WYTHEVILLE STATION, VIRGINIA—HATCHERY AND RESIDENCE.

REPORT ON THE PROPAGATION AND DISTRIBUTION OF FOOD-FISHES.

By W. DE C. RAVENEL, *Assistant in Charge.*

INTRODUCTION.

The work of the division of fish-culture during the past year was the most extensive that has ever been accomplished, and was largely due to the increase in the appropriations made by Congress. The total number of fish and eggs distributed was 1,056,371,898, representing the important commercial fishes of the Great Lakes and the Atlantic and Pacific coasts, such as the cod, shad, white-fish, lake trout, pike perch, salmon, and lobsters.

The fish-cultural work of the various stations is given in detail in the abstracts from the reports of the superintendents, and embraces the propagation of 26 species of fish and 1 crustacean.

The following stations and auxiliary stations were operated during the year:

Green Lake Station, Maine.
Craig Brook Station, Maine.
St. Johnsbury Station, Vermont.
Gloucester Station, Massachusetts.
Woods Hole Station, Massachusetts.
Cape Vincent Station, New York.
Steamer *Fish Hawk* (Albemarle Sound and Delaware River).
Battery Station, Maryland.
Bryan Point Station, Maryland.
Central Station, Washington, D. C.
Fish Lakes, Washington, D. C.
Wytheville Station, Virginia.
Erwin Station, Tennessee.
Put-in Bay Station, Ohio.
Northville Station, Michigan.
Alpena Station, Michigan.
Duluth Station, Minnesota.
Quincy Station, Illinois.
Manchester Station, Iowa.
Neosho Station, Missouri.
San Marcos Station, Texas.
Leadville Station, Colorado.
Bozeman Station, Montana.
Baird Station, California.
Battle Creek Station, California.
Clackamas Station, Oregon.
Upper Clackamas Station, Oregon.
Salmon River Station, Oregon.
Little White Salmon River Station, Washington.

As usual, special attention was paid to the propagation of the quinnat salmon on the Pacific coast, where five stations were operated—two in the Sacramento Valley in California and three in the Columbia River Basin in Oregon and Washington. Though the total number of eggs collected was not as great as in the previous year, over 29,000,000 fry were liberated in the Sacramento River and its tributaries, and 12,869,242 in streams of the Columbia River Basin.

In view of the excellent results attained by the introduction of steelhead trout in the Great Lakes and in streams in States bordering on the Atlantic, and as Fort Gaston Station had been abandoned, arrangements were made for collecting eggs of this species on the Willamette River, near Oregon City.

On the Great Lakes the collection of white-fish eggs was practically limited to Lake Erie, owing to restrictive laws passed by the States of Michigan and Wisconsin, prohibiting the capture of fish during the spawning season. Following the same lines of the previous year, arrangements were made not only for collecting eggs from commercial fishermen, but 12,785 adult fish were penned, which produced over 102,000,000, making a total collection of 185,454,000, an increase of 72,000,000 over the previous season.

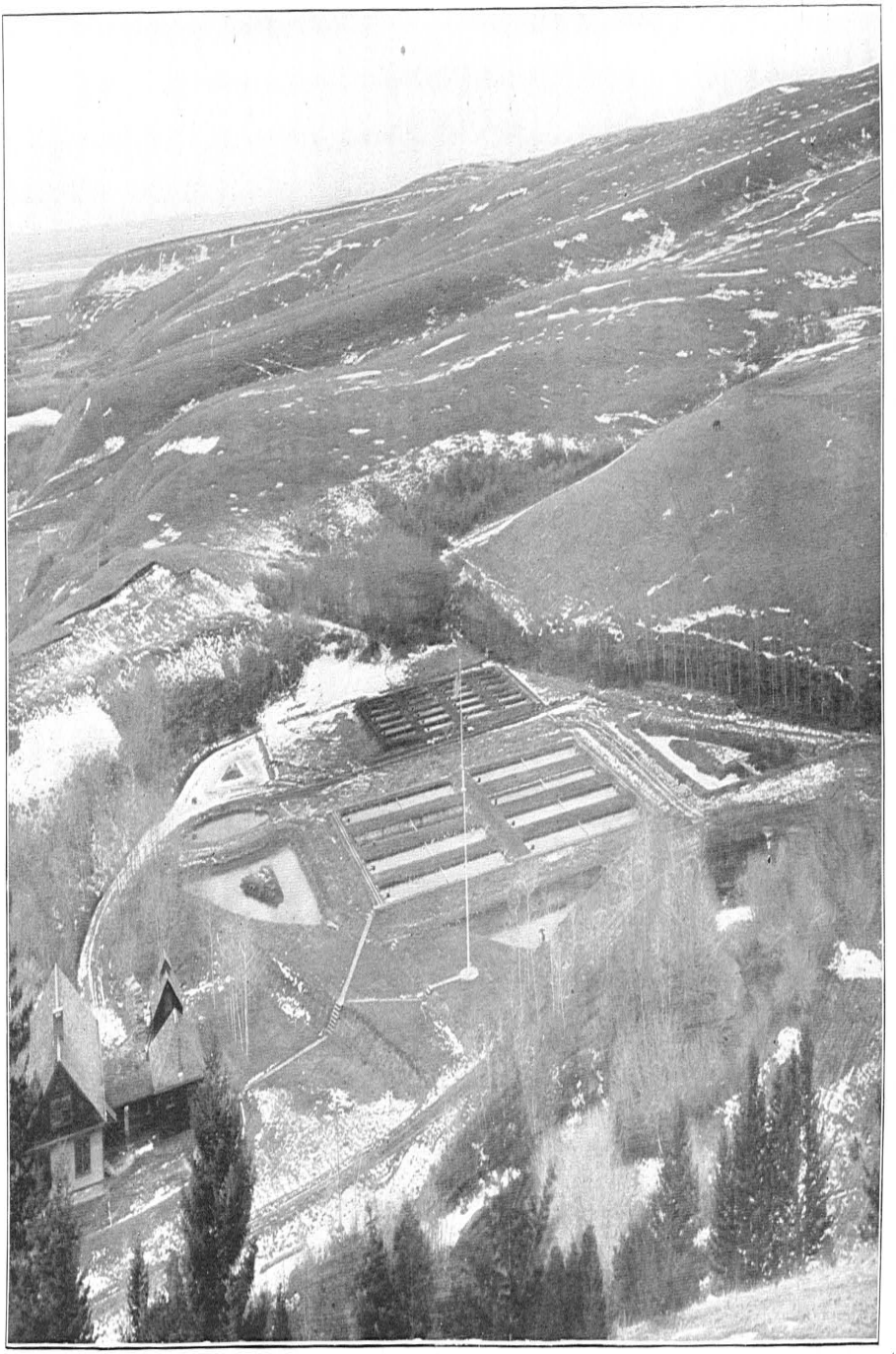
The lake-trout work on Lakes Superior, Michigan, and Huron was conducted as usual, and resulted in the distribution of 9,500,000 fry in those waters. During the early spring the collection of pike-perch eggs was undertaken not only on Lake Erie, but also on Saginaw Bay, Michigan, and on the Missisquoi River, Vermont. On Lake Erie the season's work was very satisfactory, 493,000,000 eggs being obtained. All of these were hatched and planted in Lake Erie, except 24,000,000 transferred to Cape Vincent Station and 41,630,000 to Alpena. There is little doubt but that with the experience gained on the Missisquoi River and in Saginaw Bay very successful work can be accomplished in those fields in the future.

During the season numerous experiments were carefully undertaken to determine a method to prevent adhesion of fish eggs during artificial hatching, and it was decided that the use of swamp muck was advisable where large numbers of eggs were to be handled.

Marine fish-cultural work was confined to Woods Hole and Gloucester stations on the coast of Massachusetts, and embraced the collection and hatching of eggs of the cod, flat-fish, and lobster. The cod eggs were collected at Plymouth and Kittery by spawn-takers stationed on sailing vessels fishing from those ports and from brood-fish collected during the fall months by the schooner *Grampus*, and resulted in the liberation of 208,000,000 fry along the coast.

The flat-fish work at Woods Hole was interfered with materially by unseasonable weather during the latter part of February, but from the collections made in the vicinity of Woods Hole and East Greenwich, R. I., over 52,000,000 fry were hatched and planted in those vicinities.

In the early spring the lobster work was taken up on the New England coast and arrangements were made for collecting egg-bearing lobsters from Rockland, Me., to Rhode Island. The eggs from above Cape Cod were hatched at Gloucester and those below at Woods Hole. Through the active interest taken by the commissioner of sea and shore fisheries of the State of Maine and by employing an additional steam vessel and spawn-takers our collections in this section were materially increased, and notwithstanding the fact that the catch of lobsters was no greater than the previous year 77,390,000 eggs were handled at Gloucester and 44,458,000 at Woods Hole, which yielded 110,491,000 fry. These were planted at suitable points along the coast from Rockland to Long Island Sound. Although this fishery is apparently steadily declining, judging by the numbers of lobsters taken by the fishermen



BOZEMAN STATION, MONTANA—FROM THE MOUNTAIN, LOOKING WEST.

each year, it is believed that the large number of fry planted in the last few years will have an appreciable effect, as correspondents from various points report the presence of large numbers of young lobsters.

Shad work commenced on Albemarle Sound in March, where the steamer *Fish Hawk* had been ordered for duty. At the close of the season there she proceeded to the Delaware, and continued in this work until the end of June, collecting over 72,000,000 eggs. These, with the large number taken at Bryan Point on the Potomac River and at Havre de Grace on the Susquehanna, produced over 235,000,000 fry, which were liberated in the numerous shad streams emptying into the Atlantic Ocean.

The output of trout, salmon, bass, and crappie from the inland stations was very satisfactory. These fish are now abundant in many parts of the country to which they are not indigenous. At Leadville, Colo., where a station was originally established for the propagation of the black-spotted trout, during the past season over 3,000,000 eggs of the brook trout were collected from lakes controlled by private parties.

The grayling work in Montana was very satisfactory, and the indications are that large numbers of these eggs can be collected annually, which will permit the introduction of this valuable fish in most of the States where brook trout are now found.

RESULTS OF FISH-CULTURE.

Although no systematic effort is made to investigate the various streams and lakes stocked with new varieties of fish, the office is in receipt constantly of communications showing the result of their introduction. Particularly gratifying reports have been received from Minnesota with reference to the introduction of steelhead trout in Lake Superior. Mr. L. E. Baldridge, foreman of Duluth station, Minnesota, reports, under date of March 13, 1899, that large numbers of steelhead trout, varying in length from 7 to 28 inches, were caught during the summer and fall of 1898 along the north shore of Lake Superior, between Duluth, Minn., and Rossport, Ont. Mr. D. J. Greensword, treasurer of the Duluth Fly-Casting Club, informed him that a number of members of his club took over 400 steelhead trout from Sucker River in two days' fishing with hook and line and that he had captured 85 in a single day. He further states that not less than 2,200 steelheads were taken in the same manner from the French and Sucker rivers and that they take the fly as readily as do the brook trout. The fishermen operating gill nets along the north shore for lake trout have also captured a number, varying from 14 to 18 inches in length. It appears that the steelheads caught in nets had slipped through the nets until the twine was just forward of the dorsal fin, which would indicate that they were too small to be taken in very large numbers in the large-mesh nets used for the capture of lake trout. The steelheads are probably as plentiful in other rivers along the north shore, which are not visited on account of their remoteness from Duluth.

Mr. E. H. Ashcroft, of Coudersport, Pa., reports the capture of a rainbow trout, measuring 17 inches and weighing 33 ounces, from the headwaters of the Allegheny, which is supposed to have resulted from a plant made in that stream six years ago. He states that a few have been caught each year, both large and small, showing that the fish are reproducing.

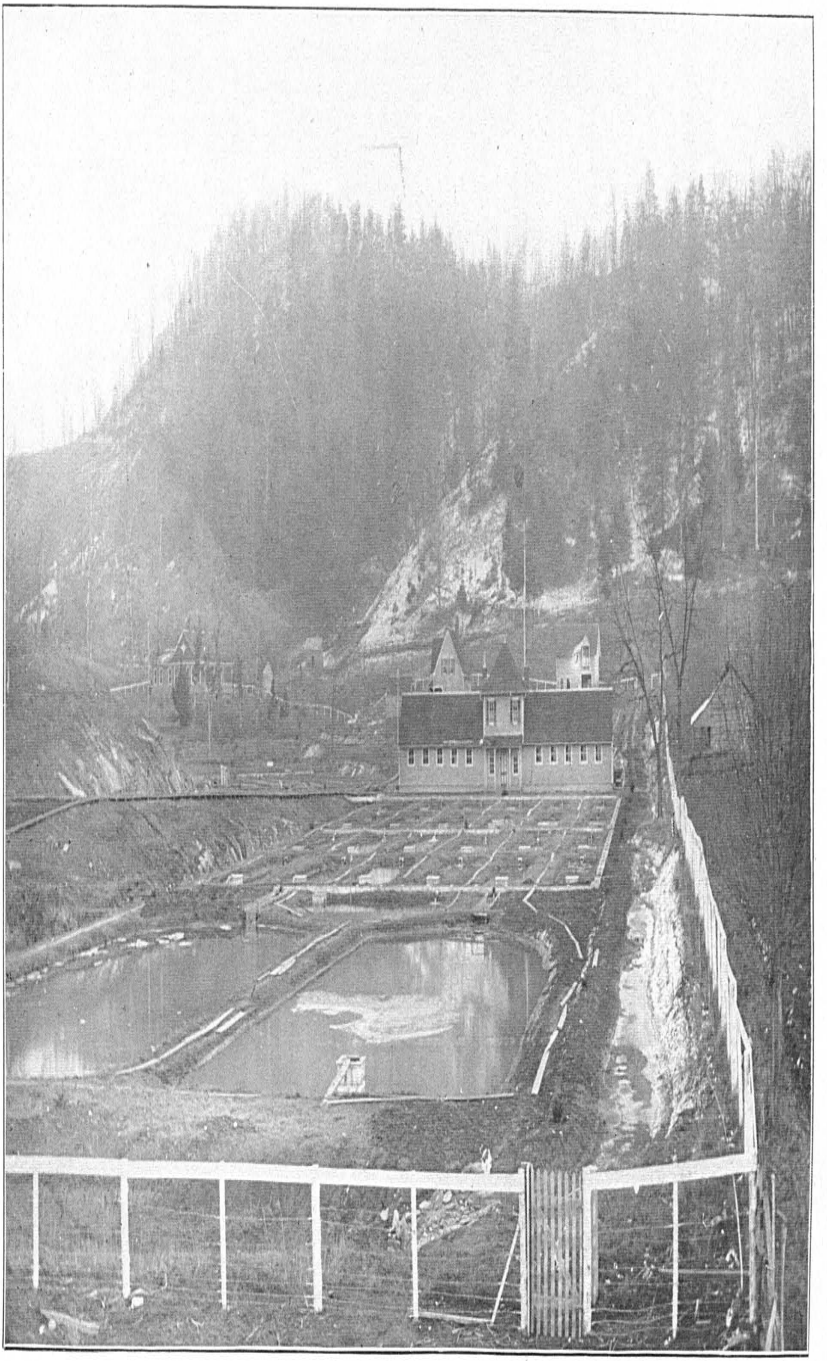
On November 6 Mr. Hiram Cady delivered to the superintendent of the Michigan stations, Mr. Frank N. Clark, a lake trout said to have been caught in Walnut Lake, Oakland County, Mich. As this is a small inland lake, and as it was not known to contain lake trout, a net was set on the 17th of November and 5 large male and female trout, 4 white-fish varying from 2 to 4 pounds, 1 pike perch, and a number of unimportant species were captured. On November 18 12 white-fish were taken, 8 of them within a space of 6 feet, showing not only that the fish travel in schools, but that they are abundant in the lake. The trout are supposed to be the result of a plant of 20,000 fingerlings in Walnut Lake from Northville, in 1890.

Dr. James A. Henshall, superintendent of Bozeman station, Montana, reports that during the past year a number of steelhead and eastern brook trout have been taken in Bridger Creek, which runs through the Bozeman station grounds, and which is a natural trout stream about 20 miles long, with an average width of 30 feet. The only fishes native to its waters are the black-spotted trout and Rocky Mountain white-fish. Steelheads have also been captured with the fly in Bozeman Creek, which was accidentally stocked in the fall of 1897 by a can of fry jolting from the wagon into the stream from a load of fish intended for Mystic Lake.

From various correspondents it would appear that the efforts to stock the waters of Vermont with landlocked salmon are producing good results. Mr. F. A. Woodbridge, of Newport, Vt., reported the capture of 10 landlocked salmon in the Clyde River, at Derby, of about 7 inches in length. Mr. E. S. Whitcomb, of Underhill, Vt., also reports the capture of a steelhead trout in Browns River, Essex, weighing 2½ pounds and 19 inches long, and of another weighing 3⅝ pounds; also a number of smaller ones. They have been frequently reported from Lake Champlain and its tributaries.

SPECIAL INVESTIGATIONS AND INSPECTION.

During July, acting under the direction of the Commissioner, Mr. Ravenel visited the Pacific coast to arrange for the transfer of Battle Creek station from the California Fish Commission and the purchase of the necessary land from Mr. F. R. Love, who owned the site on which the California station was located. The transfer of the State property in Battle Creek was satisfactorily arranged in San Francisco with the State commissioners, but after a careful examination, with Mr. John P. Babcock, of the California Commission, and Mr. G. H. Lambson, superintendent of Baird station, it was decided that to insure the operation of the station to its full capacity it would be necessary not only to



ERWIN STATION, TENNESSEE—POND SYSTEM AND HATCHERY.

acquire the property on which the station was at present located, belonging to Mr. F. R. Love, but additional land and water rights on the lower part of the creek belonging to Mr. J. A. Long. The following day an option was secured from Mr. Love at Redding, Cal., on 5 acres of land divided into two lots, one of 4¾ acres, on which the hatcheries are located, and the balance near the main rack, with all water rights and privileges, including right of way through his land to the fishing-grounds, for the sum of $300. Arrangements were also entered into with Mr. Long for the purchase of the same amount of land at $50 per acre.

Upon the completion of this duty Baird station, 16 miles from Redding, was visited and found to be in good condition, with the exception of the hatchery, which had been cheaply constructed many years ago. Recommendations were submitted, which met the approval of the Commissioner, for rebuilding the hatchery during the latter part of the year. The stations on the Clackamas and Little White Salmon rivers were also inspected and found to be in fair condition. The former station, so far as the collection of eggs is concerned, is of little value; but on account of its location on the Clackamas River, which is regarded as the most important spawning-ground of the quinnat salmon in the Columbia River basin, it is utilized for hatching a part of the eggs collected at auxiliary stations on the Salmon and Little White Salmon. The plant on the Little White Salmon had been much improved and the construction of the additional hatchery which had been authorized was in progress; when completed it will be practicable to care for between 25,000,000 and 30,000,000 eggs at this point.

An effort was also made to confer with Hon. E. C. Little, the State fish commissioner for Washington, for the purpose of deciding upon the location of a hatchery in the State of Washington, but owing to his absence the negotiations were placed in the hands of Mr. Waldo F. Hubbard, who afterwards visited, in company with Mr. Little, the State hatchery on Baker Lake and arranged for the transfer of the same to the United States for the sum of $6,400.

In September the station at Erwin, Tenn., was inspected, and the superintendent was authorized to construct additional ponds for the rearing of trout. During December the stations at Woods Hole and Gloucester, Mass., and Nashua, N. H., were visited by Mr. Ravenel for the purpose of conferring with the superintendents relative to work then in progress. At the Massachusetts stations the outlook for cod work was excellent, as both of the field stations, under Capt. E. E. Hahn, were taking large numbers of eggs.

The new station at Nashua, N. H., was found to be in fairly satisfactory condition but incomplete, owing to insufficient funds. The work of construction was discontinued and the station placed in charge of a watchman until the close of the fiscal year.

During the latter part of June the station at Bullochville, Ga., was inspected and several days spent with the superintendent, Mr. W. H. Benton, in looking over the work accomplished and making estimates

for completing a certain portion of the ponds, as it was found that the appropriation would not be sufficient to finish the station as originally planned. A large amount of work had been accomplished in clearing and grading the grounds, and in putting in water-supply pipes, etc. The property was fenced and considerable work had been done in excavating several large ponds. In addition to this, the springs had been cleaned out and cement basins constructed, the channels straightened, and a number of other minor improvements made.

Through the courtesy of the Bulloch Brothers several temporary ponds were constructed in their mill pond, which had been stocked with bream and bass. A number of schools of small bass were visible at this time, and although large results are not expected, the experience gained will be of much value to the force during the next year's work. From the progress made there is no reason why a sufficient number of ponds should not be completed to permit of the operation of this station during the next fiscal year. The superintendent was instructed to utilize the funds available for the completion of the main part of the station and construction of residence, leaving for after consideration the section lying to the south of Cold Spring Brook, which embraces the south spring reservoir and Ponds M and L.

STURGEON.

The rapid decline of the sturgeon fishery, as evidenced not only by the decreasing catch along the Atlantic coast, but also in the Great Lakes and on the Pacific coast, and the immense increase in the price for caviar, accentuated the necessity for making another attempt to undertake the propagation of this valuable species.

In May Mr. Ravenel made a preliminary investigation of the fishery on the Delaware River, which is distributed over about 75 miles of that river, with Delaware City as its center. Conferences with prominent dealers assured us of their hearty cooperation; and on May 23 Mr. L. G. Harron, who had been in charge of the shad-hatching operations on the Potomac River, was instructed to proceed to Delaware City to undertake this work. Accompanied by a force of spawn-takers, and with a steam launch for visiting the fisheries in the vicinity, operations were commenced May 27, arrangements having been made with Mr. Sadler for erecting a temporary hatchery on his wharf and for the use of his boiler and pumps to obtain a water supply. Various forms of apparatus were provided, including floating boxes, to be anchored in tide water, McDonald hatching-jars, and troughs equipped with wire trays. All of the principal fishing-grounds and floats where sturgeon were butchered were visited daily from May 29 to June 13; but although a number of ripe sturgeon were reported as having been captured, investigation would indicate that the fishermen were mistaken, though it is believed that at least two overripe fish were taken at Bayside. Fishing ceased on June 15, so that it was necessary to discontinue the work.

Although a large number of sturgeon are caught in this vicinity during the season by the 500 boats fishing from Delaware City to

Bayside, within a radius of 20 miles, the problem of securing ripe fish alive is more difficult than would appear at first glance. Over 50 per cent of the female fish caught are dead when brought to the butchering float, usually because they are hooked in vital spots when pulled into the boat, causing them to bleed to death within a short time. Of over 200 sturgeon which were butchered while Mr. Harron was at Delaware City, three-fourths were with hard roe, two were overripe, four had spawned, and two were apparently nearly ripe. Although this year's work was unsuccessful, it is believed that, with the cooperation of the fishermen, who are deeply interested in this question, and by taking up the work on the 1st of May, better results can be secured another season.

An auxiliary station was established on the Missisquoi River, Vermont, and on Lake Champlain, with the view to propagating the lake sturgeon; but the efforts resulted in failure, though much valuable experience was gained, which, it is believed, will result in obtaining a fair number of eggs next season. A full report of this work is published under the abstract from Cape Vincent station.

EXPOSITION AT OMAHA.

The Trans-Mississippi and International Exposition, which was in progress at the close of the fiscal year, terminated October 31. At the approach of warm weather, during the latter part of June, the fishes in the aquarium supplied with ordinary river water began to show signs of disease. It was found that the water, although filtered before being used, was charged with injurious parasites and the spores of fungus; and at one time it was thought that it would be necessary to abandon certain parts of the exhibit, as the loss was very heavy. Several remedies were tried, including a weak solution of alcohol, but the most effective was ordinary Turks Island salt, 1½ sacks per day being required when the disease was at its height. By a liberal use of salt and by restocking the aquarium, the exhibit of native fishes was kept in an excellent condition to the close of the season. That part of the fresh water exhibit comprising the trouts and salmons was a very attractive feature throughout the exposition. By means of an ice machine cold water was abundantly supplied during the heated term. The maximum temperature in the trout and salmon tanks during the month of June was 60°, with a minimum of 51° and a mean temperature of between 54° and 55°; whereas in the other tanks, which were supplied with ordinary river water, the temperature reached 91°. These fish were shipped from the Fish Commission stations in Colorado, Michigan, Iowa, and Missouri.

The salt-water exhibit, which had opened with a fine display of the important economic food-fishes of the New England coast, did not prove as satisfactory as was anticipated, many of the best specimens dying at the approach of warm weather. In making an exhibit of this character, it will be hereafter necessary to provide for keeping the temperature of the water below the danger mark in localities like Omaha. This exhibit was finally abandoned in August, and fresh-water fishes substituted.

The fish-cultural work, which was practically illustrated by the hatching of grayling during the month of July, and quinnat-salmon eggs (shipped from the Pacific coast) during September and October, proved very instructive and entertaining. During the entire exposition there were exhibited in the aquarium various kinds of fry which had been hatched on the grounds, including a large number of quinnat-salmon fry.

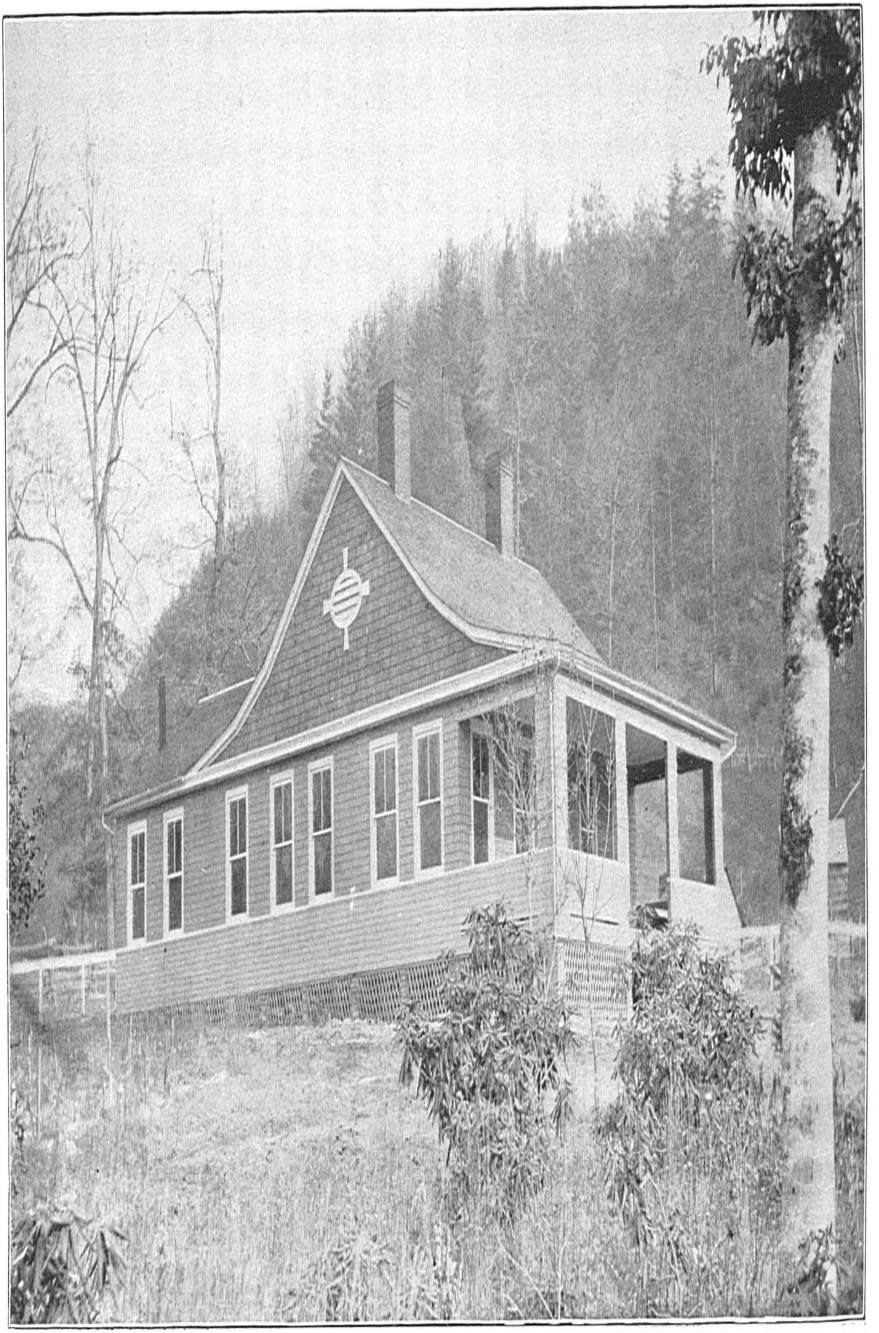
At the close of the exposition all the fish on hand which were not liberated in the vicinity of Omaha were turned over to the Nebraska Fish Commission for distribution to the public waters of the State. The aquarium was dismantled and, with the other exhibits, shipped to Washington, under the direction of Mr. R. J. Conway, assisted by Mr. W. P. Sauerhoff, to whose untiring energy and attention much of the success attained was due; Mr. Conway being in charge of the aquarium and general management of the exhibit during the exposition, and Mr. Sauerhoff of the fish-cultural work.

CAR AND MESSENGER SERVICE.

The demands in this branch of the service, which remains under the charge of Mr. J. F. Ellis, have greatly increased during the past few years, owing to the increase in the number of stations and the greater number of requests for fish from all parts of the country. During the year the four cars were actually engaged in distribution 845 days and traveled 95,374 miles, distributing 100,578,000 fish, with a total loss of 1,288,000, or 1.28 per cent. The remaining fish furnished for distribution, amounting to 955,793,000, were planted by detached messengers and employees of the various stations, who traveled 138,847 miles in making said distribution. Of these, 4,938,854 were lost en route, or 0.5 per cent. The percentage of fish lost by messengers is necessarily much smaller than where handled on the car, as in many instances the plants are made within a mile or less of the station, whereas on the cars they are frequently held for eight and ten days and carried many thousand miles in varying latitudes and temperatures.

