
Black bass		155		81	75
Rock bass		177			50
Strawberry bass		200		58	
Golden ide					11
Salmon		140			
Total	97,000	3,172	1,375	500	166

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

The brook trout on hand at the beginning of the year were kept in troughs and ponds until August, when they were distributed, with a loss of about 5,000, to applicants in Colorado.

Arrangements were made during the summer for the collection of eggs on shares from various private lakes. The brood-fish at the station commenced spawning early in October and continued until the 8th of December, 214,600 eggs being collected from them. They were of poor quality, however, and only 117,000 were eyed. Of these 45,000 were shipped and 72,000 fry were hatched. The period of incubation varied from 131 to 138 days.

The following table shows the number of brook trout eggs collected at the various points and the period of spawning:

Point of collection.	Spawning period.	No. of eggs.
Station	October, November, December	214,600
Musgrove lakes	do	805,800
Young's ponds	October and November	490,800
Ridgeway's ponds	November and December	805,100
Smith's ponds	October and November	131,400
Wellington Lake	October, November, December	1,956,400
Uneva Lake	October and November	245,400
Decker Lake	November	239,200
Derry Lakes	November and December	420,700
Total		4,815,400

The take of eggs was largely in excess of the previous year, but the quality was exceedingly poor, the best being obtained at Uneva Lake, where the loss was only 10 per cent. At Smith Lake, where 131,400 were taken, it reached 44 per cent, as against a loss of 28 per cent the previous year. At Ridgeway the loss was $77\frac{1}{2}$ per cent; at Wellington, 56 per cent; at Young's, 42 per cent; at Decker's, 80 per cent; at Musgrove's, 56 per cent, and at Derry's, $54\frac{1}{2}$ per cent. This mortality on brook-trout eggs was greater than has ever been experienced before at the Leadville station, and is very discouraging, as the work was carried on under the same conditions as heretofore, and all of the eggs were taken by the superintendent and foreman, the greatest care being exercised in transferring them from the field stations to the hatchery. It can only be attributed to the fact that about three-fourths of the eggs were taken from young fish—as at Uneva Lake, where the fish were 3 years old and over, the loss was light. At all of the other points where collections were made the owners rear fish for market and do not care to keep them longer than two years, as they do not find a ready sale after that age.

During the winter 395,000 eyed eggs were shipped to other stations and private applicants, all of them reaching destination in excellent condition except one consignment to Bozeman. On May 1 there were on hand 1,796,650 fry, of which 760,700 belonged to the Government and the balance to the owners of the various lakes. The distribution of fry began on May 27 and by the end of June 233,000 had been planted in Colorado waters.

The Loch Leven trout on hand July 1 consisted of 180 two-year-olds and 300 fingerlings. The fingerlings all died during the year, and the others were reduced to 120 by July 1, 1900. In November 6,100 Loch Leven eggs were collected at Uneva Lake and produced 5,400 fry.

The rainbow-trout work was very unsatisfactory. Of the 18,000 fry hatched in July, 8,000 were turned over to the Lake Loveland Company, and the fry resulting from the balance, together with those derived from Twin Lakes and Sisson, California, were placed in one of the ponds at the station, and on September 1 there were 32,000 fingerlings, but by the last of June 28,000 of them had been lost. Arrangements were made in the winter for the collection of eggs from fish belonging to Mr. R. M. Ridgway, at Salida, Colo., and from this source 54,500 were secured. The eye-spots appeared within 63 days, and the fry commenced hatching in 97 days. These eggs were taken from fish 3 years of age, which had spawned for the first time this year, and though they appeared excellent when stripped the loss was very heavy, only 11,100 fry resulting from them.

In March 64,700 eggs were collected from Lake Loveland, but they were also poor. It is impossible to account for their condition unless it was caused by the unusually warm and stagnant water in the lakes the previous summer, and this theory seems untenable in view of the fact that Mr. T. H. Johnson, State fish commissioner, captured a large

number of wild rainbow trout weighing from 2 to 10 pounds each in the Gunnison River, and spawned them during April and May, and fully one-half the eggs from them were bad when taken. As the Gunnison is a cold, clear stream and quite rapid, the quality of the eggs in this instance can not be attributed to the cause mentioned above. If the eggs of other wild rainbow trout are found in this condition, it would seem that there is a limit to the usefulness of that fish in the waters of Colorado.

An effort was made in April to collect eggs from Stover Lake, about 50 miles north of Fort Collins, but when the ice melted all of the fish were dead. Numbers of them were found floating in the water. One lake near Fort Collins, which had been well stocked with black bass, was practically stripped of fish, a hole 12 feet long and 5 feet deep being found full of dead bass. The same condition was found to exist in a number of other lakes in the vicinity, and it was thought the fish had smothered under the ice.

The lake trout on hand at the beginning of the year were carried through the year with a loss of about 43 per cent. In December 50,000 eyed eggs arrived from Northville in excellent condition, but the fry were not strong. The loss during the hatching period was only about 10 per cent, but since then the mortality has been very heavy.

During May 78,000 eyed grayling eggs arrived from Bozeman. They hatched with a loss of 21,000, and the loss of fry to June 30 was 36,000, leaving on hand at the close of the year 21,000 fingerling fish.

A consignment of 50,000 steelhead eggs arrived from the Pacific coast in May. They commenced hatching within five days, and finished with a loss of 300, or about 0.6 per cent. The loss of fry to July 1 amounted to 1,100.

From the 1,735,000 black-spotted trout eggs on hand in July 870,980 fry were hatched. The eggs collected at Grand Mesa Lake turned out very badly, about 50 per cent being lost in incubation. This was attributed principally to the fact that they were eyed at the lake on trays with such large mesh that they were liable to fall through; consequently it was necessary to cover the trays with mosquito netting, which collected a great deal of sediment. The fry were carried to October and distributed with a loss of about 50 per cent. Arrangements were again made this year to collect eggs of the black-spotted trout at Grand Mesa Lake, and by the close of the year 1,857,400 had been collected at Grand Mesa Lake and 16,000 at Freeman Lake, or a total to the close of the year of 1,873,400. These were at once transferred to the station, and appear to be of excellent quality.

SPEARFISH STATION, SOUTH DAKOTA (D. C. BOOTH, SUPERINTENDENT).

On July 3 Mr. D. C. Booth was appointed superintendent of this station, relieving Mr. H. H. Buck, who had directed the work of construction. In addition to the superintendent, the personnel consists of a fish-culturist and two laborers.

The hatchery, which was completed on July 25, is a frame building 66 feet long by 33 feet wide, with a 17 by 17 foot transept for main entrance. The first floor contains the hatching room (48 feet long by 32 feet wide), the boiler-room, reception-hall and office, and on the second floor are two bedrooms. The whole building is fitted with hot-water heating apparatus. The water supply is obtained from a series of springs rising in Amos Canyon within the hatchery grounds, and is conveyed by closed plank flumes, 700 feet long, to the hatchery.

During the summer various streams in the Black Hills, in South Dakota and eastern Wyoming, were investigated by the superintendent with the view to the establishment of auxiliary stations for the collection of brook and Loch Leven trout eggs, but judging from information so far gained it is believed the collections for a time will be somewhat limited, though there are many streams in this region which will eventually become productive if stocked with suitable fish. A permit was obtained from the governor of South Dakota for seining fish from Spearfish Creek, and within an area of 8 miles 900 brook trout and 140 Loch Levens were secured and transferred to the station ponds. Arrangements were also made with individuals to collect eggs on shares from private ponds. A temporary retaining-pond was constructed on Sand Creek, about 7 miles from Beulah, Wyo., in the Black Hills, and 3,000 adult trout, averaging 10 inches in length, were collected. These commenced to spawn on November 15, and by January 20 the 1,100 females had yielded 374,000 eggs.

From all sources in South Dakota and Wyoming 581,000 brook trout and 41,500 Loch Leven trout eggs were obtained, and 100,000 brook-trout eggs were shipped from Leadville. Of those obtained at Sand Creek 50,000 were sent to the Wyoming Fish Commission and to an applicant in Idaho; the balance were hatched with comparatively light losses and yielded 300,000 fry, or 93 per cent of the eggs reserved. As a result of the season's work, 579,568 brook-trout fry were hatched, 85,145 were lost during the sac stage, 87,423 were given to the owners of stock fish from private ponds, and 123,000 distributed, leaving on hand at the close of the year 284,000. A consignment of 100,000 black-spotted trout eggs, shipped from the Leadville station in July, hatched the following month with a loss of 18,240. The fry were held in troughs at the station during the winter, but the losses were very heavy, and when distributed in the spring only 20,260 of them remained; 15,000 of these were planted in May and June.

The superintendent made a trip through northern Wyoming in April with the view to establishing an auxiliary station for the collection of black-spotted trout eggs, and after several days of investigation along the Big Horn Mountains, Tongue River was decided upon as the most feasible field for operations. An egg-eying station was accordingly erected near Dayton, Wyo., early in May, and by the close of the year several hundred adults had been collected and a few thousand eggs secured, but the outlook was very unfavorable on account of the

immense quantities of snow on the mountains, which not only retarded the spawning season, but raised the streams to such an extent as to practically stop work. Permission has been obtained from Mr. S. H. Campbell, of the Wyoming Fish Commission, to operate next season for brook trout in the vicinity of Laramie, where there are a number of good streams.

The Loch Leven trout eggs collected during the fall hatched in the spring with a loss of only 2,450. The owner of the pond was given 8,000, and at the close of the year there were 27,000 on hand.

The following table shows the stock at the station on June 30:

Species.	Calendar year in which fish were hatched.			
	1900.	1899.	1897.	1896.
Brook trout.....	284,000	-----	300	600
Loch Leven trout.....	27,000	-----	40	100
Black-spotted trout.....	5,000	5,280	154	-----
Total.....	316,000	5,280	494	700

BOZEMAN STATION, MONTANA (JAMES A. HENSHALL, SUPERINTENDENT).

The freshet which occurred in June prevented the use of the creek water for the grayling fry, and as many were dying in the hatching-troughs, which are supplied by spring water of a low temperature, 300,000 were planted in Bridger Creek early in July. By the time the rest of the fry were hatched the ponds were again supplied with the creek water and they throve well in it, though the losses from cannibalism were heavy. It would seem from the experience at this station that the methods used in hatching and rearing trout are not entirely applicable to the grayling. The fry can not be retained in troughs supplied by cold spring water, as trout are. This is probably because trout when first hatched have a large yolk-sac, which supplies them with nourishment for a month or more, and by that time they are able to take artificial food. The yolk-sac of the grayling is quite small and is absorbed in a few days, consequently the fry have but little strength when they begin to swim and are apparently incapable of taking artificial food, and as there is little or no natural food in spring water, it is imperative that they be transferred to water containing it. This food can easily be seen with the naked eye. In holding a glassful to the light hundreds of small crustaceans (Entomostraca), resembling specks of dust, can be seen floating in the water. Another reason why the fry of the grayling should be transferred at an early stage to creek water is that they may get plenty of sunlight, as they have been observed to be partial to the sunny parts of the water. Within a week or two after the absorption of the sac the fry learn to take finely chopped liver very readily.

Operations at Red Rock commenced much earlier than ever before, collections of grayling eggs extending from April 30 to June 1. Mr. G. H. Tolbert, who had charge of the work, secured 3,687,000; of

these, 119,500 were lost in incubation, 1,625,000 were transferred to Bozeman, and the balance, 1,942,000, were hatched and distributed in the vicinity. The eggs were eyed in white-fish hatching-jars, and were then transferred to troughs and hatched like trout. The shipments, many of which were to distant points, reached their destination in excellent condition. This was attributed chiefly to the use of a new shipping-case, devised at the station the previous winter. The outside of this case is of the usual form, 30 inches square, from 12 to 18 inches deep, and fitted with hinges, hinged hasps, and staples, in order to allow ready access for re-icing en route. An inner case of half-inch stuff, of the same depth as the outer case, but without top or bottom and about 26 inches square, fits into the outer case, the space between the two being packed with dry sphagnum-moss or sawdust. The egg trays are 12 inches square outside and $1\frac{1}{2}$ inches deep, and as it has proven impracticable to place moss over the eggs, the only covering is a piece of mosquito netting on each tray. The stack of trays is placed in the center of the space in the case, which is then filled in with broken ice. On the top of the trays is a hopper of the same size with perpendicular sides filled with ice, which allows ready access to the ice chamber. On the outside is a notice to the express messenger that the contents are perishable and must be re-iced en route. No difficulty has so far been experienced in sending eggs to any part of the United States in this form of case. In every instance they have arrived in good condition, with a temperature of 40° or less.

The black-spotted trout eggs on hand at the first of the year were hatched in July, and the fry resulting from them were distributed in September and October in the States of Montana, Oregon, Idaho, and Washington, the output amounting to 277,000. The season at Henry Lake was about a month in advance of the usual time. The first eggs were taken on April 2, the last on June 5, the total collections being 1,441,000. The work at this point was directed by Mr. W. F. Jarvis, and was satisfactory except for the heavy loss of eggs during incubation, which was due to the fact that sufficient help could not be secured to pick out the dead ones. The losses in hatching were 398,500. During June 923,000 were transferred to Bozeman and 120,000 were hatched and distributed in Henry Lake and vicinity.

In the summer of 1897 a number of steelhead trout escaped from the ponds into Bridger Creek, which flows through the station grounds, and as a result some 200 steelheads this year entered the waste ditch from the creek and 52,000 eggs were secured from them and hatched with little loss, producing fine healthy fry. The fish from which they were taken were scarcely three years old, from 12 to 20 inches long, but were much larger than those of the same age that are confined in ponds at the station and which did not spawn this season.

The brook-trout fry on hand at the beginning of the year were distributed with the other fingerlings in the fall, having been carried through the summer with comparatively light losses.

In November 60,000 eggs were collected from the two-year-old trout reared at the station, and two consignments, comprising 100,000, were shipped from Leadville. The first of these arrived in fair condition, but the last were of poor quality and the losses consequently heavy.

At the close of the year there were on hand the following fish:

Species.	Calendar year in which fish were hatched.			
	1900.	1899.	1898.	1897.
Brook trout	128,000	.....	1,750	932
Black-spotted trout.....	800,000	.....	4,700	183
Steelhead trout.....	44,000	.....	170	5,945
Rainbow trout.....	.....	1,650	.....	.....
Grayling.....	700,000	50	.....	.....
Total	1,672,000	1,600	6,620	7,010

BAIRD STATION, CALIFORNIA (G. H. LAMBSON, SUPERINTENDENT).

During June the racks were put in by the regular employees of the station, but it was noted that the number of salmon in the pool was much smaller than in past years. The equipment for the new hatchery, which had been completed just before the close of the fiscal year, was installed during the summer and consists of 86 troughs, arranged in sections of eight, so that the water from each gate of the supply-trough passes through four troughs of eggs, with a fall of about 9 inches. The upper troughs are 52 inches above the floor and are provided with platforms for the pickers to stand on; the lower troughs are 20 inches above the floor. The troughs are 15 feet 6½ inches long, 15½ inches wide, and 7½ inches deep, inside measurement, and are equipped with 6 baskets each, 24 inches long, 15 inches wide, and 6½ inches deep. These baskets are of galvanized-wire cloth, 5 wires to the inch, ¾-inch mesh, and are substantially made, the corners being soldered to an L strip of galvanized sheet iron extending seven-sixteenths of an inch on each side, and the wire cloth attached at the top to the wooden frame by double-pointed tacks. The compartments in which they are placed are 25 inches long and are separated by pairs of steel plates placed 1½ inches apart. The first division plate is 12 inches from the upper end of the trough and the lowest division 14 inches from the lower end. The troughs are fastened together in pairs by two iron braces made of ½-inch by 1-inch iron, which extend across the bottom and up the sides in the shape of a double L, and are attached by screws. This arrangement leaves the top of the trough open, with no braces in sight, and, moreover, allows the baskets to be shifted without being lifted from the water.

The water supply for the station, which had been very unsatisfactory in the past two years, was increased by the installation of a No. 4 Byron Jackson centrifugal pump, geared to supply about 450 gallons per minute. The power for operating this pump is furnished by an undershot water-wheel, designed by Mr. Leroy Ledgerwood, one of the regular laborers at the station. It is 13 feet long with a radius

of 6 feet $1\frac{1}{2}$ inches, with 18 paddles 19 inches wide. It runs on a $3\frac{1}{2}$ -inch shaft, and makes about 6 revolutions per minute when driving the pump. The power is conveyed by an 8-segment gear of 184 teeth bolted to the framework of the wheel and driving a 24-tooth pinion, to the shaft of which is keyed the main driving-pulley, $6\frac{1}{4}$ feet in diameter. The pump is operated by a 7-inch pulley, driven by an 8-inch rubber belt 80 feet long. This wheel is so built on its supporting frames that by means of a tackle it can be raised or lowered to meet the exigencies of rising or falling waters in the river, as at certain heights of water it becomes impossible to use the water-wheel. To meet such emergencies a steam pumping-plant was installed, capable of furnishing 300 to 400 gallons of water per minute. This plant consists of a Blake special duplex pump, operated by a 15-horsepower Atlas locomotive boiler, and is set about 17 feet above the river at extreme high-water level. It is operated when the regular supply is disabled, and has proved very satisfactory. A suitable building with corrugated-iron roof was erected over this plant.

Fish-cultural work commenced August 21 and continued steadily until September 27, when the summer run was over. The fall run commenced October 18 and continued until November 9. During the first run 14,017 females and 8,047 males were captured in the 353 seine-hauls made; of these, 914 males and 1,222 females were placed in the spawning-pens. From the trap, which is located in the upper rack, 108 females were secured and 34 were taken with a dip net. The total number of fish handled does not indicate the real number in the pool, as it is customary to count them as often as they are caught. There were, perhaps, between 3,000 and 4,000 fish in the pool during the summer run, though not over a third of that number were in the pool at one time. The fall run was very irregular, and only 173 fish were captured; of these, 101 females were placed in the pound.

The seining is done in the pool between the upper and lower racks, and is carried on daily from 5 to 10 a. m. and from 5 to 10 p. m. The seine is run out in a flat-bottomed boat and hauled in by a windlass, operated by two men and a one-horse whim. While operating the seine at night it is necessary to keep a fire on the bank for warmth and light, and lanterns are hung up around the fishing-grounds to enable the men to examine the fish as they are captured.

Many fish are necessarily held in the pool for eight or ten weeks, and it has been noticed that there is a decided difference in the condition of the ripe fish, some being dark, with fins frayed, noses bitten, and of a generally dilapidated appearance, while others are bright, silvery, plump, and pliable. The former are those that have been in the pool for a long time, the latter are fresh-run fish. It is much more difficult to take eggs from the old-run fish, but no experiments have been conducted to determine whether they are actually inferior to the eggs from fresh-run fish.