The work in this branch of the service has been exceedingly satisfactory, though no important changes or improvements were made, except increasing the capacity of the air-pumps on several of the cars and the substitution of steel platforms and new couplers for the old forms. All of the cars were overhauled and repaired during the season at a cost of $3,550. In addition to the routine work of the division, the cars were called on to transport the fish exhibited at Omaha, involving two trips with salt-water fishes from Woods Hole to Omaha, besides a number of trips from the stations at Quincy, Neosho, Manchester, and Northville. They were also used for collecting wild trout in Wisconsin for the Manchester station, and at the request of the Flint and Pere Marquette Railroad distributed a carload of pike perch in Michigan.

The superintendent renews his recommendation that two additional cars, with crews, be provided, as at present it is frequently necessary to borrow or hire cars from the various railroad companies, and to employ untrained temporary assistants to assist in the distribution.



ERWIN STATION, TENNESSEE—FOREMAN'S COTTAGE.

Report U. S. F. C. 1899. (To face page XLII.)

STATION REPORTS.

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

During the spring and summer a number of improvements were made, increasing materially the effectiveness of the station. The most important change was the thorough overhauling of the main supply flume through which the water from Rocky Pond is conducted. Its foundation had settled in places, and this (together with damage by ice the previous winter) caused leaks at many points and allowed the escape of about 1,200 gallons of water per minute. The hatchery, stable, and outbuildings were repainted and 20 new troughs, each 15 feet long, were built and installed in the nursery. The old spawning-house at Great Brook and the two old buildings upon the land of Bridgham Haynes, near Green Lake, were moved to the station and fitted up for occupancy by the employees. A mill for grinding fish-food was also devised, which resulted in the saving of much time and labor. A heavy plank dam was put in the drain to carry off waste water from the ponds and hatchery, and in the rear of the dam a common overshot wheel was connected by a large pulley to a small pulley attached to the liver machine. This enables one man to prepare the food required for all the fish at the station in two hours, whereas the same amount of work used to require the services of two men each day.

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

Species.	Calendar year in which fish were hatched.		
	1898.	1897.	1896.
Landlocked salmon	336,936	.....	279
Steelhead trout	8,830	3,370	.....
Brook trout	13,831	.....	.....

The landlocked salmon were held in the ponds and troughs during the summer with slight loss, only 3,381 having died between July 1 and December 19, when the distribution was completed. Those reared in ponds were much larger than those held in troughs, varying in length from 4½ to 6¾ inches, and averaging fifteen and eighteen to the pound. Of the brook and steelhead trout on hand at the beginning of the year, 8,880 brook trout were distributed in July and 2,767 steelheads of 1897 and 1,000 steelheads of 1898, during August, September, and October. The remaining steelheads—500 of the hatch of 1897—were held in the north reservoir, which contains a large amount of natural food, and are apparently doing well, having attained a length of from 7 to 11 inches. The loss on those of 1898 during the summer amounted to 2,704, leaving only 5,000; these are being reared in one of the ponds for brood-fish. The landlocked salmon of 1896 have attained a length of 12 inches and will average from 1½ to 2 pounds in weight. The indications are that better results will be secured in their domestication than from any previously experimented with.

The white (albino) salmon are objects of much interest to the many

visitors from Bar Harbor, Bangor, Ellsworth, and other points. They are in excellent condition and have reached a length of from 5 to 6 inches. It is not unusual to find three or four white salmon during the season among several hundred thousand normally colored fish, but they are more numerous this year than ever before. As they increase in size their color gradually changes from white to straw.

Early in the summer arrangements were made for collecting eggs of the landlocked salmon, brook trout, golden trout, and lake trout, at Winkempaugh Brook, Mann Brook, Patton Pond, Great Brook, Flood Pond, and Coldstream Pond. The traps and pens were repaired and operations commenced early in September with the following results:

Point of collection.	Species.	Fish.	Eggs.
Winkempaugh Brook	Brook trout	120	98,000
Do	Landlocked salmon	39	128,000
Patton Pond	Brook trout	126	99,000
Do	Landlocked salmon	8	11,000
Flood Pond	Brook trout	27	25,000
Do	Golden trout	35	4,000
Green Lake	Brook trout	7	2,000
Do	Landlocked salmon	84	228,000
Coldstream Pond	Lake trout	1,830	1,000,000
Do	Landlocked salmon	32	85,000

In addition to the eggs collected from the points mentioned above, 100,000 brook-trout eggs were purchased in March from dealers in Massachusetts, and 10,000 black-spotted trout eggs were presented by Mr. J. Annin, jr., of Caledonia, N. Y. The eggs collected at the field stations were all transferred to the hatchery as soon as practicable after being fertilized, except those at Enfield, which were held in the State hatchery until the eye-spots developed. The losses were very light except in the case of the brook trout, which commenced hatching in March and finished early in May. It being impracticable to rear brook trout at this station on account of the high temperature of the water during the summer, all of the fry on hand were distributed in May and June, 196,000 being planted. The heaviest mortality was among eggs collected at Winkempaugh Brook, due to the loss of nearly all the male fish as the result of a severe freshet.

Of landlocked salmon eggs 82,500 were shipped during winter; the balance were held at the station and hatched with comparatively small losses. At the end of the season 311,125 strong, healthy fry remained on hand, which will be distributed as usual during the fall months.

Owing to high water in Flood Pond but few golden-trout eggs were collected, and the resulting fry were liberated in Holbrook Pond and Green Lake during the spring.

The experience of the past few years has again demonstrated the fact that the method of measuring eggs to determine their number is not accurate, owing to great variation in the size of those obtained from the different waters. It is also believed that where the eggs have been measured or weighed, after having been in the troughs 100 days

or more, a loss ensues. To obviate this loss eggs are now counted while the trays are in the hatching-troughs, and are never removed until about ready to hatch, when they are transferred to clean trays and placed in troughs with false bottoms. Each trough is allowed 15 gallons of water per minute, and the percentage of fry lost after hatching is much smaller than ever before. The use of salt in the troughs during the early stages has also been abandoned to a great extent, only 14 bushels being used during the past year. As a substitute for salt 6 quarts of fine clay are placed in each trough three times a week. After cleaning the ponds about 2 bushels of clay are thrown in. Clay is also used with great success before the fish hatch.

At the end of the year the stock on hand was as follows:

Species.	Calendar year in which fish were hatched.			
	1899.	1898.	1897.	1896.
Landlocked salmon	311,123	397	.....	277
Steelhead trout	.....	5,126	500	.....
Brook trout	.....	829	.....	.....

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

The work during the past year has been devoted principally to collecting and rearing Atlantic salmon at the main station and landlocked salmon at the substation on Grand Lake Stream. The Atlantic salmon work was conducted conjointly with the State of Maine, and consisted in the purchase of adult salmon in May and June, which were held in confinement in the fresh-water inclosure at Dead Brook until they spawned in October, when they were liberated.

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

Species.	Calendar year in which fish were hatched.					Wild fish.
	1898.	1897.	1896.	1895.	1894.	
Atlantic salmon	636,264	.....	.....	.....	233	400
Atlantic salmon, domesticated	.....	454	.....	.....	35	.....
Landlocked salmon	54,476	.....	.....	.....	1	.....
Quinnat salmon	.....	28	.....	.....	.....	.....
Steelhead trout	38,745	.....	188	.....	.....	.....
Rainbow trout	28,351	.....	.....	.....	.....	.....
Scotch sea trout	1,108	.....	.....	508	10	.....
Brook trout	2,666	.....	.....	.....	.....	.....
Total	761,700	482	188	508	279	400

In addition to the fish at Craig Brook there were 118,000 landlocked salmon at Grand Lake Stream, which were being held for distribution in the fall. These were reared in out-of-door troughs, and were fed on chopped flesh of various kinds—beef liver, hogs' plucks, flesh of condemned horses, etc. The distribution was made during the summer and fall, the first plants being made in August and the last in January.

At the beginning of the year there were three broods of Atlantic salmon on hand. The first consisted of 400 adults, collected in May and June, 1898, and held at Dead Brook. The second lot of 233 were hatched in 1894, from eggs collected from migratory fish which had

been held in a pond specially prepared for them for the purpose of experimenting in domestication. The third brood were the fry hatched in the spring of 1898, numbering 636,264. The losses on these were quite heavy late in the summer, and the number distributed amounted to only 391,898, or 61½ per cent of the stock on hand on June 30. These results were not satisfactory, compared with the output of the previous year, when over 85 per cent of the number on hand at the beginning of the year were successfully distributed in the fall months, having been reared under nearly the same conditions. The 4-year-old salmon were held until fall with a loss of only 4 per cent, and in November yielded 16,800 eggs of poor quality, which died by the end of April. On the recommendation of the superintendent the fish were liberated in Alamoosook Lake, and experiments in domestication were discontinued.

The salmon in the lot numbering 400 at the beginning of the year were reduced to 365 by November, when the spawning commenced. They yielded 2,147,677 eggs, which were reduced by losses to 1,862,767 when the division was made, the United States Fish Commission receiving 1,500,288, and the State of Maine 362,479. Of those belonging to this Commission, 656,000 were shipped to other State fish commissions and to private individuals; from the remainder, 842,017 fry were produced. In May the State of Maine turned over to the Commission the fry resulting from its share of the eggs, amounting to 354,080, making the number available for distribution 1,196,097. Of these, 450,000 were liberated in the waters of the main Penobscot River, between Passadumkeag and Mattawamkeag and the balance—704,496—was retained for disposition in the fall.

The term domesticated salmon, as used in this report, applies to salmon of the species *Salmo salar*, descended from parents hatched and reared at the station, having never gone to sea. On the 1st of July there were three lots—one of 2 fish hatched in 1892, one of 33 fish hatched in 1893, and one of 454 hatched in 1897. In November they yielded 15,800 eggs, but all of the fry hatched from them perished before the absorption of the sac. In view of the poor results obtained from the experiments it has been decided to abandon further attempts in this line and to liberate the fish in suitable waters.

Of the 54,476 landlocked salmon fry on hand in July, 45,379 were distributed during the fall and 3,961 retained. Of the 119,522 at Grand Lake Stream on June 1, 1899, 114,171 were distributed in Grand Lake Stream and Grand Lake in the fall. The trap for the collection of the adult landlocked salmon was finished in October and fishing began on October 28, continuing until November 21. During this period 866 salmon, 358 males and 508 females were collected. The largest male measured 24 inches and the shortest 13 inches, the average being 18.7; the largest female measured 22½ inches and the shortest 14 inches, the average being 18.8. The maximum weight of females was 4⅝ pounds, and the minimum 1 pound, the average being 2.59. Of the females captured 477 yielded 621,500 eggs, an average of 1,300 per fish. Of

WYTHEVILLE STATION, VIRGINIA—NEW REARING-PONDS.

these eggs 274,000 were shipped to Craig Brook and the remainder were held for hatching at Grand Lake Stream. These produced 272,672 fry, of which 130,797 were held until the close of the season, the balance being liberated in Grand Lake and Grand Lake Stream.

Of the eggs transferred to Craig Brook 160,000 were shipped to other points and the remainder were hatched. The fry resulting from them numbered 89,873 at the close of the year. Of the 28 quinnat salmon hatched in 1897, only 10 were found in September, the missing ones having probably been destroyed by minks; 188 were received in May from St. Johnsbury and placed in a large deep pond for the purpose of experimenting in the domestication of this fish.

From the lot of 2-year-old steelheads resulting from eggs shipped in 1896 from Fort Gaston, Cal., 4,500 eggs were secured during April; these were of inferior quality and only 1,637 of the fry produced from them survived to the end of the year. Of the 38,745 fry hatched in 1898 from eggs received from California there were distributed during the year 26,282. This lot of fish suffered from an obscure disease, the leading symptom of which was an apparently cancerous destruction of the fins, especially the caudal. A small lot were cared for in troughs to afford data with reference to this disease; 287 of these remain on hand.

The rainbow-trout fry resulting from eggs collected in Craig Brook from wild fish released in Alamoosook Lake in August, 1897, though suffering to a certain extent from the same disease which attacked the steelheads, were successfully carried through the summer and 23,565, or 72 per cent of those on hand at the beginning of the year, were distributed during the fall. In March and April 11,450 eggs were collected from fish in Alamoosook Lake. These yielded 7,290 fry, of which 4,829 remained on June 30.

A small number of Scotch sea trout hatched from the original invoice of eggs donated to the Commission by the journal *Shooting and Fishing* in 1891 still survive. They have occupied a small, deep, turbid pond since 1893 and have yielded eggs each year. Of their descendants several hundred active, healthy fish remain. From the other fish on hand 186,300 eggs of poor quality were collected. Only 56,551 of the fry resulting from them are on hand at the close of the year.

The fish food during the year consisted principally of liver, hog's plucks, horseflesh, aggregating 45,746½ pounds and costing $513.22. In view of the fact that for eight months the stock at the station varied from 750,000 to 2,000,000 fry, yearlings and adults, this is not excessive.

Two diseases, serious enough to demand notice during the year, differed in some respects from anything observed here before. The first heavy mortality occurred in July, August, and September among the Atlantic salmon in the ponds and troughs, compelling a great deal of extra work and entailing heavy losses. The other attacked the steelheads and rainbows, but did not, so far as observed, extend to many lots of these fish. It seemed to appear about the first of December, when part of the distribution had been made. Some of the affected lots were

retained, and from the observations made the disease appeared to be of a cancerous nature, the fins, especially the dorsal, being the first point attacked. A somewhat similar ailment of the fins has often occurred in the past, but nothing ever approaching the severity of the disease this year. In many instances its course continued until the flesh of the trunk of the fish was entirely destroyed, laying bare the bony structure attached to several of the vertebræ entirely anterior to the caudal fin. It may be mentioned here that during the summer of 1898 a microscopic examination of the fish in the ponds and neighboring waters revealed almost everywhere, even among the wild native fishes of Craig Pond, the presence of a trematode parasite, which could not be distinguished from the species that attacked the lake trout with such fatal effect.

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

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

Species.	Calendar year in which fish were hatched.			
	1898.	1897.	1896.	1895.
Steelhead trout	3,903			35
Rainbow trout			410	
Quinnat salmon		775		
Brook trout	6,199			
Landlocked salmon	9,138			

The 35 steelhead and 410 rainbow trout resulting from eggs hatched at the station in 1895 and 1896 were carried through the summer with comparatively small losses. In the fall a considerable number of eggs were collected from the steelheads, but many of them were glassy, as is common with eggs taken from 2-year-old rainbow trout. It would appear that the steelhead can be easily domesticated; the fry on hand at the close of the year were strong and healthy. The rainbow trout produced few eggs, and most of them were glassy when extruded.

During September the steelhead trout hatched in 1898 were planted in Crystal and Morey lakes and the landlocked salmon in Willoughby, Caspian, and Dunmore lakes. The brook-trout yearlings were distributed during the fall and early winter.

As the ponds at St. Johnsbury are very small and not adapted for rearing quinnat salmon, 200 were transferred to Craig Brook station in May and the remaining 147 were planted in Morey Lake.

Early in the summer field stations for collecting wild brook trout eggs were established at Darlings Pond, Groton; Lake Mitchell, Sharon, and Caspian Lake, Greensboro. Explorations were also made with the view to establishing additional stations at Little Leach Pond in Averill, Lake Dunmore at Salisbury, and ponds of the Wells River Fish and Game Club at Wells River.

On July 8 the construction of a trap was commenced at Darlings Pond, but no efforts were made to retain any fish during the warm weather. On September 20 A. H. Dinsmore was placed in charge and

the first eggs were taken on September 28. Collections continued until October 25, during which period 680,000 were obtained from 6,092 fish captured, of which 510,000 eggs, or 75 per cent, were eyed. Late in the season many spent fish ascended the stream, showing that a considerable number spawn in the pond. On account of its dark color the water of the pond can not be examined more than a foot below the surface, and consequently the nests could not be located.

In support of the theory advanced in 1898 that the quality of the egg is affected by long confinement of the fish before ripening the following table is interesting and tends to confirm the statements then made:

When taken.	Number taken.	Number eyed.	Per cent eyed.	When taken.	Number taken.	Number eyed.	Per cent eyed.
1898.				1898.			
Sept. 28 and 29	76,089	63,000	82.8	Oct. 13	74,400	56,000	75.3
Oct. 1	85,450	74,000	86.6	15	47,000	34,000	72.4
3	108,510	86,000	79.3	17	46,300	34,000	73.5
5	94,300	76,000	80.6	19-25	60,000	23,000	38.4
7	45,150	33,000	73.1				
10	43,700	31,000	71	Total	680,899	510,000	74.9

Operations at Lake Mitchell, Sharon, were inaugurated July 23 by the construction of a trap. In September Mr. G. H. Tolbert was placed in charge of the station and at once commenced the construction of a shanty 8 by 12 feet, which was supplied with water by a spring in the immediate vicinity. The volume of water from this spring amounts to only 10 or 12 gallons per minute. On October 8, when Mr. Tolbert was transferred to Danby, about 700 trout had been captured, and subsequent takes brought the total to 2,100. The first eggs were secured on October 8 and the last on November 12. The yield amounted to 408,461, but on account of trouble with the water supply, which necessitated the changing of the location of the hatchery when the eggs were at a critical stage, the loss was great. The eggs were transferred to St. Johnsbury as soon as eyed and produced 150,000 fry for distribution.

Arrangements were made, as usual, to collect eggs from trout in Fairbanks Pond. About 50,000 were secured, of which 27,500 proved good.

The Wells River Fish and Game Club ponds are about an hour's drive from Wells River, and when well stocked will prove a profitable field for work. About 17,000 eggs were secured there in October.

Arrangements were entered into with Hon. S. L. Griffith, at Danby, to collect eggs from his pond on shares. Mr. G. H. Tolbert was placed in charge of the work at that point. The Commission was to receive 200,000 eyed eggs for his services, but owing to defective arrangements the results were unsatisfactory, so that Mr. Griffith was obliged to purchase 1,000,000 eggs from one of the commercial hatcheries in Massachusetts. Of these, 200,000 were turned over to the Commission.

Arrangements were made to take both lake and brook trout eggs at Caspian Lake. A large pound net was purchased, and two fishermen from Lake Champlain were engaged to operate it. Owing to unexpected delays the net was not placed in the water until October 15, and on the

18th two ripe lake trout were captured, one male and one female; another was taken subsequently, and 17,500 eggs were secured. The location of the net was changed three times during the season, and nearly every night loosely hung gill nets of small mesh were set in various portions of the lake, in both deep and shallow water. Although the men worked nearly 16 hours per day, it became evident by November 1 that it was useless to continue the work. Large quantities of suckers, small minnows, dace, and smelt were taken.

The brook trout did not appear on the spawning-beds as usual in November, which is accounted for by the fact that the water 4 feet below the surface was much warmer than usual, registering 50° on October 25. The station was closed in November with most disappointing results, the collections amounting to only 17,500 lake trout and 6,500 brook trout eggs. It is believed, though, that the lake trout had spawned before fishing commenced with the pound net.

In order to determine whether the brook trout spawned after work was discontinued the spawning-beds were examined on December 1 and 28. The first examination showed the presence of two pairs; the last disclosed three beds which had just been cleaned. Other examinations were prevented by the extreme cold weather, the temperature standing at 12° below zero.

On October 22 the superintendent visited Lake Dunmore to determine whether it would be advisable to establish a station there for collecting lake-trout eggs. A suitable spring for eying a million or more was found near the lake, and a number of males and females were observed on the beds. A female, estimated to weigh 10 pounds, taken with a dip net, was found to be full of ripe eggs. It is believed that with suitable apparatus enough fish could be captured to yield a million or more eggs during the season at comparatively light expense.

As a result of the operations at the various points, 950,000 eyed eggs were received at St. Johnsbury at a cost of $1,000; 370,000 of these were transferred to other stations of the Commission and shipped to State fish commissions and private individuals; and 580,000 were hatched at the station, the fry resulting from them being distributed in May and June.

In addition to the eggs collected at the field stations, 9,000 eggs of the golden trout were obtained from the New Hampshire Fish Commission and hatched at St. Johnsbury for the Vermont Commission. A shipment of 50,000 landlocked salmon eggs, transferred from Craig Brook on March 22, arrived with a loss of only 17. These hatched in May, and 42,329 remained of them at the close of the year. Owing to the high temperature of the water, it was found necessary to put salt in the ponds twice a week. Before doing this the water is drawn down very low and the supply shut off; the fish are then immersed in a solution of about 4 quarts of salt to 40 gallons of water.

During June two consignments of grayling eggs were received from Bozeman, Mont. On account of the warm weather prevailing at that

time and lack of attention en route both lots arrived in poor condition, only 1,000 eggs being saved from the first shipment and 7,000 from the second. At the close of the year the fry resulting from them were being fed on finely grated liver, and were apparently healthy.

During the spring 2,000,000 pike-perch eggs were received from the Missisquoi River, and the fry resulting, about 250,000, were planted in Joe's Pond, near West Danville, Vt., and Silver Lake at Barnard.

The fish food used at the station consists principally of beef livers. Such waste material as could not be utilized in the ordinary method was used for developing insect larvæ. An odorless maggot box was devised, consisting of a floating box tightly closed with a cover, the lids extending down to the water, with a bottom of coarse wire cloth covered with excelsior or straw, upon which the meat is placed. As the maggots hatch out they work down through the excelsior and drop out into the water, where the fish are lying in wait for them.

At the request of Prof. J. W. Moenkhaus, of Cambridge, Mass., the eggs of two brook trout were fertilized with milt of two lake trout during the month of November. After supplying Professor Moenkhaus with such specimens as he required, the balance of the eggs were hatched at the station with slight loss, and on July 1 there remained 2,241 healthy fry. These hybrids were of the same size as the brook-trout fry, but resembled the lake trout in nature and markings. A larger number of deformities occurred among these than is usual with either the lake or brook trout. A notable feature consisted in not having a tail, or at least a very slight tail compared with the body.

The condition of the water supply of the station is practically the same as heretofore. Efforts were made to increase it by driving wells, under an act of Congress authorizing an expenditure of $3,000. Five wells were driven, but only one yielded any water.

During July the superintendent's residence was completed. A new pond was constructed and nursery ponds No. 7 to No. 12 were turfed and plank walks built around them.

CAPE VINCENT STATION, NEW YORK (LIVINGSTON STONE, IN CHARGE).

On account of the unusually stormy weather prevailing in October and November no lake-trout eggs were collected on Charity Shoals or any of the near-by fishing grounds, but arrangements were made to conduct operations at Dunkirk during November, and from this source 822,500 eggs were secured. These hatched the following spring with a loss of 346,505, and the 425,000 fry obtained from them were planted in Lakes Ontario and Otsego.

In December 15,000,000 white-fish eggs were transferred from Put-in Bay. These were collected at Monroe Piers, Michigan, under unfavorable conditions, and were of very poor quality. The fry hatched in April, and were planted in Lake Ontario. During the winter several shipments of brook-trout eggs, amounting to 361,480, were purchased from private hatcheries in Massachusetts. The fry from these were distributed in the spring to private applicants in New York.

All efforts to collect pike-perch eggs from Lake Ontario and tributary waters having failed, arrangements were made early in the spring to establish a collecting station on the Missisquoi River, in northern Vermont, which has always been noted for the abundance of its pike perch. As soon as the ice disappeared the fish commenced ascending the river in vast numbers as far as Swanton Dam, 7 miles above its mouth. The point selected for a fishing-ground is on the right-hand bank of the Missisquoi River, about 3 miles below Swanton Dam, the site of a former fishing-ground. A small wharf and spawning shanty were erected near where the seine would be landed, and pens were constructed for holding the spawning fish preparatory to stripping them.

As soon as the ice broke up the capturing of the fish was commenced with the ordinary haul seines, and by April 28 over 3,000 had been secured. This number might have been doubled had the operations been conducted during the night. The first eggs were stripped on April 23, and the last on April 28, the 591 females available yielding 38,000,000, of which 36,000,000 were sent to Cape Vincent and the remainder to St. Johnsbury. The methods of stripping and fertilizing the eggs were practically the same as at Put-in Bay and other stations where pike perch are handled. They were sent from Swanton to Cape Vincent on trays and in cans of water, and from the condition in which the different lots were received it would appear that better results can be secured by shipping on trays. From the 36,000,000 eggs derived from Swanton and 24,000,000 transferred from Put-in Bay, only 9,050,000 fry were hatched. Of these, 25 per cent were returned to the Missisquoi River and planted on the fishing-grounds; the balance were distributed in the State of New York. It is believed the poor results were due largely to the holding of the fish in pens too long before they were ripe. The outlook for the collection of several hundred million eggs at this point in the future is excellent, and arrangements will be made next year to conduct operations on a much larger scale.

Investigations during the previous spring having indicated that there were no points on Lake Ontario where a sufficiently large number of sturgeon could be obtained to warrant the establishment of a field station, arrangements were made this season to thoroughly investigate the Lake Champlain fisheries, as it had been reported that large numbers were being taken on that lake. Mr. Myron Green, who was employed to assist in the work, reported on May 17 that a great many were being captured at East Alburg, Vt., and that he had 16 large ones penned. An examination showed that none of these were ripe, but three of them would probably have spawned within three or four weeks. Arrangements were made with the fishermen to examine all the sturgeon caught, and in several instances females that appeared to be nearly ripe were penned and held. During the latter part of the month most of the fish captured seemed to be less matured than those taken early in the season. Concluding that the point selected for operations was at some distance from the spawning-beds, all of the

sturgeon captured for 25 miles south of Alburg, nearly down to Burlington, were overhauled, but without results. All efforts to collect eggs were abandoned late in June, as the sturgeon seemed to have left the shoal water and to have gone into the deeper portions of the lake. From the data collected this spring it is impossible to determine definitely whether or not sturgeon ascend the river to deposit their eggs. They appear in the Missisquoi River immediately after the spawning of the pike perch and suckers, going up as high as the Swanton Dam, when they suddenly disappear, the stay at Swanton never being over 6 days and sometimes not over 3 days.

The development of regular sturgeon fishing in Lake Champlain is recent, and is probably due to the sudden rise in the commercial value of the fish. The flesh brings 12½ cents per pound net to the fishermen in New York, and the eggs from 65 to 75 cents per pound. A sturgeon dressing 100 pounds and yielding 24 pounds of eggs readily brings $30. They are usually captured with gill nets of 11-inch mesh, which vary in length from 20 rods to a mile or more. By means of a 400-rod net 30 were captured in one week.

Though all efforts this year resulted in failure, it is believed that some eggs may be collected next year by setting nets in the Missisquoi and Lamoille rivers, as soon as the pike perch have spawned, capturing all the sturgeon that ascend and holding them in confinement in a suitable pound until they ripen.

The following table shows the number of eggs received at Cape Vincent during the season and the fry hatched and distributed:

Species.	Eggs received.	Fry distributed.
Lake trout	822,500	425,000
White-fish	15,000,000	5,000,000
Pike perch	60,000,000	9,050,000
Brook trout	361,480	200,000

GLOUCESTER STATION, MASSACHUSETTS (C. G. CORLISS, SUPERINTENDENT).

During the summer, in addition to various minor repairs to buildings and water-circulating plant, a 1-story storage shed, 38 by 26 feet, and a small oil and paint house, 7 by 7, were erected. The old supply tank, which had been condemned, was replaced by a new cypress tank of 15,000 gallons capacity, and the platform was raised 5 feet to secure greater pressure for hatching lobster eggs.

Shortly after the completion of this work preparations were made for the collection of cod eggs at Kittery Point, Maine, under the direction of Capt. E. E. Hahn, of the schooner *Grampus*. A small force was also stationed at Plymouth, Mass., under the immediate direction of Mr. F. S. Conley. The first eggs from Kittery were received November 21, and the last on March 28, the total collections from that source amounting to 104,000,000. The shipments from Plymouth aggregated 61,618,000, the last consignment being received April 4. From Kittery 1,559,000 pollock eggs were also received, which produced 834,000 fry.

From the cod eggs collected at Kittery and Plymouth 106,455,000 fry were hatched and planted on the natural spawning-grounds between Kittery and Boston Bay. The following shows the daily collection of cod eggs, the loss during incubation, and the fry hatched and planted:

Date of taking eggs.	No. of eggs received.	Loss during incubation.	No. of fry hatched and planted.	No. of eggs planted.
1898.				
Nov. 21	2,290,000	355,000	.....	1,935,000
24	827,000	102,000	.....	725,000
25	2,583,000	233,000	.....	2,350,000
29	711,000	212,000	499,000	.....
Dec. 1	369,000	94,000	275,000	.....
2	474,000	116,000	358,000	.....
6	664,000	167,000	497,000	.....
7	829,000	142,000	687,000	.....
8	1,112,000	332,000	780,000	.....
10	2,949,000	807,000	2,142,000	.....
11	6,163,000	1,866,000	4,297,000	.....
12	379,000	139,000	240,000	.....
13	554,000	332,000	222,000	.....
14	4,980,000	1,213,000	3,767,000	.....
15	3,916,000	849,000	3,067,000	.....
16	5,992,000	1,508,000	4,484,000	.....
17	2,989,000	1,193,000	1,796,000	.....
18	3,455,000	1,224,000	2,231,000	.....
19	2,220,000	1,177,000	1,043,000	.....
21	1,373,000	169,000	1,204,000	.....
22	1,137,000	300,000	837,000	.....
24	1,589,000	384,000	1,205,000	.....
25	1,535,000	234,000	1,301,000	.....
26	231,000	28,000	203,000	.....
30	521,000	59,000	462,000	.....
1899.				
Jan. 3	8,031,000	2,740,000	5,291,000	.....
4	5,021,000	1,267,000	3,754,000	.....
8	1,847,000	737,000	1,110,000	.....
9	1,231,000	426,000	805,000	.....
12	3,247,000	1,261,000	1,986,000	.....
13	1,326,000	435,000	891,000	.....
16	7,582,000	2,485,000	5,097,000	.....
17	852,000	346,000	506,000	.....
19	2,509,000	791,000	1,718,000	.....
20	190,000	15,000	175,000	.....
23	308,000	16,000	292,000	.....
26	2,535,000	711,000	1,824,000	.....
29	545,000	251,000	294,000	.....
30	2,131,000	1,350,000	781,000	.....
31	1,848,000	661,000	1,187,000	.....
Feb. 2	1,255,000	521,000	.....	734,000
5	4,171,000	2,153,000	.....	2,018,000
6	2,652,000	745,000	.....	1,907,000
19	5,094,000	1,113,000	3,981,000	.....
20	4,763,000	1,223,000	3,540,000	.....
21	1,397,000	641,000	756,000	.....
22	735,000	178,000	557,000	.....
23	5,803,000	1,526,000	4,277,000	.....
24	2,297,000	608,000	1,689,000	.....
25	1,936,000	919,000	1,047,000	.....
26	9,260,000	2,446,000	6,814,000	.....
28	4,783,000	1,364,000	3,419,000	.....
Mar. 1	4,902,000	1,264,000	3,638,000	.....
2	853,000	294,000	559,000	.....
6	4,502,000	692,000	3,810,000	.....
9	6,586,000	2,284,000	4,302,000	.....
11	1,232,000	165,000	1,067,000	.....
13	1,256,000	346,000	910,000	.....
15	852,000	163,000	689,000	.....
18	1,692,000	372,000	1,320,000	.....
21	5,472,000	2,118,000	3,354,000	.....
22	1,422,000	1,149,000	273,000	.....
28	1,113,000	549,000	564,000	.....
Apr. 3	1,303,000	109,000	1,194,000	.....
4	948,000	104,000	844,000	.....
6	948,000	415,000	533,000	.....
Total for season	166,302,000	50,188,000	106,445,000	9,669,000

The season was remarkable for the many severe storms and extremely cold weather prevailing during the greater part of the winter. This not only interfered materially with collecting operations along the coast, but on account of accidents to the supply pipes it became necessary on two occasions to plant all eggs and fry on hand and to suspend all operations until the pipes could be repaired. The first heavy storm occurred November 27, and resulted in the wrecking of several vessels on Ten-Pound Island and in the almost total destruction of the pier. During this gale the suction pipe was broken, and the 5,010,000 cod eggs in the hatchery at the time had to be planted, as the water supply was cut off. During the greater part of February the weather was so cold that the harbor froze over for quite a distance from Ten-Pound Island on several occasions, and, notwithstanding all precautions, the supply pipe froze, and for a second time the water supply was cut off. Towboats were hired and the pipe thawed out, but it froze again in a few days, again making it necessary to plant all eggs and fry.

In view of the rapid decline of the lobster fishery, arrangements were made early in the season for the collection of lobster eggs from all of the important points between Boston and Eastport, Me., the active cooperation of the Massachusetts, New Hampshire, and Maine State Fish Commissions being secured. Collections along the Maine coast commenced in April, under the direction of Captain Hahn, with the schooner *Grampus*, assisted by a steam smack. The results were much better than in past years, over 34,348,000 eggs being secured from this field, an increase of more than 12,000,000 over last season. From fishermen in the vicinity of Gloucester 10,120,000 eggs were obtained, and from Boston, 21,064,000; Kittery Point and its vicinity yielded 11,858,000, making a total for the season of 77,390,000. Of the fry hatched, amounting to 70,610,000, 36,925,000 were planted along the Maine coast, at various points selected by the commissioner of shell fisheries. They were very successfully shipped by rail in care of a messenger to Portland, from which point they were distributed by the *Grampus* and the steam smack. The *Grampus* also took several shipments, amounting to over 8,000,000, from the station. The remaining fry, amounting to 33,685,000, were distributed in Massachusetts waters by means of the steam launch chartered for the collection of adult lobsters in the vicinity of Boston and Gloucester. The first lobster eggs were collected on April 27; the last on July 16. The fry commenced hatching about the first of June and continued until July 28, when the last plant was made.

The following table shows the number of eggs of each species received, and the fry hatched and distributed during the season:

Species.	Eggs received.	Fry hatched.
Cod	166,302,000	106,445,000
Pollock	1,559,000	834,000
Lobster	77,390,000	70,610,000
Total	245,251,000	177,889,000

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

During the summer a number of repairs and improvements were made to the buildings and equipment, including the substitution of a wooden roof for the old iron one on the coal shed, the painting of the residence, and putting in new plumbing. A new boiler was also placed in the *Cygnet*, and the *Blue Wing* was provided with a new crank shaft. The laboratory was kept open during the entire year, and in July and August was taxed to its utmost capacity.

Following the usual methods, the collection of brood cod was commenced about October 1 by the *Grampus*, the first lot being received at the station October 11. Work was continued until November 15, during which time the schooner delivered 2,485 cod, varying in size from 6 to 20 pounds; and this collection was still further increased by the purchase of 349 from some of the commercial fishermen. All of the fish were delivered in excellent condition. They were fed on freshly shucked clams during the winter and appeared to thrive on them. The first ripe fish were found November 14, and collections continued daily from that time until February 10, when all of the brood-fish on hand were killed by the extremely cold weather. The total collections from these fish amounted to 102,223,000 eggs.

In addition to eggs collected from fish at the station, 54,380,000 were obtained at Plymouth by a crew of men stationed at that point under the direction of Mr. F. S. Conley. Operations were to have commenced in November, but owing to the fact that the steam launch *Blue Wing*, which had been detailed for that work, was unable, on account of the stormy weather, to report until December 12, no eggs could be delivered at the station from that point before the 13th. The season was very unfavorable, owing to the extremely cold weather and the numerous storms that prevailed along the coast during December and January.

As a result of the operations at the two points, 156,603,000 eggs were received and 92,143,000 fry hatched. These were all liberated in Vineyard Sound near Gay Head, except a few released in Buzzards Bay when the weather was so rough that the vessel used in making the plants could not reach that point.

Table showing the number of cod eggs collected, daily losses in incubation, and fry hatched.

Date eggs were received.	Number of eggs received.	Loss during incubation.	Fry hatched.	
			Number.	Date.
1898.				1898.
Nov. 14	711,000	194,000	457,000	Nov. 23
16	1,184,000	221,000	794,000	26
18	1,231,000	289,000	648,000	28
21	4,168,000	780,000	2,681,000	Dec. 3
22	2,273,000	457,000	1,394,000	5
23	3,505,000	640,000	2,303,000	5
25	3,790,000	1,013,000	2,197,000	11
29	3,267,000	1,041,000	1,925,000	18
Dec. 1	4,831,000	1,533,000	2,771,000	20
2	3,553,000	898,000	2,404,000	21
6	5,319,000	1,329,000	3,435,000	26
8	5,825,000	1,586,000	3,799,000	28
10	4,169,000	1,668,000	2,333,000	29

Table showing the number of cod eggs collected, etc.—Continued.

Date eggs were received.	Number of eggs received.	Loss during incubation.	Fry hatched.	
			Number.	Date.
1898.				1899.
Dec. 13	3,439,000	968,000	2,248,000	Jan. 2
14	1,100,000	537,000	269,000	3
15	9,212,000	5,910,000	2,954,000	3
16	7,152,000	2,559,000	4,281,000	5
17	3,220,000	806,000	2,066,000	6
19	5,091,000	1,928,000	2,846,000	8
21	3,836,000	1,355,000	2,266,000	10
22	971,000	247,000	608,000	12
24	4,596,000	2,098,000	2,199,000	14
27	1,588,000	479,000	1,003,000	16
29	5,164,000	2,126,000	2,605,000	17
31	4,477,000	1,702,000	2,272,000	19
1899.				
Jan. 3	3,056,000	2,343,000	478,000	24
5	3,696,000	906,000	2,472,000	25
7	4,210,000	1,383,000	2,321,000	28
9	6,392,000	1,412,000	4,657,000	29
13	3,496,000	704,000	2,647,000	Feb. 2
14	2,394,000	189,000	2,130,000	3
16	10,160,000	2,337,000	7,042,000	5
17	2,297,000	488,000	1,606,000	7
19	1,288,000	532,000	693,000	8
20	2,510,000	531,000	1,758,000	9
21	3,790,000	1,300,000	2,215,000	10
22	3,696,000	1,126,000	2,172,000	11
23	5,617,000	1,614,000	3,434,000	12
24	4,361,000	1,823,000	2,148,000	12
Feb. 4	1,113,000	873,000	108,000	Mar. 3
Mar. 21	1,706,000	487,000	1,062,000	Apr. 10
22	758,000	239,000	497,000	10
26	2,400,000	252,000	1,895,000	13
Total	156,603,000	51,053,000	92,143,000	

Continuing the system adopted the previous season, as soon as the fish had finished spawning they were tagged with small aluminum tags and released, 597 being disposed of in this way, and at the close of the fiscal year reports had been received of the capture of 17 by commercial fishermen, at points along the coast from off Chatham and Georges Bank on the north to Amagansett, Long Island, on the south.

Owing to intensely cold weather from February 9 to 15, closing all harbors and bays in the vicinity of the station, the fyke nets for the capture of flat-fish could not be set in Waquoit Bay until February 23, and then only after breaking considerable ice. Nets were also set in Great and Little Woods Hole harbors. Most of the fish captured in February were spent. 341 were taken at Waquoit Bay on March 11, but nearly all of them had spawned. Mr. J. B. Rogers was ordered to East Greenwich, R. I., on March 8, to collect eggs from fish taken at that point. From February 26 to April 21 94,792,000 were received at the station, 26,125,000 of them resulting from 90 fish taken at Waquoit, 29,099,000 from 81 fish captured around Woods Hole, and the remainder from 145 fish taken at East Greenwich, R. I. The eggs obtained early in the season, though treated as in former years, were poor, a large proportion being unimpregnated. The unfertilized ones were found in the middle of clusters. A number of methods were tried in handling, but the best results were obtained by taking them in water in shallow dishes, putting only enough eggs in a dish to cover the bottom. They were then allowed to stand about two hours, at the expiration of which

time they were found in sheets about the thickness of ordinary window glass. These sheets were broken up, measured, and placed in the Chester jars and yielded a fair percentage of fry. In all 52,441,000 were hatched, 5,000,000 of which were shipped to East Greenwich, R. I. The remainder were planted in and around Woods Hole Harbor.

Large numbers of small flat-fish from $\frac{3}{8}$ inch to $\frac{7}{8}$ inch in length were captured during the spring in surface nets near the station, and while it is impossible to say whether or not these were the results of Fish Commission operations, it would seem reasonable to so claim.

In April arrangements were made to obtain egg lobsters from the fishing centers between Noank, Conn., and Scituate, Mass. The launch *Cygnet* was detailed to collect from fishermen operating in Vineyard Sound and Buzzards Bay and a schooner was employed to cover the field around Noank and Stonington, Conn., and Block Island, R. I. This boat was also used in planting fry and adult lobsters in Connecticut waters after the eggs had been hatched. At Plymouth and Scituate local men were engaged to collect and ship the lobsters to the station by express. The work was pushed energetically to the close of the fiscal year, at which time 18,498,000 eggs had been obtained from Noank, Stonington, and Block Island, 11,760,000 in the vicinity of Woods Hole, including Buzzards Bay, 298,000 from Plymouth, Mass., 2,491,000 from Scituate, Mass., and 11,411,000 from Newport, R. I. The collections from the first three points mentioned were a little behind those of last season; those from Woods Hole and vicinity averaged about the same, while the Plymouth collections were only about 7 per cent of the take of 1898. The decrease resulted from fishermen taking less interest in the work. The Newport field is a new one, and it is believed that next year's collections at that point can be made to double this year's.

As there is no law in Rhode Island which prohibits the sale of egg lobsters, arrangements were made to pay dealers for the privilege of stripping the eggs, after which they were returned to them to be sold. From the 44,458,000 eggs collected, 39,881,000 fry were hatched and planted over a wide territory. All of the adult lobsters handled, except those at Newport, were liberated in open waters.

A pound net was set in Buzzards Bay to obtain mackerel eggs, and from May 29, when the first haul was made, to the end of June 4,918,000 apparently good eggs were secured, but they produced only a few fish. This was disappointing, as nearly all of the eggs developed to a point where, by aid of the microscope, the pulsations of the heart were plainly visible and the embryo could be seen to twist and turn in the egg.

The following shows the number of eggs collected and fry hatched during the season:

Species.	Number of eggs collected.	Number of fry hatched.
Cod	156, 603, 000	92, 143, 000
Flat-fish	94, 792, 000	52, 441, 000
Lobster	44, 458, 000	39, 881, 000
Mackerel	4, 918, 000	.....

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

On March 18 the vessel left Edenton, N. C., and anchored at the entrance to the Chowan River, near the mouth of Salmon Creek. Two days after her arrival, the hatching apparatus having been installed, spawn-takers were sent to the various fishing shores and pound nets, but for two or three weeks the conditions were unfavorable, the weather being cold and rainy and the water temperature ranging from 47° to 56°. The first shad eggs were obtained March 27, but though daily trips were made to all the seines and pounds in the vicinity, no further collections were made until April 5, when 209,000 eggs were secured from Dr. W. R. Capehart's seine at Avoca. A few eggs were obtained each day until the 15th, when the water temperature rose to 58°. On that date 1,234,000 were collected at Dr. Capehart's seine and 269,000 from a seine operated by T. D. Holly in the Upper Chowan. From the 15th to the 30th good collections were secured, aggregating 21,267,000 eggs, from which 13,898,000 fry were hatched. As in past years, most of the eggs were obtained from Capehart's fishing shore, though efforts were made to secure them from pound nets on the north shore of the Chowan, from the seines on the Roanoke, and also the Upper Chowan. The largest take in any one day was on April 28, when 2,487,000 were collected at the Capehart fishery. The vessel at that time was lying in Edenton Harbor and the eggs were transferred by steam launch.

For the purpose of testing the water of Pembroke Creek, where a site for a new shad station had been purchased, experiments were conducted on board the *Fish Hawk*, during April, in hatching shad eggs in water under closed circulation. The results were unsuccessful, and on April 28 the vessel proceeded to Edenton and anchored in the harbor. G. L. Hopper was placed in charge of a temporary plant erected on Pembroke Creek, and 375,000 impregnated eggs were transferred from the ship and placed in jars at that point. By April 30, at noon, 307,000 of the fry had been hatched and deposited in the creek near the station. The experiment was entirely successful, proving beyond doubt the suitability of the water of Pembroke Creek for hatching shad eggs. When the vessel left on May 1 there remained 4,147,000 eggs, and in order to avoid transferring these, arrangements were made with the Edenton Ice and Storage Company to erect a temporary plant on its grounds. A shed of rough boards was put up, and a table with the necessary tanks, jars, pipes, etc., installed. The eggs were then transferred from the vessel and hatched, and the fry resulting from them, 3,652,000, were deposited in Edenton Harbor.

The vessel arrived at Gloucester City, N. J., on May 11 at 9 a. m. The same evening 3,000,000 shad eggs were collected by spawn-takers from Howells Cove, Bennett's fishing shore, and the gill nets at Billingsport and Cramer's fishery, above Philadelphia. Work continued uninterruptedly until June 3, during which period 51,983,000 eggs were obtained. These produced 31,731,000 fry, which were planted in waters of Delaware, New Jersey, New York, and Connecticut. In addition to

these, 2,200,000 fertilized eggs were deposited on the spawning-grounds at Howells Cove and 5,475,000 were transferred to other stations, 3,765,000 being sent to the Bristol hatchery, which is operated by the Pennsylvania Commission. These transfers were necessary, as the apparatus on the vessel was inadequate for hatching all the eggs taken. Howells Cove yielded the greatest number of eggs, 22,737,000 coming from that field; Bennett's fishery yielded 13,551,000; the remainder were obtained from the Cramer Hill fishery and gillers.

As the term of enlistment of some of the crew expired in May, it was necessary to employ seven additional men to assist in spawn-taking and hatching. On June 3 the collecting was discontinued, but the last of the fry were not hatched until June 8. On that date the fish-cultural apparatus was dismantled, and on the 12th the vessel proceeded to Woods Hole, where it reported to Dr. H. C. Bumpus.

BATTERY STATION, MARYLAND (ALEXANDER JONES, IN CHARGE).

A part of the temporary force was engaged on April 1 and the work of fitting up the hatchery, overhauling the boats, machinery, etc., commenced. By the 10th the station was in readiness for the reception of eggs, and when the first collections came in the force was increased to 43 men, the largest number employed at this station in many years. During the previous summer a number of minor repairs were made to the buildings and launches, and the capacity of the hatchery, which had been severely tested during the past two seasons, was increased by the erection of a line of shelves along its sides and ends, providing room for 180 additional jars, and giving the hatchery an aggregate capacity for 50,000,000 shad eggs. This extension proved insufficient, however, to accommodate the great numbers of eggs that came in during the season, and a further enlargement was necessary. A shed 10 feet wide and 60 feet long was erected on the south side of the building, in which 8 tables, holding 224 jars, were set up. By this means the capacity of the station was increased to about 70,000,000.

The prospects at the beginning of the season were very unfavorable, as the temperature of the water remained low, and fish were reported to be very scarce down the bay. The first eggs came in April 19, and collections gradually increased from that time until the 24th, when 16,845,000 were taken. The daily average was one to nine millions until June 2, when the appearance of salt water terminated the work. The total number of eggs reported was 185,058,000, though the actual number received probably exceeded 200,000,000.

The majority of the eggs are purchased from the fishermen, and as many of them are dead when brought in, and as it is impossible to always determine which are dead without the aid of a microscope, they were not measured until they had been in the house from 12 to 24 hours. This practically insured reporting only fairly good eggs. The regular spawn-takers took 35,000,000 during the season; the remainder, except 1,700,000 transferred from the *Fish Hawk*, were purchased from fishermen on the same basis as heretofore, at $20 per 1,000,000.

Some of the best collecting fields were several miles from the station, and as it was impossible for the launches and spawn-takers to attend these regularly, auxiliary stations were established—one in North-east River, one at Havre de Grace, and one in the narrows—for the purpose of receiving eggs obtained by the fishermen in those localities. The eggs so obtained were either brought to the station at once by the men in charge of the auxiliary station or held until they could be called for next day by the launches. This arrangement was inexpensive and worked very satisfactorily. The number of fishermen furnishing eggs has increased each year, and during the past season over 100 boats were engaged in the work.

The quality of the eggs was excellent, over 125,596,000 fry being hatched. 2,800,000 eyed eggs were transferred to Central Station, 5,500,000 were sent to the State hatchery at Bristol, Pa., and 10,930,000 were planted on the spawning-grounds.

The following table shows in detail the daily collections and losses, number of fry hatched and planted, and period of incubation:

Date.	Eggs.		Fry.		Date of hatching.	Eggs shipped.
	Taken.	Lost.	Hatched.	Planted.		
1899.						
Apr. 19	68,000	68,000				
20	182,000	57,000	125,000	125,000	Apr. 29	
21	538,000	438,000	100,000	100,000	29	
22	1,705,000	605,000	1,100,000	1,100,000	29	
23	4,480,000	1,245,000	3,235,000	3,235,000	May 1	
24	16,845,000	7,740,000	9,105,000	9,105,000	2	
25	9,005,000	3,700,000	3,805,000	3,805,000	2	1,500,000
26	5,720,000	1,095,000	4,625,000	4,625,000	2	
27	5,795,000	715,000	5,080,000	5,080,000	3	
28	4,100,000	325,000	975,000	975,000	3	2,800,000
29	5,715,000	1,070,000	2,645,000	2,645,000	3	2,000,000
30	4,363,000	913,000	3,450,000	3,450,000	5	
May 1	4,250,000	1,155,000	3,095,000	3,095,000	5	
2	845,000	80,000	765,000	765,000	6	
4	2,575,000	340,000	2,235,000	2,235,000	8	
5	2,250,000	290,000	1,960,000	1,960,000	9	
6	540,000	135,000	405,000	405,000	10	
7	3,315,000	510,000	2,805,000	2,805,000	11	
8	6,930,000	1,200,000	5,730,000	5,730,000	13	
9	1,955,000	295,000	1,660,000	1,660,000	13	
10	3,056,000	516,000	2,540,000	2,540,000	14	
11	7,625,000	700,000	6,925,000	6,925,000	15	
12	4,950,000	300,000	4,650,000	4,650,000	16	
13	5,855,000	440,000	5,415,000	5,415,000	18	
14	4,465,000	190,000	4,275,000	4,275,000	18	
15	4,435,000	700,000	3,735,000	3,735,000	19	
16	2,055,000	125,000	1,930,000	1,930,000	20	
17	1,190,000	115,000	1,075,000	1,075,000	21	
18	3,270,000	185,000	3,085,000	3,085,000	22	
19	2,385,000	190,000	2,195,000	2,195,000	25	
20	2,120,000	235,000	1,885,000	1,885,000	26	
21	2,000,000	110,000	890,000	890,000	27	100,000
22	2,645,000	2,750,000	2,370,000	2,370,000	28	
23	4,385,000	525,000	3,860,000	3,860,000	29	
24	4,135,000	664,000	3,471,000	3,471,000	30	
25	9,485,000	2,780,000	6,705,000	6,705,000	31	
26	1,710,000	1,050,000	660,000	660,000	June 1	
26	7,780,000	2,615,000	5,165,000	5,165,000	1	
27	8,211,000	2,541,000	4,745,000	4,745,000	2	925,000
28	7,845,000	2,290,000	2,645,000	2,645,000	2	2,910,000
29	5,475,000	480,000	1,580,000	1,580,000	3	3,415,000
30	3,975,000	765,000	1,110,000	1,110,060	4	2,100,000
31	3,635,000	445,000	1,610,000	1,610,000	5	1,600,000
June 1	215,000	40,000	175,000	175,000	5	
2	980,000					98,000
Total	185,058,000	40,232,000	125,596,000	125,596,000		19,230,000

Early in the season 40 cases of herring roe were canned, to be used as fish food at the Wytheville and Erwin stations. An immense amount of this roe is wasted every year, and as it is considered an especially suitable food for young rainbow trout it is recommended that a larger canning plant be installed before the opening of another season. The work of canning costs nothing, as it is done by the station force.

Attention is called to the condition of the marine railway for hauling out the launches. It is unsafe, and should be removed at once.

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

The work of this station for the year has been conducted as usual, it being used as headquarters for the Fish Commission cars and as a receiving depot for the shipment of the output of the fish ponds. Eggs of salmon, trout, shad, and yellow perch were hatched at the station to demonstrate the methods of the Commission, forming an instructive and entertaining exhibit, for about eight months of the year, to the many visitors attracted to the aquarium.

The following table shows the number of eggs received and hatched:

Species.	Eggs received.	Fry hatched.
Shad	4,013,000	3,500,000
Brook trout	9,990	9,990
Rainbow trout	13,440	13,397
Atlantic salmon	4,990	4,225
Lake trout	12,000	11,128

The superintendent of Central Station is also charged with receipting for and shipping all freight and express received or sent by the Commission, and this work during the past year involved the handling of 749 packages received and 541 sent out.

The appearance of the station has been much improved recently by the installation on the ground floor of most of the exhibits used by the Commission at the various expositions, also a large variety of fishery apparatus, including not only domestic material but many forms from the Bergen Exposition, Norway.

BRYAN POINT STATION, MARYLAND (L. G. HARRON, IN CHARGE).

The storage shed and boathouse were whitewashed in March, and the boats and other equipment were painted and put in readiness for the coming season. On April 13 the launches *Petrel* and *Blue Wing* reported for duty, and at the first appearance of ripe shad (April 17) the force was increased to 45. The egg collections by April 30 aggregated 32,740,000, but the number of fish commenced falling off from that time, and on May 19 it became necessary to discontinue operations and dismiss the men, though a few were retained until the 25th to close the station. The collections amounted to 49,283,000 eggs, from which 37,384,000 fry were hatched and 4,062,000 eyed eggs transferred to other points. Of the fry, 6,110,000 were planted in Southern waters, and 31,274,000 in the Potomac River on the natural spawning-grounds.

The following table shows the daily collection of eggs, fry hatched, eggs shipped, and air and water temperatures for the season:

Date.	Eggs received.	Eggs hatched.	Eggs shipped.	Temperature.		Date.	Eggs received.	Eggs hatched.	Eggs shipped.	Temperature.	
				Mean air.	Mean water					Mean air.	Mean water.
				°	°					°	°
Apr. 15	426,000	.....	.....	68	56	May 6	732,000	1,962,000	513,000	65.33	68
17	610,000	.....	.....	52	55	7	608,000	.....	.....	68.33	68
18	1,158,000	.....	.....	58.66	56	8	689,000	1,910,000	.....	68.33	68.33
19	4,616,000	.....	.....	65.66	58	9	566,000	.....	.....	69	68.33
20	5,327,000	.....	.....	66.66	58.66	10	1,200,000	1,930,000	.....	70.66	69
21	2,663,000	.....	230,000	65	59	11	622,000	644,000	.....	69.66	68.66
22	3,374,000	.....	.....	58.33	60	12	1,028,000	525,000	.....	72.66	69
23	2,974,000	803,000	.....	66	60	13	279,000	600,000	.....	71.33	69
24	3,095,000	952,000	.....	70.66	62.33	14	359,000	.....	.....	71.66	70.33
25	3,135,000	.....	.....	73.66	64	15	1,004,000	526,000	.....	70.33	69
26	1,542,000	918,000	.....	70.33	65.66	16	388,000	1,589,000	.....	76.66	70.66
27	1,142,000	3,170,000	2,401,000	68.66	66.66	17	519,000	926,000	812,000	71.33	70
28	1,175,000	3,668,000	.....	65.33	67	18	659,000	583,000	.....	68	69.33
29	802,000	2,121,000	.....	68.66	67.33	19	106,000	.....	.....	64	68
30	701,000	5,378,000	.....	76	68.66	20	.....	774,000	.....	61.66	66
May 1	2,363,000	2,399,000	.....	73.33	69.33	22	.....	.....	106,000	59.66	62.66
2	2,260,000	1,940,000	.....	74.33	71.33	23	.....	832,000	.....	61	61.66
3	132,000	1,956,000	.....	72	71						
4	1,505,000	645,000	.....	65	69.33	Total	49,283,000	37,384,000	4,062,000	.....	.....
5	1,134,000	624,000	.....	67.33	68.66						

As the tarred felt roof of the hatchery had commenced leaking, a shingle roof was substituted during the summer. In the following spring a sea wall, 120 feet long and 5 feet high, was built along the south side of the building to prevent the encroachment of the bank at its rear. The material used for this wall consisted of 8-inch cedar posts, 4 inches by 4 inches by 16 feet white-oak wales, and oak planks 2 inches thick. Another section, 32 feet long and 4 feet high, was built along the north side of the boiler house, and another along the north side of the cottage, to afford protection against the encroachments of the river. Considerable damage having resulted to the wharf during the winter, it became necessary to refloor it and to drive a number of white-oak piles at the corners as a protection against ice.

FISH PONDS AT WASHINGTON, D. C. (DR. RUDOLPH HESSEL, SUPERINTENDENT).

As a result of the work at this station during the fiscal year 44,465 large-mouthed bass, 160 small-mouthed bass, 3,662 crappie, and 3,000,000 shad were distributed in the fall months. Of the large-mouthed bass 39,000 were produced in the north pond, which has an area of about 3½ acres. The remaining 5,465 were taken from the west pond and are supposed to have been derived from a few late-spawners placed in one of the partitions of this pond in June. In view of the exceedingly poor results attained with the small-mouthed bass, it seems useless to continue experimenting with these fish at this station. Early in the summer the south pond, which has been devoted to their culture for several years, was estimated to contain about 4,000, but the number dwindled gradually and when the pond was drawn down in August only 160 remained.

The experiments with crappie were continued in ponds 20 and 5, and 3,662 were available for distribution in October. These were fed on

young carp early in the season and subsequently on finely ground fresh fish.

A few common tench and gold-fish were reared for the aquarium at Central Station and for stocking fountains in public parks. The golden ide spawned as usual in April, but their eggs were destroyed by the cold weather.

The shad fry placed in the west pond in May, 1898, numbering 3,537,000, were held until October and then liberated. It is impossible to determine the exact number that passed out of the gates, but it was thought about 3,000,000 survived, as natural food was abundant in July, August, and September. As suitable food becomes very scarce in October, it is deemed advisable to liberate these fish hereafter in September.

Late in March the adult black bass were transferred from the retaining tanks, where they had been held through the winter, to the spawning partitions in the north and south ponds and ponds Nos. 6 and 7, from ten to fifteen being placed in each partition. They commenced spawning about the middle of April and continued until May 10, when all of the adults were taken out and placed in partitions in the west pond. The first young were observed five days after the eggs were deposited, the temperature at that time ranging from 62° at 7 a. m. to 72° at 4 p. m. As soon as the schools scattered the young fish were allowed to pass through the gateway of the spawning partitions to the large ponds, where, on account of the great abundance of natural food, their development was rapid, and on June 20 the work of transferring the larger ones to the rearing-tanks was commenced. They were captured in small-haul seines, all that were less than 2 inches in length being returned to the ponds, as it has been found by experience that it is difficult to make them take artificial food under that size. The indications at the close of the year point to a good crop of large-mouthed bass.