The methods of taking the eggs are the same as heretofore. After

the fish are stripped the females are knocked on the head and given to the Indians for winter stores, though a few were put up by the white residents during the past season. The males are returned to the river unless there is a scarcity, when they are retained in the pound to be used again, as one male will frequently furnish milt for several pans of eggs.

From the summer run 6,228,260 eggs were secured; from the fall run 186,800, a total of 6,415,060. The summer run averaged 4,896 per fish; the fall run 5,494. After the eggs are taken to the hatchery they are measured and put in baskets, 40,000 to the basket. As the eggs were much smaller this year than heretofore, it was discovered later in the season that the first 72 baskets filled contained 48,800 each.

As soon as the water is turned on the baskets are covered and the dead eggs are picked out every other day until they reach the critical stage, which is usually the fourth or fifth day at this station. They are then left undisturbed until the day after the closing of the blastopore, which usually occurs about the eleventh or twelfth day. At that time they are uncovered and washed without lifting the baskets from the water, which is done by removing the division plates, and after that are picked daily until all dead eggs have been removed.

When the eggs were from 25 to 28 days old 1,000,000 were shipped to the California Fish Commission station on Eel River, and 1,905,000 to the Sisson hatchery. The remainder, with 1,224,000 from Battle Creek, were hatched at the station. Of the eggs taken during the summer run 1,115,000 were lost during incubation and from the fall run 11,880, making a total of 1,126,880, or 17.9 per cent loss on the eggs taken at Baird. Of those transferred from Battle Creek 24,400, or 1.9 per cent, were lost.

Very unfavorable reports were received from the California Fish Commission as to the condition of the eggs sent to Sisson. The shells seemed to be spotted by a thinning of the membrane, and this was followed later by its rupture and consequent death of the aborted fry. The superintendent, accompanied by Mr. Wallich, the foreman at Baird, examined the eggs at Sisson and found the disease present, though not to so great an extent as had been reported. It is believed by the California Commission that it was due to fungus, but as the eggs at Baird during the season had been exceptionally free from this disease, the superintendent was unable to concur in this opinion. Later Mr. Cloudsley Rutter, of the Division of Scientific Inquiry, was detailed to examine into the trouble, but not arriving at Baird until the affected eggs had hatched and most of the fry had been planted, he was unable to make as thorough investigation as was desired. This is not the first appearance of this disease. It has been observed several years previously, but no systematic study involving an examination of the parent fish, eggs, and fry has ever been made, nor has there been any attempt to cultivate the bacteria and determine its

exact nature. The majority of the eggs retained at the station were taken from the first run and commenced to hatch on September 27. They finished on October 27, the yield amounting to 2,208,260.

The eggs from the fall run and from Battle Creek were hatched in October and November, and yielded, respectively, 174,920 and 1,187,050. The loss of fry during the sac stage was comparatively small, amounting to 49,130, or 3.6 per cent of the total fry hatched. Several days before the eggs commence to hatch at this station the baskets are placed in clean troughs, two to each trough, where they remain until all have hatched except a few hundred. The baskets are then transferred to the last section of the trough, as these eggs produce a large percentage of deformed fry. This was particularly noticeable in the eggs from Battle Creek; in some cases both the caudal fin and the caudal vertebræ were apparently lacking. During the process of hatching the baskets are shaken up twice a day to sift the fry through and prevent their smothering. The fry are cleaned daily, but the troughs can not be thoroughly scrubbed until the hatching is completed. Upon the removal of the baskets the troughs are given a good scrubbing and the operation is repeated twice a week until they are planted.

Early in the season the eggs retained for hatching seemed to show an unusual mortality late in their development, but the measurement of losses did not reveal anything to cause alarm. A considerable mortality occurred in the alevins after they were somewhat advanced in development, but in most instances the losses seemed to be individually selective. The victims showed no preliminary affection, and were usually taken from the oldest, strongest, and best lots of fry. As this loss was not due to the fish smothering, it was believed that the depth of water in the troughs might be too great; consequently it was lowered from 6 to 4 inches in another line of troughs, but the results were identically the same. A mud bath was also tried without effect. The greatest loss occurred among the scattered baskets of eggs, which had been retained at the station on account of extraordinary losses upon first picking. This would seem to point to the cause as antedating the taking of the eggs from the fish.

The following table shows the daily take of eggs, eggs lost, and mean temperature of water:

Table showing daily take of eggs, eggs lost, etc., at Baird Station.

Date.	Females stripped.	Eggs taken.	Eggs lost.	Mean water temperature.	Date.	Females stripped.	Eggs taken.	Eggs lost.	Mean water temperature.
1899.					1899.				
Aug. 21	-----	-----	-----	55	Aug. 29	20	102,200	350	55
22	32	175,000		54	30	21	106,000	275	55
23	25	117,900	600	54	31	81	155,400	200	55
24	13	80,200	60	54	Sept. 1	40	206,594	4,400	54½
25	14	80,200		55	2	40	205,455	4,100	53
26	-----	-----	1,200	55	3	50	218,043	9,000	53
27	28	151,000	200	55	4	45	209,855	4,000	53½
28	24	118,500	90	55	5	53	254,343	11,000	52½

Table showing the daily take of eggs, eggs lost, etc.—Continued.

Date.	Females stripped.	Eggs taken.	Eggs lost.	Mean water temperature.	Date.	Females stripped.	Eggs taken.	Eggs lost.	Mean water temperature.
1899.					1899.				
Sept. 6	32	154,378	4,000	52½	Nov. 21	.....	.....	850	52
7	54	275,978	9,400	53½	22	.....	.....	125	53
8	72	335,620	7,800	53½	23	.....	.....	525	49
9	40	206,000	8,500	54	24	.....	.....	500	50½
10	69	344,422	8,700	54½	25	.....	.....	150	51½
11	73	345,054	10,300	54	26	.....	.....	250	52
12	90	432,000	14,900	54½	27	.....	.....	150	52
13	78	357,100	15,600	55	28	.....	.....	100	54½
14	51	254,700	19,300	53½	29	.....	.....	600	53
15	37	176,500	13,800	54	30	.....	.....	450	52
16	36	173,200	15,000	53½	Dec. 1	.....	.....	850	50
17	39	180,700	15,000	53½	2	.....	.....	.....	51
18	36	168,300	21,500	54	3	.....	.....	.....	50
19	36	179,100	24,300	53½	4	.....	.....	750	48
20	35	174,850	20,700	53½	5	.....	.....	.....	47½
21	20	92,650	19,600	53	6	.....	.....	.....	46½
22	.....	.....	22,000	53	7	.....	.....	225	47½
23	24	120,000	22,300	53	8	.....	.....	200	49½
24	.....	.....	20,700	53	9	.....	.....	.....	45½
25	8	48,250	20,700	52½	10	.....	.....	350	47½
26	.....	.....	20,700	52½	11	.....	.....	.....	49
27	6	30,250	18,400	52½	12	.....	.....	300	49
28	.....	.....	26,500	52½	13	.....	.....	.....	45
29	.....	.....	34,500	52½	14	.....	.....	310	43
30	.....	.....	42,700	52½	15	.....	.....	.....	47
Oct. 1	.....	.....	32,000	50½	16	.....	.....	175	49
2	.....	.....	27,600	49½	17	.....	.....	.....	48½
3	.....	.....	36,000	50	18	.....	.....	.....	45
4	.....	.....	73,700	50	19	.....	.....	800	45½
5	.....	.....	83,000	49½	20	.....	.....	.....	46
6	.....	.....	62,000	49½	21	.....	.....	.....	48½
7	.....	.....	20,700	50½	22	.....	.....	200	48½
8	.....	.....	27,000	51½	23	.....	.....	.....	49½
9	.....	.....	59,900	50½	24	.....	.....	470	49
10	.....	.....	46,000	49	25	.....	.....	.....	47
11	.....	.....	59,000	46½	26	.....	.....	.....	47
12	.....	.....	55,000	46	27	.....	.....	325	47
13	.....	.....	16,000	45½	28	.....	.....	.....	44½
14	.....	.....	8,000	47	29	.....	.....	525	44
15	.....	.....	.....	46½	30	.....	.....	.....	46½
16	.....	.....	8,800	46½	31	.....	.....	.....	49
17	.....	.....	6,600	48½	1900.	.....	.....	.....	.....
18	3	.....	4,000	49	Jan. 1	.....	.....	.....	50
19	.....	.....	.....	50	2	.....	.....	.....	51
20	8	18,000	.....	50	3	.....	.....	.....	52
21	2	17,550	.....	50	4	.....	.....	.....	52
22	.....	.....	4,000	49	5	.....	.....	.....	51
23	.....	.....	2,000	48	6	.....	.....	.....	54
24	.....	.....	2,400	47	7	.....	.....	.....	52
25	.....	.....	.....	47	8	.....	.....	.....	48
26	.....	.....	.....	47	9	.....	.....	.....	49
27	.....	.....	525	47	10	.....	.....	.....	50
28	.....	.....	.....	47	11	.....	.....	.....	50
29	1	4,600	.....	46	12	.....	.....	.....	52
30	.....	.....	.....	47	13	.....	.....	.....	50
Nov. 1	4	27,200	.....	48	14	.....	.....	.....	50
2	1	6,800	.....	47	15	.....	.....	.....	51
3	.....	.....	.....	46	16	.....	.....	.....	51
4	8	40,800	.....	46	17	.....	.....	.....	52
5	.....	.....	.....	48	18	.....	.....	.....	51
6	6	28,050	.....	48	19	.....	.....	.....	49
7	.....	.....	.....	47	20	.....	.....	.....	49
8	.....	.....	100	48	21	.....	.....	.....	49
9	6	32,700	40	48	22	.....	.....	.....	48
10	.....	.....	21	49	23	.....	.....	.....	49
11	.....	.....	.....	53	24	.....	.....	.....	48
12	.....	.....	101	55	25	.....	.....	.....	47
13	.....	.....	.....	55	26	.....	.....	.....	47
14	.....	.....	128	56	27	.....	.....	.....	48
15	.....	.....	150	53	28	.....	.....	.....	48
16	.....	.....	150	54	29	.....	.....	.....	50
17	.....	.....	.....	51	30	.....	.....	.....	48
18	.....	.....	1,200	50	31	.....	.....	.....	51
19	.....	.....	1,350	52	Total ..	1,306	3,415,140	1,120,880	.....
20	.....	.....	330	53					
	.....	.....	600	50					

The total of fry lost during the season was 36,280.

The following is a summary of fishing operations:

Month.	Seine hauls.	Trap hauls.	Males taken.	Females taken.	Total taken.	Ripe females im-pounded.	Ripe females stripped.	Percent-age of females ripe.	Ripe males stripped.
1899.									
August	87	3	3,692	6,474	10,166	224	208	3†	133
September.....	266	25	4,425	7,736	12,161	1,142	1,064	14	886
October.....	10	4	45	42	87	13	13	31	11
November.....	11	4	58	59	117	21	21	35	15
Total.....	374	36	8,220	14,311	22,531	1,400	1,306	.....	1,045

BATTLE CREEK, CALIFORNIA (G. H. LAMBSON, SUPERINTENDENT).

The station remained in charge of a watchman until September 10, when work was regularly installed by the superintendent, Mr. W. B. Hunt, an employee of the California Commission, being put in charge of the hatchery and Mr. A. P. Smiley in charge of work on racks, ditches, etc. The main rack was commenced at once and was completed so that no salmon could ascend the stream by September 15, when the energies of the men were directed to completing racks 2 and 3, clearing the seining-grounds between the racks, cleaning out the water-supply ditch, and placing the hatchery apparatus in condition for work.

On October 1, when the first salmon appeared, the water in the Sacramento River was so low that very few fish entered Battle Creek. On October 11 a heavy rainfall raised the creek and brought down a large amount of trash, but only a few salmon were brought up by the rise. Rains continued, and on October 19 racks 2 and 3 had been damaged, No. 3 being partially carried away, but the main rack was uninjured. On October 26 the first haul of the seine was made and about 60 fish secured. Of the 18 females included in this catch only 1 was ripe.

Regular seining commenced on October 28 with a crew of 7 men, and continued to November 18, on which date only 24 fish were secured in 6 hauls of the seine. This season the seine was hauled at intervals of 40 to 60 minutes for about 10 hours during the day, though in previous years when fish were plentiful it has been customary to employ two crews and keep the seine going continuously night and day. When working at night two locomotive headlights are used to illuminate the grounds, and fires are maintained on the banks for the comfort of the workmen.

The season proved a total failure. Only 3,258 fish were captured, and of these 255 yielded 1,420,500 eggs, an average of 4,984 per fish. The usual methods were employed in taking eggs. All eggs were transferred to the hatchery, where they were eyed, 1,224,000 being shipped to Baird and 20,000 to France.

On December 18 the remaining temporary employees were discharged and the regular men transferred to Baird, the property being

left in charge of a watchman. As usual, the adult fish were given to residents in the vicinity of the station, who came in large numbers from 50 miles around for them.

CLACKAMAS STATION, OREGON (S. W. DOWNING IN CHARGE).

Mr. W. F. Hubbard, who had been in charge of this station since its acquisition by the Government, was transferred to Nashua on July 1, and the station left in charge of Mr. J. N. Wisner, field superintendent until July 10, when it was turned over to Mr. S. W. Downing, who had been appointed to the vacancy. The construction of the rack across the Clackamas River, a short distance above the station, was undertaken at once and finished July 25. As the water supply had been very unsatisfactory for a number of years a well was sunk to a depth of about 20 feet near the hatchery, 4 feet below the level of the low-water mark of the Clackamas River, and as the land formation at that depth is of coarse gravel, an abundant supply of water was secured. The water was very clear, of even temperature, and proved of excellent quality for hatching purposes. During the summer the seining-grounds below the rack were cleared and a number of other improvements made.

Operations commenced on September 13, but no ripe fish were taken until the 15th. As there were very few fish below the rack, an agreement was entered into with G. H. Oldenburg to furnish eyed eggs at 40 cents per 1,000, and 775,000 were secured in this way. The fishing at the station resulted in the collection of 619,900, and 620,000 were transferred from the Salmon River, which was being operated by the State Fish Commission. In November 2,436,000 more were received from the Little White Salmon, making a total of 4,450,900 handled during the season. The fry resulting from these, 4,371,422, were liberated in the Clackamas River and Clear Creek, over an area of about 10 miles above and below the station, except 250,000, which were held in troughs and fed until they were four months old, when all were liberated except 2,000 retained for further experiment. On February 25 the fingerlings that were being fed were attacked by fungus, the dorsal and pectoral fins turning white and little white spots appearing on different parts of the body. Salt was applied by drawing the water in the trough down low and then adding a pailful of strong brine. The fry were allowed to remain in this until they showed signs of distress, when fresh water was again turned on. After several such treatments the disease disappeared. The well water was used until November 30, when the water from the spring was turned on. The spring water had been tried early in the season when the eggs were received from the Salmon River, but on account of its high temperature they commenced dying within a few hours after being placed in it.

With the view to getting additional data relative to the number of salmon that return to the streams in which they are liberated, efforts

were made in June to tag the fry that had been held, but although the greatest care was exercised, all the fish experimented with died in a few days. Twenty-four of them were tagged through the mouth, but with the same result. The difficulty in marking such small fish lies in the liability of injury to the scales and fins. Every fish, though handled very carefully with a soft linen cloth, showed white spots or finger marks within 5 minutes after being returned to the water, and on the following day they were covered with fungus.

Experiments were also tried to determine how many eggs are left in a salmon after being stripped by the usual process, and as to the practicability of taking these through an opening in the abdomen. The abdomen was opened and all of the eggs found in the ovaries were washed free of blood and milt applied, but the eggs were of no value. At the Rogue River station, however, very good results were secured, 35,800 of the 53,200 eggs taken being successfully eyed. At that point, in order to avoid possible injury to the eggs by washing, Mr. Berrian bled the fish by cutting off their tails before placing them in the spawning-box. The fry hatched from them appeared to be as healthy and strong as the others, and it was decided that from 400 to 500 eggs per fish could in this manner be saved.

Besides the quinnat-salmon eggs handled here, 150,000 eggs of the silver salmon were received from the Rogue River in January, from which 146,000 fry were hatched and liberated in the Clackamas. One hundred thousand lake-trout eggs shipped from Northville produced 88,000 fry, which were held until March, and then planted in suitable lakes in the State of Washington. Two shipments of white-fish eggs, aggregating 1,000,000, were also received from this station. The first proved a total loss, having been 8 days en route; the other yielded 160,000 fry, which were liberated in Lake Washington, King County, Wash. From the 25,000 rainbow-trout eggs received from the California Fish Commission 22,000 fry were distributed in Meachum, Pearson, and McKay creeks, all tributaries of the Columbia River, near Pendleton, Oreg., at the request of the Oregon Fish Protective Association. On the last of May 144,000 steelhead eggs were transferred from the Rogue River and produced 124,000 fry.

From Bozeman 50,000 grayling eggs were received, which produced 41,000 fry.

On May 7 Mr. Downing was transferred to the superintendency of the Put-in Bay station and was succeeded by Mr. E. N. Carter.

ROGUE RIVER STATION, OREGON.

As the State Fish Commission had decided to operate the Upper Clackamas and Salmon River stations, the superintendent visited Rogue River with Mr. R. D. Hume late in July and arranged to reopen the station there. Large numbers of salmon were to be seen jumping, and to prevent their further ascent a rack was immediately placed across the river. Fishing commenced during the latter part

of August and continued steadily to October 19, when the rack was carried away by high water and all the fish escaped.

The indications are that Rogue River will prove a valuable field for salmon work. There is no doubt but that double as many eggs would have been collected this season had not the rack been carried away. The day it was swept out 264,800 eggs were collected and there were numbers of green fish in the pool. The water of this stream is of the very best quality for hatching operations, the highest temperature recorded being 53°. The following illustrates what may be accomplished in water of this character: A basket containing 8,000 eggs was placed in a trough in the river and left undisturbed for 21 days, when they were found to be perfectly eyed, and only 80 dead ones were picked out; a total loss of 1 per cent.

The take for the season was 4,364,800, of which 1,800,000 were sent to Mr. Hume's hatchery at Wedderburn, Oreg., near the mouth of the Rogue River. The first shipment of 800,000, although two weeks en route and hauled about 100 miles over a wagon road, reached destination with a loss of only about 10 per cent; the second lot carried much better, the loss being only about 1 per cent. They were hatched at Wedderburn and the fry held until they were 3 or 4 inches long, being fed entirely on canned salmon. They were then liberated in the Rogue and its tributaries. The balance of the eggs were hatched at the station, producing 2,156,000 fry, which were liberated in Elk Creek and Rogue River.