The following shows the water temperature in the north pond at 7 a. m. and 4 p. m., from April 20 to May 10, the spawning period:

Date.	7 a. m.	7 p. m.	Date.	7 a. m.	7 p. m.
	°F.	°F.		°F.	°F.
Apr. 20	63	70	May 1	72	81
21	61	70	2	75	83
22	64	78	3	77	82
23	64	64	4	69	77
24	62	72	5	70	71
25	60	76	6	67	68
26	62	78	7	67	70
27	60	76	8	68	70
28	50	67	9	67	74
29	49	67	10	69	77
30	68	80			

Early in April 60 adult crappie were placed in pond 2 and commenced spawning about the middle of that month. At the close of the year it was impossible to form any idea of the result, as these fish are very shy and remain hidden in dense watergrass at all times.

In ponds 21 and 22, set apart for the rearing of carp for fish-food, 150 spawners were placed, and as soon as they commenced to spawn (April 30) the spawning-beds were taken from the ponds and placed in tanks connected with the bass ponds, so that the young carp could pass freely into them as soon as they were needed. It is customary to introduce them when the bass have attained a length of an inch, but as the carp spawned much later than usual none were ready on May 16, when the bass had attained the requisite size. It is estimated that over 600,000 young carp were turned into the north and south ponds.

In May 2,700,000 shad fry were again placed in the west pond, to be held until September and liberated in the Potomac River.

AQUARIUM, CENTRAL STATION (L. G. HARRON, IN CHARGE).

During the summer, while the aquarium was closed, the interior of the grotto was repainted and dusted with stone dust, in imitation of Seneca stone. One of the nickel pumps used at the Omaha Exposition was installed in place of the hard-rubber pump, which was worn out, and a water motor was purchased to operate it in circulating the salt water. Other minor changes were made, including repairs to several of the large aquaria which had been broken during the summer.

In the fall a new supply of salt water was brought from Chesapeake Bay, near Old Point Comfort, and the usual collections of fishes and other marine animals were made, 415 specimens, representing 32 species, being procured and placed in the aquarium. Collections of sea anemone, star-fish, and lobsters were also received by express from the Gloucester, Mass., station. The majority of these specimens were kept until June without difficulty, the success attained being attributable in a large measure to improved facilities provided for the circulation of the salt water.

The ornamental fishes and species indigenous to this region, exhibited in the large tanks on the main floor of the building, were carried through the summer without difficulty. Special mention should be made of the 3-year-old large-mouth bass, which have been in the aquarium since they were taken from the ponds where they were hatched in 1897. During the year 2 died and 4 were used for scientific purposes, leaving 24 of the 30 still on exhibition. During the fall consignments of trout and salmon were received from Wytheville, Va., and Craig Brook, Me., and proved a most attractive display through the winter months. On June 1, the temperature having reached 71°, the trout were planted in suitable streams in Virginia and Maryland.

The principal food given the fish consists of round beefsteak and beef liver, the fat and sinew being removed and the meat cut in small pieces for the adult fish and ground in a meat-chopper for the small ones. The diet of the marine animals is changed from time to time by feeding chopped oysters or clams, fresh-water snails, and other crustacea, which form their natural food. Live minnows, small craw-fish, and angleworms are provided in limited quantities for crappie and bass.

The following shows the salt and fresh water fishes exhibited during the year:

Salt-water fishes: Jumping mullet, spot or goody, tautog, croaker, sea bass, sea trout, rabbit-fish, swell-fish, toad-fish, bur-fish, pig-fish, blue-fish, flounder, red drum, moon-fish, remora, king-fish, cavally, blenny, yellow-tail, hog-choker, striped bass, white perch, sea-robin, spade-fish, snapper, black drum, pompano, file-fish, sea anemone, star-fish, lobster, shrimp, blue crab, hermit crab, king crab.

Fresh-water fishes: Rainbow trout, brook trout, steelhead trout, Scotch sea trout, quinnat salmon, landlocked salmon, Atlantic salmon, large-mouth black bass, small-mouth black bass, crappie, yellow perch, rock bass, common tench, golden tench, channel cat-fish, yellow cat-fish, golden ide, sun-fish, mill roach, chub sucker, common eel, paradise-fish, top-minnows, gold-fish, terrapin, snapping turtle.

The following table shows the maximum and minimum temperatures of the salt water from October 1 to June 30, and of the fresh water from July 1 to June 30:

Month.	Fresh water.		Month.	Salt water.	
	Max.	Min.		Max.	Min.
	°F.	°F.		°F.	°F.
July	85	77	October	68	58
August	86	78	November	64	54
September	84	72	December	55	51
October	74	55	January	54	40
November	54	38	February	55	45
December	38	33	March	61	48
January	36	33	April	66	52
February	34	32	May	74	53
March	46	34	June	81	70
April	66	46			
May	71	64			
June	80	71			

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

All of the fish hatched the previous spring having been disposed of, in order that the station might be thoroughly overhauled and remodeled, the employees were occupied during the summer in caring for the adult fish on hand and assisting in the general work of construction. In addition to rebuilding the old ponds 18 new ones were added, making a total of 42. The present system for trout comprises 8 stock-ponds and spawning-ponds 15 feet by 48 feet by 3½ feet, and 14 rearing-ponds varying in size from 10 feet by 50 feet to 15 feet by 106 feet, and from 6 inches to 5 feet in depth. For the basses and crappie 4 breeding-ponds and 15 rearing-ponds have been provided, and 1 pond for carp.

In constructing the trout ponds several minor improvements were made. In addition to providing the spawning-ponds with raceways 4 feet wide by 20 feet long by 1 foot deep, a receiver 2 feet by 4 feet by 2 feet was built at the foot of each pond between the guard-screens and the dam-boards, over which was set a grating in the space where the bottom was cut away. In this receiver excrement and other foul matter settles after passing from the pond through the guard-screen, and before washing over the dam-board into the raceway leading to the next pond below. This receiver is connected with a large sewer or waste-pipe of 8-inch terra cotta, which is closed at its mouth by a sliding gate arranged so that it can be drawn out to flush and clean the receiver and pond; by this means all foul matter is carried off through the flush-pipe without passing into the next pond.

WYTHEVILLE STATION, VIRGINIA—SPAWNING-POND, SHOWING RACEWAY.

The ponds were built with plank sides and earth bottoms, all timbers used in the construction being of the best white oak, thoroughly soaked in coal tar. In the lower corner of each pond was placed an outlet pipe constructed of heavy oak timber, in the form of a letter L, the short stem forming the standpipe in the corner of the pond. Around this was constructed a crib with guard-screens in front, and set in a receiving-trough at the bottom of the pond. The ponds along Tate Run are protected against the ravages of high water by piling and stone walls from 6 to 7 feet high, running parallel to the ends of the ponds. Between this protecting wall and the end wall of the pond is a space of 12 feet filled with earth, forming a strong embankment.

The trout ponds are located on the north side of Tate Run and are supplied with water from the spring. Those for the bass and crappie are on the south side and receive their supplies from Tate Run, the stream being tapped 1,580 feet above the ponds and the water conveyed through a 12-inch terra-cotta pipe laid with cement-mortared joints in a ditch from 3 to 6 feet below the surface and passing under the run about midway between the intake and the ponds.

A new residence was constructed for the superintendent, the former one having been condemned. This building was erected at a cost of $2,828.50, and is a two-story and cellar frame 56¾ by 53 feet It has a stone foundation and contains a parlor, sitting-room, kitchen, bathroom and bedroom on the first floor and 4 bedrooms on the second floor. It is heated by hot air.

The hatching capacity of the station was materially increased by a 10-foot addition to the east end of the hatchery, at an expense of about $547. Considerable was also done toward the improvement of the roadways on the Government property and in beautifying the grounds; maple trees were planted around the spawning-ponds to furnish necessary shade, and the old ice and storage sheds were removed. Additional funds are needed to put the station in first-class condition. The old nursery, which is essential for carrying fry during the early stages, is in bad condition and should be rebuilt.

The rainbow trout commenced spawning November 10 and the season continued until February 23, a period of 105 days. During this time 607,000 eggs were collected from 742 female fish, 425 males being used in fertilizing them. Of these eggs 465,000 proved good. As soon as they were eyed 230,000 were shipped to other hatcheries, State fish commissions, and foreign applicants and societies. The others were retained and hatched during March and April. There was practically no loss of fry during the first few weeks, but in May the fingerlings began to act strangely, darting and spinning around in the water in a dazed manner, and the daily death-rate increased from 40 to nearly 1,000. This state of affairs continued until June, when the disease disappeared, and on counting the fish it was found that 132,000 remained. These were carried to the close of the year without material loss.

On January 7 a consignment of 51,000 eyed brook-trout eggs was

received from a private hatchery at South Wareham, Mass. These hatched within ten days after arrival, and the fry appeared to be strong and vigorous until about the 1st of April, when they began to deteriorate. Their gills became badly swollen and inflamed, and heavy losses occurred. This disease was thought to be due to the muddy condition of the water in April. By actual count on May 10 there were found to be only 11,800. The poor results were not unexpected, as several attempts have been made to rear brook trout at this station in past years without success, but as such fine results had been more recently attained in rearing rainbow trout, it was thought that good work might now be done with brook trout, especially as the water supply had been increased.

The brood-ponds for the black bass were prepared early in March, gravel supplied for building the nests, and the adult fish introduced on the 31st. On April 25 they began to show signs of nesting, and on May 10 the first eggs were observed. A number of other nests were noted on May 17, and all indications point to a good crop of young.

The rock bass were transferred to breeding-ponds on March 24, and nesting commenced late in April or early in May. Owing to the dense growth of water-plants it was impossible to remove the adult fish or to make any estimate as to the number of young hatched.

Of 85 three year-old crappie placed in the retaining-ponds during the year, only 12 remained when the pond was drawn in the spring. This loss was probably due to poachers, as no dead ones were seen in the pond during the winter. Those remaining were placed in a small breeding-pond provided with nests in March, but there is no indication that they have spawned, and as it is impossible to train crappie to take liver and food of like character, and as it is very difficult to obtain live food, it is doubtful whether it is advisable to continue experimenting with them.

Of the 1,350 quinnat salmon on hand at the beginning of the year, the result of eggs shipped to the station in the winter of 1897, 500 were released in Tate Run in February and 730 more on May 17, leaving 100 on hand. During the past year they have grown very little, though they consumed a large amount of food, and at the age of 2 years they were only from 7 to 9 inches in length. The 100 referred to will be retained at the station in order to note their growth, but will be placed in a larger pond than heretofore.

The propagation of carp for distribution was discontinued several years ago, but a number of the fish have been retained, with the view to rearing young ones as food for bass. These were placed in a pond 25 by 30 feet early in April, where they remained until June 8, without showing any signs of spawning. On that date they were transferred to two shallow narrow ponds, and on the following day deposited a large amount of spawn on the plants and moss growing in the ponds. As soon as the fry hatched they were transferred to the bass ponds as food for the young fish.

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

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 fish food used during the year consisted of 8,957 pounds of beef liver, costing $441.29; 564 pounds of beef hearts, $27.79; 7,400 pounds wheat chop, $74; 364 1-pound cans herring roe, $14.56; 3 half-barrels salted herring roe, $3, making the total cost $560.64. To this must be added $119.26 for expressage, $163.50 for drayage, and $42.30 for ice, an aggregate of $885.70.

The trout fry were fed exclusively on fish roe until they were two months old, when they were given cooked liver and roe, alternately. At the end of the third month a mixed diet of raw liver and wheat chop was substituted. It is customary at this station to feed the fry six times a day until they learn to take food readily. When the liver and mush diet is taken up the number of daily feeds are reduced to four, and finally they are fed only three times, morning, noon, and evening. All trout over one year old are fed twice a day, on a mixture composed of four parts mush to one of liver. The amount given to each lot depends on the size and age of the fish, the smaller ones being allowed more in proportion to their weight than the larger ones.

From records kept during the year, it was found that 1,000 fingerlings, 4 months old and weighing 28½ ounces, consumed 4 ounces of food per day; 1,000 fish 18 to 24 months old, 7 to 9 inches in length and weighing 180 pounds, required 6¼ pounds daily; and a similar number of adults, from 12 to 16 inches long and weighing 1,040 pounds, took 25 pounds. It will be seen that the fingerlings 4 months old ate about 14 per cent of their weight daily, while adults required only 2½ per cent of theirs.

Erwin Station, Tennessee (S. G. Worth, in charge).

The superintendent and a part of the force were occupied the greater part of the year in the various works of construction authorized by the act of July 1, 1898, appropriating $4,418 for the completion of the station. The most important was the building of 30 rearing-ponds and 2 breeding-ponds below the hatchery, and the erection of an ice-house near the railroad crossing. General improvements to the roads and grounds were made.

In July there were 11,562 brook-trout fry and 73,099 rainbow-trout fry on hand. These were held through the summer in troughs in the hatchery and in rearing-ponds Nos. 1 to 6, and in September the distribution was made partly by means of car No. 1 and partly by the employees of the station, the output of rainbow trout amounting to 45,550 and of brook trout 6,000.

During October and November 1,000 adult fish were collected for brood stock from streams in the vicinity of Erwin and delivered at the station in good condition. The men employed for this work were paid 10 cents for each fish collected, and the hauling amounted to $30.75.

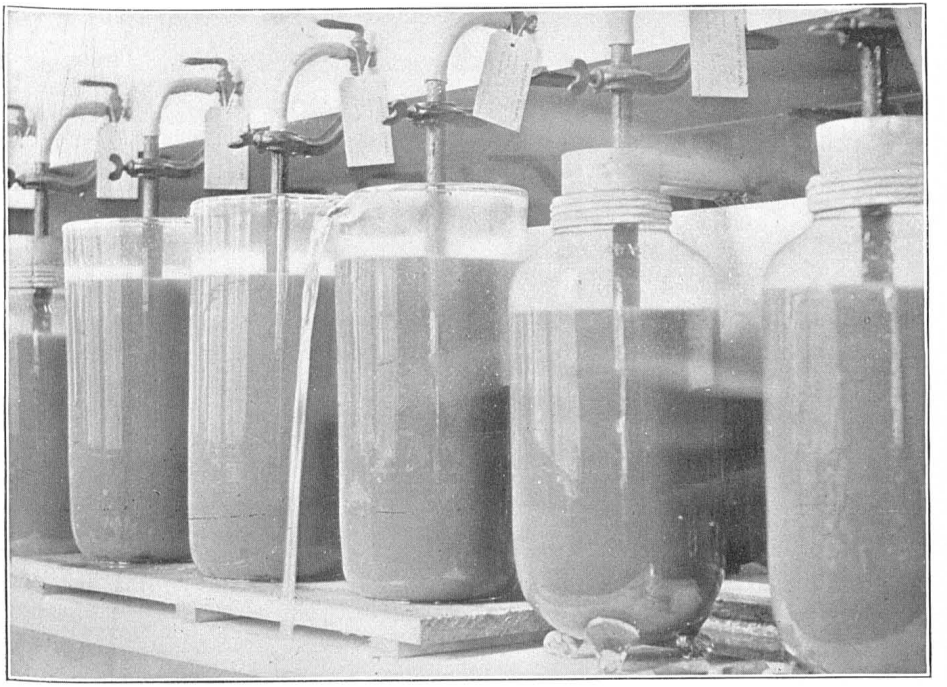
As most of the fish collected the previous year and held at the station had died during the summer, arrangements were made to purchase brook-trout eggs from private hatcheries in New England, three consignments, aggregating 253,109, being received from that source in January. The first and third shipments arrived safely, but the second lot were in bad condition, the temperature in the case when opened registering 56°.

The trout at the station commenced spawning October 19, and continued until November 19, yielding 106,500 eggs. The ponds in which they were confined had been provided with temporary raceways, but they failed to ascend them, and it became necessary to capture the greater number with seines. 94,766 of the eggs died and only 11,734 fry were hatched. The eggs from Massachusetts yielded 243,901 fry. The losses during the winter on fry hatched from eggs collected at the station were very heavy, and by March 1 only 1,000 remained. Of those purchased, 221,760 were on hand on that date.

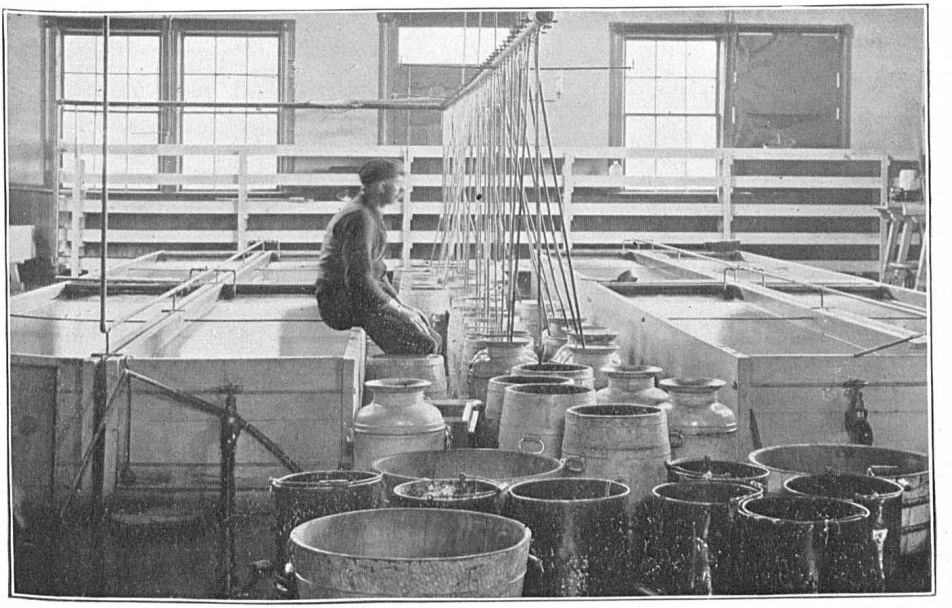
In January two consignments of rainbow-trout eggs, aggregating 75,000, were received from Wytheville. These commenced hatching January 30, and yielded 72,208 fry, 68,040 of which survived to March 1. This number also covers 900 fry hatched from a small lot of eggs derived from rainbow-trout reared at this station.

On March 23 the work of transferring the fry of both brook and rainbow trout from the hatching-troughs to the six ponds northeast of the hatchery was commenced, and as soon as the new ponds below the hatchery were completed they were also used for this purpose, the fish being first assorted and counted and about 5,000 placed to each pond. The death-rate after the fry were transferred to the ponds continued high—the loss in April of the brook trout amounting to 14,293, and of the rainbows 3,078. In May the mortality of the brook trout amounted to 4,096, and of the rainbows 848. In June 9,534 brook trout died, and 961 rainbows, leaving on hand at the close of the year 48,545 rainbow-trout fry and 76,588 brook-trout fry.

Several experiments were tried in June to ascertain, if possible, the cause of the excessive mortality in the new ponds. A fence 3 feet high, of domestic cloth, was placed around one where the mortality was heavy; boards were put on edge around the banks of another to prevent the young fish from sleeping in the shallow water; bulkheads



NEW AND OLD HATCHING-JARS IN USE AT PUT-IN BAY STATION.



PUT-IN BAY STATION—SHOWING ARRANGEMENTS FOR PIKE-PERCH EGGS BEFORE THEY ARE PLACED IN HATCHING-JARS.

were put in several—some at the head of the pond in order to prevent the fry from injuring themselves by leaping. Shade was also provided, traps of various kinds were placed for the purpose of catching rats and other animals destructive to fish, and a night watch was established. In some of the ponds the fish were thoroughly assorted and in other ponds wood mold was used liberally, several bushels being thrown in the water at a time. These experiments failed to produce any beneficial results, and it was finally concluded that the large loss was due to the ravages of the belostoma. This insect appeared in comparatively large numbers about June 15, as many as 12 specimens being caught on one day, June 28. Before it made its appearance around the upper ponds the death rate there was light, but with its increase the mortality was greater. This bug, well known as one of the most destructive enemies of young fish, does its work at night. It both flies and crawls, and it apparently came into the ponds through the open ditch.

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

Species.	Calendar year in which fish were hatched.				
	1899.	1898.	1897.	Adults collected in 1898.	Adults collected in 1897.
Brook trout	76,588	991		482	384
Rainbow trout	48,545	2,975	764		
Total	125,133	3,966	764	482	384

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

The weather during the white-fish season was worse than any experienced for a decade, as shown by the marine reports, in which it is recorded that the loss of vessels on the Great Lakes was the largest in the history of the country. In addition to this, the season opened later than usual, the first eggs being secured on November 11. On the 23d the mercury dropped to 19°, and fishing practically ceased at the very height of the season, the fishermen removing their nets to prevent their being caught in the ice and destroyed. Notwithstanding these unfavorable conditions, the catch at the west end of the lake was greater than for several years previous; 83,403,000 eggs were secured from the boats of the commercial fishermen and 12,785 adult fish were penned at Put-in Bay Island and Monroe Piers, Michigan, from which 102,051,000 eggs were taken, making a total of 185,454,000 for the season, as against 112,842,000 the previous year. The work of penning live fish began at both points on October 31, and continued uninterruptedly, except on very stormy days, until November 21 at Monroe Piers and November 29 at the station.

The fish at Monroe Piers were evidently more advanced than those at Put-in Bay, the first eggs there being secured on November 11, whereas at the station no eggs were obtained until December 17.

As the work of penning white-fish had been conducted on a very limited scale the previous year, it was necessary this season to construct five new rafts, which, with the old one, gave a capacity for from 15,000 to 18,000 fish. These rafts carry five crates each, each crate being divided into two pens 8 feet square and 6¼ feet deep. The boom logs at the sides of the rafts were discarded, as they were clumsy and did not afford sufficient space for walks. Gunwales were made of 4 by 8 inch hemlock joists, placed 2 feet apart and trussed at frequent intervals by diagonal cross-ties and braces, on top of which were placed two tiers of 2-foot-wide hemlock planks, making the gunwale, as built up, 52 feet long, 2 feet wide, and 1 foot deep, strong and rigid, and able to withstand seas of considerable violence. At each end and between all the crates were 2-foot plank walks, giving ample room for working on all sides, a consideration of the utmost importance in handling fish and fertilizing eggs in stormy weather. With these improvements the rafts are considered almost perfect for the work.

A large live-car, capable of holding 600 fish, was also constructed at Monroe Piers, to be used in conveying fish from the nets to the crates. This did not prove as effective or convenient, however, as tanks carried on the decks of the steamers.

The work at Monroe was under direction of J. C. Fox, foreman of Put-in Bay station, who reported that of 8,779 fish placed in subnets, 8,624 were transferred to the crates, about half of them being females; 3,307 of these yielded 62,208,000 eggs, an average of 18,961. At the close of the season 8,584 fish were returned to the fishermen, only 195 having been lost.

At Put-in Bay 4,282 fish were collected, of which 1,217 yielded 39,843,000 eggs, an average of 32,738 per fish. Of the whole number collected, 3,921 were returned to the fishermen, 237 died or were liberated, and 3 were held at the station for experimental purposes.

Comparing the cost of operating at these two points with that of collecting from the boats of the commercial fishermen, it was found that the cost per quart of those secured from the fishermen was 72.56 cents, those from fish penned at Put-in Bay cost 76.22 cents, and from the Monroe crates 77.53 cents, the average cost of the crated fish being 76.87 cents per quart. With an ordinarily good season the 6,125 females should have furnished 171,500,000 eggs, on a basis of 35,000 per fish, estimating four-fifths of them as productive.

Of the eggs collected, 126,036,000 were held at the station to be hatched and planted in Lake Erie, 32,508,000 were shipped to Alpena, 12,132,000 to Duluth, and 14,778,000 to Cape Vincent. The number of fry hatched was 105,500,000. These were planted with comparatively small losses on the spawning-grounds in Lake Erie, reefs and gravel bars where white-fish deposit their eggs naturally being selected.

The fry were planted under favorable conditions, the water being clear, and immense numbers of Daphnia, Cyclops, Diaptomus, and other crustacea being observed.

A few white-fish fry were kept in a floating box in one of the fry tanks, and in the same tank outside the floating box about 1,000 pike-perch fry were retained. Both of these lots throve on food found in the water. The superintendent's attention was called by Mr. E. M. Ball to the fact that the white-fish fry avoided the Diaptomus, which is easily distinguished by its long antennæ. He then began a series of observations with both white-fish and pike-perch fry, and found that Mr. Ball's conclusions were correct. The fry partook freely of the other forms of life, but refused to touch the Diaptomus. It was also observed that by the end of the third or fourth day all forms of life became scarce except this.

As the success of the white-fish work depends to a large extent upon the abundance of natural food when the fry are first planted, and as this food seems to be present only when the water is clear, it seems advisable, in making future plants, to pay more attention to the condition of the water in which deposits are made. In other words, if the water in one locality is clear the fry should be planted there, even though it may not be the natural spawning-ground of the fish.

Further experiments were conducted at the station this season to determine how long eggs may be held in water before applying the milt and still retain their vitality. As a result of these observations, it was ascertained that 97 per cent could be fertilized after being in the water six minutes, 98½ per cent being fertilized where the milt was applied instantly. At the end of the eighth minute only 81 per cent were impregnated; at the expiration of the tenth minute, 47½ per cent; at the fifteenth minute, 40½ per cent; at the twenty-fifth minute, 17 per cent. After sixty minutes not an egg was fertilized. The object in making these experiments was to find out how long the eggs may be held in water and still be capable of perfect fertilization, in order to determine how wide a range may be depended on in remilting.

Experiments with pike-perch eggs during the past season seem to indicate that the eggs of this fish may be remilted to great advantage; but unfortunately the experiments could not be continued this year.

A number of experiments were also tried to determine whether or not it is advisable to remilt all eggs. From the first lot 16½ per cent of unimpregnated eggs were found where the milt was applied only once and 12.2 per cent where applied twice. In the second lot fertilization was the same by both methods. In the third lot there was a difference of less than 0.4 per cent.

As it is impossible to use the dry method of fertilization in very rough weather or when raining very hard, some experiments were tried to determine the difference in results between the wet and dry methods. In the first two experiments the wet process produced slightly better results; in the last, the dry.

The season for pike perch was peculiar in many respects. It opened ten days late, as the ice remained in the lake much longer than usual; but fishing ceased about the usual time, and the rapid rise in tempera-

ture prevented good work, though large numbers of eggs were secured. Arrangements had been made to pen pike perch as an experiment at Monroe Piers and Put-in Bay, but the operations were not as successful as had been anticipated. Contrary to expectation, the fish did not stand transportation or confinement as well as the white-fish, though apparently they are more hardy; but this may have been due to the higher temperature of the water at the time of the collection and penning of these fish. It was also found impossible to carry as many of these fish in the tanks on the steamer, due probably to the warmer water. From this season's work it appears that pike perch will not yield good eggs after being held in confinement more than three days, and that the males can not be used more than once.

The percentage of fertilization from the fish confined in the pens at Monroe Piers was exceedingly small. During the season 2,771 were penned, of which 1,486 were females. After the eggs had been stripped 2,638 were returned to the fishermen, the remaining 133 having died in the pens. The 956 females stripped yielded 84,675,000 eggs, an average of 88,572 per fish.

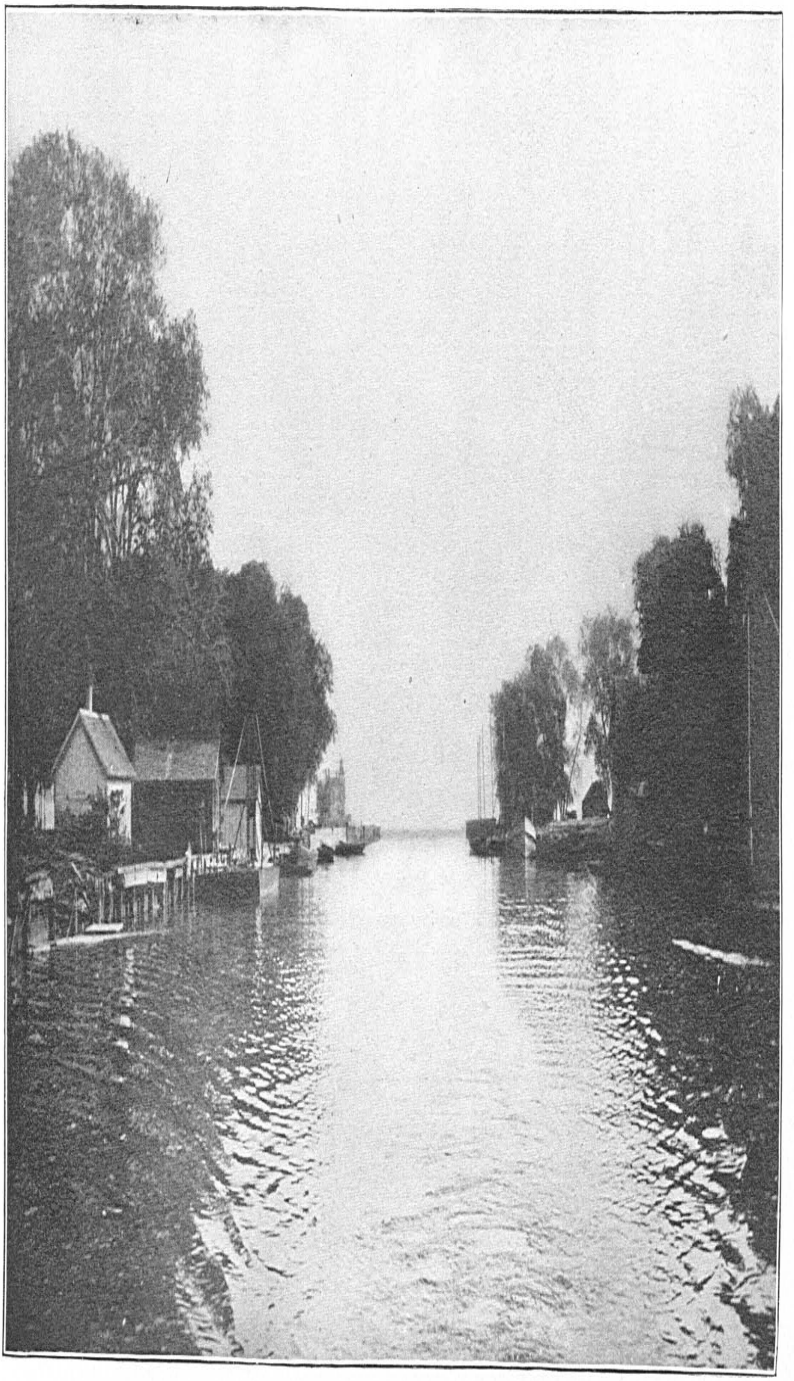
The temperature of the water at Monroe Piers averaged 55½° during the 15 days collections were made; but it varied greatly, frequently changing 5° to 6° in a half hour, according as the wind or tide set in or out at the mouth of the river. Its maximum was 60°.

At Put-in Bay 252 fish were penned, 111 of them being females. These yielded 3,187,700 eggs, an average of 72,447 per fish.

As soon as the eggs are received at the station they are placed in 5-gallon kegs for about 24 hours and a gentle stream of water is allowed to flow over them. At the expiration of that time they are placed in jars, 3½ quarts to each jar. At the end of three days they will have swelled to a bulk of about 4½ quarts. To attain the best results the eggs should be worked with the least amount of water possible to keep them in motion. This is very important, as experience shows that two jars of equally good eggs will produce very different results if one is worked rapidly and the other slowly.

Of the 493,000,000 eggs collected, 65,630,000 were transferred to the Alpena and Cape Vincent stations. The others were hatched at the station and planted on the spawning-grounds in the vicinity of Put-in Bay, Port Clinton, Monroe Piers, and Toledo. They commenced hatching on May 4 and by May 17 plants amounting to 198,540,000 had been made, all in Lake Erie with the exception of a few million used for stocking lakes in Indiana.

Toward the close of the season the fry were sent out in a 400-gallon tank on the steamer *Shearwater*, instead of in cans or kegs in the usual manner. This very much simplified the work of planting, as the fry were drawn from the tanks in the hatchery by means of a 1-inch rubber hose acting as a siphon to the tank on the vessel. In this way the vessel was loaded in about fifteen minutes, whereas it requires from two to three hours to do the work in the ordinary way. Careful



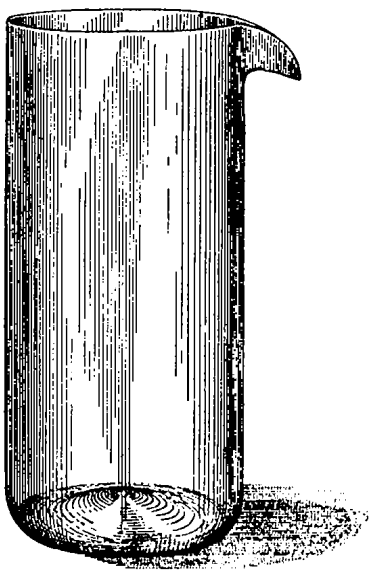
HARBOR AT MONROE PIERS, MICH.—U. S. FISH COMMISSION BUILDING SECOND ON THE LEFT.

examination showed that the fry were not injured by being passed through the pipe. When the vessel arrived on the planting grounds a section of hose about 10 feet long was attached to the bottom of the tank and the fry were allowed to pass overboard through it. By placing the end of the hose under the surface of the water no possible injury could result.

The following gives the temperature of air and water at the station during the year:

Month.	Air.			Water.			Month.	Air.			Water.		
	Max.	Min.	Mean.	Max.	Min.	Mean.		Max.	Min.	Mean.	Max.	Min.	Mean.
1898.	°F.	°F.	°F.	°F.	°F.	°F.	1899.	°F.	°F.	°F.	°F.	°F.	°F
July.....	92	62	77	84	70	76	Jan.....	49	—0	26.75	32.5	32.5	32.5
Aug.....	88	70	76	79	73	76.2	Feb.....	53	—11	21.79	32.5	32.5	32.5
Sept.....	90	56	69.3	77.5	65	69.83	Mar.....	50	18	32.61	35	32.5	33.59
Oct.....	76	34	51	74	47	58.6	Apr.....	85	27	49.53	58	33	42.27
Nov.....	62	19	39.76	50	37	43.13	May.....	81	52	62.41	65	54	58.82
Dec.....	45	6	28.85	36	32.5	33.22	June ...	90	60	73.23	75	62	68 7

On March 12 a field of ice gorged at the point where the west intake pipe enters the lake and carried away 20 feet of the 10-inch suction pipe. On May 30 the storehouse of the station and its contents were burned. Spontaneous combustion is supposed to have been the cause of the fire. The loss amounted to about $438.



White-fish hatching jar designed by J. J. Stranahan.

Experiments have been conducted for a number of years with the purpose of designing a jar better adapted for the white-fish and pike-perch work than the McDonald jar. One designed by the superintendent and manufactured by Dorflinger & Sons, of White Mills, Pa., was used this season along with the old jars, and from the results attained it is believed it will be an improvement over the old form. It is of glass, 15½ inches high and 7 inches in diameter, with a glass spout, thus eliminating the old metal spout, which had to be attached to the jar by rubber gaskets, putty, or cement. The bottom is 5 inches in diameter and rests directly on the shelf, obviating the necessity for glass legs, which are apt to break. It works well with 5 quarts of eggs, using less water than the McDonald jar, and by filling the jar to within an inch of the top it acts automatically, all fungused eggs being carried over into the receiving-trough by the current of water. They are prevented from entering the lower row of jars by wire-cloth pockets inserted in the outlet of the discharge trough. The water enters the jar through a steel tube with a trumpet-shaped

bottom, the internal diameter of which is greater than the external diameter of the rubber tube which attaches it to the supply tank. The advantage of this arrangement is that it permits the escape of the air upward.

Experiments were carried on in order to determine definitely the most effective means of preventing the adhesion of eggs while being fertilized. It was learned that adhesion may be absolutely prevented by applying just enough water to fill and slightly cover the egg mass, then adding (every 10 minutes for the first hour and every 20 minutes for the second) additional water to cover the eggs, stirring gently each time. This operation requires two or three hours' time, but it is strongly recommended where eggs are taken in small quantities. A number of jars manipulated in this way hatched over 85 per cent, the best percentage during the season.

The use of swamp muck was continued, and after careful experimenting it was decided that it is better to use the muck in the pan after fertilization takes place than to introduce it in the kegs in which the eggs are poured after being fertilized. The eggs should be allowed to stand in the milt and sufficient water to cover them for about 10 minutes, when a tablespoonful of the muck mixture, about the consistency of cream, should be added. This gives the egg mass a dark-gray color. Water should then be added until the pan is nearly full, the mass being stirred gently and then allowed to stand a half hour. The important point in preventing adhesion is to let the eggs stand until the particles of muck have settled, then pour off the comparatively clear water, adding a fresh supply and gently agitating the eggs. Most of the muck particles will have settled at the end of a minute, the water becoming clear.

The preparation of the swamp-muck solution is simple, but should be carefully conducted. The plan pursued at Put-in Bay is as follows: The apparatus consists of two tubs and a screen about 20 by 30 inches, made of fine brass wire cloth—about 40 strands to the inch. After selecting a suitable location a depression is dug in the muck, which quickly fills with water. The muck is dissolved in this by constant beating and stirring, care being exercised not to get the mixture too thick, as in that event the sand will not settle. This is then poured through the screen into the tubs. When the water has partially cleared in the tubs it is poured off, leaving a few quarts of the muck of the consistency of thick cream in the bottom. The tubs are again filled with water, thoroughly agitated, and allowed to stand a few seconds so that the sand may settle. The water containing the solution is then poured in kegs or cans, where it remains for an hour or more, when the water is drained off, leaving the muck in the bottom. It should be free from sand, which interferes with the working of the eggs in the jars. The muck must now be thoroughly scalded in order to prevent the development of infusoria, which at times are apt to cause much trouble. The preparation may be dried in any desired form and held ready for use.

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

During the summer the station force was occupied in painting the buildings, improving the lawns, and getting the hatching and collecting apparatus ready for the fall work. In August the superintendent, accompanied by Mr. H. H. Marks, who was employed to act as field foreman during the absence of Mr. S. W. Downing on the Pacific coast, visited the important fishing centers on Lakes Huron, Michigan, and Superior, to arrange for the collection of lake-trout eggs. As results on Lake Superior the previous year had been poor, arrangements were made for operating there only in the vicinity of Sault Ste. Marie.

Particular attention was paid to the fishing-grounds on Georgian Bay and the upper end of Lake Michigan, including Beaver Island, and spawn-takers were stationed at Pilot Harbor, Cockburn Island, Meldrum Bay, Burnt, Green, and Duck islands. The first eggs were collected on October 13, but the fish were driven out into deep water about this time by a heavy storm, and unprecedentedly bad weather prevailed to the close of the fishing season, preventing the fishermen from lifting their nets oftener than once or twice a week (most of the fish being then either spent or dead), and also causing considerable loss on the fishing tugs. The spawn-takers were shifted from field to field, as weather conditions demanded, and every effort was made to fill the hatchery before November 3, the commencement of the close season. On October 20 three cases of eggs were received from Lake Superior, but the temperature at the time of shipment was so high that they came through in poor condition. The operations resulted in the delivery of 3,978,000 eggs at Northville, the last shipment arriving November 7. On the first of the month the indications were that the trout had just commenced to spawn in large numbers, and if operations could have been continued for ten or twelve days, there is little doubt that large collections could have been made, particularly at Beaver Island.

The eggs were placed in troughs at the station and commenced hatching December 4. The distribution of the fry was made from January 19 to March 14, 2,800,000 being deposited on spawning-grounds in lakes Huron and Michigan, and 60,000 furnished for inland lakes in Michigan and Indiana. The remaining 200,000 were put in troughs, to be held until fall. At the close of the year there were estimated to be about 130,000 on hand. These were about 3 inches long and were doing well.

The fingerlings on hand at the beginning of the year (hatched in January, 1898) were held through the summer and planted during August and September without loss in Lakes Superior, Michigan, and Huron.

The passage of an act, known as the Milliken bill, by the Michigan legislature, authorizing the United States Fish Commission to fish in any of the waters of the State at any season of the year for the purpose of gathering spawn from the fish so caught, with the provision that such work be under the supervision and control of the State game and

fish warden and that 75 per cent of the fry resulting from spawn so taken be planted in the waters of Michigan, will allow the Commission in future to continue work during the closed season, and will undoubtedly permit the collection of as many lake-trout eggs as may be needed to fill the hatcheries of the Commission.

The brook-trout brood-fish at the station yielded 97,600 eggs between October 18 and December 13. As it is important that the supply of this fish be kept up in the various streams of Michigan, 638,000 eggs were purchased from a private hatchery at South Wareham, Mass., and 96,000 eggs from wild fish were transferred from the St. Johnsbury station. The eggs from Vermont were excellent, and commenced hatching December 10 and finished December 22, producing 94,114 strong,

New hatchery, Northville Station, 1899.

active fry. Of these, 92,994 remained in the rearing-troughs February 8. Early in April these fry were observed to be peculiarly affected. They refused to take food, seemed to grow constantly weaker, and each of the affected ones developed a small red spot. By May 1 they commenced dying in large numbers, and before the disease could be checked and the fish distributed nearly 32,000 had died.

The eggs purchased from Massachusetts produced 618,000 fry, which were held for several months and then distributed, making the total distribution of brook-trout fingerlings 669,000. A small number were retained for the fall distribution, and on June 30 they numbered 31,493.

During November the trout carried over from the previous year were attacked by an epidemic, and very heavy losses ensued. Mr. M. C.

Marsh was detailed from November 14 to 27 to investigate the disease, and on his return to Washington, Dr. C. M. Blackford was sent to continue the investigation, remaining in Northville from December 5 to January 14. The affection was apparently traced to bacteria, supposed to have been caused by the rotting timbers of which the ponds were constructed. From experiments conducted at the station it would appear that even where an epidemic of this character prevails, if the fish can be transferred to open waters and allowed to subsist on natural food the mortality will at once cease. On June 9, 5,000 brook-trout fry, which had been fed for several months in the rearing-troughs and were from 2½ to 3 inches long, were placed in the spring pond, where they received only the natural food contained in the spring water. After remaining there for some time they began to assume a different color from those fed on liver, their tails and fins becoming very brilliant and presenting a beautiful appearance. Not over half a dozen dead ones were taken from the spring from the time they were introduced to September 30, yet when counted on that date there were only 3,400, the loss being attributed to kingfishers and destructive animals.

The Loch Leven brood trout were quite old and yielded only 14,500 eggs, all of which were shipped to Prof. William A. Locy, of the Northwestern University, Evanston, Ill., and to the Connecticut Fish and Game Commission. On June 30 there were 107 Loch Leven trout of the hatch of 1895, 1,464 of 1897, and 2,308 of 1898. The fish of 1897 will probably yield a considerable number of eggs during the coming fall.

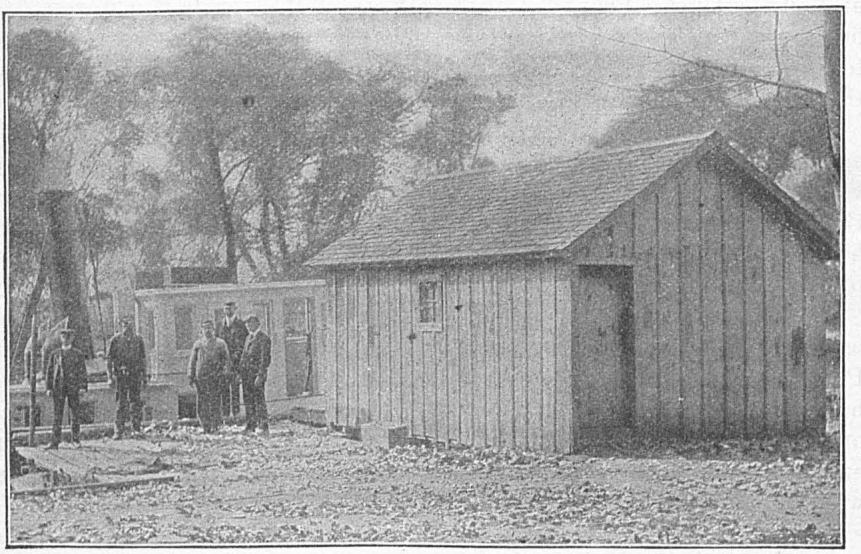
Of the steelhead trout on hand at the beginning of the year, 2,500 were planted in September in streams along the line of the Flint and Pere Marquette Railroad. At the close of the year there remained on hand 607 of the hatch of 1897 and 3,549 of the hatch of 1898. A case of eggs was received from Oregon in June, but unusually warm weather en route caused almost a total loss. The 5,000 fry hatched from them were doing well at the close of the year.

On February 2, 16,500 rainbow-trout eggs were received from Neosho; these yielded 13,000 fry, which were distributed during the spring.

On the 6th of June 67,360 grayling eggs were received from Elk Creek, Montana. Though the weather was very warm, the condition of the eggs on arrival was excellent, the temperature of the top tray being 55° and the middle of the case 60°. They were hatched on open trays in shallow troughs. A few of the fry came out immediately after being unpacked, and by June 13 they were all hatched, but it was noted that the fry remained at the bottom of the trough for several days before attempting to swim. The fry from Michigan grayling, handled at Northville fifteen years ago, commenced to swim as soon as hatched, and were much larger and stronger than these. Of the 55,000 resulting from the shipment, 50,000 were planted in the Au Sable and Pere Marquette rivers. The balance were retained for observation and experiment, and at the close of the year they were doing well, apparently taking food as freely as the trout.

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

This station was closed from July 1 to November 24, on which date 36,120,000 white-fish eggs arrived from the auxiliary station at Monroe Piers, Mich.; 500,000 of these were shipped, as soon as the eye-spots appeared, to New Zealand, for the New Zealand Fish Commission. The eggs seemed to develop normally at first, but about the middle of December Mr. Downing reported them to be in poor condition. A consignment of 30,000 was sent to Northville, and Dr. Blackford, who was engaged there in studying the diseases of the brook trout, made a thorough examination of them, pronouncing them to be in good condition. They were placed in spring water, where they developed very rapidly, half of them hatching by January 27. The eggs at Alpena commenced hatching on April 13 and finished on the 28th, yielding



U. S. Fish Commission building, Monroe Piers, Michigan.

28,000,000 fry, about 79 per cent of the total number of eggs received. These were deposited in Lakes Michigan, Huron, and Superior, and some inland lakes at Iron Mountain, Mich.

Arrangements were made during the fall to collect pike-perch eggs in Saginaw Bay, and on the 17th of April the foreman, Mr. Downing, began operations, shipping the first eggs to Alpena on April 20. The results at this point were only fair, owing principally to the fact that the ice remained in the lake so much later than usual that the earlier spawners, which produce the best eggs, had already deposited their eggs. Collections continued until May 3, but the eggs secured were of poor quality. On April 22 and 25 two shipments of eggs, aggregating 41,630,000, were received from the Put-in-Bay auxiliary station at Monroe Piers. They yielded only about 30 per cent of fry, which hatched

between May 12 and 18. The Michigan Commission received 12,000,000 of them for distribution in inland lakes in Lenawee, Cass, St. Joseph, Calhoun, Barry, Jackson, Ingham, Cheboygan, Emmet, Antrim, and Wexford counties, Mich. The remainder were planted as follows: 7,500,000 in Saginaw Bay, 4,000,000 in Thunder Bay, 1,000,000 in Hamlin Lake, near Ludington, and 500,000 in Devils Lake, near Addison, Mich. From the experience gained this spring it is believed that with fairly good weather very large collections of pike-perch eggs might be made in Saginaw Bay.

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

During August arrangements were made for collecting lake-trout and white-fish eggs at a number of points in Minnesota and Ontario, also at Isle Royale and Ontonagon, Mich.

The lake trout commenced to spawn about the middle of September in the vicinity of Rossport and Port Arthur, and along the Michigan shores about the 20th. Eggs continued to come in until November 4, the total collections aggregating 6,300,000; 1,950,000 of these were obtained from the Isle Royale field, 315,000 from Grand Portage, Minn., 2,300,000 from Rossport, 1,235,000 from Ontonagon and vicinity, and 500,000 from Copper Harbor, Mich. Shipments amounting to 875,000 were made to other stations of the Commission, State fish commissions, and private applicants, and 1,500 were sent to Chicago University for biological purposes. The eggs retained at the station were carried through the winter without unusual loss and commenced hatching late in April. The distribution was started as soon as the yolk-sac was absorbed—about May 10—and lasted until June 30, the entire output amounting to 4,335,000 fry, which were planted in the vicinity of the spawning-grounds from which the eggs were secured.

In addition to the 7,067,000 white-fish eggs collected in the vicinity of Port Arthur, Ontario, 12,132,000 were transferred to the station from Put-in Bay. From this stock 15,300,000 fry were hatched and planted during the month of May in Lake Superior.

In February, 100,000 brook trout eggs were received from Leadville, and in May and June 100,000 grayling eggs from Bozeman, and 93,000 steelhead eggs from Clackamas. The brook-trout eggs were in excellent condition, and hatched 87,308 fry, which were distributed in public and private waters during the summer. The steelheads were shipped in three consignments, the first of which reached the station in fair condition, but only about 50 per cent of the others were saved. At the close of the year 53,841 of these fish remained. On the grayling eggs, received in two consignments, on June 26 and 27, there was a loss of 15,000 in transit. The eggs were so far advanced on their arrival that they commenced hatching as soon as placed on the trays, the water temperature at the time registering 60°. Owing to this high temperature and to the poor condition of the eggs when received, only about 15,000 healthy fry remained at the close of the year.

In planting the fry hatched at this station, steamers are utilized for conveying them to the natural spawning-grounds. The fish are carried in 10-gallon cans, 30,000 to the can, the water being kept at from 35° to 44°, and fresh supplies substituted when necessary. When the vessel approaches the planting-grounds, the fry are poured into a tub filled with water and placed in the gangway. Into the side of this tub is fitted a spout 2½ inches in diameter and long enough so that when the tub is in position it extends about 6 feet out from the steamer, its end touching the surface of the water. The fry pass through this spout, and as the steamer is running from 6 to 10 miles per hour while the deposit is being made, a plant of 240,000 is scattered over several miles of territory.

During the year a number of improvements were made. A new two-story frame building 18 by 22 feet was erected south of the hatchery. Upon the first floor, which will be used as a supplementary hatchery, 8 hatching-troughs, 4 large fry-troughs, and a picking-trough were arranged. The upper story will be utilized as a workshop and store-house. The crib wall on the beach south of the hatching-house was raised, and the carpenter shop, which stood on the bank of the river, was moved and set up over it. The small octagonal building located over the reservoir was removed to a point just east of the out-of-door fry-troughs, and is now used for storing paints and oils. A pier 8 feet by 24 feet by 3½ feet was built and filled with rock near the mouth of the Lester River to protect the end of the drain pipe running from the hatchery from becoming covered with gravel or being broken off by the waves from the lake. A new gravel road was also constructed from Lester street across the hatchery grounds to a point near the flagstaff, thence north to a junction with Park avenue. A number of other walks were laid out, improving the grounds greatly, and a large amount of grading was done north of the hatching-house. During the summer all of the hatching apparatus was overhauled and painted.

Quincy Station, Illinois (S. P. Bartlett, Superintendent).

As indicated in the report for the previous year, the spring of 1898 was unusually favorable for the spawning of bass and crappie in the overflowed regions of the Illinois and Mississippi river valleys; consequently young bass were very plentiful at the beginning of the fiscal year. The spring having been warm and the temperature of the water high, the young fish grew very rapidly, and it was an ordinary occurrence during the summer to take specimens weighing ¾ pound from schools hatched late in the spring. The early part of July was marked by heavy storms extending the whole length of the river and causing high water, nevertheless 30,000 large-mouthed bass were collected that month and 24,000 shipped. Had there been sufficient storage room it would have been possible to have secured 100,000 during the same period. The fish averaged 4 inches in length.

On August 3, immediately after a severe storm, accompanied by electrical disturbances, 2,400 of the largest bass were found dead in one of the ponds. As the fish in the other ponds were not affected it was thought this pond was struck by lightning. Other storms occurring in August interfered with the work very materially, but operations continued to the middle of November, the season's work resulting in the collection and distribution of 68,452 black bass, 9,270 crappie, and 1,250 cat-fish. In addition, large numbers of the coarser fishes were taken from ponds that were drying up and transferred to living waters.

Crappie were very plentiful early in the season, but on account of the great difficulty experienced in transporting these fish prior to the middle of September no effort was made to collect them until fall.

Through the courtesy of the Illinois Fish Commission the steamer *Lotus* was available for making collections during part of the season, and rendered valuable assistance.

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

During the summer and fall of 1898, pending the obtainment of a special appropriation for the completion of the station, considerable work was done on ponds X, Y, and Z, so that they would be available for fish-cultural purposes the following season. A breeding-pond for crappie, 80 by 40 feet, with an average depth of 2 feet, was excavated and lined with plank. During the winter an appropriation of $6,000 was secured for the completion of the station, including the construction of additional breeding-ponds and the protection of the ponds and grounds from freshets in Spring Branch, and work was commenced on April 17.

By the end of the year steam-heating plants had been installed in the hatchery and residence and a contract was given out for the building of a stone protection wall from the upper spring reservoir along Spring Branch; 3 spawning-ponds, 75 by 17 feet, and 3 feet deep, had been completed; also 6 rearing-ponds, 22 by 7 feet, and 3 feet deep. The 80-foot ponds previously constructed, which had been lined with cobble-stones laid in clay, became so unsatisfactory that the stones were removed and four were lined with concrete and cement and the other four with 2-inch hemlock plank. A breeding-pond for bass, 150 by 100 feet, and 4 feet deep, was excavated and its sides lined with plank. As the soil is too porous to hold water the bottom will be lined with clay to the depth of 4 inches. The channel in Lower Spring Branch was straightened and widened and a stone wall was built to protect pond X from freshets. A protection wall of cement and stone, 5 feet high and 3½ feet thick, was constructed from the wagon-bridge along Spring Branch to a point opposite the dwelling, and the channel of the branch was moved 75 feet westward. All of the low land east of the protection wall was filled in and graded, and the work of constructing a dam across Spring Branch was commenced.

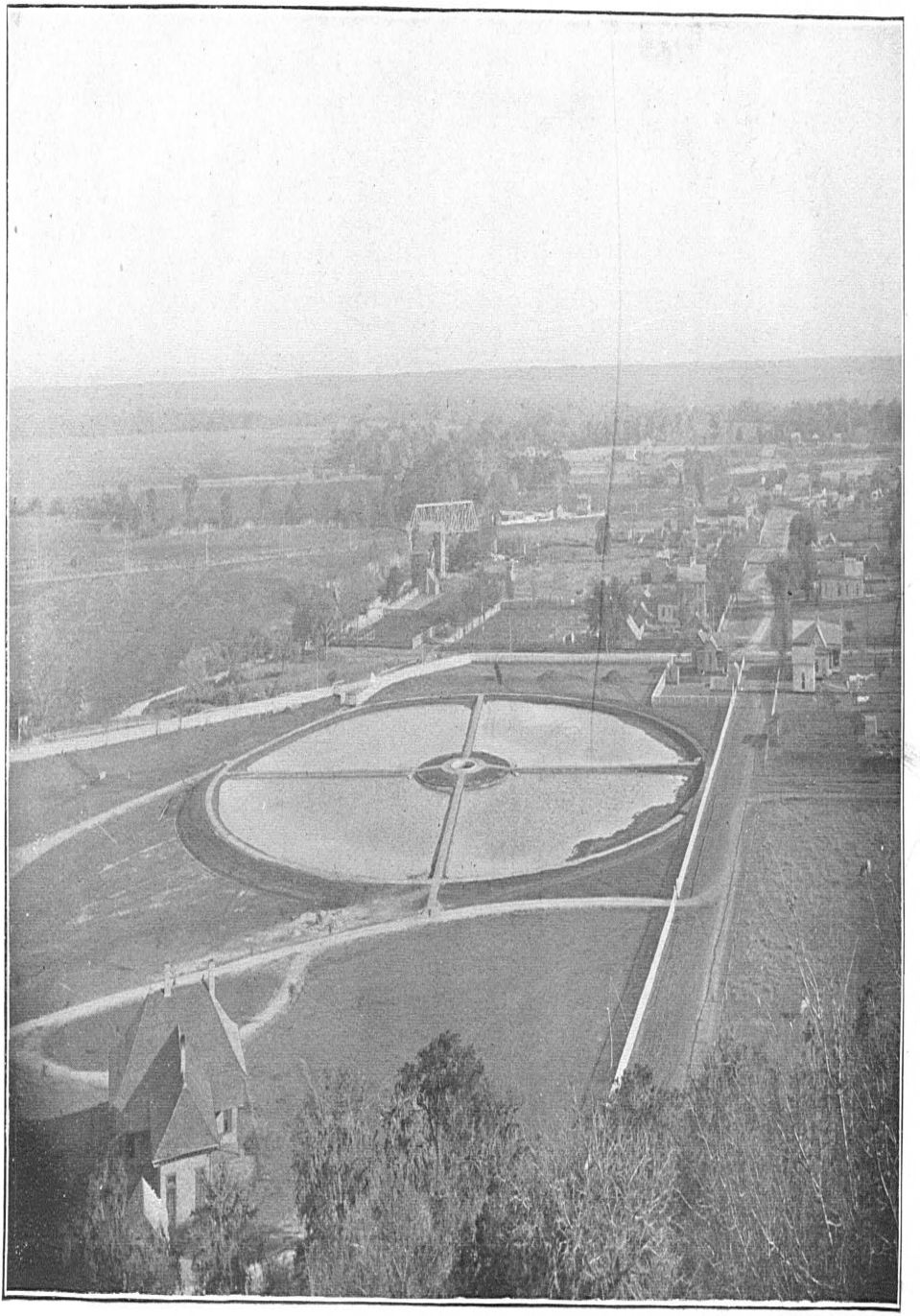
Fish cultural operations were conducted on the same lines as in the previous year. Ponds X, Y, Z, and W were used for the propagation of large-mouthed bass and crappie, and two of the 80-foot stock ponds were devoted to the culture of rock bass. Owing to the limited amount of space and the poor results attained at other stations in the propagation of the small-mouthed bass, work with that fish was discontinued. At the beginning of the fiscal year the bass ponds appeared to contain a great number of young fish, and it was then thought there would be a good crop for the fall distribution, but in July they commenced dying in large numbers, probably on account of the scarcity of natural food. An effort was made to collect natural food for them from the river bottoms along the Maquoketa River, but the supply was insufficient. The ponds were then drawn down and the fry placed in troughs, and an effort was made to feed them chopped beef and liver, but for some reason they did not thrive on it, possibly because of their weak condition when transferred, and only a few were saved for the fall shipments. These were distributed to applicants in Iowa.

Early in April the adult bass were placed in the breeding-ponds, and on May 8 the first nest was discovered in pond Z. The temperature of the water at this time was 61°. Nests were seen in the other ponds on the 10th, and on June 3 the first school of young fish was observed in pond Z. Schools were subsequently observed in the other ponds. Quite a number of nests built in the mud near the edges of the ponds contained fungused eggs, and these proved a total loss. The indications at the close of the year are that the output will be larger than that of the previous season. A lot of 3,000 young bass, 1¼ inches long, have already been taken from pond Z and placed in troughs, and the experiment of feeding them maggots is being tried. Up to the end of June several of the bass were still spawning.