Efforts were also made to collect silver-salmon eggs. A rack was placed across Elk Creek on November 19, and on the 27th, when it was carried away by a freshet, 200,000 eggs had been secured. They were of fair quality, and 150,000 of them were eyed, but as the hatchery was overcrowded with quinnat salmon they were shipped to Clackamas.

As numbers of steelhead trout had been observed in Elk Creek it was decided to establish an auxiliary station on that stream, and a point about 10 miles above the station, known as Elk Creek Falls, was selected. Here the stream forks at almost right angles, the falls being in the east branch. By February 1 an effectual barrier to the ascent of the fish up the west branch had been completed in the form of a solid log dam a short distance from the base of the falls, thus compelling the fish to ascend the east branch. A heavy log was then placed across the creek at the upper edge of the falls and pinned to the bed-rock, forming so sudden an ascent that the fish were unable to jump over it. A deep natural channel, with almost level bottom, about halfway up the falls formed an excellent place for a trap, and here the greater portion of the fish were secured. Many fish were also captured on the north side of the falls, where a channel 40 feet long, 2 feet deep, and 4 feet wide was blasted in the solid rock. A small shed 15 by 38 feet, without sides, was erected, and two hatching-troughs set up, the water supply being conveyed to them by means of

a ditch and 100 feet of flume. The first eggs were secured March 7, and the season closed May 11, with a total take of 530,000. Of these 315,000 were shipped to various points in the United States, 70,000 were lost in incubation, and the balance transferred to Clackamas on May 24, when the Elk Creek Falls station was closed.

LITTLE WHITE SALMON STATION, OREGON (J. N. WISNER, SUPERINTENDENT).

The station was opened August 5 and preparations at once commenced for the capture of quinnat salmon. The channel of the river was found blocked by a mass of débris, caused by the lumber company fluming lumber down to the Columbia River. On September 2, after much correspondence and several interviews, the company was induced to discontinue operations, so that in a few days salmon began to appear in the river, and on the 10th fishing was commenced. The daily catch increased steadily until September 25, when the number seemed to have reached its maximum. On that date 1,025,000 eggs were secured, the largest take of the season.

The fish are captured by means of a downstream trap, which consists of a box about 20 feet long by 8 feet wide and 18 inches deep, made of slats placed 2 inches apart, anchored in midstream. The end of the trap pointing upstream is weighted to the bottom of the river and a dam or rack extends from its two sides to within a few feet of either bank. The fish ascending the stream pass around the rack to the spawning-grounds above, and as soon as a sufficient number have collected a seine is drawn downstream at a rapid rate. Although salmon always swim against the current, when frightened they turn and go rapidly downstream, and as a consequence they are brought to a halt high and dry upon the lower end of the trap. They are then quickly assorted and placed in pens near the traps, the males and females being put in separate compartments. Most of the fishing during the season is done at night, the best hauls being usually made about an hour after dark.

Spawning operations commence in the morning and continue until all ripe fish have been stripped. The female is first taken from the pen by the spawn-taker, and if found to be ripe she is killed by striking her upon the back of the head with a club. She is then placed in the spawning-box, which is raised to a vertical position so that the eggs may be stripped into a pan held by an assistant. As soon as the milt is added to the eggs the contents are gently stirred until every egg has come in contact with it. A little water is then added and the pan placed aside for $1\frac{1}{2}$ minutes, when it is handed to a third person, who washes the milt and dirt from the eggs by immersing the pan in water. The eggs are then carried in buckets to the hatchery, measured, and placed in baskets. The buckets hold about 15,000 eggs each, and are carried in pairs by means of yokes, one man carrying two buckets. The baskets to which they are transferred on arriving at the hatchery hold from 25,000 to 40,000 each, depending on the size

of the troughs used. After being placed in the troughs they are covered to exclude the light. On the first, second, and third days the dead eggs are picked off, after which they are not uncovered for at least 30 days, provided the water is clear. At the expiration of this period they are placed in water-buckets and a strong current of water turned on, which causes all of the unimpregnated eggs to turn white, while it does not injure the good ones. After the dead eggs have been removed the remainder are returned to the baskets.

The first eggs were secured September 11 and the last on October 10. During this period 10,385,000 were collected from 2,148 females, making an average of 4,835 per fish; 1,042,125 were lost in incubation; 250,000 were shipped to New Zealand, and 2,436,000 transferred to Clackamas. The eggs retained at the station hatched in November and the fry were liberated in December and January, as soon as the sac was absorbed, in the Little White Salmon, Dog Creek, and the Columbia River, the total loss being only 30,820 during the fry stage. In all 6,626,947 were planted in the streams referred to.

Several experimental forms of hatching and rearing apparatus were tried during the season, but proved unsatisfactory. It is believed, however, that the present forms can be materially improved upon.

Eggs of the blueback salmon were impregnated with milt of the quinnat and, contrary to theory, hatched nicely, the fry resulting being strong and healthy. Eggs of the humpback salmon were also fertilized with milt of the quinnat, giving as good results.

As the result of a number of experiments the conclusion was reached that an average of 825 eggs remain in a salmon after it has been stripped by the usual operation, and of these 48 per cent might be impregnated, or 400 eggs per fish; and, consequently, had all the eggs been removed through an incision made in the abdomen 859,000 more fry could have been hatched. The experiments seemed to demonstrate that where the eggs are removed through an incision and fertilized immediately before the blood is removed the loss would be about 3 per cent, whereas if the blood is quickly rinsed off before the milt is applied the loss is very heavy, sometimes averaging 99 per cent. Of the eggs remaining after the fish has been stripped by the usual method, only 48 per cent could be fertilized when they were removed through an incision.

On one salmon weighing about 40 pounds a lump as large as a man's head was observed immediately under the dorsal fin. The lump was found to consist partly of a gristly growth resembling a tumor and partly of a gelatinous substance, the former being of a light color and the latter of about the same shade as the fish. The eggs from this fish were good, and the lump had apparently not interfered at all with its locomotion. A male was also observed with all the characteristics of a female. Another fish with jaws crossed in such a way as to resemble a pair of shears was noted. The bones seemed not to have been broken.

During the early part of December the force at the station was occupied in building a boom around the premises, cutting down trees near the buildings and flume, and preparing for high water during the following summer. The boom as completed protects all the shore lines from drift. It was made from sticks of timber 40 to 60 feet in length and 12 to 20 inches in diameter. The amount of drift and lumber that settled on the station grounds the previous winter caused very serious inconvenience and necessitated an immense amount of work before the station could be opened.

During the fall the superintendent visited all the streams on both sides of the Columbia River, between Viento and Celilo Falls, Oregon, with the view to establishing auxiliary stations for taking and eying eggs. The only places that offer any possibilities are the falls at Celilo, where by running a fish-wheel during the closed season some ripe fish might be captured. On the Big White Salmon the prospects are better, except that logging operations would prevent the construction of a rack.

In December the station was closed and placed in charge of a watchman, and the superintendent was transferred east for duty in connection with the shad work.

BAKER LAKE STATION, WASHINGTON (H. H. BUCK, SUPERINTENDENT).

In July Mr. J. N. Wisner was instructed to proceed to Baker Lake and receive the station from the Washington Fish Commission, from whom it had been purchased, and turn it over to Mr. W. W. Thayer, who had been appointed superintendent. Mr. Thayer, after visiting the station, resigned and was succeeded by Mr. H. H. Buck, but in the interim Mr. Wisner employed a force of men and commenced clearing the seining-grounds and getting the equipment in readiness for the salmon work. By August 1 the permanent personnel, consisting of a superintendent, fish-culturist, and two laborers, had been appointed, and a good working force of temporary assistants taken on.

All supplies for the use of the station were packed in during August and September, as it is very difficult, if not dangerous, to bring in material late in the fall.

Early in September arrangements were completed for fishing for blueback or sockeye salmon, which seek the lake in large numbers to spawn in still water along its rocky shores. Gill nets 300 feet long and 20 feet deep were employed for the work here, as it was impossible to use seines, as the shores of the lake are covered with heavy timber which must have been killed by a rise of water from 50 to 100 years ago. The task of removing this material would be exceedingly expensive, and as it seems to afford shelter for the young fish and serves as a breeding-place for their food, it is questionable whether it would be advisable to do so. The nets are handled from boats, two

men in a boat, the plan being to attach one end to the shore and pay it out quietly in the arc of a circle around a spawning-bed. The inclosed salmon are then driven into the net by movements of the boat and splashing of the oars. The spawners are put into pens provided near the spawning-shed, which stands upon a large float in front of the hatchery, and the same process is repeated upon another part of the shore. As night approaches the nets may often be left set for two hours or more. On the same day or the one following the fish are handled in the usual manner by the spawn-takers.

The season practically closed October 28, though a few eggs were taken as late as November 10, and resulted in the collection of 11,613,000 eggs from 3,218 females. No record was kept of the number of males, but it is believed that at least 5,000 were used.

The hatchery, which is a wooden structure, is fitted with 74 troughs, each 16 feet long and containing 7 baskets. The number of eggs placed to a basket varied from 30,000 to 40,000, and each trough was given a maximum flow of 12 gallons of water per minute. The period of incubation for the first eggs collected was seventy-two days, at a mean temperature of 45° F., corresponding closely to the rule of fifty days at 50°, and five days more or less for each degree of lower or higher temperature, as established by Seth Green. The hatchery is supplied with water from the creek, which drains the hills on the south side of the lake, its normal volume being about 200 miner's inches of water, equal to about 2,000 gallons per minute. It is unfortunately subject to sudden rises, and at such times is muddy, which will necessitate the erection of a settling tank at some time in the future, in order to guard against losses of eggs.

Of the eggs collected, 92 per cent hatched, and 10,683,000 fry were liberated in the lake and in Skagit River. No attempt was made to ship eggs from the station on account of its isolated position. Hamilton, the nearest railroad station, is 36 miles away, and 18 miles of this distance is over a mountain trail. It is hoped that during the next year a trail will be opened up on the south side to Baker, where the railroad is now extending its tracks.

A few silver salmon appeared in the lake after the bluebacks, but as the hatchery was crowded, no attempt was made to handle them.

An effort was made to collect steelheads when the first fish appeared at the foot of the lake on March 9, but between that time and May 8 only 81 were captured in the gill nets. These were placed in the floating-pens to ripen, but most of them died, the 14 surviving females yielding 52,000 eggs, which hatched in about seventy-five days, in a mean temperature of 40½°. The losses aggregated 50 per cent, and occurred largely in the early stages of development. The mortality was supposed to have been due to the parent fish failing to properly mature their eggs on account of confinement in the pens.

Details of distribution.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Shad:</i>			
State Fish Commission Ponds, Deep River, Conn Stratford, Conn		4,080,000	
Brandywine Creek, Wilmington, Del		2,040,000	
Blackbird Creek, Middletown, Del		5,175,000	
Smyrna Creek, Clayton, Del		300,000	
Leipsic Creek, Cheswold, Del		150,000	
St. Johns Creek, Dover, Del		150,000	
Lebanon, Del		300,000	
Murderkill Creek, Felton, Del		450,000	
Frederica, Del		600,000	
Mispillion Creek, Millford, Del		450,000	
Indian River, Millsboro, Del		600,000	
Anacostia River, Bennings Bridge, D. C		475,000	
Twining City, D. C		1,000,000	
Potomac River, opposite fish lakes, D. C		1,085,000	2,000,000
St. Lucie River, Fort Pierce, Fla		160,000	
New River, Fort Lauderdale, Fla		140,000	
St. Marys River, Macclenny, Fla		200,000	
Suwannee River, Ellaville, Fla		340,000	
Ocklocknee River, Ocklocknee, Fla		340,000	
Aucilla River, Aucilla, Fla		340,000	
Chattahoochee River, Chattahoochee, Fla		376,000	
Tomoka River, Ormond, Fla		60,000	
Spruce Creek, New Smyrna, Fla		60,000	
Savannah River, Augusta, Ga		537,000	
Flint River, Albany, Ga		500,000	
Ocmulgee River, Macon, Ga		500,000	
Ogeechee River, Millen, Ga		500,000	
Potomac River, off Bryan Point, Md		9,072,000	
Piscataquis Creek, Md		1,897,000	
Accocek Creek, Md		2,180,000	
Pomonkey Creek, Md		3,043,000	
Bar Landing, Md		1,070,000	
Broad Creek, Md		2,280,000	
Swan Creek, Md		1,237,000	
Point of Rocks, Md		750,000	
Chesapeake Bay, Battery Haul, Md		4,758,000	
Battery Flats, Md	9,222,000	9,106,000	
Eastern Flats, Md		6,638,000	
Battery Channel, Md	2,071,000	10,598,000	
Susquehanna Flats, Md		2,267,000	
Havre de Grace, Md		621,000	
Western Channel, Md		10,823,000	
Spesutia Narrows, Md		2,157,000	
Carpenter Point, Md		650,000	
Narrows, Md		465,000	
Battery Shoals, Md	6,418,000		
State Fish Commission, Baltimore, Md	4,000,000		
Susquehanna River, Port Deposit, Md		9,692,000	
Garrett Island, Md		1,000,000	
Cooley Point, Md		600,000	
Gunpowder River, Gunpowder station, Md		455,000	
Bush River, Bush River station, Md		1,460,000	
Mill Creek, Mill Creek, Md		1,500,000	
Swan Creek, Swan Creek, Md		2,400,000	
Elk River, Elkton, Md		450,000	
Wicomico River, Salisbury, Md		450,000	
Tuckahoe Creek, Queen Anne, Md		450,000	
Chester River, Chestertown, Md		450,000	
Northeast River, Northeast, Md		483,000	
Patuxent River, Laurel, Md		687,000	
Patapsco River, Relay station, Md		750,000	
Wankinco River, Wareham, Mass		300,000	
Furnace Pond, Hanover, Mass		200,000	
Delaware River, off Gloucester, N. J	895,000		
Howell Cove, N. J	4,054,000	12,832,000	
off Bennett's fishery, N. J	2,483,000	4,093,000	
Millford, N. J		8,220,000	
Lambertville, N. J		12,610,000	
Salem Creek, Salem, N. J		700,000	
Hudson River, Catskill, N. Y		4,100,000	
Albany, N. Y		4,120,000	
Glens Falls, N. Y		2,060,000	
Edenton Bay, Edenton, N. C		990,000	
Albemarle Sound, Edenton, N. C		4,142,000	
Chowan River, Colerain, N. C		967,000	
Mouth of Chowan River, Avoca, N. C		200,000	
Ronoke River, Plymouth, N. C		146,000	
Susquehanna River, Peach Bottom, Pa		525,000	
Fites Eddy, Pa		1,050,000	
Columbia, Pa		450,000	

Details of distribution—Continued.

Species and disposition	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Shad</i> —Continued.			
Delaware River, Lackawaxen, Pa.		450,000	
Delaware Watergap, Pa.		450,000	
State Fish Commission, Bristol, Pa.	6,000,000		
Palmer and Rulin River, Providence, R. I.		500,000	
Point Judith Pond, Wickford, R. I.		500,000	
Pedee River, Pedee, S. C.		412,000	
Santee River, St. Stephens, S. C.		400,000	
Cooper River, Monks Corner, S. C.		400,000	
Combahee River, Yemassee, S. C.		400,000	
Edisto River, Ponpon, S. C.		400,000	
Potomac River, off Craney Island Swash, Va.		4,587,000	
Occoquan Bay, Va.		3,799,000	
Mount Vernon, Va.		2,199,000	
Dogue Creek, Va.		5,485,000	
Hunting Creek, Va.		2,885,000	
Pohick Creek, Va.		7,805,000	
Nansemond River, Suffolk, Va.		485,000	
Moreton Frowen, Queenstown, Ireland	700,000		
Total	38,749,000	202,307,000	2,000,000
<i>Quinnat salmon:</i>			
State Fish Commission, Sisson, Cal.	1,905,000		
Eel River, Cal.	1,000,000		
McCloud River, Baird, Cal.		3,533,950	
Shoal Creek, Neosho, Mo.			200
Gacondade River, Arlington, Mo.			300
Meramec River, Cuba, Mo.			300
Hickory Creek, McMahon Spring, Mo.			350
W. H. Phelps, Carthage, Mo.			200
Clackamas River, Clackamas, Oreg.		4,909,422	
Rogue River, Trall, Oreg.		2,156,945	
Little White Salmon River, Chenowith, Wash.		4,791,823	
Skamania County, Wash.		839,624	
Dog Creek, Chenowith, Wash.		112,000	
Columbia River, Skamania County, Wash.		784,000	
Hatchery Creek, Skamania County, Wash.		100,000	
Government of New Zealand, Wellington, New Zealand	250,000		
J. Williamson, Paris, France	20,000		
Total	3,175,000	16,687,264	1,350
<i>Atlantic salmon:</i>			
Sobec River, Milo, Me.			33,000
Pleasant River, Brownville, Me.			154,692
East Branch Penobscot River, Grindstone, Me.		320,000	197,014
East Branch Mattawamkeag River, Oakfield, Me.		330,000	90,285
West Branch Mattawamkeag River, Island Falls, Me.			45,595
Alamoosook Lake, Orland, Me.			20,671
Toddy Pond, East Orland, Me.		19,630	
Orland and Surry, Me.		78,434	
Penobscot River and tributaries, Brownville, Me.		100,000	
State Fish Commission, Laconia, N. H.	200,000		
Adirondack League Club, Fulton Chain, N. Y.	100,000		
State Fish Commission, Allentown, Pa.	250,000		
Total	550,000	908,073	541,858
<i>Landlocked salmon:</i>			
Herbert W. Burdette, Creede, Colo.	5,000		
State Fish Commission, Windsor Locks, Conn.			3,000
Reservoir, Seymour, Conn.			2,000
Zoological Park, D. C.		3,850	
Embsden Lake, North Anson, Me.			2,000
Newfound Meadow Brook, Oakland, Me.			1,000
Canaan Lake, Camden, Me.			3,000
Wilson Lake, Wilton, Me.			3,000
Phillips Lake, Lakehouse, Me.			3,000
St. George Lake, Thorndike, Me.			2,500
Sysladobis Lake, Grand Lake Stream, Me.			8,000
Grand Lake, Grand Lake Stream, Me.			30,000
Grand Lake Stream, Grand Lake Stream, Me.			67,787
Weld Pond, Wilton, Me.			2,000
City Water Company's reservoir, Belfast, Me.			2,000
Moosehead Lake, Greenville, Me.			6,000
Morrison Ponds, Amherst, Me.			2,000
Long Pond, Mount Desert, Me.			2,000
Hayden Lake, Skowhegan, Me.			2,000
Meddybemps Lake, Eastport Junction, Me.			3,000
Howard Lake, Calais, Me.			3,000
Myrick Lake, Hancock, Me.			2,000
Round Pond, Shirley, Me.			3,000
Molasses Pond, Franklin, Me.			2,000