The adult crappie were placed in pond W in April. They nested in May, and on June 21 two schools of young fish made their appearance. This pond contains an abundance of natural food, and it is thought the results will be fair.

During the summer of 1898, 1,183 rock bass were taken from the 80-foot stock-ponds, this number being the result of the spring spawning. In the spring of 1899, 30 adult rock bass were collected from the river and placed with the adults already on hand, 27 being placed in each of the two rearing-ponds. The fish were seen spawning late in June.

On July 1 there were 79,598 brook-trout fry on hand. These were held until September with a loss of 21,348, when 60,000 were distributed to applicants in Iowa, and the balance held for brood stock. During the summer 700 adult trout were collected, making the total number of brood fish 1,184. The first brook-trout eggs were secured on November 1, and collections continued until the 4th of March, 286 females yielding 246,278 eggs, an average of 861. These produced 67 per cent of fairly good fry. The small percentage hatched is attributed to the



CIRCULAR POND AT SAN MARCOS STATION, TEXAS.

fact that most of the fish were only two and three years old. During the winter three consignments of eggs, aggregating 150,000, were received from Leadville in excellent condition and 138,035 fry were hatched from them, bringing the total stock to 297,097; 178,900 of these were distributed during the spring to private applicants and planted in the public waters of Iowa. The remaining fry were held to be reared as yearlings.

A shipment of 22,800 rainbow-trout eggs was received from Neosho and 200,000 lake-trout eggs from Duluth. Both consignments arrived in good condition, and the fry resulting from them were planted during the spring, most of the lake trout being planted in Okoboji and Spirit lakes. The 26,000 rainbow-trout fry on hand at the beginning of the year were distributed in the fall with the exception of 4,800 retained for brood stock.

The graylings resulting from eggs shipped from Bozeman in the spring of 1898 suffered severe losses during the summer, as it was difficult to get them to take artificial food. Plants aggregating 22,000 were made in Spring Branch and Bear Creek, and the remaining 1,450 were retained for experimental rearing.

The Loch Leven trout collected in the vicinity of the station the previous fall yielded 2,980 eggs, from which 2,665 fry were hatched. At the close of the year 1,840 remained; these will be held for brood fish.

The following stock remained on hand June 30, 1899:

Species.	Calendar year in which hatched.		
	1899.	1898.	Adults.
Brook trout	70,000	5,250	967
Rainbow trout	.....	4,800	3,265
Grayling	.....	1,450	.....
Loch Leven trout	1,840	.....	45
Large-mouth black bass	.....	.....	140
Rock bass	.....	.....	50
Crappie	.....	.....	30

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

In August work was resumed on the four ponds intended to be supplied by water wheel, and by the end of October they were completed. This addition to the pond system adds very materially to the productive area of the station, and its cost, including water-wheel and reservoir, was only $2,363.77.

The outer banks of these ponds form a large circle, 1,200 feet in circumference; in the center is a circular mound, 80 feet in diameter, in which is located the distributing reservoir 20 feet in diameter and 3 feet deep, with walls of rock and cement 2½ feet thick at base, topped with 16-inch limestone coping and completed with interwoven guard rail of half-inch iron. The circle is divided into four equal parts by 6-foot embankments, making each pond the form of a keystone, with an area

of about half an acre each. The depth of the ponds at the narrow ends near the reservoir is 5 feet, and it decreases as it approaches the outer edge of the circle, the average being about 3 feet. When the ponds were filled with water it was found that the wheel would keep them abundantly supplied.

To overcome the difficulties heretofore experienced in handling bass while the work of distribution is going on, the upper end of pond M was converted into 8 retaining-pools, 6 by 16 feet. The partitions were built of brick and cement with concrete foundation, and each pool was supplied with a half-inch supply pipe. This work was done largely by the employees of the station.

In July the distribution of bass hatched in the spring of 1898 was again undertaken, 11,720 being moved by the station force. The work was then discontinued until the arrival of car No. 2, in December, when four trips were made, and 5,025 black bass, 3,015 rock bass, 1,035 crappie, and 4,000 rock bass from Neosho were distributed.

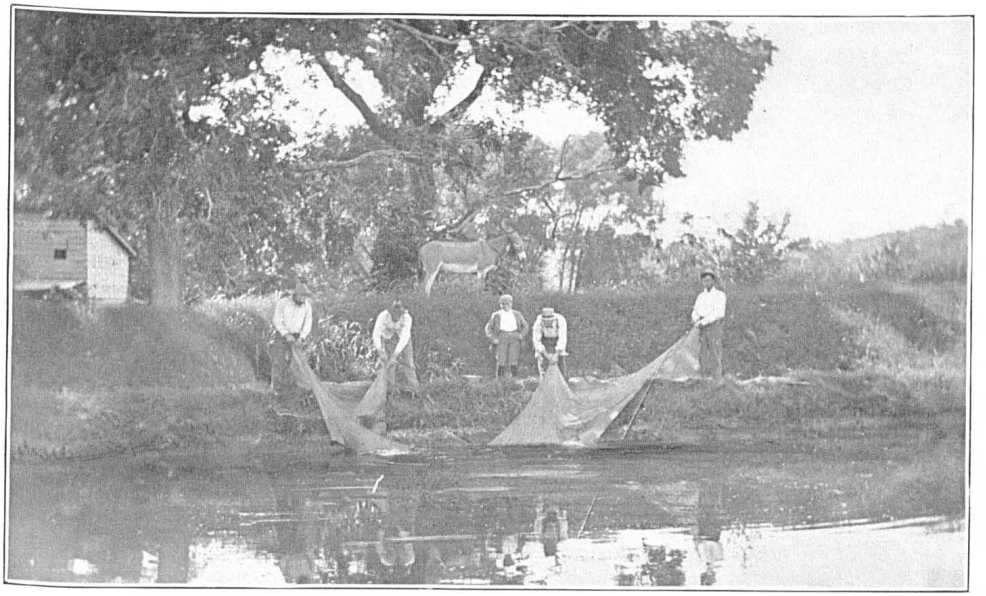
Fish-cultural work was conducted on the same lines as heretofore, the propagation of black bass being the most important feature. Incidentally, experiments were continued in the propagation of rock bass, calico bass, crappie, and bream, and carp and mud shad were reared as food for the bass. Early in the fall the brood-fish were transferred to the breeding-ponds, about 12 pairs being placed to each half acre, experience having shown that the best results are attained by so apportioning them. They commenced spawning on February 18, nine days later than the previous season. This delay was undoubtedly due to the weather prevailing during the winter, which was the coldest recorded for many years. As in the past, they deposited their eggs on the clay banks of the ponds instead of the piles of gravel provided for them. As soon as the young fish were 1½ inches long they were transferred to rearing-pools, a seine of bobinet being used.

Several experiments were conducted during the season to determine at what age it is best to transfer the young from the breeding-ponds, and from the results attained it was decided that they should be at least 1½ inches in length before being disturbed.

The following table summarizes the experiments referred to:

Size of fish.	Number of fish.	Size of pond.	Number distributed from pond.
1½ inches	1,000	6 by 16 by 1½ feet deep	735
Just after absorption of sac	1,000	Same	200
1½ inches	1,500	33 by 50 feet	1,240
Just after absorption of sac	5,000	16 by 50 feet	760

On April 18 the distribution of the fish hatched during the winter was taken up and carried on until the close of the fiscal year. During this period 69,800 young black bass were delivered to private applicants and planted in public waters, with a loss of only 100.



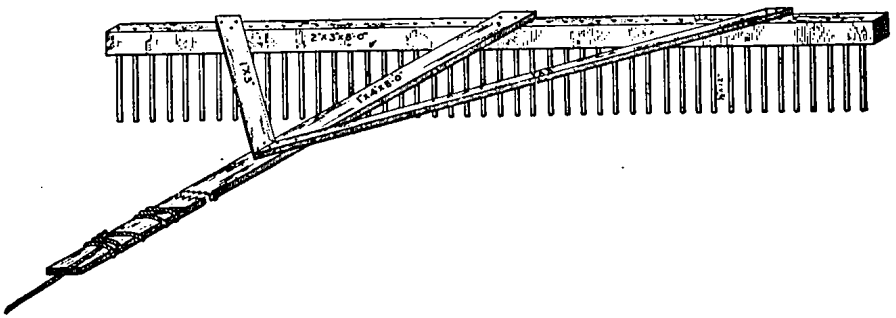
SEINING A SCHOOL OF YOUNG FISH, SAN MARCOS STATION.

SEINING ADULT FISH, SAN MARCOS STATION.

It is a matter of regret that the railroads of Texas, with the exception of three—the St. Louis Southwestern, Texas and Pacific, and Fort Worth and Rio Grande—declined to give the Commission any more free transportation, as this will increase the cost of distribution very greatly. It may be of interest to know that the employees of the station traveled 18,857 miles in making the spring distribution, 9,000 of which were free. The amount expended in traveling was $773.43.

Of the fish distributed 37,550 of the black bass were planted in the following streams: Trinity River, 8,000; Brazos River, 7,150; Colorado River, 9,300; Guadalupe River, 5,000; Nueces River, 2,500; Frio River, 2,000; Medina River, 1,400; San Saba River, 1,000; San Antonio River (above city), 500; Pecan Creek, 700.

As it was impossible to obtain any rock bass in Texas, 10 adults were transferred from the Neosho station in December and placed in a pond 50 by 100 feet. At first the clear water appeared to affect their eyes, but they recovered and commenced nesting on the 23d of March. At the close of the year there appeared to be quite a number of young



Rake for drawing aquatic plants and moss to pond banks.

fish about 1½ inches long in the pond. At the same time these fish were transferred from Neosho, 12 calico bass were received and placed in a pond of the same size; these showed signs of nesting during the latter part of March and quite a number of small ones were observed on April 19.

Profiting by the experience of the past year, the adult crappie were placed in a pond with carp so that the water would be kept muddy. They commenced nesting late in March and at the close of the year a number of fish about 2 inches long were observed. For breeding purposes it is not deemed advisable to place more than 50 of these fish to a half-acre pond.

An effort was made to propagate bream, and early in the winter 30 were placed in a small pond. They commenced spawning in April and had not finished at the close of the year.

Blind salamander and shrimp continued to come up in the water from the artesian well, the shrimp constantly, the salamander at intervals. Perhaps two or three would be found one week, and then for several weeks none would be seen. Many of the specimens were for-

warded to Washington, some alive and some in formalin. Those sent alive were placed in 1-quart Mason jars, about three-quarters full of water. They can be kept alive easily for nine weeks, undergoing great changes of air temperature seemingly without inconvenience. One of a pair furnished to the School of Science at Austin, Tex., has been kept in an aquarium over 12 months, and about every eight days is fed a small bit of the flesh of crawfish. One was kept alive at the station, hermetically sealed in a Mason jar two-thirds full of water, for 31 days.

The trees planted the previous year have done well, taking into consideration the hot climate and almost total drought for 12 months.

The weather during the year has been very clear and dry, with high winds during the winter months and unprecedented cold, the thermometer registering 5° below zero on February 12, and remaining low for nearly a week. Ice nearly 4 inches thick formed over the ponds during this spell, but no harm resulted to the fish. Owing to the light rainfall during the past two years, the flow from the artesian well gradually dwindled, until in May it was less than 200 gallons per minute,

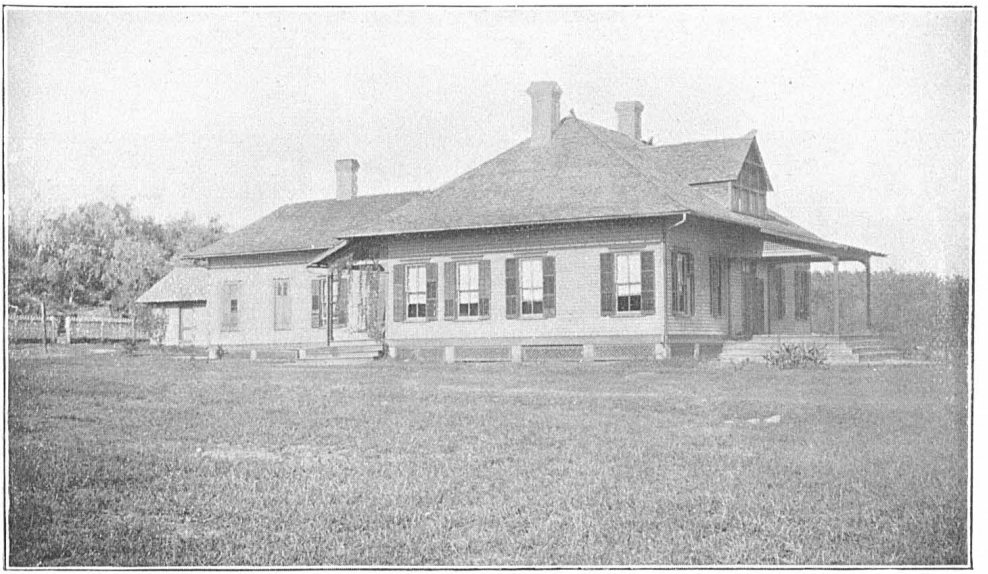
Rake for taking aquatic plants from ponds.

and the overflow from the ponds was so light that the hydraulic ram could not be operated. Heavy rains in June caused the flow to become normal again.

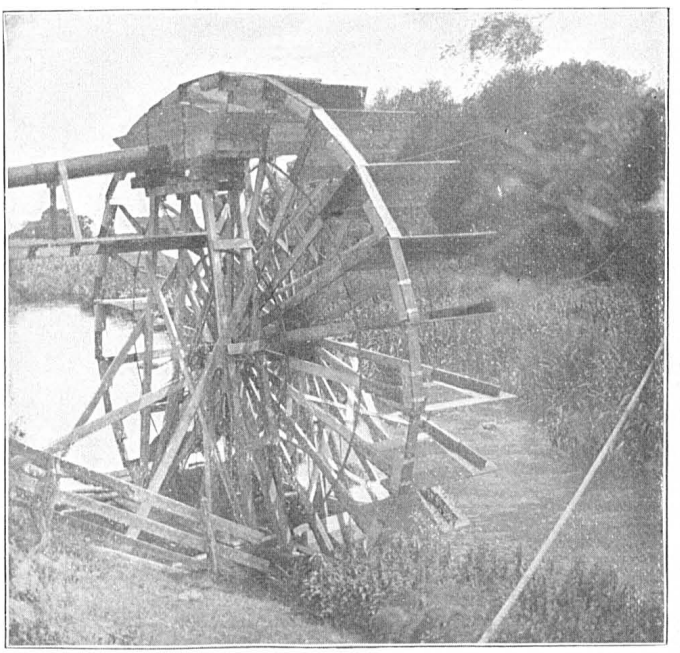
NEOSHO STATION, MISSOURI (H. D. DEAN, SUPERINTENDENT).

In addition to the usual fish-cultural work the station employees made many minor improvements during the year: Two spawning-ponds were constructed at the head of pond No. 14, and quite extensive repairs were made to Nos. 14 and 15, including new piling and new standpipes. The material used for this purpose was 1½-inch cypress, coated with pine tar. A new barn was constructed in the rear of the residence, three hydrants were installed on the grounds for watering the lawns, and a refrigerator was built in the corner of the ice-house for the preservation of liver and fish-food. An artesian well, 3-inch bore, was also sunk, with a view to increasing the water supply, but the flow from it is small, and the water is strongly impregnated with sulphur.

Fish-cultural operations were on about the same lines as in the past. The fish this year were singularly free from disease, and as a consequence the output of the station was larger than usual. Of the 92,200 rainbow-trout fingerlings on hand at the beginning of the year, 83,775 were distributed in the fall, and 2,000 retained for brood stock, showing a loss of only 7 per cent for four months. Of this loss 1,500 were prob-



SAN MARCOS STATION, TEXAS—WEST SIDE OF SUPERINTENDENT S DWELLING.



WATER-WHEEL AT SAN MARCOS STATION.

ably killed by being placed in a pond in which the piling was coated with coal tar.

The spawning season of the rainbow trout extended from December 16 to March 10, the total take of eggs amounting to 349,629, of which 225,939, or only 57 per cent, were fertilized. 125,800 eyed eggs, were sent to other stations and private applicants, leaving 100,000 to be hatched; from these there were on hand at the close of the year 57,400 fingerlings.

In May 10,000 wild rainbow trout eggs were received from California. These had been taken by the California Fish Commission at Sisson, Cal., and shipped to Leadville, where they were repacked and sent to Neosho. They produced 6,600 fine, healthy fry, which will be reared for brood stock.

The small number of eggs obtained this season and their poor quality is due to the fact that the brood-fish were in poor condition from constant handling and interbreeding, and it is hoped the introduction of new stock will bring about an improvement.

After the ponds containing the young black bass and rock bass had been carefully drawn down the fish were transferred to troughs and small pools, where they could be supplied with water of a higher temperature than it is possible to provide in the rearing-ponds. The troughs constructed over the branch proved very successful for this purpose, the temperature there being kept at 75° without difficulty. The young black bass learned to take artificial food very readily, though not so quickly as the rock bass. Of the 18,632 young black bass taken from the ponds, 16,750, or 90 per cent, were carried through the summer and successfully distributed in the fall. An accidental plant of 5,000 was made in Hickory Creek, the flood of July 31 carrying away the troughs in which they were held.

From the rock-bass ponds 32,100 young were removed to troughs, and the output in the fall amounted to 29,596. These were cared for in the same way as the black bass.

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

Species.	Calendar year in which fish were hatched.			
	1899.	1898.	1897.	1896.
Rainbow trout	64,000	1,990	600	720
Black bass	.....	.....	85	101
Rock bass	.....	.....	.....	55
Strawberry bass	.....	.....	71	48
Golden ide	.....	.....	.....	12

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

At the beginning of the year there were on hand 340,000 brook trout, 25,000 Loch Leven trout, 41,500 grayling, 3,000 rainbow trout, 153,600 black-spotted trout eggs, and 4,900 rainbow-trout eggs. The rainbow-trout eggs were a total loss, but, except the grayling, which were distributed in July and August, the balance of the stock was carried until

fall with comparatively light losses. Arrangements were made during the summer for the collection of eggs at all of the points heretofore operated, and at a number of private ponds and lakes. The first eggs were obtained October 7 from brood-fish at the station, and collections continued coming in until late in December.

The following table shows the number collected at the various points, spawning period of the fish, number of eggs lost and fry hatched:

Source.	Spawning period.	Eggs collected.	Eggs lost.	Fry hatched.
Station	Oct. 7 to Dec. 17	292,100	48,600	62,300
Uneva Lake	Oct. 30 Nov. 21	76,000	6,650	69,350
Smith Lake	Oct. 28 Dec. 5	138,000	37,750	100,250
Ridgway Lake	Oct. 26 Dec. 13	484,700	119,200	360,100
Wellington Lake	Oct. 29 Dec. 1	842,200	241,900	499,300
Youngs Lake	Oct. 22 Nov. 26	109,900	42,900	67,000
Decker Lake	Nov. 3 Nov. 27	1,328,000	696,720	533,280
Musgrove Lake	Oct. 21 Nov. 29	349,900	126,450	122,950
Derry Lake	Nov. 7 Nov. 16	36,000	1,400	34,600
Total		3,656,800	1,321,570	1,849,130

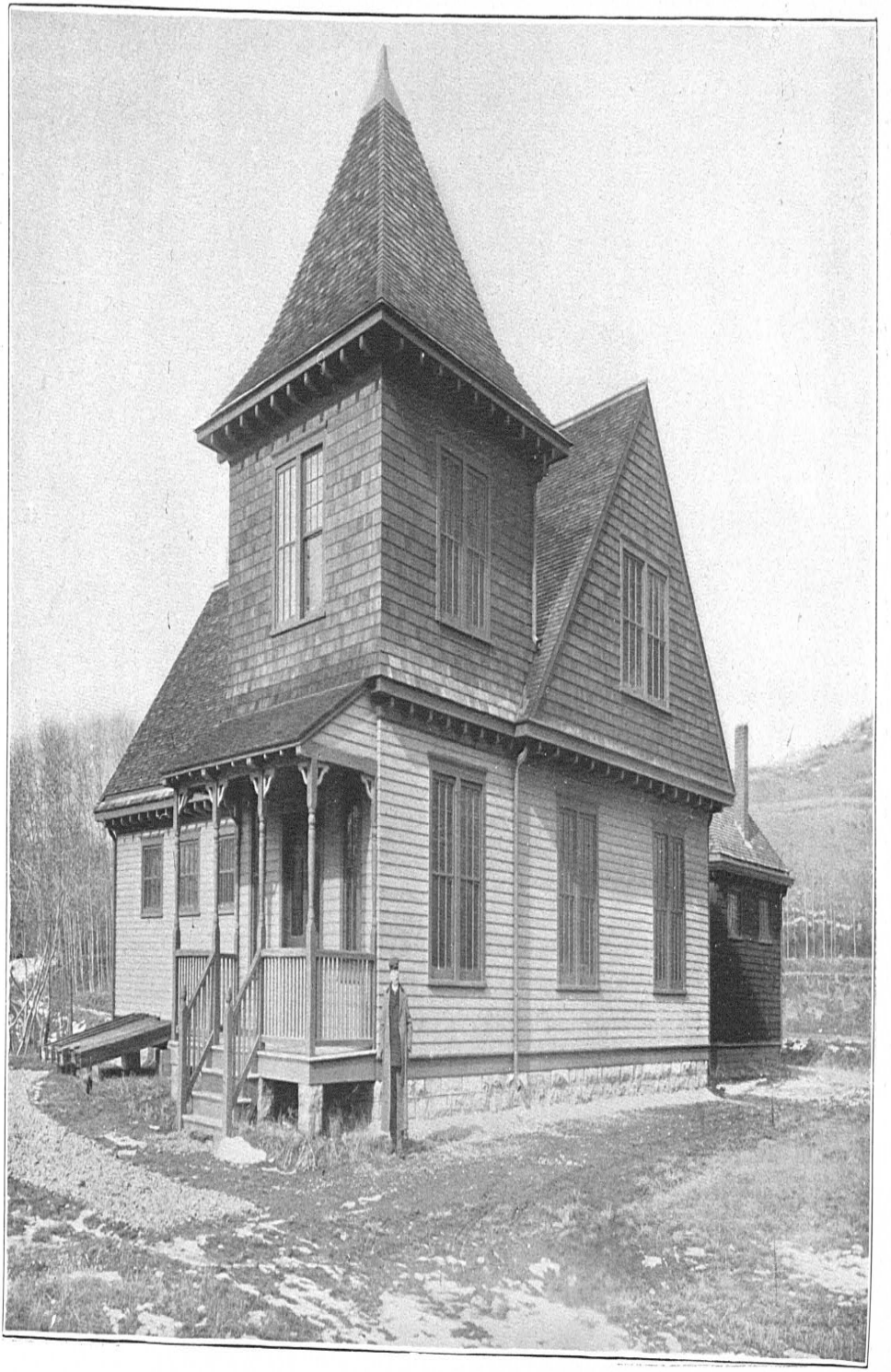
Of the total collections, amounting to 3,656,800, 485,600 were transferred to other stations of the Commission and to private applicants. On May 1 there remained at the station 778,790 brook-trout fry belonging to the Commission, and 1,016,340 belonging to private parties. As Congress had made a special appropriation to be used in repairing and remodeling the station, it was necessary to distribute all of these fish before the close of the fiscal year; 200,000 were shipped by car No. 2 to the Bozeman station, and the balance given to applicants in Colorado, South Dakota, Nebraska, Montana, Utah, Washington, Oregon, and Idaho. The fry owned by private parties were turned over to them.

Steps were taken early in the spring to again undertake the collection of black-spotted trout eggs at Freeman Lake, and also at the Grand Mesa Lakes. Only 18,500 were secured at the former point, but the take at the Grand Mesa Lakes amounted to 1,727,000. By June 30 143,000 had been transferred to the station, and 1,584,000 were in troughs at the lakes waiting for the eye-spots to develop. The results were exceedingly gratifying, as all efforts in past years to find a good collecting field for black-spotted trout eggs had proved fruitless.

In April and May 66,900 rainbow-trout eggs were collected at Lake Loveland and Twin Lakes. The loss on the Lake Loveland eggs during incubation was very heavy, amounting to over 54 per cent of the take. This was attributed to the freezing of the eggs in the pan just after they were taken. Quite a number of young trout were seen in the lake, and it is believed that much larger collections can be secured there next season.

In addition to eggs already mentioned, 25,000 rainbow-trout eggs were received from the California Fish Commission station at Sisson, Cal., 10,000 of them being reshipped to Neosho.

The stock of Loch Leven trout at this station has died out, the only



BOZEMAN STATION, MONTANA—HATCHERY BUILDING.

eggs collected being 15,500, obtained in December from the Ridgway Ponds. These hatched with comparatively small loss.

As there had been numerous calls for lake-trout fry in the Rocky Mountain regions, 25,000 eggs were transferred from Duluth in January and arrived in excellent condition, the loss in hatching amounting to only 200. During June 10,000 fry were shipped, and 11,700 remained on hand at the close of the year.

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

Species.	Calendar year in which hatched.					
	1899.	1898.	1897.	1896.	1895.	Eggs.
Brook trout	35,000	.....	.....	.....	104	.....
Loch Leven trout	300	.....	80	100	.....	.....
Black-spotted trout	.....	.....	200	.....	.....	1,651,000
Lake trout	11,700	.....	.....	.....	.....	.....
Rainbow trout	55,500	.....	.....	.....	.....	.....
Grayling	.....	2,700	.....	.....	.....	.....
Total	102,500	2,700	280	100	104	1,651,000

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

During the fiscal year a number of improvements were made at this station, including the installation of a heating plant in the superintendent's residence. The warm spring was raised 4½ feet, so that the water could be flumed across the creek and used for moderating the temperature in the rearing-ponds, and 12 new ponds, 10 by 25 feet, were constructed with a complete system of water-supply and waste pipes. In June a freshet carried away the flume to the warm-water spring and the south abutment of the bridge, near the main entrance to the grounds.

All of the fish on hand at the beginning of the year were distributed during the summer and fall, the grayling fry being liberated early in July, owing to the great difficulty experienced in feeding them.

Arrangements were made the following winter for collecting black-spotted-trout eggs at Henry Lake and grayling eggs at Red Rock, also for the operation of a private hatchery on the ranch of Mr. Burton Vincent, 4 miles from Anaconda, on Warm Spring Creek.

The Henry Lake station was opened April 3 and operated under the direction of Mr. W. F. Jarvis, fish-culturist at Bozeman. From the 407 ripe trout captured in the lake and in Howard and Meadow creeks 615,000 eggs were secured, the fish taken from the lake averaging 1,500 eggs each, and those from Meadow Creek 2,400. During May and June 507,000 of these eggs were transferred to Bozeman and 50,000 were hatched and planted in Henry Lake. The temperature of the water during the season varied from 43° to 57°. On June 27 the station was closed and the apparatus stored for the season.

The substation at Anaconda is located on the ranch of Mr. Burton Vincent, who has equipped a small hatchery to be operated by the

Commission on shares. Mr. G. H. Tolbert was detailed for duty at this point, and took charge of the work on March 15. Under his direction, runways were made to connect the several ponds, which were originally beaver-dams; traps were put in for the capture of adult trout, and live-boxes constructed. The first eggs were taken on May 7, the last July 3. The results secured were not as large as had been anticipated, as only 250,000 eggs were obtained. Of these, 194,600 were shipped to Bozeman and the rest were hatched and planted in the ponds. These ponds contain an abundance of natural food, such as Gammarus, and the fish in them are healthy and well fed.

The Red Rock Lake station was opened on April 6, Mr. A. J. Sprague, fish-culturist of the Leadville station, being in charge. The temporary hatchery, erected the previous fall, was equipped with troughs and a suitable trap was placed in the creek. The water supply to the hatchery was also increased by enlarging the spring and raising it to a higher level. As more grayling were taken than could be utilized, the trap was fished only during the day. The first eggs were collected May 14 and the last on June 29, 5,300,000 being taken in all.

As some difficulty had been experienced during the previous season in handling grayling eggs on flat trays, both the McDonald jars and the Stone-Williamson baskets were employed this year, and with very satisfactory results, no trouble arising from fungus or from bunching of the eggs, as heretofore. It would appear that grayling eggs should be eyed under a water pressure from above rather than with a lateral current.

Owing to an unforeseen delay in the delivery of the shipping-boxes, it became necessary to hatch the bulk of the eggs at the station and deposit the fry in adjacent streams. Of those transferred, 750,000 were sent to Bozeman, 100,000 to St. Johnsbury, 100,000 to Duluth, 67,000 to Northville, 25,000 to the Wyoming Fish Commission, and 50,000 to the Rhode Island Fish Commission.

The fry hatched at the station were planted as follows: 3,000,000 in Elk Creek, 100,000 in Elk Lake, 800,000 in Picnic Spring Creek, and 75,000 in Hidden Lake.

During the winter and spring 130,000 brook-trout eggs, 50,000 rainbow-trout eggs, and 15,000 steelhead-trout eggs were received at the station from different points. These were hatched and the fry will be held for rearing.

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

Species.	Calendar year in which fish were hatched.			
	1899.	1898.	1897.	Eggs.
Brook trout	68,800	2,100	*1,456	
Black-spotted trout		4,945	80	584,000
Steelhead trout		100	0,370	14,700
Rainbow trout	20,000			
Grayling				590,000

*Received 780 from Leadville station.

BOZEMAN STATION, MONTANA—SHOWING STABLE AND NEW WAGON-SHED.