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Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Landlocked salmon—Continued.</i>			
Donnell Pond, Franklin, Me.			2,000
Moulton Pond, Moulton Lake, Me.			2,000
Woods Pond, Ellsworth, Me.			2,000
Duck and Junior lakes, Duck Lake, Me.			3,000
Lake Maranocook, Augusta, Me.			8,000
Lake Cobboscocontee, Augusta, Me.			3,000
Spring Lake, Carrabassett, Me.			2,000
Varnum Pond, Farmington, Me.			4,000
Clearwater Pond, Farmington, Me.			2,000
Webb Pond, Ellsworth Falls, Me.			4,000
Lake Anasagunticook, Canton, Me.			2,000
Green Lake, Otis, Me.			152,774
Dedham, Me.			3,000
Squaw Pond, Presque Isle, Me.			3,000
Toddy Pond, Orland, Me.			20,154
Surry, Me.		7,000	32,025
Branch Pond, Dedham, Me.			25,000
Patten Pond, Ellsworth, Me.			12,500
Orland, Me.			6,112
Blunt Pond, Ellsworth, Me.			1,500
Silver Lake, Great Pond, Me.			4,000
Crystal Lake, Waldoboro, Me.			500
Lake Moosetocmagantic, Bemis, Me.			2,000
Lunksoo Pond, Grindstone, Me.			1,200
Heart Pond, East Orland, Me.		1,000	
Craig Pond, East Orland, Me.		2,000	
State Fish Commission, Enfield, Me.	30,000		
Chain Ponds, Farmington, Me.			2,000
Seven Ponds, Whittins Station, Mass.			2,000
Lake Quinsigamond, Worcester, Mass.			2,000
North Watuppa Lake, Watuppa, Mass.			2,000
Long Pond and Lake, Falmouth, Mass.			2,000
Lake Pearl, Wrentham, Mass.			1,000
State Fish Commission, Wilkinsonville, Mass.	20,000		
William H. Drew, Plymouth, Mass.	5,000		
G. H. Richards, Wenaumet, Mass.	5,000		
State Fish Commission, Paris, Mich.	5,000		
Crystal Lake, Enfield, N. H.			200
Mascoma Lake, Enfield, N. H.			2,000
Penacook Lake, Concord, N. H.			4,000
Lake Massabesic, Manchester, N. H.			2,000
Dan Hole Pond, Center Ossipee, N. H.			1,000
Bradley Pond, Andover, N. H.			2,000
Lake Winnepesaukee, Laconia, N. H.			2,000
Applicant at Drewsville, N. H.			500
State Fish Commission, Colebrook, N. H.	10,000		
Adirondack League Club, Fulton Chain, N. Y.	10,000		
Tuxedo Club, Tuxedo Park, N. Y.	10,000		
Lake George, Caldwell, N. Y.			5,000
Lake Champlain, Fort Henry, N. Y.			5,000
Paradox Lake, Ticonderoga, N. Y.			500
State Fish Commission, Carolina, R. I.	10,000		
State Fish Commission, Murray, Utah.	10,000		
Derby Pond, Newport, Vt.			1,100
Lake St. Catharine, Poultney, Vt.			1,000
Caspian Lake, Greensboro, Vt.			3,698
Willoughby Lake, Westmore, Vt.			5,995
Long Pond, Westmore, Vt.			2,092
Little Averill Pond, Averill, Vt.			2,980
Lake Dunmore, Salisbury, Vt.			1,500
State Fish Commission, St. Johnsbury, Vt.	20,000		
Total	140,000	13,570	508,487
<i>Silver salmon:</i>			
Clackamas River and Clear Creek, Clackamas, Oreg.		140,824	
<i>Sockeye or blueback salmon:</i>			
Baker Lake and stream, Baker Lake, Washington.		10,683,000	
<i>Steelhead trout:</i>			
Cobboscocontee Lake, Winthrop, Me.		2,800	
Billings Pond, Bluehill, Me.		3,000	
Canaan Lake, Rockland, Me.		2,500	
Rocky Pond, Otis, Me.			3,653
Alamoosook Lake, Orland, Me.			220
Washington Harbor, Washington Harbor, Mich.	5,000		
Grace Harbor, Washington Harbor, Mich.	10,000		
Baldwin Creek, Baldwin, Mich.			4,835
Pickwick Lake, Pickwick, Minn.	13,500		
French River, Duluth, Minn.	15,000		
Sucker River, Two Harbors, Minn.	5,000		
Baptism River, Beaver Bay, Minn.	20,000		

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Steelhead trout</i> —Continued.			
Poplar River, Lutsen, Minn.		20,000	
Eagle Lake, St. Louis County, Minn.		5,000	
Sucker River, Duluth, Minn.		15,000	
Lester River, Duluth, Minn.		5,000	
State Fish Commission, St. Paul, Minn.		20,000	
Clear Creek and Clackamas River, Clackamas, Oreg.		99,000	
State Fish Commission, Murray, Utah.	10,000		
Willoughby Lake, Westmore, Vt.		10,650	2,200
Baker Lake, Baker Lake, Wash.		26,000	
A. J. McNab, Lake Nebagomain, Wis.	50,000		
Trout Brook Company, Hudson, Wis.	25,000		
Brule River, Winneboujou, Wis.		15,000	
State Fish Commission, Laramie, Wyo.	25,000		
Bear Tooth Lake, Bighorn County, Wyo.			5,000
Brooks and lakes, Bighorn County, Wyo.			5,000
Total.....	110,000	301,450	20,414
<i>Loch Leven trout:</i>			
Hartman Pond, South Bend, Ind.		5,000	
Maquoketa River, Forestville, Iowa.			1,700
Applicant at Plymouth, Mich.		3,000	
State Fish Commission, Laconia, N. H.	20,000		
Total.....	20,000	8,000	1,700
<i>Rainbow trout:</i>			
Spring Lake, Seale, Ala.			500
Spring Lake, Springville, Ala.			200
Applicants in Alabama.			500
Liveoak Creek, Flagstaff, Ariz.			2,400
Spring Creek, Denieville, Ark.			3,800
Custer Creek, Batesville, Ark.			1,000
Illinois River, Siloam Springs, Ark.			1,300
Buffalo Creek, Cova, Ark.			1,100
Spring River, Mammoth Springs, Ark.			1,250
Applicants in Arkansas.			1,000
Tumbling Rock Creek, Woodland Park, Colo.			500
Rox Park Lake, Leadville, Colo.			500
North Fork South Platte River, South Platte, Colo.			500
Columbine Lake, Rockwood, Colo.			650
St. Vrain River, Lyons, Colo.			500
Dick Lake, Telluride, Colo.			250
Frees Lake, Cimarron, Colo.			200
Trout Creek, Como, Colo.			500
Lake Lenore, Ouray, Colo.			600
Dallas River, Ridgway, Colo.			300
Frying Pan River, Thomasville, Colo.			500
Ruedi, Colo.			1,000
Norrie, Colo.			500
Eagle Lake, Thomasville, Colo.			300
Lake No. 3, Cimarron, Colo.			300
Lake Alicia, Thomasville, Colo.			300
Fairview Lake, Thomasville, Colo.			300
Spring Creek, Thomasville, Colo.			300
Keno Lake, Aspen, Colo.			400
Applicants in Colorado.			100
State Fish Commission, Hartford, Conn.	30,000		
State Fish Commission, Wilmington, Del.			1,000
Zoological Park, D. C.			300
Chattahochee River, Clarksville, Ga.			800
Ward and Norton creeks, Jasper, Ga.			500
Applicants in Georgia.			1,000
Spirit Lake, Rathdrum, Idaho.			3,000
Applicants in Idaho.			3,000
Thomas Turton, Kilgore, Idaho.	10,000		
Black River, Sallisaw, Ind. T.			1,300
Mill Creek, Bellevue, Iowa.			500
Bear Creek, Edgewood, Iowa.			400
Spring Branch, Manchester, Iowa.			900
Applicants in Kansas.			500
Onawa Lake, Groesville, Me.		1,000	
Canaan Lake, Rockland, Me.		800	
Long Pond, Somesville, Me.		1,000	
Alamoosook Lake, Orland, Me.			0
Black Run, Deer Park, Md.			500
Mountain Stream, Swanton, Md.			550
Spring Branch, Texas, Md.			258
Lake and stream, Glyndon, Md.			200
Applicants in Maryland.			919
State Fish Commission, Worcester, Mass.	15,000		
Stony Creek, Shelly, Mich.			101
Turk Lake, Greenville, Mich.			103

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Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Rainbow trout</i> —Continued.			
Pine River, West Harrisonville, Mich		1,000	
Paint Creek, Ypsilanti, Mich		1,000	
Spring Brook trout hatchery, Kalamazoo, Mich	25,000		
Cowskin River, Lanagan, Mo			1,300
Railroad Pond, Cedargap, Mo			1,250
Railroad Pond, Mountain Grove, Mo			1,250
Piney Creek, Cabool, Mo			1,250
Bennett Mill Spring, Lebanon, Mo			1,700
Baker Lake, Franks, Mo			1,100
Gasconade River, Arlington, Mo			2,300
Meramec River, Cuba, Mo			600
McMahon Spring, Neosho, Mo			500
Hickory Creek, Neosho, Mo			139
Applicants in Missouri			3,200
Elk Springs, Mondak, Mont			5,000
Applicant at Red Rock, Mont			2,000
J. F. Comee, Missoula, Mont	10,000		
State Fish Commission, South Bend, Nebr			8,800
State Fish Commission, Laconia, N. H.	20,000		
Applicant at Drewsville, N. H.			1,550
Musconetcong River, Junction, N. J.			1,000
Reeves Pond, Glassboro, N. J.			1,000
Bandall Pond, Glassboro, N. J.			1,000
Pequest Creek, Belvidere, N. J.			1,000
Cooper Creek, Haddonfield, N. J.			1,000
Applicants in New Jersey			800
Vermejo Creek, Catskill, N. Mex			350
Vermejo Creek, Maxwell City, N. Mex			350
Bayado Creek, Springer, N. Mex			250
Trout Springs, Las Vegas, N. Mex			350
Rio Bonito Creek, Peters, N. Mex			500
Chicarrica Creek, Raton, N. Mex			350
Reservoir, Raton, N. Mex			350
Penasco Creek, Toboggan, N. Mex			300
Fresnal Creek, Fresnal, N. Mex			200
Mal Pais Spring, Three Rivers, N. Mex			700
Mescalero Creek, Tularosa, N. Mex			300
Eagle Creek, Gilmore, N. Mex			500
Ruidosa Creek, Ruidosa, N. Mex			500
Spring Lake, Herkimer, N. Y.			400
Gip Creek, Andrews, N. C.			1,000
Green River, Hendersonville, N. C.			1,000
Yadkin River, Lenore, N. C.			1,000
South Fork New River, Lenore, N. C.			500
Grassy Creek, Marion, N. C.			500
Mountain stream, Marion, N. C.			1,000
Sam Creek, Marion, N. C.			500
Crabtree Creek, Marion, N. C.			500
Buck Creek, Marion, N. C.			500
Clear Creek, Marion, N. C.			500
Beaver Creek, Marion, N. C.			500
Toe Creek, Marion, N. C.			1,000
Pine Branch, Marion, N. C.			500
Canoe Branch, Marion, N. C.			500
Little Bear Creek, Marion, N. C.			500
Rose Creek, Marion, N. C.			500
Gorge Creek, Marion, N. C.			500
North Fork Creek, Marion, N. C.			1,000
Elk River, Elk Park, N. C.			1,000
Baker Creek, Fayetteville, N. C.			500
French Broad River, Biltmore, N. C.			500
Blevin Creek, Cranberry, N. C.			1,000
C. A. Schenck, Biltmore, N. C.	10,000		
Applicants in North Carolina			2,250
Applicant at Oxford, Ohio			
Spring Creek, Bridgeport, Okla.		1,000	
Rock Creek, Shattuc, Okla.			1,000
Silver Lake, Morvin, Okla.			350
Applicants in Oklahoma			500
McKay and Pearson Creek, Pendleton, Oreg		22,303	
Stream and pond, Wilkesbarre, Pa			200
Rogue Harbor Creek, Westover, Pa			450
Buckmountain Dam, Ashland, Pa			300
West Fall Creek, Ashland, Pa			300
Bentley Creek Pond, Tioga, Pa			600
Mill Creek, Tioga, Pa			300
Laurel Creek, Redding, Pa			300
Blair River, Altoona, Pa			300
Three-Spring Run, Altoona, Pa			300
Piney Creek, Altoona, Pa			300
Clover Creek, Altoona, Pa			300
Spruce Creek, Altoona, Pa			300
Bell Run, Altoona, Pa			300

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Rainbow trout</i> —Continued.			
Genesee Fork of Pine Creek, Ulysses, Pa.			1,000
Dyberry Creek, Honesdale, Pa.			600
Butternut Creek, Honesdale, Pa.			600
Boyd Brook, Honesdale, Pa.			300
Lackawaxen River, Honesdale, Pa.			300
East Branch, Honesdale, Pa.			300
Barney Creek, Smethport, Pa.			200
Robbins Brook, Smethport, Pa.			200
Gallup Brook, Smethport, Pa.			200
Daly Brook, Smethport, Pa.			200
Beaver Run, Smethport, Pa.			200
Blacksmith Brook, Smethport, Pa.			200
Boyer Brook, Smethport, Pa.			200
Lock Run, Ralston, Pa.			200
Frozen Run, Ralston, Pa.			400
Lycoming Creek, Ralston, Pa.			200
Mehoopany Creek, Mehoopany, Pa.			300
West Branch Potato Creek, Colegrove, Pa.			200
Black Lick Creek, Ebensburg, Pa.			450
Zeller Run, Mifflinburg, Pa.			450
Raritan Run, Mifflinburg, Pa.			450
Spruce Run, Lewisburg, Pa.			600
Spruce Creek, Tyrone, Pa.			600
Big Fill Run, Tyrone, Pa.			300
McAteer Run, Tyrone, Pa.			300
Brandywine Creek, Avondale, Pa.			600
Spring Brook, Moosic, Pa.			300
Trout and Monument creeks, Moosic, Pa.			400
Lick Run, Roaring Branch, Pa.			300
Roaring Branch, Roaring Branch, Pa.			300
Salt Springs Run, Roaring Branch, Pa.			200
Mill Creek, Roaring Branch, Pa.			1,000
Sugarworks Run, Roaring Branch, Pa.			200
Lycoming Creek, Roaring Branch, Pa.			400
Falling Springs, Chambersburg, Pa.			2,000
Park Creek, Penllyn, Pa.			200
Spring Creek, Penllyn, Pa.			200
Dodge Brook, Harrison Valley, Pa.			400
Marsh Creek, Harrison Valley, Pa.			200
Spring Run, Reynoldsville, Pa.			200
Lamott Branch, New Freedom, Pa.			600
Spring Lake, Frazer, Pa.			300
Sulphur Spring Run, Irvine, Pa.			300
Quakaka Creek and Pond, Shenandale, Pa.			300
Mill Creek, Coudersport, Pa.			400
Allegheny River, Coudersport, Pa.			1,400
Gardiner Spring Brook, Coudersport, Pa.			700
Mill Creek, Birdsboro, Pa.			900
Birdsboro Reservoir, Birdsboro, Pa.			700
Sixpenny Creek, Birdsboro, Pa.			600
Pine Creek, Birdsboro, Pa.			300
Hay Creek, Birdsboro, Pa.			300
French Creek, Birdsboro, Pa.			300
Powdermill Creek, Birdsboro, Pa.			500
Millbach Creek, Sheridan, Pa.			300
Antletam Creek, Waynesboro, Pa.			200
Stone Creek, Huntingdon, Pa.			400
Detwiler Run, Huntingdon, Pa.			200
Spruce Creek, Huntingdon, Pa.			200
Lake of Herod's Queen, Huntingdon, Pa.			200
Middle Fork of Bell Run, Potter County, Pa.			1,000
Cedar Run, Lockhaven, Pa.			600
McElhattan Run, Lockhaven, Pa.			1,200
Fishing Creek, Lockhaven, Pa.			400
Cherry Run, Lockhaven, Pa.			200
Rattlesnake Run, Lockhaven, Pa.			200
Lick Run, Lockhaven, Pa.			200
Spring Run, Lockhaven, Pa.			400
Hyner Creek, Lockhaven, Pa.			200
Spring Meadow Brook, Bedford, Pa.			300
Rock Run, Westover, Pa.			300
Tucquan Creek, Rawlinsville, Pa.			300
Hoover Run, Cresson, Pa.			300
Wallace Run, Bellefonte, Pa.			400
Spring Creek, Bellefonte, Pa.			1,400
Buffalo Creek, Bellefonte, Pa.			200
Logan Branch, Bellefonte, Pa.			400
Rock Run, Bellefonte, Pa.			200
Bons Creek, Johnstown, Pa.			300
Mountain Stream, Johnstown, Pa.			300
Solomon and Adams creeks, Johnstown, Pa.			300
Mosquito Creek, Williamsport, Pa.			600
Wolf Run, Williamsport, Pa.			200

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Rainbow trout</i> —Continued.			
Mill Creek, Scranton, Pa.			200
Pennypack Creek, Willowgrove, Pa.			200
Spruce Creek, Pottsville, Pa.			300
Bear Run, Bear Run, Pa.			1,000
Swamp Run, Bear Run, Pa.			500
Silver Spring Run, Bear Run, Pa.			500
Beech Creek, Snowshoe, Pa.			300
Miller Creek, Hamburg, Pa.			300
Beaver Dam Run, Hooversville, Pa.			300
Rattlesnake Run, Wetham, Pa.			300
Starancea Creek, Lanesboro, Pa.			200
Roaring Run, Wilkesbarre, Pa.			300
Black Creek, Tremont, Pa.			500
Trout Run, Morristown, Pa.			500
McGinnis Run, Ligonier, Pa.			300
North Branch Wopwallopen Creek, Wopwallopen, Pa.			200
Spring Brook, Potterbrook, Pa.			300
Applicant at Kasiesville, Pa.		6,000	
Applicants in Pennsylvania			3,000
Conneross Creek, Wallhalla, S. C.			400
Drake Springs, Sioux Falls, S. Dak.			1,000
Cedar Creek Pond, Morristown, Tenn.			200
Stone River, Murfreesboro, Tenn.			300
Spring Lake, Murfreesboro, Tenn.			300
Collins Spring Branch, Belmont, Tenn.			450
Camp Creek, Greenville, Tenn.			400
Richland Creek, Greenville, Tenn.			400
Spring Lake, Corryton, Tenn.			500
Indian Creek, Agee, Tenn.			500
Caney Creek, Rogersville, Tenn.			500
Dry Creek, Garbers, Tenn.			500
Doe River, Hampton, Tenn.			500
Roan Mountain, Tenn.			500
Laurel Fork, Hampton, Tenn.			500
Elizabethton, Tenn.			1,000
Bee and Glade Creeks, Seals, Tenn.			450
Nolachucky River, Chestoa, Tenn.			1,000
Little River, Maryville, Tenn.			450
South Indian Creek, Unicol County, Tenn.			2,000
Rock Creek, Unicol County, Tenn.			1,000
Indian Creek, Unicol County, Tenn.			2,000
Granny Lewis Creek, Unicol County, Tenn.			400
Dick Creek, Unicol County, Tenn.			1,000
Hollow Poplar Creek, Hollow Poplar, Tenn.			000
Silver Lake, Johnson County, Tenn.			500
Dry Creek, Drycreek, Tenn.			500
Big Creek, Jacksboro, Tenn.			580
Applicants in Tennessee			470
Colony Fork Lake, Ranger, Tex.			500
Beaver Pond, Proctor, Vt.			1,500
South Fork Appomattox River, Appomattox, Va.			500
Tom Creek, Coeburn, Va.			500
Pond and creek, Tazewell, Va.			500
Millpond in Falling River, Brookneal, Va.			500
Hale Spring and brook, Gate City, Va.			500
Millpond, Occoonta, Va.			200
Little River, East Lexington, Va.			500
Dry River, Harrisonburg, Va.			2,500
Dry Run, Wytheville, Va.			50
Tate Run, Wytheville, Va.			1,044
Dan River, Stuart, Va.			910
Millpond, Glade Spring, Va.			300
Big Stoney Creek, Pearisburg, Va.			500
Abraham Creek, Winchester, Va.			500
Reservoir, Crozet, Va.			200
Water Company's reservoir, Roanoke, Va.			500
Howardin Run, Hot Springs, Va.			500
Healing Springs Creek, Hot Springs, Va.			1,000
Reservoir, Lynchburg, Va.			500
Spring Brook, Winchester, Va.			500
Van Clure Spring, Winchester, Va.			20
Mountain Lake, Mountain Lake, Va.			1,000
Walker Little Creek, Pulaski City, Va.			1,500
Big Stoney Creek, Pembroke, Va.			1,000
Tye River, Vesuvius, Va.			500
Mill Creek, Millboro, Va.			1,500
Applicant at Round Hill, Va.			22
Applicants in Virginia			3,500
Snowy Creek, Terra Alta, W. Va.			300
Indian Run, Berkeley Springs, W. Va.			500
Meadow Brook, Berkeley Springs, W. Va.			500
White Oak Spring Run, Terra Alta, W. Va.			500
Ice Pond, Bens Run, W. Va.			250

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Rainbow trout</i> —Continued.			
Tug River, Naugatuck, W. Va			698
Tuscarora Creek, Martinsburg, W. Va			500
Spring Lake, Martinsburg, W. Va			1,000
Southwood Spring, Martinsburg, W. Va			500
Glade Creek, Glade, W. Va			475
Laurel Creek, Alderson, W. Va			325
Tygart Valley River, Elkins, W. Va			500
Blackwater River, Davis, W. Va			1,000
Rocky Marsh Run, Shepherdstown, W. Va			500
Black Run, Huttonsville, W. Va			1,000
Cheat Mountain hatchery ponds, Huttonsville, W. Va			500
Browning Dam, Preston County, W. Va			1,000
Indian Creek, Fort Spring, W. Va			800
Trout Run, Romney, W. Va			500
Little Kanawha River, Burnsville, W. Va			500
Elk River, Sutton, W. Va			500
Tributaries of Spruce Run, Harman, W. Va			500
Applicants in West Virginia			1,300
F. A. Degler, Cheat Bridge, W. Va	25,000		
State Fish Commission, Sheridan, Wyo.	20,000		
Laramie, Wyo.	25,000		
H. M. Phipps, Inverness, Scotland	10,000		
Walter Bailey, Malvern Wells, England	20,000		
John Dinsmore, Ballymena, Ireland	20,000		
Moreton Frewen, Innishannon, Ireland	15,000		
Total	255,000	34,100	203,572
<i>Black-spotted trout:</i>			
Ross Pond, Granite, Colo			10,000
Castlewood Lake, Castlerock, Colo			20,000
Brush Creek, Eagle, Colo			20,000
Spring Lake, Twinlakes, Colo			10,000
South Platte River, Alma, Colo			20,000
South Platte River and tributaries between Grant and Buffalo, Colo			40,000
Grand Lake, Grandlake, Colo			20,000
State Fish Commission, Denver, Colo			75,000
Prospect Lake, Telluride, Colo			20,000
Mammoth Creek, Mammoth Lake, South Boulder Creek, Jenny Lind Creek, Central City, Colo			20,000
North and south branches of St. Vrain River, Lyons, Colo			20,000
Los Pinos River, Cumbres, Colo			25,000
South Bear and Marshall creeks, Iola, Colo			25,000
Gypsum Creek, Gypsum, Colo			15,000
Texas Creek, Cotopaxi, Colo			15,000
Frying Pan River, Thomasville, Colo			50,000
Surface Creek, Delta, Colo			20,000
Eagle River, Wolcott, Colo			20,000
R. A. Osborn, Rea, Idaho	10,000		
Twin Lakes, Rathdrum, Idaho			5,000
Spirit Lake, Rathdrum, Idaho			5,000
Anderson millpond, Vollmer, Idaho			5,000
Henry Lake, Fremont County, Idaho		10,000	
Lake Palmer, near Butte, Mont			5,000
Little Blacktail Lake, near Butte, Mont			5,000
Spring Brook, Redrock, Mont			5,000
Bozeman Fork Creek, Leadboro, Mont			10,000
Spring Creek millpond, Lewis, Mont			10,000
Sixteen-mile Creek, between Lombard and Dorsey, Mont			10,000
Little Boulder Creek, Boulder, Mont			10,000
Cottonwood Creek, Bozeman, Mont			10,000
Tributaries of Big Hole River, Browns Station, Mont			10,000
Wisconsin Lake, Twin Bridges, Mont			10,000
Vincent Lake, Anaconda, Mont			10,000
Rock Creek, Browns Station, Mont			10,000
Reservoir, Lewiston, Mont			10,000
Basin Lake Reservoir, Portage, Mont			5,000
Gold Creek, Pioneer, Mont			5,000
Marias Run, Shelby, Mont			20,000
Spring Creek, Salesville, Mont			10,000
Cliff Lake, Monida, Mont			
Waterdog Lake, Sweetgrass, Mont		20,000	
Mill Creek, Salem, Oreg			10,000
South Fork Spearfish Creek, Elmore, S. Dak			2,000
Beaver Creek, Buffalo Gap, S. Dak			2,000
Silver Creek, Sturgis, S. Dak			4,000
Rosebud and Rock creeks, Rosebud Agency, S. Dak			2,000
Applicants in South Dakota			5,000
Camil Lake, Blossburg, Wash			3,000
Lake Creek, Harrington, Wash			4,000

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Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Black-spotted trout</i> —Continued.			
Little Spokane River, Spokane, Wash.			10,000
Plugh Creek, Spokane, Wash.			5,000
Natches River, North Yakima, Wash.			5,000
Yakima River, Cle Elum, Wash.			5,000
Touchet River, Dayton, Wash.			5,000
Sequillitchew, Tacoma, Wash.			10,000
American Lake, Tacoma, Wash.			10,000
Gravelly Lake, Tacoma, Wash.			10,000
State Fish Commission, Laramie, Wyo.	75,000		10,000
Bear Tooth Lake, Bighorn County, Wyo.			10,000
Sunlight Creek, Bighorn County, Wyo.			10,000
Total.....	85,000	120,000	737,000
<i>Brook trout:</i>			
Robert Mathis, Cajon, Cal.	10,000		
South Platte River, Florissant, Colo.		3,000	10,000
Hartsell, Colo.		10,000	
Lake Louore, Ouray, Colo.		5,000	
Mahon Brook, Buenavista, Colo.		5,000	
Frying Pan River, Basalt, Colo.		10,000	
Norrie, Colo.		5,000	
Thomasville, Colo.		5,000	
Ruedl, Colo.		10,000	
Spring Creek, Montrose, Colo.		13,000	
Reservoir, Eastonville, Colo.		3,000	
Lake Alicia, Thomasville, Colo.		3,000	
Dallas River, Ridgway, Colo.		5,000	
Lake Isherwood, Salida, Colo.		1,000	
South Arkansas River, Salida, Colo.		11,000	
Lake No. 3, Cimarron, Colo.		3,000	
Big Cimarron River, Cimarron, Colo.		5,000	
Little Cimarron River, Cimarron, Colo.		5,000	
Spring Lake, Cimarron, Colo.		2,000	
Eagle River, Berrys Station, Colo.		10,000	
Wolcott, Colo.		15,000	20,000
Chaquauqua Lake, Telluride, Colo.		5,000	
Lake San Cristobal, Lake City, Colo.		10,000	
Lake Fork Gunnison River, Lake City, Colo.		10,000	
Bear Creek, Morrison, Colo.		3,000	
North Fork Big Thompson River, Loveland, Colo.		10,000	
Summit Lake, Sawpit, Colo.		5,000	
Tennessee Creek, Leadville, Colo.		20,000	
Goose Creek, Wagonwheel Gap, Colo.		20,000	
Mount Sopris Lake, Carbondale, Colo.		10,000	
Applicants in Colorado		14,000	
State Fish Commission, Hartford, Conn.	20,000		
Kettle Brook, Hartford, Conn.		14,985	
Norwalk River, South Wilton, Conn.		10,000	
Shotgun Creek, Spencer, Idaho.			4,000
Blue Lake, Blue Lake, Idaho.			8,000
Fish Lake, Rathdrum, Idaho.			4,000
Thorp Lake, Rathdrum, Idaho.			2,000
Elk Creek, Kendrick, Idaho.			8,000
R. A. Osborn, Rea, Idaho.	15,000		
Galeon River, Hatch Mills, Ind.		10,000	
St. Jo Pond and Creek, South Bend, Ind.		10,000	
Graveyard Run, Mongo, Ind.		5,000	
Spring Lake, Niles, Ind.		1,000	
Applicants in Indiana		2,000	
Canoe and Bear creeks, Decorah, Iowa.			2,000
Mill Creek, Bellevue, Iowa.			2,000
Snymagill Creek, McGregor, Iowa.			2,000
Village Creek, Lansing, Iowa.			5,000
Clear Creek, Lansing, Iowa.			5,000
Bacon Creek, Lansing, Iowa.			5,000
Bear Creek, Edgewood, Iowa.			2,000
Maquoketa River, Forestville, Iowa.			5,250
Manchester, Iowa.			5,000
Spring Branch, Manchester, Iowa.		25,000	5,800
Applicants in Iowa			1,300
Lake Walking, Milldale, Ky.			450
Lake Isham, View, Ky.			450
Applicant at Nolin, Ky.			180
Canaan Lake, Camden, Me.		10,000	
Norton Lake, Camden, Me.		10,000	
Otter Pond, Bingham, Me.		10,000	
Jewett Pond, Bingham, Me.		5,000	
Reno Pond, Bingham, Me.		5,000	
Clear Pond, Bingham, Me.		5,000	
Rowe Pond, Bingham, Me.		5,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Brook trout—Continued.</i>			
Pierce Pond, Bingham, Me		20,000	
Great and Long ponds, Belgrade, Me		10,000	
Webb Pond, Ellsworth, Me		10,000	
Patten Pond, Ellsworth, Me		25,000	
Lake Anasagenticook, Canton, Me		10,000	
Wapskalugan and Moosehorn brooks, Charlotte, Me		5,000	
Varnum Pond, Farmington, Me		5,000	
Clearwater and Worth ponds, Farmington, Me		10,000	
St. George Lake, Thordike, Me		10,000	
Pennamaquan Creek, Calais, Me		5,000	
Meadow Brook, Calais, Me		5,000	
Wilson Lake, Wilton, Me		10,000	
Farmachene Lake, Bethel, Me		20,000	
Craig Pond, Orland, Me			5,210
Craig Brook, East Orland, Me		4,578	
Water company's reservoir, Belfast, Me		5,000	
Mooshead Lake, Greenville, Me		25,000	
Jordan Pond, Bar Harbor, Me		10,000	
Eagle Lake, Bar Harbor, Me		10,000	
Lake Thompson, Oxford, Me		10,000	
Branch Pond, Dedham, Me		35,000	
Holland Pond, Alton, Me		15,000	
Green Lake, Otis, Me		8,644	
Israel Creek, Walkersville, Md			775
Lake and stream, Oakland, Md			1,000
Pond and spring, Brownsville, Md			400
Turkey Run, Emmitsburg, Md			775
Mountain stream, Swanton, Md			1,000
Henson Branch, Silverhill, Md			365
Spring Branch, Texas, Md			32
Applicants in Maryland			400
Fuller Brook, North Attleboro, Mass		10,000	
North Branch Creek, Springfield, Mass		10,000	
Mist Pond, Cottage City, Mass		10,000	
Pond and stream, Cottage City, Mass		5,000	
Lake Quinsigamond, Worcester, Mass		10,000	
State Fish Commission, Worcester, Mass	20,000		
State Fish Commission, Wilkinsonville, Mass	25,000		
Samoset Ponds, Fall River, Mass		5,000	
Mill Brook, Medfield, Mass		10,000	
Cold Spring Brook, Lawrence, Mass		5,000	
Applicant at Cambridge, Mass			100
Spring Brook, Milford, Mich		5,000	
Cedar Creek, Pentwater, Mich		5,000	
Boardman River, Traverse City, Mich		2,500	
Silver and Gold creeks, East Tawas, Mich		20,000	
Witch Lake, Marquette County, Mich		5,000	
Red Run, Dorr, Mich		5,000	
Burch Creek, Greenville, Mich		9,000	
Silver Creek, West Harrisonville, Mich		5,000	
Hubbard Lake, West Harrisonville, Mich		5,000	
Vaughn Creek, Emery Junction, Mich		10,000	
Cedar Creek, West Greenbush, Mich		5,000	
Norton Creek, Wixom, Mich		5,000	
Halfway Creek, New Richmond, Mich		10,000	
Branch of Paint Creek, Oxford, Mich		5,000	
Spring Brook, Eau Claire, Mich		5,000	
McEwan Creek, Clare, Mich		5,000	
Silver Creek, Clare, Mich		5,000	
McKinley Creek, Clare, Mich		5,000	
Chippewa lakes and streams, Lake Station, Mich		10,000	
Grand River, Hanover, Mich		10,000	
Nottawasippi Creek, Union City, Mich		5,000	
Coldwater Creek, Freeport, Mich		5,000	
Boardman River, South Boardman, Mich		10,000	
Kalkaska, Mich		10,000	
Boyne River, Elmira, Mich		10,000	
Little Manistee River, Canfield, Mich		22,500	
Washington River, Washington Harbor, Mich		7,000	
Sturgeon River, Trowbridge, Mich			154
Cook Valley Creek, Kellogg, Minn			3,000
Trout Brooks, Northfield, Minn			11,000
Beaver River, Beaverbay, Minn		10,000	
Baptism River, Beaverbay, Minn		7,000	
Shingobe Creek, Walker, Minn		5,000	
Stuart River, Waldo, Minn		10,000	
Poplar River, Lutsen, Minn		5,000	
French River, Duluth, Minn		8,000	
Sucker River, Duluth, Minn		8,000	
Tlacher Creek, Duluth, Minn		6,000	
Bear Gulch Creek, Bozeman, Mont			3,000
Beaver Creek, Fort Assiniboine, Mont			3,000

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Brook trout</i> —Continued.			
J. F. Comee, Missoula, Mont.	20,000		
Walnut Creek, Nebraska City, Nebr.			4,000
State Fish Commission, Laconia, N. H.	20,000		
Spring Brooks, Concord, N. H.		20,000	
Wild Meadow Brooks, Grafton, N. H.		10,000	
McQueston Brook, Nashua, N. H.		10,000	
Whitten Pond West Ossipee, N. H.		10,000	
A. M. Bigelow, Branchville, N. J.	20,000		
Paulins Kill River, Washingtonville, N. J.			1,000
J. Minton, Las Vegas, N. Mex.	10,000		
Harrison Brook, Oneonta, N. Y.			400
Oneonta Creek, Oneonta, N. Y.			800
Charlotte Creek, Oneonta, N. Y.			400
Harrison Brook, Oneonta, N. Y.			400
Keyes Brook, Oneonta, N. Y.			400
Otego Creek, Oneonta, N. Y.		18,750	
Elk Creek, Worcester, N. Y.			800
Owego Creek, Owego, N. Y.			800
Nigger Hollow Swamp, Sherburne, N. Y.			750
Tiquin, Limon, and Howard brooks, Sherburne, N. Y.		18,750	
Montfredy Brook, Syracuse, N. Y.			800
Trout Creek, Schenectady, N. Y.			400
Van Epps Brook, Schenectady, N. Y.			400
Cedarvale and Judd brooks, Syracuse, N. Y.		15,000	
Lishas Kill Brook, Niskayuna, N. Y.			400
Toughnoga River, De Ruyter, N. Y.		44,000	750
Quaker Brook, Patterson, N. Y.			800
Otsdawa Creek, Otego, N. Y.			800
Moyer Brook, Frankfort, N. Y.		12,500	
Richmondville Creek, Richmondville, N. Y.		18,750	
Schenevus Creek, East Worcester, N. Y.		12,500	
Canisteo River, Hornellsville, N. Y.		15,000	
Edwards and Burchard brooks, Waterville, N. Y.		18,750	
Tributaries of Stony Brook, St. Regis Falls, N. Y.		40,000	
State Fish Commission, Watertown, N. Y.		30,000	
Spring Brook, Littleton, N. C.			500
Applicant at Morrisville, N. C.			200
Spring Lake, Sheldon, N. Dak.		5,000	
Silver Lake, Bellefontaine, Ohio		5,000	
Spring Lake, Bellefontaine, Ohio		5,000	
Applicants in Ohio		9,500	
Applicant at Junction City, Oreg.			2,000
Tobyhanna Creek, Tobyhanna Mills, Pa.			300
Butternut Creek, Honesdale, Pa.			300
Swamp Brook, Honesdale, Pa.			300
Middle Creek, Honesdale, Pa.			300
Lackawaxen River, Honesdale, Pa.			600
Goodrich Brook, Honesdale, Pa.			300
Paddy Run, Renovo, Pa.			300
Drury Run, Renovo, Pa.			300
Pond and stream, Berwindale, Pa.			200
Sandy Run, Edgehill, Pa.			300
Mill race and pond, Bedford, Pa.			500
Clover Creek, Altoona, Pa.			300
Valley Creek, Valley Forge, Pa.			500
Bear Run, Bear Run, Pa.			500
Allegheny River and tributaries, Coudersport, Pa.			1,000
Crescent Lake, Cocono Summit, Pa.			300
Painter Creek, Moosic, Pa.			300
Laurel Run, Cresson, Pa.			300
Lick Run, McElhattan, Pa.			500
Rock Run, McElhattan, Pa.			200
Spring Run, McElhattan, Pa.			300
Rhodes Branch, New Freedom, Pa.			300
Solomon and Adams creeks, Johnstown, Pa.			300
Spring Creek, Bellefonte, Pa.			200
Hagerman Run, Williamsport, Pa.			600
Mountain Stream, Wetham, Pa.			300
Rattlesnake Run, Wetham, Pa.			1,100
Plumb Run, Lockhaven, Pa.			300
Beech Creek, Snowshoe, Pa.			200
Cook Creek, Troy, Pa.			300
Ballard Creek, Troy, Pa.			300
Morgan Creek, Troy, Pa.			300
Slannera Creek, Susquehanna, Pa.	12,500		
Starruca Creek, Susquehanna, Pa.	15,000		
Applicants in Pennsylvania			1,100
Bartlett Brook, Providence, R. I.	10,000		
Applicant at Providence, R. I.	3,000		
Queons River and tributaries, Kingston, R. I.	10,000		
Little Spearfish Creek, Deadwood, S. Dak.	5,000		