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

Owing to the difficulties experienced in past years in constructing a rack across the Clackamas strong enough to withstand the freshets that occur every fall, and as arrangements had already been made to collect eggs on the upper river, the Salmon River, and the Little White Salmon, it was decided not to attempt collections on the lower river in the vicinity of the station, but to use the hatchery for hatching and rearing fry from eggs transferred from the substations mentioned. As the season advanced, however, it became apparent that collections at these points would be light, and 704,000 eyed eggs were purchased from local fishermen. The transfers from other stations were as follows: 4,926,000 from the Little White Salmon, shipped between October 26 and November 8; 16,200 from the Salmon River and 2,000,000 from Battle Creek, received January 6; making a total of 7,646,200 salmon eggs handled at Clackamas. It became necessary during the winter to erect rearing-troughs out-of-doors to care for the fry.

With the view to increasing the fry-holding capacity of the hatchery a number of experiments were made, and it was found that twice as many eggs could be cared for by suspending baskets of fine-mesh wire cloth in the troughs midway between top and bottom, thus permitting the carrying of two sets of fry in each trough, the usual number on the bottom, and the same number in the basket. These experiments were not made until the season was well advanced, but they demonstrated clearly that the baskets could be used in this way with excellent results, though the water supply was unusually bad, due to the washing down of mud by the heavy rain storms during the winter.

The fry were planted from time to time during the winter and spring in the Clackamas River, the last deposit being made on May 11. The total number planted was 7,489,206, showing a loss of only 150,974 on the eggs received.

Early in March J. W. Berrian, J. N. Wisner, and E. C. Greenman were sent to the falls of the Willamette River, near Oregon City, to collect eggs of the steelhead. A tent was erected for the accommodation of the men, and water was obtained from a steamboat basin near by for supplying the hatching-troughs, erected in the open air near the tent.

A party of fishermen operating a fish-wheel in the vicinity agreed to turn over all the fish captured by them, and it was arranged so that the fish caught in the wheel would slide through a trough into a live-box anchored in the water. From this box they were transferred to larger boxes, where they were held until ripe. The live-boxes were 8 feet square and 6 feet deep, constructed with adjustable bottoms. The first fish caught by the wheel was on April 9, and up to May 2 only 61 females and 22 males were obtained from that source. As indications did not point to any increase in the catch, steps were taken to obtain additional supplies of fish from other fishermen who were operating

dip nets on an island under the falls. From this source 209 were secured—153 females and 56 males.

The fish from the island, taken in dip nets, were in much better condition than those from the wheel. A few were also secured from gill nets, but they soon died from injuries. The loss on the fish held in live-boxes was considerable, though every possible effort was made to keep them alive until ripe.

Eggs were obtained from 160 females, the first being taken on April 28 and the last on May 24. The total collection amounted to 393,000, of which only 167,000 developed to the eyed stage. These were shipped as follows: 93,000 to Duluth, 15,000 to Bozeman, 21,000 to the Connecticut Fish Commission, and 30,000 to Northville. The remaining 8,000 were hatched and transferred to Clackamas, where they were liberated in Clear Creek.

In addition to these, 3,501 steelhead eggs were received from Salmon River, which produced 625 fry. These were planted with the other lot.

Upper Clackamas Station, Oregon.

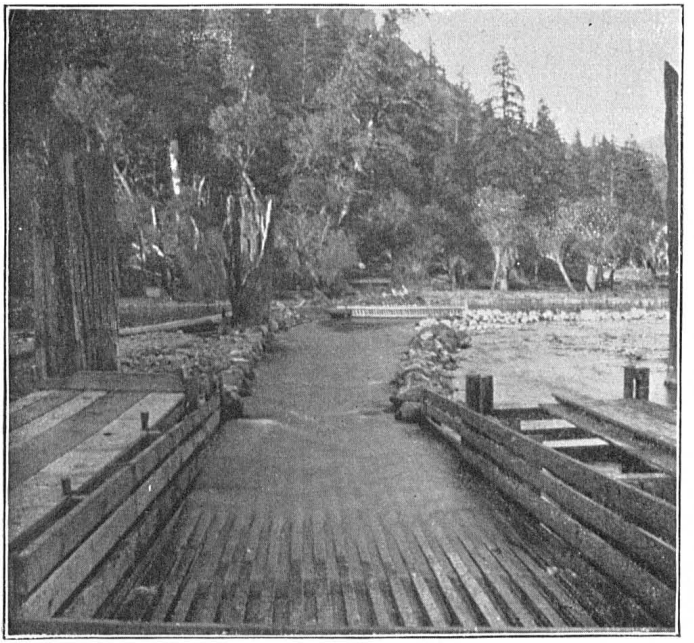
Early in the spring arrangements were made to have a rack across the Clackamas and one across Oak Grove built by contract. They were finished by the last of May, so as to prevent any salmon passing above the station. On July 1 men were employed to put the apparatus in order for the season's work. Operations were conducted on substantially the same lines as in previous years, except that a water wheel was made and placed in the river to furnish water to some of the temporary hatching-troughs on the river bank. This wheel was built upon a raft anchored at the head of a riffle, and was so arranged that the water in the river would revolve the wheel. Buckets fastened to the rim of the wheel raised the water and emptied it into a flume, from which it was conveyed to the hatching-troughs. The regular water supply to the hatchery failed early in the season on account of dry weather, but as the wheel furnished an ample supply for the troughs, no inconvenience resulted.

The first eggs were collected July 19 and the last on August 29. During this period 675 females were stripped, yielding 3,421,000 eggs, from which 2,930,000 fry were hatched and planted in October, November, and December in the headwaters of the Clackamas River.

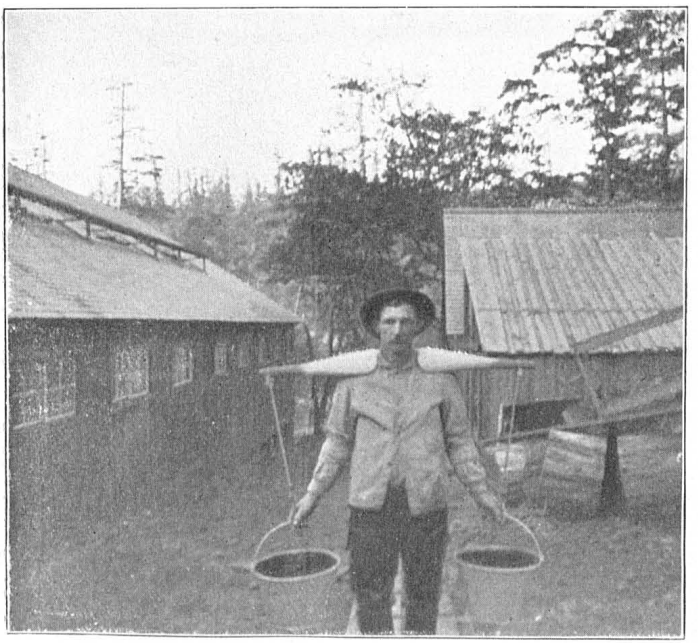
The station was closed in December, and put in charge of a custodian, and on April 1 it was turned over to the State Fish Commission.

Salmon River Station, Oregon.

Arrangements were made in the spring with Thomas Brown to furnish the Commission all the salmon eggs collected by him on this river at the rate of 40 cents per 1,000, eyed. The rack was built early in June, before any salmon ascended the stream, and in the first part of the summer the prospects for a good season's work seemed bright, as many



SALMON-PENS AND RETAINING-RACKS AT LITTLE WHITE SALMON STATION.



CARRYING EGGS FROM SPAWNING-GROUNDS TO HATCHERY, AT LITTLE WHITE SALMON STATION.

TAKING SALMON EGGS AT LITTLE WHITE SALMON STATION.

STRIPPING LARGE SALMON.

salmon were observed in the pools below the rack. Before they were ready to spawn, however, many of them were killed and others injured by explosives used by people in the vicinity, so that very few eggs were secured.

The spawning season commenced late in July and lasted until September 1, the total collections amounting to 745,200 eyed eggs. Of these, 27,000 were shipped to Portland, to the late Hon. H. D. McGuire, where they were hatched at the Industrial Exposition, forming a very interesting exhibit; 16,000 of the last eggs taken were sent to Clackamas, and the balance were hatched, the fry resulting from them (650,355) being liberated in the Salmon River during the fall months. After the last of them had been disposed of, the station was closed until March 1, when an attempt was made to collect steelhead eggs. A rack was finished on March 14, but was destroyed by high water on April 11. It was rebuilt, but too late to secure any eggs.

The operations resulted in the collection of 22,000, only 3,500 of them surviving to the eyed stage. These were transferred to Clackamas on May 14.

The State Fish Commission took charge of this station on June 15.

LITTLE WHITE SALMON STATION, WASHINGTON.

This station was opened July 13, with S. W. Downing in charge, assisted by J. W. Berrian and J. N. Wisner. As more eggs had been taken the previous season than could be handled in the hatchery, work was at once commenced on an additional hatchery, which was practically completed at the opening of the spawning season. This building is a frame structure 100 feet long by 40 feet wide, and is equipped with 80 troughs 1½ feet wide by 16 feet long. The mess and bunk houses were also enlarged and an office building erected. The rack across the river was completed on August 8, but no salmon were observed near it until September 7, though they had been seen jumping in the lake at the mouth of the river some time before that.

Fishing commenced September 11, and was carried on daily until October 3, resulting in the collection of 7,176,000 eggs. The run of fish was unusually light, and only about one-fourth as many eggs were secured as had been anticipated, though all the fish that entered the river were captured, the seine being hauled night and day.

In accordance with the usual custom, all females were killed before being stripped. Of the eggs collected 4,926,000 were sent to Clackamas station. From the balance 1,791,000 fry were hatched and liberated in the Little White Salmon River, the plants being made between December 8 and 13. As soon as all of them had been disposed of, the station was closed and left in charge of a laborer, who was employed during the winter in completing the wagon road commenced the previous year and in doing other necessary work around the hatchery.

This station is fully equipped for handling 25,000,000 to 30,000,000 eggs per season, and can be worked on a very economical basis.

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

Early in the summer the rack was put in place across the river to stop the ascent of the salmon. It had been observed for several years that many unripe fish were driven from the spawning-pools below the rack, backed down the river, and lost, and to guard against this a retaining-rack was constructed early in July about 100 yards below the pool. This rack is 190 feet long and is built on six piers placed 28 feet apart. The piers were made by bolting timbers together in the form of a triangle, the long angle upstream, and filling in the spaces with stone. There are five traps in the rack which permit the fish to pass upstream, but will not allow them to return. The weirs, whim, seine reel, boats, and other apparatus were placed in order early in the summer and when the spawning season opened on August 15 everything was in readiness for a good season's work.

The regular summer fishing commenced August 15, three ripe females being taken on that date, and closed September 17, with a collection of 13,445,900 eggs. Of these 1,467,000 were lost in incubation, and 11,340,000 were shipped, 100,000 being sent to Japan, 25,000 to France, 25,000 to New Zealand, 35,000 to the Trans-Mississippi and International Exposition at Omaha, and the remainder to the California hatcheries at Sisson and Eel River.

The fall run commenced November 5 and closed December 27. During this time 3,122,700 eggs were collected, making a total for the two runs of 16,568,600. Of the eggs retained at the station 3,263,560 were hatched and planted in the McCloud River, with a loss of only 112,610 fry during the sac stage. The take was larger than ever before and it became necessary to erect a number of troughs outside the hatchery to care for the surplus. These troughs were made of green lumber and proved very unsatisfactory, causing the loss of the surplus fry. The baskets were also overcrowded, as it was necessary to place 40,000 in each, and this probably increased the loss during incubation.

The methods were practically the same as heretofore. The eggs were stripped in a pan moistened with water, the milt being added at the same time and the mass gently stirred with the hand or a feather until thoroughly mixed. About half a cup of water was then added to the mass. This process was repeated with four or five other pans, when they were all poured into a bucket holding about 50,000 eggs and fresh water added from time to time until they could be taken to the hatchery. The buckets containing eggs are handled very carefully, and on arrival at the hatchery the eggs are measured into baskets with dippers holding an average of 1,800 each. After being placed in the baskets they are picked over every other day and all dead and white ones removed until the fifth day, when they are covered and left undisturbed until the embryos are sufficiently developed to permit handling. At an average temperature of 50° they will reach this stage in about fifteen days, but great care should be exercised in handling

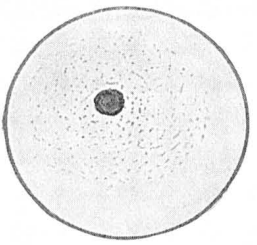


Fig. 1.

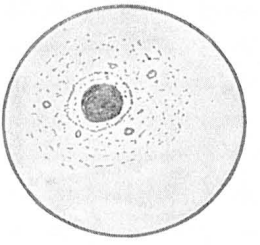


Fig. 2.

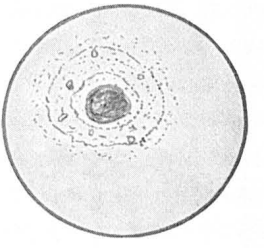


Fig. 3.

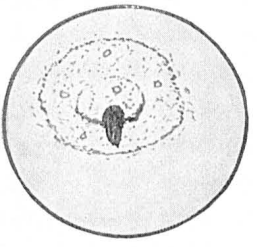
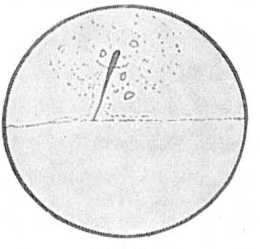


Fig. 4.



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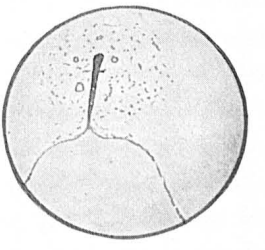


Fig. 6.

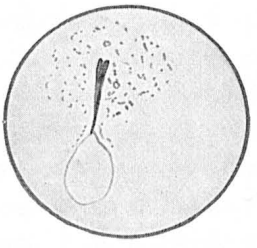


Fig. 7.

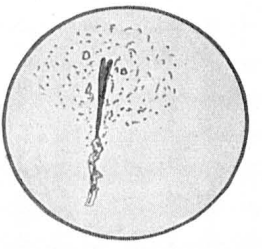


Fig. 8.

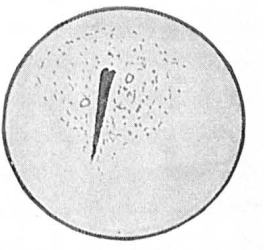


Fig. 9.

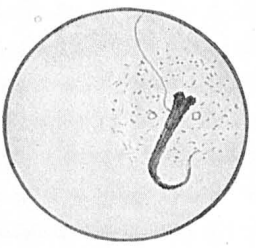


Fig. 10.

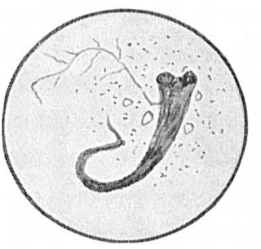


Fig. 11.

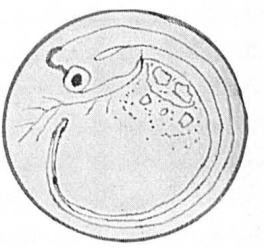


Fig. 12.

DEVELOPMENT OF SALMON EGGS FROM TWO DAYS OLD TO THIRTY DAYS AT 54° F.

Fig. 1. Appearance of egg two days after fertilization, and while it can be handled.
Fig. 2. Egg at four days, when it can be picked over but must be handled with extreme care.
Fig. 3. Egg at six days, when it should not be touched.
Figs. 4, 5, 6, 7, and 8. Egg on the seventh, eighth, ninth, and tenth days, when it is very tender and can not stand handling.
Fig. 9. Egg at eleven days, when it can be handled but with extreme care.
Figs. 10, 11, and 12. Egg at fourteen, twenty, and thirty days, when very hardy.

After the loop, shown in figs. 6, 7, and 8, has closed and all trace of it disappeared, as in fig. 9, the egg can be picked over, and from that time on it grows constantly more hardy and can be shipped.

(Drawings by Leroy Ledgerwood.)

them the first two or three times. When the troughs are first uncovered the eggs are found buried in the mud and sediment to the depth of ¼ inch or more, but this is easily removed by raising the basket slightly and settling it back in the trough. A little fungus also develops, but the loss from this cause is slight, amounting this season to less than 200,000 on 16,000,000 eggs. As soon as the eye-spots appear the eggs are packed in the Annin shipping-case and sent to the California hatchery.

As the temperature of the water at Baird varies constantly, observations of the eggs at different stages were made, as a result of which the employees of the station are now able to determine from the appearance of the eggs, after knowing the mean temperature of the water, not only the age of the eggs, but their fitness for shipment. With a mean temperature of 54° the egg enters the critical stage at the end of the fourth day, fig. 2. At the sixth day they are very tender and remain so for several days. On the fourteenth day (fig. 10) they are hardy and can be picked without danger. At 54° they can, with care, be picked over on the fourth day, but from that time to the end of the eleventh or twelfth day they should be left undisturbed.

This information is important where there are many millions of eggs to be cared for, as it saves the necessity of keeping an exact record of the length of time the various lots have been under cover, and does away with the old custom of washing a basket for the purpose of determining whether or not they will stand handling, this method destroying many eggs in experimental washing. The figures show the development of the egg at 54°, but the same would be true at any temperature except that with colder water more time is required for the egg to reach the various stages.

Owing to the crowded condition of the hatchery it became necessary to plant some of the eggs from the fall run before the sac was nearly absorbed, and it is feared that quite a large proportion of these were destroyed, as several trout captured were full of young salmon. The majority of the fry, though, were planted at the proper age, and it is believed that comparatively few of these were eaten by trout, judging from an examination of the stomachs of those caught.

In a pond 50 feet long, 4 feet wide, and 6 inches deep near the edge of the river, and fed by the overflow from the hatchery, 20,000 young salmon were placed. They remained here for nearly a month and were in fine condition when liberated.

The results secured this year were not due so much to the large run of salmon as to the fact that all fish entering the rack were held there by the retaining-rack. Many more eggs could have been taken, as the crew fished only four hours each day, but as the hatchery was overcrowded it was not deemed advisable. After the salmon were stripped they were killed and given to the Indians, who came from far and near for them. The flesh is dried in the sun, and this forms their main food supply during the winter months.

Early in the spring, immediately after the fry had been planted, the old hatchery was torn down, and by April 15 everything had been cleared away and the grading of the site for the new hatchery commenced. This building, which was completed on June 29, is a frame structure 120 by 40 feet, with side walls 12 feet high; it has 36 windows on the sides and ends and 12 skylights in the roof. The sides and ends are sheathed with rustic lumber and the floor is of 1½ by 6 inch yellow pine laid half an inch apart. The studding and rafters are of spruce. The building is covered with redwood shingles and is equipped with sufficient troughs to care for 20,000,000 eggs. A new centrifugal pump was purchased and the water-wheel rebuilt to insure an abundant supply for the new hatchery. Contracts were also entered into for the erection of a steam plant, which will furnish several hundred gallons of water per minute, in the event of an accident to the wheel.

At the close of the year the rack was again placed across the river. It was noticed that the run of salmon which usually makes its appearance in the McCloud River about the last of March did not appear this season. In the pool below the rack on June 30, where there are usually several thousand fish, only a few were found. This scarcity was attributed to the discharge of refuse from the smelters at Keswick, and as thousands of dying fish were observed, the matter was investigated by the California Fish Commission, who reported that the mortality was not caused by the discharge of silt from the smelters, but from poison in a spring near Keswick.

The following shows the number of fish and eggs handled during the summer run:

Date.	Fish spawned.	Eggs taken.	Eggs lost.	Date.	Fish spawned.	Eggs taken.	Eggs lost.
Aug	16	62,400	11,603	Sept. 5	138	617,100	43,225
18	21	96,390	7,589	6	113	511,800	75,498
19	29	144,635	7,674	7	233	1,082,300	113,150
20	16	80,345	5,932	8	144	684,500	352,700
22	51	248,205	9,853	10	148	703,900	394,500
23	24	176,785	14,416	11	111	495,000	2,700
24	55	250,000	3,630	12	97	435,200	32,675
25	86	418,540	26,213	13	103	443,500	46,050
26	72	353,700	11,680	14	77	348,200	20,375
27	83	401,800	18,270	15	38	156,500	15,880
28	76	386,700	13,450	16	64	273,100	19,645
29	73	361,400	10,375	17	70	296,300	19,825
30	162	783,300	36,480	18	21	86,200	7,917
31	131	616,100	25,650	20	30	118,500	9,700
Sept. 1	157	708,500	27,170	22	19	72,100	2,350
2	141	694,100	23,800				
3	146	724,000	19,625	Total	2,888	13,445,900	1,407,150
4	133	614,800	37,550				

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

The station was opened September 10, and steps were at once taken to repair the racks and weirs and to equip the hatchery for the reception of eggs. By the middle of October the main rack across the creek and the two retaining-racks at the mouth had been completed. The main rack, which is 273 feet long, was built in 1897, at an expense of

$1,650, and has proved very satisfactory, having withstood the freshets of the past season without damage. This rack was completed first, in order to prevent the salmon from ascending the creek beyond the hatchery. The retaining-racks at the mouth of the creek were then rebuilt, to keep the salmon that had entered from returning to the river. On October 22 the first haul of the seine was made, and 29 ripe females were secured.

Egg collections commenced on the 26th, the 169 females stripped on that date yielding 990,000 eggs. Fishing continued uninterruptedly from this time till December 9, when the crew was discharged and the station practically closed. During this period 484 seine-hauls were made and 3,938 females captured and placed in the pens. Of these, 3,876 yielded 19,429,000 eggs, of which 1,059,000 were lost in incubation, and 18,369,000 were eyed and shipped to other stations, the California Commission receiving 13,687,500. The last shipment was made on January 14, the day the station was closed.

The following table shows the daily catch of fish, eggs taken, eggs lost, and water temperature during the season:

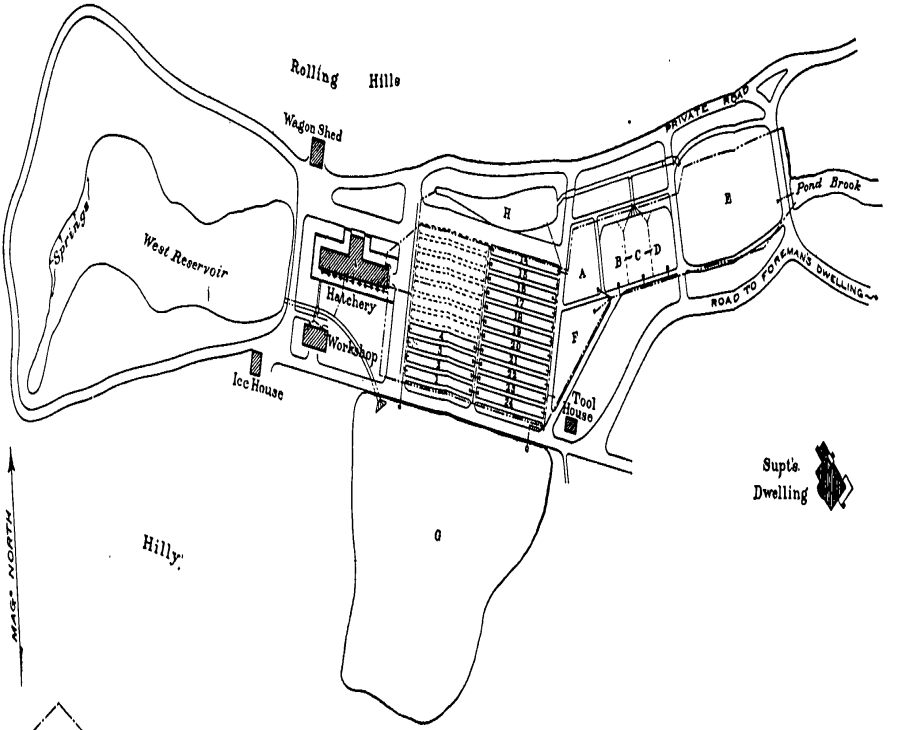
Date.	Females caught	Eggs taken.	Eggs lost.	Water temperatures. 6 a. m.	Water temperatures. 6 p. m.
1898.				° F.	° F.
Oct. 22	29	.....	.....	55	57
23	97	.....	.....	56	58
24	34	.....	.....	52	55
25	48	.....	.....	51	55
26	31	990,000	.....	52	56
27	46	234,000	2,000	51	55
28	29	230,500	.....	52	55
29	70	262,000	.....	52	55
30	60	270,000	.....	53	56
31	82	354,000	2,000	54	56
Nov. 1	96	342,000	.....	50	53
2	103	356,000	.....	49	54
3	126	818,000	2,000	51	53
4	127	610,000	.....	51	55
5	99	658,000	2,000	52	55
6	103	482,000	2,000	52	55
7	129	598,500	3,000	47	52
8	133	682,000	3,000	47	49
9	97	496,000	8,000	45	49
10	146	468,000	8,000	45	50
11	70	626,000	12,000	47	49
12	105	542,000	12,000	46	50
13	135	464,000	12,000	46	51
14	148	812,000	14,000	47	51
15	118	732,000	15,000	48	51
16	200	958,000	12,000	48	50
17	155	920,000	10,000	52	53
18	175	862,000	10,000	49	53
19	116	584,000	15,000	51	52
20	141	562,000	20,000	48	49
21	87	460,000	21,000	46	47
22	93	380,000	23,000	47	48
23	51	284,000	25,000	45	48
25	72	162,000	26,000	43	47
26	53	298,000	30,000	43	49
27	60	258,000	36,000	45	47
28	60	420,000	22,900	49	50
29	69	228,000	32,000	51	53
30	74	258,000	30,000	50	51
Dec. 1	70	374,000	30,000	48	50
2	67	304,000	24,000	46	48
3	75	374,000	22,000	45	48
4		214,000	.....	46	49
Dec. 5	38	.....	21,000	46	48
6	38	280,000	29,000	45	47
7	16	.....	30,000	44	46
8	21	146,000	30,000	44	45
9	6	64,000	30,000	44	46
10	.....	.....	40,000	41	44
11	.....	.....	40,000	41	43
12	.....	.....	40,000	40	44
13	.....	.....	40,000	42	45
14	.....	.....	30,000	45	46
15	.....	.....	30,000	44	47
16	.....	.....	.....	44	46
17	.....	.....	.....	45	48
18	.....	.....	.....	47	49
19	.....	.....	30,000	48	49
20	.....	.....	30,000	48	48
21	.....	.....	30,000	45	46
22	.....	.....	20,000	42	46
23	.....	.....	28,000	42	45
24	.....	.....	.....	42	45
25	.....	.....	.....	42	45
26	.....	.....	.....	45	47
27	.....	.....	.....	44	47
28	.....	.....	30,000	46	48
29	.....	.....	.....	47	48
30	.....	.....	.....	43	45
31	.....	.....	.....	41	43
1899.					
Jan. 1	.....	.....	.....	41	43
2	.....	.....	.....	40	42
3	.....	.....	.....	42	44
4	.....	.....	44,000	40	44
5	.....	.....	.....	42	44
6	.....	.....	.....	43	43
7	.....	.....	.....	43	45
8	.....	.....	.....	43	44
9	.....	.....	.....	45	47
10	.....	.....	.....	43	45
11	.....	.....	.....	41	43
12	.....	.....	10,500	43	45
	3,938	19,429,000	1,059,000		

The work on the whole was disappointing. No rain fell during the season and but few salmon entered the creek, as the low water in the Sacramento River permitted spawning in the main stream at points which would not ordinarily be suitable. This is likely to be repeated every dry season. Reports from 30 miles down the river showed that salmon were spawning in many localities where they had never been seen before, and that the number entering all the creeks was small.

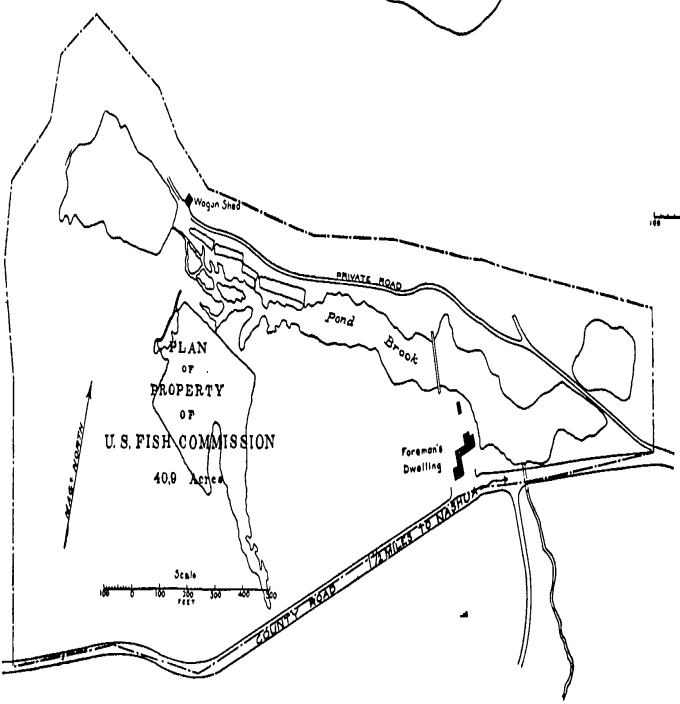
The methods employed in stripping and fertilizing the eggs were the same as heretofore. The force consisted of ten men, three of whom stripped the females, two the males, one looked out for the pans in which the eggs were taken and added water to the milt; two men were employed steadily in dipping females out of the pen and one the males. As heretofore, the eggs were taken in pans containing about half a pint of water each, instead of by the dry method, as at most of the other stations of the Commission. The milt and eggs were taken at the same time and stirred constantly to insure immediate fertilization. When thoroughly mixed the pan was filled with fresh water, placed on a shelf, and allowed to remain until seven or eight other pans had been similarly treated, after which they were all poured into a transportation can and sent to the hatchery, fresh water being added frequently to wash off the milt. If the eggs were still adhesive on arrival at the hatchery, fresh water was added until they separated, when they were distributed in baskets, 40,000 to each. As soon as the fish spawned they were thrown in a pen and afterwards turned over to people who came from far and near to lay in supplies for the winter.