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Brook trout—Continued.</i>			
South Fork Spearfish Creek, Englewood, S. Dak		5,000	
Whitewood Creek, Englewood, S. Dak		15,000	
Rapid Creek, Rapid City, S. Dak		10,000	
Spring Lake, Fairfax, S. Dak		5,000	
Cascade River, Cascade, S. Dak		5,000	
Pond and stream, Spearfish, S. Dak		5,000	
Crow Creek, Spearfish, S. Dak		5,000	
Horse Creek, Sheridan, S. Dak		5,000	
Beaver Creek, Buffalo Gap, S. Dak		5,000	
Falsebottom Creek, Minnesota, S. Dak		5,000	
Rosebud and Rock creeks, Rosebud Agency, S. Dak		10,000	
Lake Creek, Pine Ridge Agency, S. Dak		8,333	
Wolf Creek, Pine Ridge Agency, S. Dak		8,333	
American Horse Creek, Pine Ridge Agency, S. Dak		8,334	
Box Elder Creek, Nemo, S. Dak		5,000	
Applicants in South Dakota		13,000	
Stone Creek, Murfreesboro, Tenn			90
Spring Lake, Murfreesboro, Tenn			80
Pine and Falling Water creeks, Watertown, Tenn			900
Fall Creek, Hohenwall, Tenn			450
Buffalo River, Linden, Tenn			450
Big Stony Creek, Elizabethton, Tenn			982
Martin Creek, Unicoi County, Tenn			1,668
Mill Creek, Unicoi County, Tenn			1,000
Granny Lewis Creek, Unicoi County, Tenn			1,000
Crow Branch Fishery, Tenn.			9,380
Rock Creek, Rock Creek, Tenn			400
Ponds and springs, Erwin, Tenn			921
Applicants in Tennessee			1,728
Pinewood Lake, Clarksville, Tenn			270
State Fish Commission, Murray, Utah	50,000		
Orson Saunders, Salt Lake City, Utah	5,000		
Caspian Lake, Greensboro, Vt		49,985	3,134
Little Leach Pond, Averill, Vt		20,000	2,775
Henderson Brook, Salisbury, Vt			300
Vermont State Fish Commission, Colebrook, N. H	50,000		
F. J. Robinson, North Underhill, Vt	5,000		
S. L. Griffith, Danby, Vt	100,000		
Spring Brook, White River Junction, Vt		10,000	
Frog Pond, Waterford, Vt		5,000	
Mill Brook, Newport, Vt		15,000	
Mason Pond, Randolph, Vt		5,000	
Hatch Brook and pond, Randolph, Vt		5,000	
Ayer and Peth brooks, Randolph, Vt		10,000	
Molly Brook, West Danville, Vt		10,000	
Caledonia Trout Ponds, St. Johnsbury, Vt		20,000	
Hastings Brook, St. Johnsbury, Vt		5,000	
Passumpsic River, St. Johnsbury, Vt		2,500	
Tributaries of Sloop River, St. Johnsbury, Vt		10,000	
Carr, Scyles, and Rousing brooks, East Concord, Vt		10,000	
Hawitt Brook, Bristol, Vt		5,000	
Lake Mitchell, West Norwich, Vt		50,000	
Quinby Mill Pond, Sharon, Vt		5,000	
Joe Brook, Walden, Vt		5,000	
Spring Branch, Brownington, Vt		10,000	
Water Andrick Brook, Passumpsic, Vt		5,000	
Danville, Vt		5,000	
Stanton Brook, North Danville, Vt		5,000	
Craven Brook, North Danville, Vt		10,000	
Rake Factory Brook, East Barnett, Vt		5,000	
Waterford Brook, Passumpsic, Vt		5,000	
Lewis Creek, Vergennes, Vt		10,000	
Branch Brook, South Wallingford, Vt		10,000	
Pico Pond, Rutland, Vt		50,000	
Sherburne, Vt		49,800	
Streams at Stowe, Vt		10,000	
Groves Brook, Kirby, Vt		2,800	
Wheelock Brook, Lyndon, Vt		5,000	
Big Fish Pond, Lyndon Center, Vt		10,000	
Bean Pond, South Barton, Vt		5,000	
Summit Pond, South Barton, Vt		5,000	
Stevens Brook, Barnett, Vt		5,000	
Baldwin Pond, Starksboro, Vt		10,000	
Applicants in Vermont		15,000	
Mountain stream, Linden, Va			400
Darb Creek, Winchester, Va			500
Applicants in Virginia			573
Diamond Lake, Cunden, Wash			3,000
Lake Wildwood, New Whatcom, Wash			3,000
Little Spokane River, Spokane, Wash			5,000
Ahtanum River, North Yakima, Wash			1,000

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Brook trout</i> —Continued.			
Touchet River, Dayton, Wash			1,000
Chambers Creek, Tacoma, Wash			250
Lake Steilacoon, Tacoma, Wash			250
F. A. Degler, Cheat Bridge, W. Va.	25,000		
Salt Lick Creek, Terra Alta, W. Va.			500
Big and Meadow Runs, Huttonsville, W. Va.			1,000
Spring Lake, Martinsburg, W. Va.			500
Applicants in West Virginia			750
Trout Brook, Woodruff, Wis.			1,000
Lake Nebagemain, Lake Nebagemain, Wis.		10,000	
Black River, Foxboro, Wis.		10,000	
State Fish Commission, Sheridan, Wyo.	35,000		
Laramie, Wyo.	75,000		
Brooks and lakes, Bighorn County, Wyo.			4,000
Bear Tooth Lake, Bighorn County, Wyo.			2,000
H. M. Phipps, Inverness, Scotland	20,000		
Total	534,000	1,067,062	195,021
<i>Lake trout:</i>			
State Fish Commission, Windsor Locks, Conn.		25,000	
Quoninnaug Lake, New Haven, Conn.		25,000	
State Fish Commission, Enfield, Me.	350,000		
Donnell Pond, Franklin, Me.		55,000	
Long Pond, Great Pond, Me.		40,000	
Morrison Lake, Green Lake, Me.		20,000	
Rocky Pond, Otis, Me.		45,000	
Green Lake, Otis, Me.		21,000	
Holbrook Pond, Holden, Me.		45,000	
Little Fitz Pond, Holden, Me.		45,000	
Phillips Lake, Dedham, Me.		45,000	
Tunk Pond, Sullivan, Me.		40,000	
Schoodic Lake, Schoodic, Me.		150,000	
Belgrade Lake, Belgrade, Me.		41,000	
Messalouskee Lake, Belgrade, Me.		40,000	
Watuppa Lake, Fall River, Mass.		25,000	
Lake Huron, Alpena, Mich.		20,000	14,000
East Tawas, Mich.			15,000
Chelcoygan, Mich.			14,000
Lake Huron, off Scarecrow Island, Mich.		125,000	
North Point, Mich.		125,000	
Middle Island, Mich.		125,000	
Thunder Bay Island, Mich.		500,000	
Lake Michigan, Charlevoix, Mich.		1,962,500	9,600
Manistique, Mich.		987,500	
Lake Superior, Bay Mills, Mich.		800,000	
Ontonagon, Mich.		500,000	
Long Point, Mich.		280,000	
Firesteel River, Mich.		280,000	
Fourteen-mile Point, Mich.		280,000	
Washington Harbor, Mich.		280,000	
Keystone, Mich.		210,000	
Little Montreal River, Mich.		210,000	
Rock Harbor, Mich.		280,000	
Fish Island, Mich.		140,000	
Tobins Harbor, Mich.		140,000	
Todds Harbor, Mich.		280,000	
Hamlin Lake, Ludington, Mich.			15,000
Straits of Mackinac, Mackinaw City, Mich.		2,000,000	14,850
Walnut Lake, North Farmington, Mich.			2,700
State Fish Commission, Reed City, Mich.	1,500,000		
Sault Ste. Marie, Mich.	350,000		
Portage Lake, Ypsilanti, Mich.		50,000	
Union Lake, Commerce, Mich.		100,000	
Pine Lake, Charlevoix, Mich.		500,000	
Round Lake, Hanover, Mich.		20,000	
Beaver Lake, Alpena, Mich.		100,000	
Turtle Lake, Alpena County, Mich.		65,000	
Eagle Lake, Willmar, Minn.		28,000	
Bear Lake, Akely, Minn.		10,000	
Leech Lake, Walker, Minn.		25,000	
Lake Superior, Duluth, Minn.		2,000,000	
Grand Portage, Minn.		227,500	
Hovland, Minn.		280,000	
Beaver Bay, Minn.		560,000	
Lutsen, Minn.		420,000	
Lake Winnisquam, Laconia, N. H.		30,000	
Granite Lake, Hudson Center, N. H.		20,000	
Lake Winnepesaukee, Weirs, N. H.		112,425	
New Pound Lake, Bristol, N. H.		45,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
<i>Lake trout—Continued.</i>			
Lake Asquam, Ashland, N. H.		52,500	
Babosc Pond, Amherst, N. H.		10,000	
Dublin Lake, Dublin, N. H.		5,900	
Lake Masabesic, Hillsboro and Rockingham counties, N. H.		8,730	
Adirondack League Club, Fulton Chain, N. Y.	300,000		
State Fish Commission, Caledonia, N. Y.	500,000		
Coldspring Harbor, N. Y.	1,000,000		
St. Lawrence River, Cape Vincent, N. Y.		36,200	
Lake Ontario, off Grenadier Island, N. Y.		730,600	
Tibbetts Point Lighthouse, N. Y.		1,100,000	
Lower Tumbling Run Lake, Pottsville, Pa.		8,368	
State Fish Commission, Murray, Utah	500,000		
State Fish Commission, Roxbury, Vt.	300,000		
Lake Dunmore, Salisbury, Vt.		50,000	
Willoughby Lake, Westmore, Vt.		20,000	
Harvey Pond, Barnett, Vt.		15,000	
Great Averill Pond, Averill, Vt.		10,000	
Stone Pond, Barton, Vt.		10,000	
Newman Lake, Hauser, Wash.		14,955	
Loon Lake, Loonlake, Wash.		28,637	
Lake Washington, Seattle, Wash.		21,985	
Lake Whatcom, New Whatcom, Wash.		17,822	
Applicant at Wenatchee, Wash.		5,000	
Lake Superior, Bayfield, Wis.		280,000	
Sand Island, Wis.		700,000	
Madoline Island, Wis.		280,000	
Bark Point, Wis.		560,000	
Lake Nebagemain, Lake Nebagemain, Wis.		400,000	
Crooked Lake, Woodruff, Wis.		30,000	
State Fish Commission, Laramie, Wyo.	200,000		
Sheridan, Wyo.	50,000		
Lake Superior, Port Arthur, Ontario, Canada		304,500	
Total	5,050,000	19,577,415	86,650
<i>Scotch sea trout:</i>			
Heart Pond, Orland, Me.			5,266
Toddy Pond, Orland, Me.			248
Patten Pond, Orland, Me.			18,890
Ellsworth, Me.		20,000	27,234
Long Pond, Bar Harbor, Me.		7,000	
G. H. Richards, Wenaumet, Mass.	10,000		
Big Sandy Pond, Marshfield, Mass.		8,000	
Total	10,000	35,000	51,647
<i>Golden trout:</i>			
Harriman Pond, Dedham, Me.		6,990	
<i>Hybrid trout:</i>			
Applicant at Cambridge, Mass.			100
Caspian Lake, Greensboro, Vt.			1,850
Total			1,950
<i>Grayling:</i>			
South Platte River, Florissant, Colo.		1,000	
Platte River, Webster, Colo.		4,500	
Frying Pan River, Ruess, Colo.		5,000	
Eagle River, Barry station, Colo.		10,000	
East Fork of Big Wood River, Hailey, Idaho.			5,000
Spring Branch, Manchester, Iowa		5,000	
Maquoketa River, Forestville, Iowa		15,000	
Village Creek, Lansing, Iowa.		15,450	
State Fish Commission, Puris, Mich.	200,000		
Spring Brook, Westbranch, Mich.		10,000	
Pere Marquette River, Baldwin, Mich.		27,000	
Baldwin Creek, Baldwin, Mich.		10,000	
Baptism River, Lake County, Minn.		14,000	
Lester River, Duluth, Minn.		10,000	
Tributaries of Big Hole River, Brown Station, Mont.			5,000
Elk Creek, Redrock Lake, Mont.		1,628,100	
Elk Lake, Redrock Lake, Mont.		150,000	
Picnic Creek, Redrock Lake, Mont.		104,000	
Bridger Creek, Bozeman, Mont.		300,000	
McKay and Pearson Creeks, Pendleton, Oreg.		41,608	
State Fish Commission, Murray, Utah.	72,000		
Caspian Lake, Greensboro, Vt.		20,000	
Brule River, Winnboujou, Wis.		10,000	

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Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearling.
<i>Grayling</i> —Continued.			
State Fish Commission, Sheridan, Wyo	50,000		
Laramie, Wyo	50,000		
Total	372,000	2,449,718	10,000
<i>White-fish:</i>			
Henry A. Mower, Worcester, Mass	300,000		
Lake Erie, Monroe, Mich		8,840,000	
Lake Huron, near North Point, Mich		11,000,000	
Scarecrow Island, Mich		9,700,000	
Presque Isle, Mich		7,000,000	
Sturgeon Point, Mich		3,500,000	
off Forester, Mich		3,000,000	
Detour (north shore), Mich		10,000,000	
Lake Michigan, Charlevoix, Mich		16,000,000	
Frankfort, Mich		10,000,000	
St. James, Mich		4,000,000	
Lake Superior, off Sault Ste. Marie (east end), Mich		6,500,000	
Ontonagon, Mich		2,800,000	
Grace Harbor, Isle Royale, Mich		2,200,000	
Detroit River, off Belle Isle, Detroit, Mich		58,000,000	
Lake St. Clair, off Belle Isle, Detroit, Mich		8,000,000	
Thunder Bay, off North Point, Mich		2,300,000	
St. Marys River, off Sault Ste. Marie, Mich		3,500,000	
Whitefish Bay, off Tequamenon Island, Mich		5,000,000	
Lake Superior, off Soucis Island, Minn		400,000	
State Fish Commission, Plymouth, N. H.	500,000		
St. Lawrence River, Cape Vincent, N. Y.		22,000,000	
State Fish Commission, Caledonia, N. Y.	10,000,000		
Lake Ontario, off Grenadier Island, N. Y.		5,000,000	
Lake Erie, Peach Point Reef, off Put-in Bay, Ohio		6,580,000	
Buckeye Island Reef, off Put-in Bay, Ohio		3,600,000	
West Sister Island Reef, off Put-in Bay, Ohio		5,250,000	
Rattlesnake Island Reef, off Put-in Bay, Ohio		8,350,000	
North Bass Island Reef, off Put-in Bay, Ohio		23,000,000	
Middle Bass Island Reef, off Put-in Bay, Ohio		10,100,000	
Niagara Reef, off Put-in Bay, Ohio		5,600,000	
Starvo Island Reef, off Put-in Bay, Ohio		5,600,000	
Ballast Island Reef, off Put-in Bay, Ohio		4,800,000	
Moore Point Reef, off Put-in Bay, Ohio		4,320,000	
Sugar Island Reef, off Put-in Bay, Ohio		2,000,000	
Green Island Reef, off Put-in Bay, Ohio		3,250,000	
Kelly Island Reef, Erie County, Ohio		2,500,000	
Put-in Bay, east side, Ohio		4,130,000	
Port Clinton, Ohio		5,600,000	
Toledo, Ohio		6,300,000	
State Fish Commission, Erie, Pa	5,832,000		
Silver Creek Lake, Pottsville, Pa		258,000	
Lake Champlain, Alburg, Vt.		400,000	
Lake Washington, Seattle, Wash		160,000	
Lake Superior, Port Wing, Wis		4,200,000	
Bark Bay, Wis		4,200,000	
Sand Bay, Wis		4,200,000	
Port Arthur, Ontario, Canada		2,000,000	
Total	16,632,000	321,206,000	
<i>Pike perch:</i>			
Lake Maxinkuckee, Culver, Ind		800,000	
Blue River, Rome City, Ind		500,000	
Mississinewa Lake, Ridgeville, Ind		500,000	
State Fish Commission, Boston, Mass		1,000,000	
Detroit, Mich	25,000,000		
Merrimac River, Concord, N. H.		1,000,000	
Raquette River, Potsdam, N. Y.		900,000	
St. Lawrence River, Cape Vincent, N. Y.		19,500,000	
Thompson & Warner's Lake, Altamont, N. Y.		900,000	
Spring Lake, Cleveland, Ohio		1,000,000	
Grand River, Eagleville, Ohio		1,000,000	
Western Reserve, Midland City, Ohio		1,000,000	
Baker Lake, Mechanicsburg, Ohio		500,000	
Tuscarawas River, Zoar, Ohio		1,000,000	
Lake Erie, Peach Point Reef, off Put-in Bay, Ohio		6,600,000	
Rattlesnake Island Reef, off Put-in Bay, Ohio		5,700,000	
Ballast Island Reef, off Put-in Bay, Ohio		5,200,000	
North Bass Island Reef, off Put-in Bay, Ohio		3,000,000	
Susquehanna River, Susquehanna, Pa.		2,000,000	
State Fish Commission, St. Johnsbury, Vt		12,600,000	
Total	25,000,000	64,700,000	

Details of distribution—Continued.

Species and disposition.	Adults and yearlings.	Species and disposition.	Adults and yearlings.
Cat-fish:		Black bass—Continued.	
Mississippi River, Bellevue, Iowa	4,000	Warm Springs Branch, Bullochville, Ga.	47
Lake Irvine, Church Ferry, N. Dak.	10	Applicants in Georgia	3,330
Weiremiller Lake, Church Ferry, N. Dak.	14	Rose Lake, Iuka, Ill.	100
Total	4,024	Electric Light Lake, Cartersville, Ill.	100
		Millpond, Paris, Ill.	150
Pike:		Horseshoe Lake, Carbondale, Ill.	100
Mississippi River, Bellevue, Iowa	5,000	Bang Lake, Wauconda, Ill.	200
Pickeral:		Little Creek, Marshall, Ill.	200
Devils Lake, Devils Lake, N. Dak.	185	Applicants in Illinois	640
		Leatherwood Creek, Bedford, Ind.	400
Yellow perch:		Upper Salt Creek, Bedford, Ind.	550
Mississippi River, Bellevue, Iowa	8,000	Guthrie Creek, Bedford, Ind.	200
Devils Lake, Devils Lake, N. Dak.	100	Indian Creek, Bedford, Ind.	400
Lake Irvine, Church Ferry, N. Dak.	35	Williams, Ind.	100
Weiremiller Lake, Church Ferry, N. Dak.	35	Owensburg, Ind.	500
Total	8,170	White River, Bedford, Ind.	360
		Castleton, Ind.	150
Black bass:		Noblesville, Ind.	200
Cahaba River, Birmingham, Ala.	400	Spring Lake, Evansville, Ind.	150
Savage & Willetts Lake, Anniston, Ala.	200	Cook Park Lake, Evansville, Ind.	150
McCarty Millpond, Ethelville, Ala.	150	Salt Creek, Heltonville, Ind.	250
Barren Fork Flint River, Newmarket, Ala.	200	Patoka River, Huntington, Ind.	200
Davidson Lake, Uniontown, Ala.	300	Stone Quarry Lake, Kokomo, Ind.	250
Biving Lake, Dunham, Ala.	200	Raccoon Creek, Ladoga, Ind.	100
Alabama River, Montgomery, Ala.	250	Wabash River, Williamsport, Ind.	200
Gulce Fish Lake, Eufaula, Ala.	800	Tippecanoe River, Monticello, Ind.	300
Applicants in Alabama	2,500	Brookville and Metamora Canal, Metamora, Ind.	200
Spring Lake, Tucson, Ariz.	100	Fish Trap Lake, Laporte, Ind.	250
San Juan Lake, Bisbee, Ariz.	75	Sugar and Young creeks, Franklin, Ind.	700
Indian School Lake, Phoenix, Ariz.	200	Wabash Pond, Vincennes, Ind.	250
Liveoak Creek, Flagstaff, Ariz.	100	Downey Lake, Princeton, Ind.	100
Spring Lake, Benton, Ark.	400	Pretty Lake, Plymouth, Ind.	250
Grayson Millpond, Barham, Ark.	150	Spring Lake, Knightstown, Ind.	325
Railroad reservoir, Ashdown, Ark.	200	Lake Maxinkuckee, Culver, Ind.	5,198
Big Lake, Biglake, Ark.	200	Waterworks Lake, Bloomington, Ind.	150
Upper Blackfish Lake, Earle, Ark.	200	Kale Lake, South Bend, Ind.	200
Applicants in Arkansas	750	Applicants in Indiana	2,200
Big Spring Lake, Klowa, Colo.	100	Pecan Creek, Gwendale, Ind. T.	100
Reservoir, Pueblo, Colo.	200	Simpson Spring Branch, Pontotoc, Ind. T.	200
Lake Minnequan, Pueblo, Colo.	200	Applicants in Indian Territory	400
Herrick Lake, Littleton, Colo.	100	Maquoketa River, Manchester, Iowa.	1,800
Marston Lake, Denver, Colo.	200	Forestville, Iowa.	500
Lake Wauconda, Perry Park, Colo.	100	Monticello, Iowa.	300
Applicants in Colorado	140	Lake Edgewood, Corning, Iowa.	450
Paper Millpond, Seymour, Conn.	600	Plum Creek, Earlville, Iowa.	300
Little River, Seymour, Conn.	350	North River, Winterset, Iowa.	500
Lake Wenonscopomus, Lakeville, Conn.	500	Middle River, Winterset, Iowa.	500
Applicants in Connecticut	200	Silver Creek, Dewitt, Iowa.	200
Chesapeake and Delaware Canal, Delaware City, Del.	300	Vernon Spring Millpond, Cresco, Iowa.	900
State Fish Commission, Wilmington, Del.	500	Turkey River, West Union, Iowa.	300
Millpond, Rome, Ga.	100	Fraze and Leffnwoil lakes, Wheatland, Iowa.	200
Ruby Lake, Fort Valley, Ga.	100	Shell Rock River, Northwood, Iowa.	500
Yahoola Creek, Gainesville, Ga.	100	Lake Okoboji, Spirit Lake, Iowa.	10,000
Lake Juliette, Cedartown, Ga.	100	Cedar River, Cedar Rapids, Iowa.	5,250
Turkey Creek, Carrollton, Ga.	200	Clear Lake, Clearlake, Iowa.	300
Spring Lake, Tunnel Hill, Ga.	400	Applicant in Iowa	1,740
Ward Creek, Jasper, Ga.	100	Mississippi River, Bellevue, Iowa	5,000
Wimberley Millpond, Lumpkin, Ga.	100	Silver Lake, Agra, Kans.	140
Clamdale Lake, Washington, Ga.	100	Beaver Creek, Leoti, Kans.	140
Swift Creek, Macon, Ga.	200	Spring Creek Lake, Smith Center, Kans.	140
McCall Lakes, Macon, Ga.	500	Baldwin Creek, Manhattan, Kans.	140
State Fish Commission, LaGrange, Ga.	500	Sevenmile Creek, Manhattan, Kans.	140
		Eureka Lake, Manhattan, Kans.	140
		Wildcat Creek, Manhattan, Kans.	210

Details of distribution—Continued.

Species and disposition.	Adults and yearlings.	Species and disposition.	Adults and yearlings.
<i>Black bass—Continued.</i>		<i>Black bass—Continued.</i>	
Deep Creek, Manhattan, Kans.	140	Hamlin Lake, Ludington, Mich.	135
McDowell Creek, Manhattan, Kans.	210	Little Big Stone Lake Evart, Mich.	135
Willow Lake, Baxter Springs, Kans.	100	Clark Lake, Clark Lake, Mich.	125
Hazeldell Lake, Garnett, Kans.	140	Round Lake, Hanover, Mich.	125
Crooked Creek, Fowler, Kans.	100	Murray Lake, Ypsilanti, Mich.	85
Hinchy Creek, Ellsworth, Kans.	140	Rawson Lake, Schoolcraft, Mich.	300
Little Arkansas River, Wichita, Kans.	200	Pine River, Alma, Mich.	200
C. R. I. and P. R. R. reservoir, Herrington, Kans.	140	Black Lake, Onaway, Mich.	125
Spring Creek, Atchison, Kans.	140	Stony Lake, Oxford, Mich.	85
Forest Lake, Bonner Springs, Kans.	200	Pentwater Lake, Pentwater, Mich.	135
Applicants in Kansas	4,845	Big Lake, Gaylord, Mich.	135
Spring Lake, Peewee Valley, Ky.	200	Caribou Lake, Duluth, Minn.	1,000
Fennessy Lake, Culberson, Ky.	100	Conocia Lake, Duluth, Minn.	1,000
Spring Lake, Anchorage, Ky.	200	Sevenmile Lake, Fulda, Minn.	1,000
Cemetery Lake, Milldale, Ky.	100	Big Lake, Barnum, Minn.	1,000
Cadle Lake, Somerset, Ky.	200	Sexton Lake, Hazlehurst, Miss.	100
Elkhorn Creek, Frankfort, Ky.	100	Idlewild Lake, Hazlehurst, Miss.	100
Stoner Creek, Winchester, Ky.	100	Lake Ann, Hazlehurst, Miss.	100
Howard Lower Creek, Winchester, Ky.	100	Lake Leroy, Hazlehurst, Miss.	100
Water company's lake, Winchester, Ky.	300	Chataqua Lake, Crystal Springs, Miss.	250
Spring Lakes, Winchester, Ky.	300	Trinity Creek, Osyka, Miss.	250
Clark County Poorhouse lake, Winchester, Ky.	100	Spring Creek, Waterford, Miss.	200
Spring Lake, Lebanon, Ky.	100	Spring Lake, Canton, Miss.	250
Lake Ellerslie, Lexington, Ky.	300	Forest Home Lake, Fayette, Miss.	100
Spring Lake, Nicholasville, Ky.	100	Millpond, Silver, Miss.	200
Byars Lake, Guthrie, Ky.	200	Cade Lake, Jackson, Miss.	150
Spring Lake, Paducah, Ky.	200	Spring Lake, Jackson, Miss.	200
Cemetery Lake, Newport, Ky.	100	Factory Pond, Meridian, Miss.	250
Crystal Lake, Ryland, Ky.	150	Park Lake, Tupelo, Miss.	100
Applicants in Kentucky	4,000	Horseshoe Lake, Macon, Miss.	400
Sandy Creek, Clinton, La.	600	Rose Lake, Oxford, Miss.	250
Bayou Macon, Wisner, La.	100	Applicants in Mississippi	5,746
St. George Lake, Schriber, La.	200	Big River, Irondale, Mo.	200
Black River, New Orleans, La.	200	Springwater Lake, Independence, Mo.	140
Cypress Brake Lake, Bastrop, La.	200	Dickinson Lake, Independence, Mo.	140
Chaplin Lake, Natchitoches, La.	200	Crisp Lake, Independence, Mo.	100
Lake Julia, Bermuda, La.	200	Chick Lake, Excelsior Springs, Mo.	140
Applicants in Louisiana	950	Cutoff Lake, Brunswick, Mo.	250
Little Youghiogheny River, Oakland, Md.	500	Park Lake, Clinton, Mo.	140
Chevy Chase Lake, Montgomery County, Md.	100	Park Lake, Noel, Mo.	100
Potomac River, Woodmont, Md.	500	Hampton Spring Lake, Seneca, Mo.	100
Applicants in Maryland	425	Hickory Creek, Neosho, Mo.	1,085
Horn Pond, Woburn, Mass.	300	Applicants in Missouri	1,050
Connecticut River, Holyoke, Mass.	300	Oberfelder Lake, Lodgepole, Nebr.	500
Cannon Lake, Sharon, Mass.	300	Spring Lake, Humphreys, Nebr.	550
Mabnessett Pond, West Chelmsford, Mass.	300	Van Sickle Lake, McCook, Nebr.	100
Triangle Pond, Sandwich, Mass.	500	Applicants in Nebraska	1,150
Segreganset River, Segreganset, Mass.	300	Dark Pond, Harrisville, N. H.	490
Applicants in Massachusetts	75	Spring Lake, Spring Lake, N. J.	200
Devils Lake, Devils Lake, Mich.	200	State Fish Commission, Jersey City, N. J.	8,400
Loon Lake, Wixom, Mich.	90	Sunset Lake, Sewell, N. J.	300
Pleasant Lake, Leslie, Mich.	250	Mirror Lake, Browns Mills, N. J.	500
Baldwin and Burgess Lakes, Greenville, Mich.	135	Applicants in New Jersey	600
Lake Como, Greenville, Mich.	135	Spring Lake, Las Vegas, N. Mex.	200
Turk Lake, Greenville, Mich.	135	Baker Pond, Fayetteville, N. C.	400
Fish Lake, Greenville, Mich.	135	Stewart Pond, Charlotte, N. C.	100
Woodbeck Lake, Greenville, Mich.	135	Applicants in North Carolina	100
Twin and Long Lakes, Greenville, Mich.	135	Gordon Lake, St. John, N. Dak.	300
Lake Bawbeose, Hillsdale, Mich.	125	Sargent Lake, Amenia, N. Dak.	400
Bear Lake, Clarion, Mich.	135	Spiritwood Lake, Jamestown, N. Dak.	2,000
Lake Huron, Alpena, Mich.	125	Blanchard Lake, Blanchard, N. Dak.	200
Long Lake, Alpena, Mich.	200	Mayville Reservoir, Mayville, N. Dak.	225
Fox Lake and Lake Harbor, Muskegon, Mich.	265	Stump Lake, Lakota, N. Dak.	1,000
Big Platt Lake, Benzonia, Mich.	135	Devils Lake, Devils Lake, N. Dak.	1,030
Cheboygan River, Cheboygan, Mich.	135	Harmonson Lake, Devils Lake, N. Dak.	200
		Sweetwater Lake, Devils Lake, N. Dak.	200
		Weiremillor Lake, Church Ferry, N. Dak.	200
			200

Details of distribution—Continued.

Species and disposition.	Adults and yearlings.	Species and disposition.	Adults and yearlings.
<i>Black bass—Continued.</i>		<i>Black bass—Continued.</i>	
Lake Irvine, Church Ferry, N. Dak.	200	Perkiomen Creek, Yerkes Station, Pa.	100
Hanson Reservoir, Church Ferry, N. Dak.	25	Conococheague Creek, Marion, Pa.	100
Lewis Pond, Church Ferry, N. Dak.	25	Silver Lake, Montrose Pa.	150
McKinney Lake, Church Ferry, N. Dak.	25	Rose Lake, Andrews Settlement, Pa.	100
Lake Metigoshna, Bottineau, N. Dak.	400	Tidall Mill Pond, Rimerton, Pa.	35
Fish Lake, Rolla, N. Dak.	300	Ridley Creek, Chester, Pa.	100
Willow Lake, Rolla, N. Dak.	300	Folly Farm Lake, Elkins, Pa.	100
Steel Ranch Spring, Rolla, N. Dak.	75	Spring Creek, Cherrytree, Pa.	100
Ueland Lake, Edgely, N. Dak.	25	Harney Lake, Shawanace, Pa.	300
Perkins Lake, Oakes, N. Dak.	300	Susquehanna River, George town, Pa.	150
Forman Reservoir, Forman, N. Dak.	300	Liverpool, Pa.	100
Applicants in North Dakota	100	Crystal and Norton lakes, Carbondale, Pa.	300
Stillwater Creek, Pleasant Hill, Ohio	50	Lake Ariel, Ariel, Pa.	200
Stillwater Creek, Dayton, Ohio	200	Applicants in Pennsylvania	100
Bush and McCulloch creeks, McCulloch, Ohio	200	State Fish Commission, West-terly, R. 1.	1,000
Lake Anna, Barberton, Ohio	200	State Fish Commission, Provi-dence, R. 1.	1,000
Raccoon Creek, Newark, Ohio	100	Applicant at Charleston, S. C.	100
South Fork Licking River, New-ark, Ohio	100	Big Stone Lake, Wilmot, S. Dak.	800
North Fork Licking River, New-ark, Ohio	100	James River, Mitchell, S. Dak.	250
Rocky Fork Licking River, New-ark, Ohio	100	Scotland, S. Dak.	400
Twin Lakes, Earleville, Ohio	300	Lake Campbell, Brookings, S. Dak.	500
Dolner Lake, Doylestown, Ohio	200	Lake Hendricks, Brookings, S. Dak.	1,000
Cliff Lake, Springfield, Ohio	200	Lake Kampeska, Watertown, S. Dak.	1,400
Springfield Lake, Akron, Ohio	200	Sylvan Lake, Custer, S. Dak.	600
West Branch Mill Creek, Glon-dale, Ohio	200	Lake Madison, Madison, S. Dak.	700
Muskingum River, Dresden, Ohio	200	Applicants in South Dakota	2,950
Big Miami River, Franklin, Ohio	200	Buffalo River, Perryville, Tenn.	150
Little Miami River, Columbia, Ohio	200	Spring Lake, Woodstock, Tenn.	250
Little Miami River, Waynesville, Ohio	200	Blueback Creek, Centerville, Tenn.	200
Hopkins Lake, Willoughby, Ohio	100	Lamb's Fork Creek, Del Rio, Tenn.	100
Whitewater River, Harrison, Ohio	300	Cosby Creek, Del Rio, Tenn.	100
Applicants in Ohio	1,325	Water company's lake, Jackson, Tenn.	200
Indian Creek, Woodward, Okla.	100	Applicants in Tennessee	1,200
Spring Lake, Woodward, Okla.	100	Lake Blanche, Austin, Tex.	500
Spring Creek, Woodward, Okla.	100	Walnut Springs, Austin, Tex.	100
Ivanhoe Creek, Shattuck, Okla.	300	Llano River, Austin, Tex.	1,000
Crutcho Creek, Oklahoma, Okla.	300	Llano and Colorado rivers, Kings-land, Tex.	5,000
Applicants in Oklahoma	1,025	Quoin Creek, Manchaca, Tex.	100
Weidner Millpond, Rouding, Pa.	425	Golden Lake, Manchaca, Tex.	5,000
Reservoir, Pheonixville, Pa.	100	Little Brazos River, Hearne, Tex.	2,500
Lake Taminent, East Strouds-burg, Pa.	150	Spring Lake, Hearne, Tex.	500
Mud Run, East Stroudsburg, Pa.	150	Fin and Feather Club Lake, Hutchins, Tex.	2,050
Hunter Range Lake, East Stroudsburg, Pa.	200	Spring Lake, Holland, Tex.	100
Kooney Lake, New Freedom, Pa.	100	Wallace Lake, Moore, Tex.	300
Hoffmanville Lake, New Free-dom, Pa.	100	Moore Lake, Moore, Tex.	50
Wissahickon Creek, Penllyn, Pa.	100	Spring Lake, Vernon, Tex.	100
Ambur, Pa.	100	Elmendorf Lake, San Antonio, Tex.	1,000
Cloverly Farm Lake, Westchos-ter, Pa.	50	San Pedro Springs, San Antonio, Tex.	250
French Creek, St. Peters, Pa.	100	Spring Lake, Ennis, Tex.	300
Juniatz River, Everett, Pa.	200	Guadalupe River, Kerrville, Tex.	3,000
Huntingdon, Pa.	300	Cuero, Tex.	4,700
Shades Creek, Shadegap, Pa.	100	Spring Lake, Valentine, Tex.	200
Schuykill River, Birdsboro, Pa.	150	Hondo Creek, Hondo, Tex.	2,500
Conneaut River, Conneautville, Pa.	100	Spring Lake, Spofford, Tex.	500
Big and Little Conewago Creeks, New Oxford, Pa.	100	San Gabriel River, Georgetown, Tex.	1,000
Oswago Creek, Shinglehouse, Pa.	100	Spring Lake, Amarillo, Tex.	500
Blacklog Creek, Rockhill, Pa.	100	Lake McDonough, Phelps, Tex.	500
Aughwick Creek, Rockhill, Pa.	100	Spring Lake, Waco, Tex.	200
Shirleysburg, Pa.	100	Day Lake, Waco, Tex.	500
		Lake Eloise, Waco, Tex.	500
		Washita River, Canadian, Tex.	3,000
		Gageby Creek, Canadian, Tex.	1,500
		Spring Brook, Canadian, Tex.	500

Details of distribution—Continued.

Species and disposition.	Adults and yearlings.	Species and disposition.	Adults and yearlings.
<i>Black bass—Continued.</i>		<i>Small-mouth black bass:</i>	
Sand Creek, Canadian, Tex.	500	State Fish Commission, Westerly, R. I.	200
Grigsby Creek, Canadian, Tex.	1,000		
Lambert Creek, Canadian, Tex.	500	<i>Crappie:</i>	
South Concho River, San Angelo, Tex.	150	State Fish Commission, Wilmington, Del.	500
Little Joshua Creek, Welfare, Tex.	300	Murray Hill Lake, Augusta, Ga.	100
Spring Creek Research, Ranger, Tex.	400	Horseshoe Lake, Wynwood, Ind. T.	200
Spring Creek, Marfa, Tex.	1,700	Applicants in Indian Territory	200
Green Creek, Clairette, Tex.	2,500	Lake Okoboji, Spirit Lake, Iowa	1,375
Bosque River, Clairette, Tex.	5,000	Upper Iowa River, Limesprings, Iowa	500
Fishing Club Lake, Gatesville, Tex.	300	Maquoketa River, Manchester, Iowa	1,500
Claude Lake, Claude, Tex.	1,725	Clear Lake, Clearlake, Iowa	10,500
Nueces River, Cotulla, Tex.	2,000	Clear River, Orchard, Iowa	300
Sweetwater Creek, Sweetwater, Tex.	725	Clear River, Cedar Rapids, Iowa	7,300
Iatan Lake, Iatan, Tex.	800	Middle River, Winterset, Iowa	500
Spring Creek, Colorado, Tex.	200	North River, Winterset, Iowa	200
Spring Lake, Richland, Tex.	350	Silver Creek, Dewitt, Iowa	250
San Marcos River, San Marcos, Tex.	50,000	Frazer and Lefnwell lakes, Wheatland, Iowa	250
Applicants in Texas	4,655	Mississippi River, Bellevue, Iowa	100,000
Connecticut River, Wells River, Vt.	500	Applicants in Iowa	200
Salem and Derby ponds, Newport, Vt.	100	Lakeside Lake, Olathe, Kans.	200
Lake Dunmore, Norfolk, Va.	100	Eureka Lake, Manhattan, Kans.	200
North Anna River, Mineral City, Va.	200	McDowell Creek, Manhattan, Kans.	100
Peak Creek, Pulaski City, Va.	100	Little Arkansas River, Wichita, Kans.	200
Millpond, Burkeville, Va.	100	Frairie Dog Dam, Dresden, Kans.	75
Mattaponi River, Guinea, Va.	200	Polcan Creek, Oberlin, Kans.	75
Baker Millpond, Widewater, Va.	100	Northwest Fork Kiowa Creek, Bucklin, Kans.	100
King Pond, Ashland, Va.	100	Forest Lake, Bonner Springs, Kans.	230
Great Run, Warrenton, Va.	100	Applicants in Kansas	1,775
Mountain Lake, Mountain Lake, Va.	200	Spring Lake, Paducah, Ky.	600
Falling River, Brookneal, Va.	150	Stoner Creek, Winchester, Ky.	100
Canterbury Pond, Richmond, Va.	100	Howard Lower Creek, Winchester, Ky.	100
Difficult Creek Pond, Clover, Va.	200	Water company's lake, Winchester, Ky.	100
Cowpasture River, Millboro, Va.	355	Clark County Poorhouse lake, Winchester, Ky.	100
Jackson River, Cedar Creek, Va.	200	Lake Ellerslie, Lexington, Ky.	100
Millpond, Raphine, Va.	100	Ritter Lake, Falmouth, Ky.	200
Black Pond, Vienna, Va.	240	Applicants in Kentucky	2,300
Buestone River, Pauls Mills, Va.	100	Little Youghiogheny River, Oakland, Md.	1,500
Millington Pond, Green Springs Depot, Va.	100	Potomac River, Woodmont, Md.	200
Artificial Lake, Rapidan, Va.	100	Applicants in Maryland	100
Ice Pond, Mount Holly, Va.	50	Sturgeon Lake, Sturgeon Lake, Minn.	375
North River, East Lexington, Va.	200	Cutoff Lake, Brunswick, Mo.	300
James River, Gilmore Mills, Va.	100	Springwater Lake, Independence, Mo.	100
Abert, Va.	50	Crisp Lake, Independence, Mo.	3,100
Hollywood Cemetery Lake, Richmond, Va.	150	Lake McDonald, Independence, Mo.	1,270
Silver Spring Lake, Gordonsville, Va.	100	Hickory Creek, Neosho, Mo.	320
Applicants in Virginia	1,350	Park Lake, Clinton, Mo.	100
Decker Creek, Morgantown, W. Va.	275	Applicants in Missouri	300
Buffalo Creek, Fairmont, W. Va.	275	McPherson Pond, Fayetteville, N. C.	20
Bethany, W. Va.	200	Johnston Mill Pond, Littleton, N. C.	20
Tygart's Valley River, Foxhall, W. Va.	400	Little Alamance River, Burlington, N. C.	100
Elkins, W. Va.	600	Lake Rhott, Flatrock, N. C.	50
Elk Creek, Clarksburg, W. Va.	275	Toe River, Marion, N. C.	200
West Fork River, Clarksburg, W. Va.	275	Applicants in North Carolina	410
Lake Terra Alta, Terra Alta, W. Va.	275	Devils Lake, Devils Lake, N. Dak.	150
Snowy Creek and Lake, Terra Alta, W. Va.	275	Weiremiller Lake, Church Ferry, N. Dak.	50
Shenandoah River, Charlestown, W. Va.	275	Lake Irvine, Church Ferry, N. Dak.	25
Back Creek, Martinsburg, W. Va.	200	Lewis Pond, Church Ferry, N. Dak.	75
Opequan Creek, Martinsburg, W. Va.	400	Whitewater River, Harrison, Ohio	200
Potomac River, Martinsburg, W. Va.	275	Glendale Lake, Glendale, Ohio	200
Elk River, Charleston, W. Va.	1,750	Burger Fish Pond Lake, Pondercreek, Okla.	100
South Branch Potomac River, Romney, W. Va.	275	Spring Lake, Enid, Okla.	100
Little Kanawha and Elk rivers, Sutton, W. Va.	700	Applicants in Oklahoma	200
Applicants in West Virginia	250	Mud Run, Penlllyn, Pa.	100
Wanby Lake, Lakewood, Wis.	600	Lake Melinie, Ebensburg, Pa.	300
Elbow and Newton lakes, Wausauke, Wis.	600	Conococheague Creek, Marion, Pa.	500
Bearskull Lake, Lac du Flambeau, Wis.	600	Lake Hopatcong, Bethlehem, Pa.	200
Elk Lake, Phillips, Wis.	2,300	Juniata River, Huntingdon, Pa.	400
Butternut Lake, Butternut, Wis.	2,300		
Applicants in Wisconsin	100		
Total	232,127		

Details of distribution—Continued.

Species and disposition.	Adults and year-lings.	Species and disposition.	Adults and year-lings.
<i>Crappie</i> —Continued.		<i>Rock bass</i> —Continued.	
Ingleside Fish Lake, Summerville, S. C.	50	Howard Lower Creek, Winchester, Ky.	100
Clifton Millpond, Clifton, S. C.	50	Stoner Creek, Winchester, Ky.	100
Sycamore, S. C.	50	Strode Creek, Winchester, Ky.	100
Saluda River, Pelzer, S. C.	100	Water Company's Lake, Winchester, Ky.	100
Fair Forest Creek, Spartanburg, S. C.	50	Spring Lake, Winchester, Ky.	300
Broad River, Blacksburg, S. C.	130	Lake Ellerslie, Lexington, Ky.	200
Applicants in South Carolina	275	Applicants in Kentucky	600
Sylvan Lake, Custer, S. Dak.	30	Moose Lake, Hancock, Minn.	300
Buffalo River, Perryville, Tenn.	800	Spring Creek, Marionville, Mo.	200
South Fork Holston River, Bluff City, Tenn.	125	Hickory Creek, Neosho, Mo.	500
Watauga River, Watauga, Tenn.	125	Rogers Lake, Frederickstown, Ohio.	300
French Broad River, Leadvale, Tenn.	228	Odell Lake, Lakerville, Ohio.	300
Alanosa Lake, Wichita Falls, Tex.	50	Dohner Lake, Doylestown, Ohio.	300
Spring Lake, Wichita Falls, Tex.	50	Applicants in Ohio	800
Millpond, Amarillo, Tex.	75	Sportsman Creek, Bridgeport, Okla.	200
Spring Lake, Brownwood, Tex.	50	Gageby Creek, Amarillo, Tex.	100
Barton Creek, Clarendon, Tex.	200	Gabe Creek, Amarillo, Tex.	100
Myers Pond, San Angelo, Tex.	125	Amarillo Creek, Amarillo, Tex.	425
South Concho River, San Angelo, Tex.	25	Chicken River, Amarillo, Tex.	800
Flag Springs Lake, Taylor, Tex.	25	Buffalo Springs Creek, Tascosa, Tex.	50
Lake Olmos, Taylor, Tex.	30	Barton Creek, Clarendon, Tex.	200
Burns Lake, Taylor, Tex.	20	Spring Lake, Tyler, Tex.	400
Turner Lake, Taylor, Tex.	25	Lake View, Brownwood, Tex.	100
Moore Lake, Taylor, Tex.	20	Sabine River, Groenville, Tex.	300
Reservoir, Brownwood, Tex.	30	Willow Lake, Pittsburg, Tex.	100
Fairland Lake, Brownwood, Tex.	60	Long Branch, Kingsbury, Tex.	50
Lake Thorne, Longview, Tex.	150	Artificial Lake, Austin, Tex.	50
Hill Lake, Longview, Tex.	150	Aughtaugh Lake, Richmond, Tex.	100
Lovelace Lake, Hillsboro, Tex.	50	Dry Creek, Richmond, Tex.	100
Lake Gibbons, Paris, Tex.	100	Fairchild Creek, Richmond, Tex.	50
Oak Lake, Waco, Tex.	50	Gibbons Lake, Paris, Tex.	75
Bold Springs Lake, West, Tex.	30	Cottonwood Creek Lake, Goodwin, Tex.	50
Quion Creek, Manchaca, Tex.	50	Applicants in Texas.	2,500
Crystal Lake, Pittsburg, Tex.	40	Spring Branch, Mosleys Junction, Va.	100
Artificial Lake, Austin, Tex.	25	Lake Raymond, Petersburg, Va.	300
Walnut Stream, Austin, Tex.	50	Millpond, Roxbury, Va.	300
Running Stream, Llano, Tex.	100	Little River and Goose Creek, Plains Station, Va.	600
Marcado Creek, Victoria, Tex.	30	Glen Allen Lake, Glen Allen, Va.	100
Reservoir, Victoria, Tex.	20	Applicants in Virginia	2,800
Spring Creek, Victoria, Tex.	25		
Quitague Creek, Canyon City, Tex.	30	Total	18,164
Guadalupe River, Kerrville, Tex.	245		
Cuero, Tex.	50	<i>Strawberry bass:</i>	
Millpond, Kerrville, Tex.	25	Liveoak Creek, Jerome, Ariz.	100
San Pedro Springs, San Antonio, Tex.	75	Flagstaff, Ariz.	100
Applicants in Texas	1,035	Big Lake, Biglake, Ark.	200
Jackson River, Cedar Creek, Va.	720	Cypress Brake Lake, Bastrop, La.	100
Cowpasture River, Millboro, Va.	300	Chaplin Lake, Natchitoches, La.	100
James River, Gilmore Mills, Va.	120	Applicants in Louisiana	70
Abert, Va.	60	Gasconade River, Arlington, Mo.	4,000
Applicants in Virginia	240	Hickory Creek, Neosho, Mo.	574
Docker Creek, Morgantown, W. Va.	100	Applicants in Missouri	300
Tygart Valley River, Foxhall, W. Va.	300	Colony Fork Lake, Ranger, Tex.	2,000
Elk Creek, Clarksburg, W. Va.	100		
Lake Terra Alta, Terra Alta, W. Va.	150	Total	7,544
Snowy Creek and Lake, Terra Alta, W. Va.	150	<i>Warmouth bass:</i>	
Back Creek, Martinsburg, W. Va.	300	Maquoketa River, Manchester, Iowa.	1,600
Opequan Creek, Martinsburg, W. Va.	300	Lake McDonald, Independence, Mo.	250
Potomac River, Martinsburg, W. Va.	400	Total	1,850
Elk River, Charleston, W. Va.	500	<i>Sun-fish:</i>	
Buffalo Creek, Bethany, W. Va.	600	Lake McDonald, Independence, Mo.	2,100
Applicants in West Virginia	600		
Total	151,633	<i>Bream:</i>	
<i>Rock bass:</i>		Millpond, Pittsboro, Ala.	200
Oxford Lake, Oxford, Ala.	200	Clamdale Lake, Washington, Ga.	100
Spring Branch, Birmingham, Ala.	58	Spring Branch, Utopia, Ga.	100
Applicants in Alabama	718	East Lake, Atlanta, Ga.	200
Liveoak Creek, Flagstaff, Ariz.	200	McCall Lake, Macon, Ga.	200
Applicants in Arizona	300	Applicants in Georgia	300
Applicants in Arkansas	900	Mississippi River, Bellevue, Iowa	50,000
Horseshoe Lake, Wynwood, Ind. T.	100	Crystal Lake, Palestine, Tex.	300
Applicants in Indian Territory	200		
Applicants in Kansas	1,250	Total	51,300

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Details of distribution—Continued.

Species and disposition.	Fry.	Species and disposition.	Fry.
<i>Cod:</i>		<i>Lobster—Continued.</i>	
Tangier Sound, Crisfield, Md.	2,000,000	Atlantic Ocean—Continued.	
Vineyard Sound:		Scituate, Mass.	1,933,000
Near Tarpaulin Cove Light,		Cohasset, Mass.	2,530,000
Mass.	37,593,000	Lanesville, Mass.	1,800,000
Robinson Hole, Mass.	11,807,000	Beverly, Mass.	3,950,000
Off Jobs Neck, Mass.	24,625,000	Woods Hole Harbor, off Grass	
Quicks Hole, Mass.	11,064,000	Ledge Island, Mass.	1,150,000
Gay Head Light, Mass.	5,046,000	Eel Pond, Waquoit, Mass.	1,258,000
Nobska Light, Mass.	17,095,000	Katama Bay, off Edgartown,	
Can Buoy, Mass.	6,327,000	Mass.	1,274,000
Bow Bells, Mass.	419,000	Wellfleet Harbor, off Mayo	
Atlantic Ocean:		Beach, Mass.	875,000
Off Gay Head, Mass.	3,047,000	Casco Bay, off—	
Gloucester, Mass.	97,392,000	Diamond Island, Me.	1,200,000
Rockport, Mass.	26,500,000	Long Island, Me.	1,500,000
Ipswich Bay, Rockport, Mass.	11,511,000	Cow Island, Me.	1,500,000
Eel Pond, Woods Hole, Mass.	4,935,000	Small Point, Me.	500,000
Woods Hole Harbor, Woods Hole,		Penobscot Bay, off Isle au Haut,	
Mass.	4,963,000	Me.	500,000
Total	265,324,000	Gulf of Maine, off—	
<i>Flat-fish:</i>		Boothbay Bay, Me.	1,500,000
Woods Hole Harbor, Woods Hole,		Port Clyde, Me.	500,000
Mass.	66,317,000	Cape Meddick, Me.	1,000,000
Eel Pond, Woods Hole, Mass.	548,000	Kennebunkport, Me.	1,000,000
Waquoit Bay, Waquoit, Mass.	17,590,000	Cape Porpoise, Me.	2,000,000
Buzzards Bay, off Weepecket		Wood Island, Me.	1,000,000
Island, Mass.	2,660,000	Richmond Island, Me.	1,000,000
Total	87,115,000	Matinicus Island, Me.	500,000
<i>Lobster:</i>		Gulf of Maine, near Halfway	
Fisher Island Sound, off—		Rock, Me.	3,000,000
Fisher Island, Conn.	745,000	Indian Harbor, Indian Harbor,	
Noank, Conn.	1,123,000	Me.	200,000
Seal Harbor, between Whitehead		Moose River (mouth of), Som-	
and Sprucehead, Me.	500,000	erset County, Me.	300,000
Owls Head Bay, near western		Harpwell Harbor, Harpswell	
shore of Owls Head, Me.	500,000	Harbor, Me.	2,500,000
Rockland Harbor (southwestern		Orr Island Harbor, Orr Isl-	
side), Rockland, Me.	1,000,000	and, Me.	1,000,000
Atlantic Ocean:		Hadley Harbor, Gosnold, Mass.	8,086,000
Kittery Point, Me.	1,500,000	Vineyard Sound:	
York Harbor, Me.	4,750,000	Off Cedartree Neck, Mass.	589,000
Portsmouth Harbor, Me.	1,625,000	Menemsha Bight, Mass.	243,000
Newcastle, N. H.	1,625,000	Cuttyhunk Channel, Cutty-	
Gloucester, Mass.	15,720,000	hunk, Mass.	467,000
Rockport, Mass.	2,270,000	Buzzards Bay, off Penikese Isl-	
		and, Mass.	353,000
		Total	*77,166,000

* In addition to the above, 3,767,000 lobster fry were produced, which were delivered to Dr. H. C. Bumpus for scientific purposes.