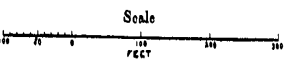
At the beginning of the season threats were made that the rack would be blown up, hence an armed guard was placed on watch for a few nights, but no trouble was experienced. These threats were made by people living above the station on the creek, who wanted the salmon to ascend. Many carp were caught while hauling the seine and were turned over to the Chinese population, who prefer them to salmon or trout.

During the season a new stable was built, 26½ feet long by 11 feet wide and 8¼ feet high, with slanting shake roof and sheds 16½ feet long and 11 feet wide at both ends for wagons. As considerable trouble was experienced with the water supply, from hogs and cattle, it became necessary to fence the ditch on both sides with barbed wire, the top and second strands being covered with board railings to prevent stock from being injured.



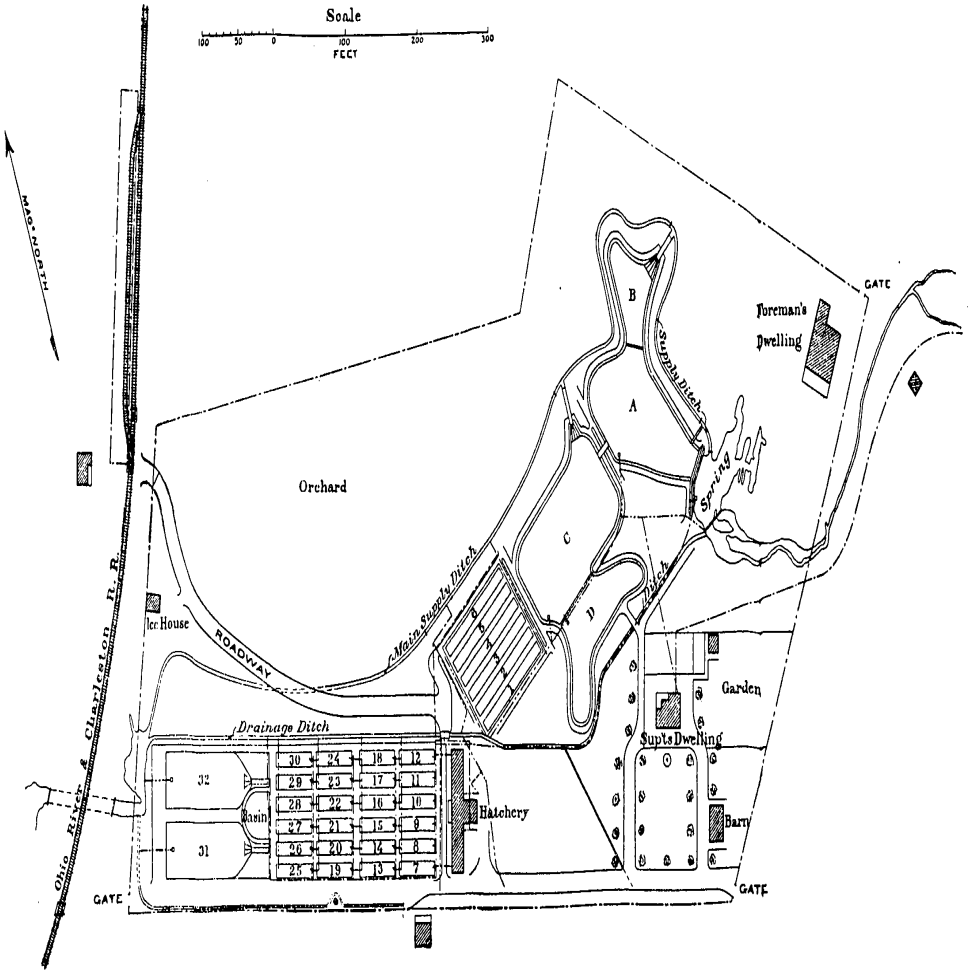
Notes
Rearing Ponds, Nos 1 to 24
Spawning " " A to H
December 1899



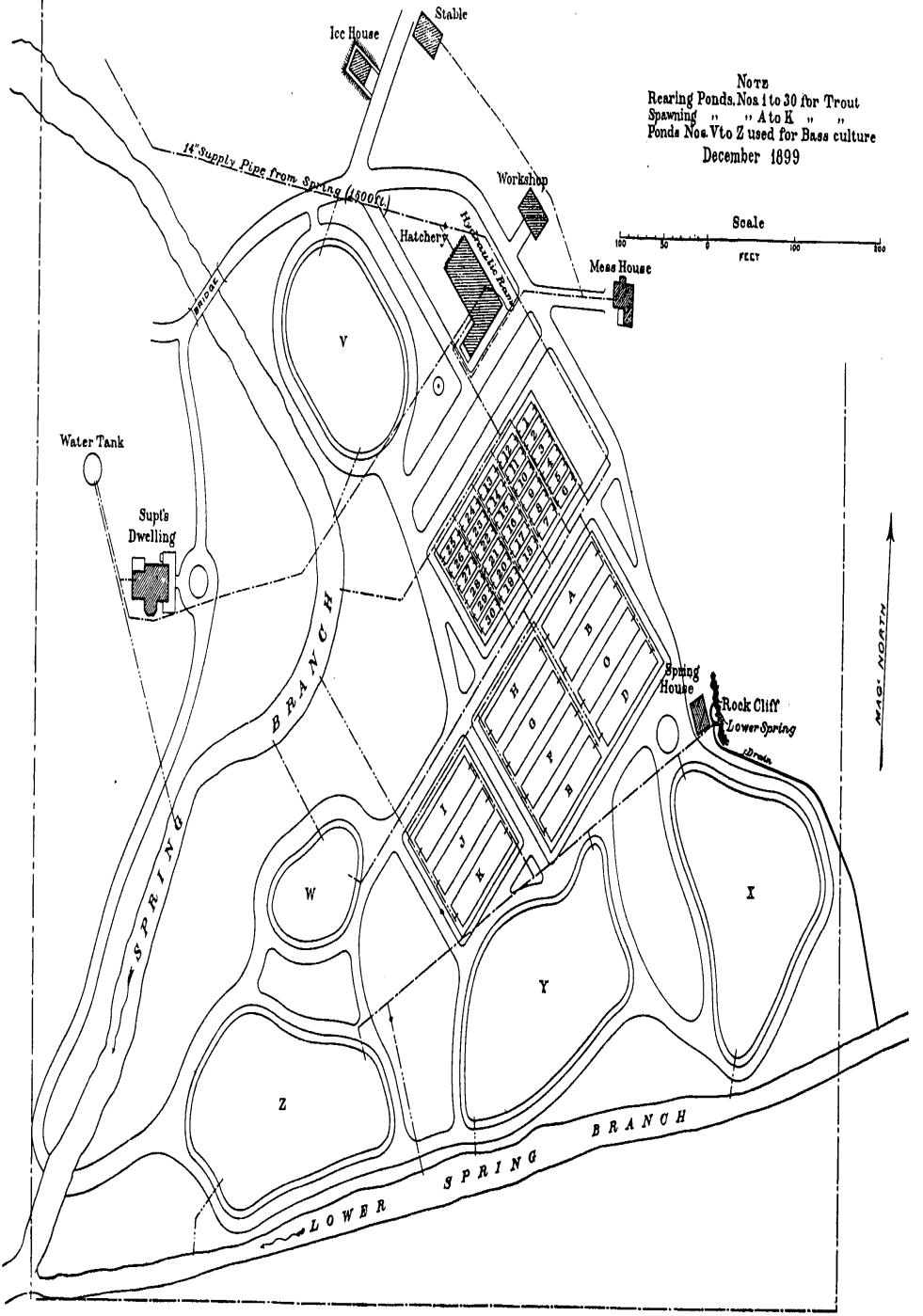


NASHUA STATION, NEW HAMPSHIRE.

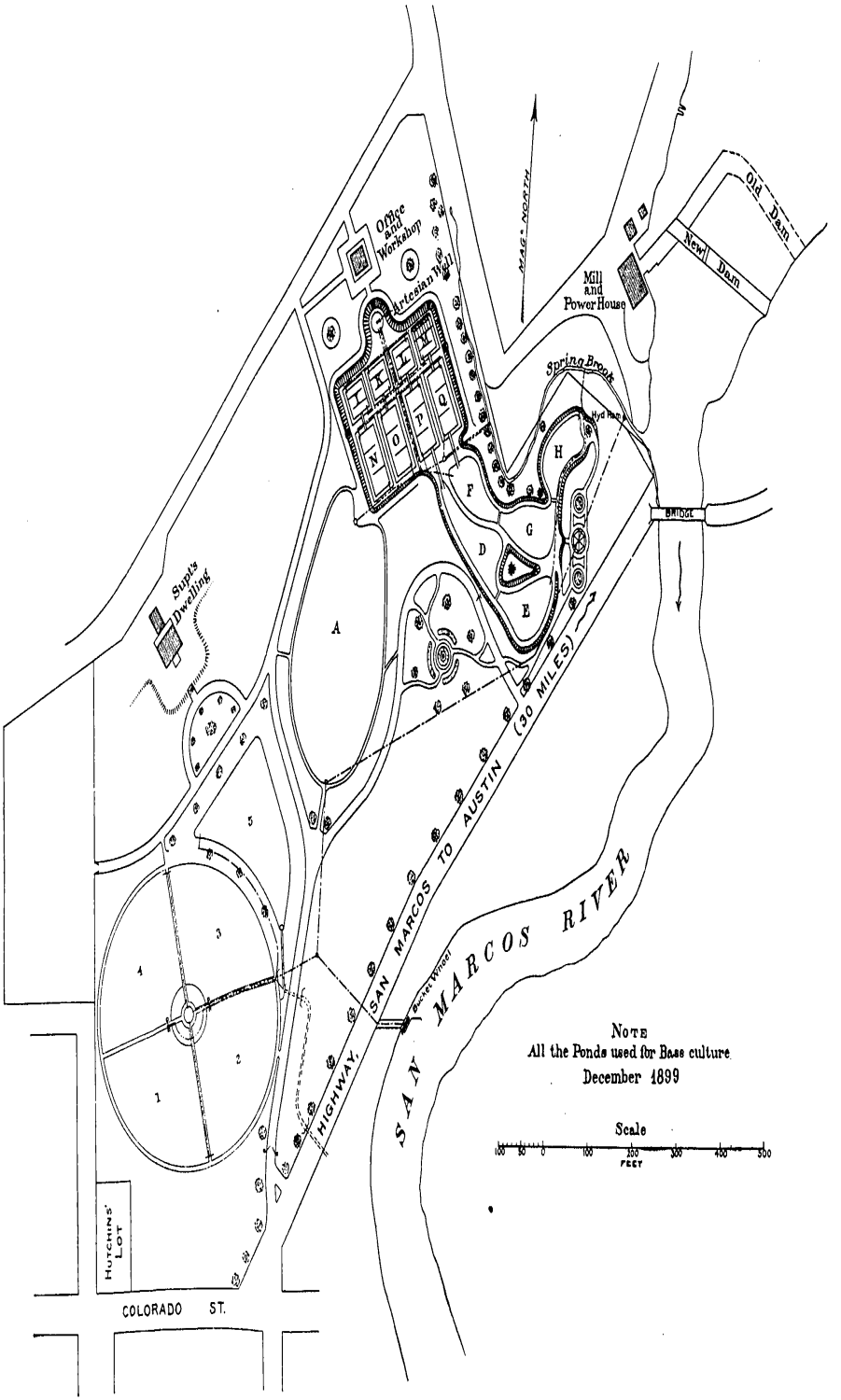
NOTE
Rearing Ponds, Nos. 1 to 30
Spawning " " 31 & 32
Stock " " A to D
December 1899



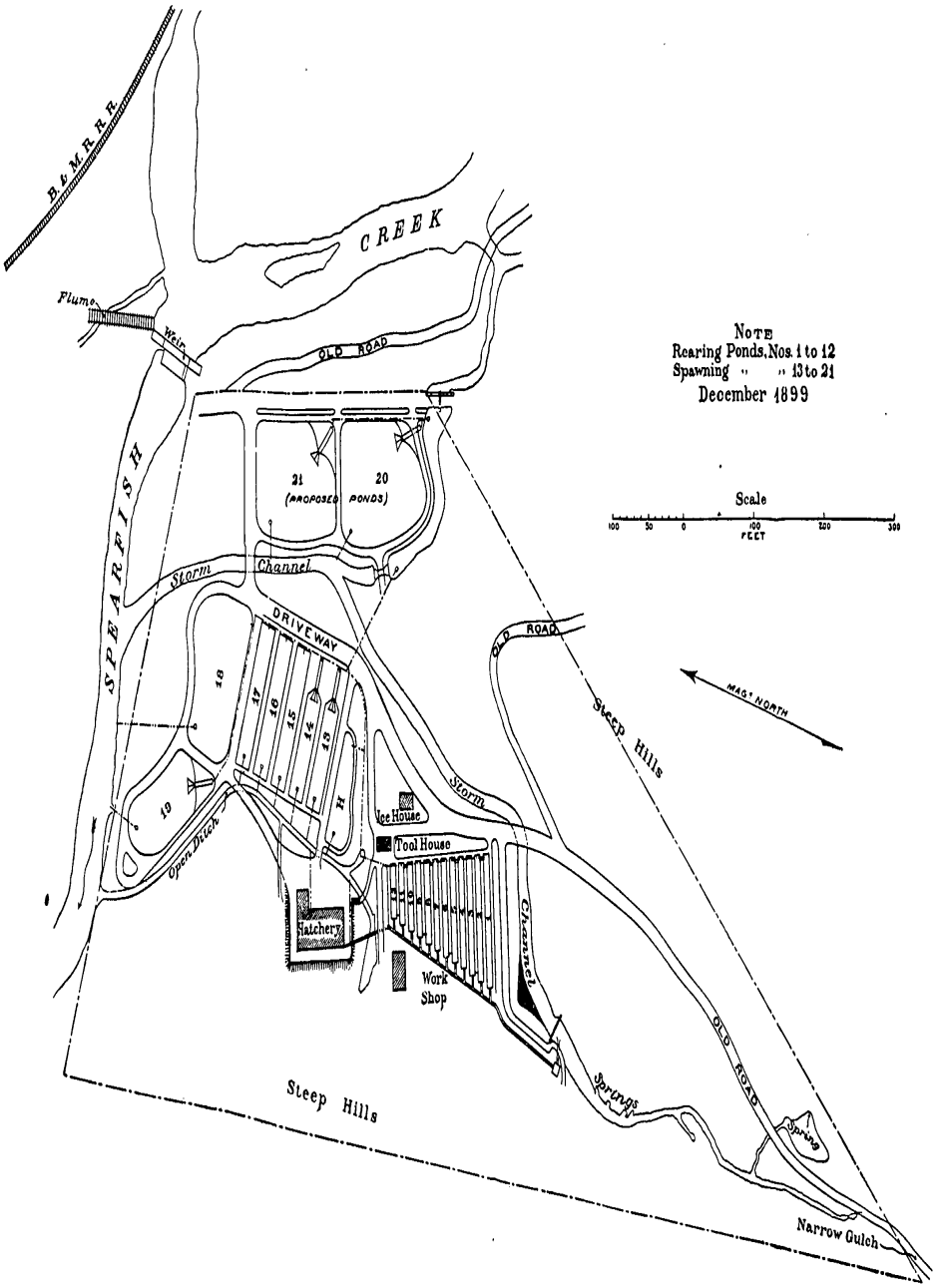
ERWIN STATION, TENNESSEE.



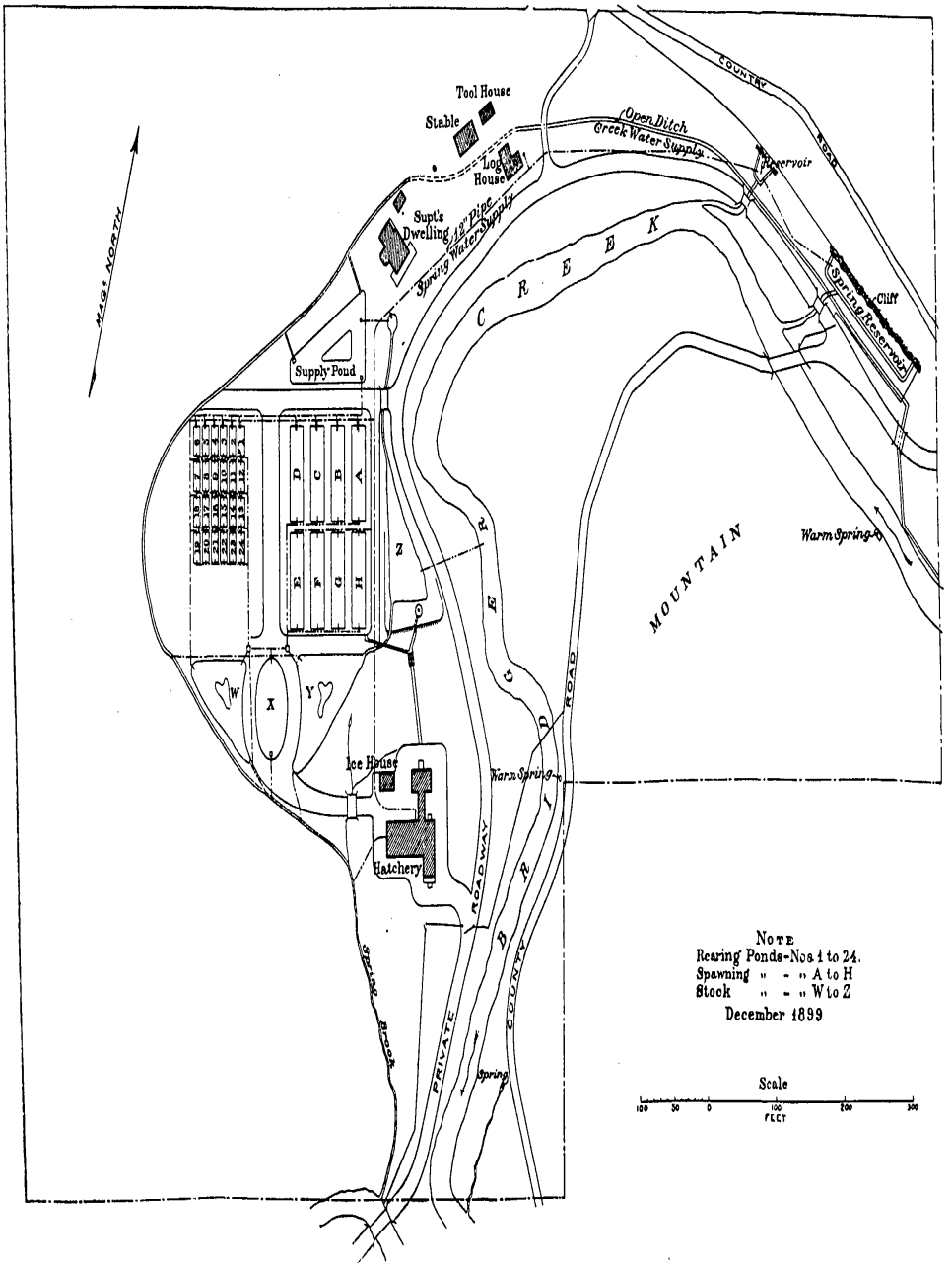
MANCHESTER STATION, IOWA.



SAN MARCOS STATION, TEXAS.



SPEARFISH STATION, SOUTH DAKOTA.



BOZEMAN STATION, MONTANA.

Details of distribution.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Shad:			
Connecticut State Fish Commission, Joshuatown, Conn	.....	9,700,000	.....
Blackbird Creek, Middletown, Del	.....	120,000	.....
Mount Pleasant, Del	.....	300,000	.....
Appoquirimink Creek, Middletown, Del	.....	120,000	.....
Mount Pleasant, Del	.....	120,000	.....
Smyrna Creek, Smyrna, Del	.....	540,000	.....
Leipsic Creek, Cheswold, Del	.....	540,000	.....
St. Johns Creek, Dover, Del	.....	840,000	.....
Murderkill Creek, Felton, Del	.....	1,140,000	.....
Mispillion Creek, Milford, Del	.....	780,000	.....
Indian River, Millsboro, Del	.....	2,850,000	.....
Wyoming, Del	.....	360,000	.....
Brandywine Creek, Wilmington, Del	.....	15,210,000	.....
Potomac River, near Fish Lakes, D. C	.....	.....	3,000,000
Cannouchee River, Groveland, Ga	.....	394,833	.....
Chattahoochee River, Atlanta, Ga	1,901,000	28,600	.....
Flint River, Albany, Ga	.....	459,000	.....
Potomac River, off Bryan Point, Md	.....	1,755,000	.....
Broad Creek, Md	.....	801,000	.....
Piscataway Creek, Md	.....	2,797,000	.....
Bar Landing, Md	.....	1,571,000	.....
Point of Rocks, Md	.....	800,000	.....
Pamunkey Creek, Pamunkey Creek, Md	.....	4,402,000	.....
Accokeek Creek, Accokeek Creek, Md	.....	4,116,000	.....
Piscataway Creek, Piscataway Creek, Md	.....	1,189,000	.....
Broad Creek, Broad Creek, Md	.....	453,000	.....
Chesapeake Bay, Havre de Grace, Md	10,930,000	53,481,000	.....
Spesutia Narrows, Md	.....	1,000,000	.....
Swan Creek, Md	.....	1,250,000	.....
Patuxent River, Laurel, Md	.....	450,000	.....
Patapsco River, Relay, Maryland	.....	450,000	.....
Bush River, Bush River Station, Md	.....	1,200,000	.....
Susquehanna River, Garrett Island, Md	.....	450,000	.....
Port Deposit, Md	.....	2,900,000	.....
Gunpowder River, Gunpowder Station, Md	.....	950,000	.....
Wicomico River, Salisbury, Md	.....	900,000	.....
Tuckahoe Creek, Queen Anne, Md	.....	2,550,000	.....
Chester River, Chestertown, Md	.....	900,000	.....
St. Martin's River, Bishop, Md	.....	300,000	.....
Mill Creek, below Perryville, Md	.....	1,375,000	.....
Wankinco River, Wareham, Mass	.....	450,000	.....
North River, Hanover, Mass	.....	420,000	.....
Delaware River, Gloucester, N. J	2,200,000	1,000,000	.....
Billingsport, N. J	.....	4,957,000	.....
Lambertville, N. J	.....	9,461,000	.....
Milford, N. J	.....	2,968,000	.....
Toms River, South Lakewood, N. J	.....	1,000,000	.....
Metedeconk River, Lakewood, N. J	.....	1,000,000	.....
Menasquan River, Farmingdale, N. J	.....	1,000,000	.....
Salem Creek, Salem, N. J	.....	525,000	.....
Hudson River, Catskill, N. Y	.....	11,470,000	.....
Albemarle Sound, off Avoca, N. C	.....	8,130,000	.....
off Edenton, N. C	.....	903,000	.....
Edenton Harbor, Edenton, N. C	.....	3,652,000	.....
Perquimans River, Hertford, N. C	.....	450,000	.....
Neuse River, Goldsboro, N. C	.....	684,285	.....
Six Runs, near Waraaw, N. C	.....	684,285	.....
Tar River, Tarboro, N. C	.....	684,285	.....
Northeast Branch of Cape Fear River, Wallace, N. C	.....	684,285	.....
Pembroke Creek, Edenton, N. C	.....	307,000	.....
Pennsylvania State Fish Commission, Bristol, Pa	9,265,000	.....	.....
Susquehanna River, Fites Eddy, Pa	.....	7,050,000	.....
Columbia, Pa	.....	6,750,000	.....
Peachbottom, Pa	.....	3,750,000	.....
McCalls Ferry, Pa	.....	3,300,000	.....
Delaware River, Lackawaxen, Pa	.....	450,000	.....
Delaware Water Gap, Pa	.....	450,000	.....
Pee Dee River, Pee Dee, S. C	.....	394,833	.....
Santee River, S. C	.....	394,833	.....
Santee Canal, Monk's Corner, S. C	.....	394,833	.....
Edisto River, Ponpon, S. C	.....	394,833	.....
Combahee River, Yemassee, S. C	.....	394,833	.....
Nansemond River, Suffolk, Va	.....	425,000	.....
Potomac River, Mount Vernon, Va	.....	858,000	.....
Occoquan Bay, Occoquan, Va	.....	5,180,000	.....
Little Hunting Creek, below Alexandria, Va	.....	1,962,000	.....
Dogue Creek, Dogue Creek, Va	.....	3,100,000	.....
Pohick Creek, Pohick Creek, Va	.....	2,647,000	.....
Craney Island Swash, Va	.....	377,000	.....
Total	24,296,000	208,311,740	3,000,000

NOTE.—2,700,000 fry were transferred from Central Station to the Fish Lakes rearing-ponds, and are not included in the above tabulation.

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Quinnat salmon:			
California Fish Commission, Sisson, Cal	13,850,500		
Eel River Hatchery	10,042,300		
Bear Valley Hatchery	1,000,000		
McCloud River, Baird, Cal	85,200	3,275,110	
Salmon River, Salmon, Oreg		650,355	
Clackamas River, Garfield, Oreg		2,930,000	
Stone, Oreg		4,003,961	
and Clear Creek, Stone, Oreg		3,493,870	
Oregon Fish Commission, Mapleton, Oreg	2,002,000		
Lake Morey, Fairlee, Vt			147
Tuscarora Creek, Leesburg, Va			12
Tate Run, Wytheville, Va			1,230
Little White Salmon River, Chenowith, Wash		1,791,056	
Washington Fish Commission, Tacoma	500,000		
Japanese Government, Niigata Ken, Japan	100,000		
J. Williamson, St. Denis, France	25,000		
L. F. Ayson, New Zealand	25,000		
Total	27,630,000	16,144,352	1,389
Atlantic salmon:			
Connecticut Fish Commission, Windsor Locks, Conn	200,000		
Alamoosook Lake, Orland, Me			76,465
Toddy Pond, Orland and Surry, Me			134,000
Williams Pond, Bucksport, Me			12,000
Long Pond, Bucksport, Me			6,922
Hancock Pond, Bucksport, Me			2,000
Brewer Pond Tributary, Bucksport, Me			8,920
Penobscot River, Passadumkeag, Me		140,000	85,000
Mattawamkeag, Me		155,000	65,610
Lincoln Center, Me		150,000	
Heart Pond, Orland, Me			440
Youghiogheny River, Swanton, Md		4,225	
New Hampshire Fish Commission, Laconia, N. H	200,000		
Pennsylvania Fish Commission, Allentown, Pa	250,000		
Tuscarora Creek, Leesburg, Va			95
Total	650,000	449,225	392,352
Landlocked salmon:			
California Fish Commission, Sisson, Cal	20,000		
Connecticut Fish Commission, Windsor Locks, Conn	25,000		2,000
Hayden Lake, Skowhegan, Me			1,500
Lake George, Thorndike, Me			5,000
Rangeley Lakes, Upton, Me			2,000
Holbrook's Pond, Holden, Me			3,500
Jim Pond, Carrebassett, Me			1,500
Thompson's Pond, Oxford, Me			4,000
Tea Pond, Carrebassett, Me			1,500
Moose Pond, Hartland, Me			2,000
Long Pond, Livermore, Me			1,500
Kendall Pond, Livermore, Me			1,500
Wood's Pond, Ellsworth, Me			2,000
Sandy Creek, Unity, Me			1,500
Moosehead Lake, Greenville, Me			3,000
Blunt's Pond, Ellsworth, Me			2,000
Donnell's Pond, Franklin, Me			4,000
Lake Maranocook, Winthrop, Me			4,000
Round Pound, Shirley, Me			3,000
Dutton Pond, Ellsworth Falls, Me			2,000
North Pond, Farmington, Me			2,000
Half-Mile Pond, Great Pond, Me			4,775
Cobbosseecontee Pond, Winthrop, Me			9,500
Alligator Lake, Great Pond, Me			5,000
Lake Annasguntticook, Canton, Me			2,000
Bemis Brook, Bemis, Me			1,000
Cupsuptic Brook, Bemis, Me			1,000
King and Bartlett Lakes, Dead River, Me			2,000
Branch Pond, Dedham, Me			51,000
Green Lake, Otis, Me			176,657
Heart Pond, Orland, Me			4,606
Roach Pond, Greenville, Me			2,000
Grand Lake Stream, Washington County, Me		141,875	33,000
Grand Lake, Washington County, Me			81,171
Sebec Lake, Foxcroft, Me			2,000
Long Pond, Bar Harbor, Me			1,500
Canaan Lake, Rockland, Me			2,500
China Lake, Waterville, Me			1,000
Toddy Pond, Orland, Me			17,794
Surry, Me			679
Tunks Pond, Sullivan, Me			1,000

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Landlocked salmon—Continued.			
Phillips Lake, Lakehouse, Me			4,000
Maine Fish Commission, Enfield, Me	42,500		
Parmachene Club, Camp Caribou, Me	20,000		
Podunk Pond, Brookfield, Mass			2,000
Comet Lake, Worcester, Mass			1,000
William Lawrence, Worcester, Mass	5,000		
W. H. Drew, Plymouth, Mass	5,000		
Massachusetts Fish Commission, Sutton, Mass	10,000		
Crystal Lake, Enfield, N. H			2,000
Grafton Pond, Grafton, N. H			1,000
Lake Winnepesaukee, Laconia, N. H			2,000
Penacook and Webster Lakes, Concord, N. H			2,000
A. M. Bigelow, Branchville, N. J	5,000		
Paradox Lake, Ticonderoga, N. Y			2,000
Big Trout Lake, Horseshoe, N. Y			1,000
Calvin Lake, Horseshoe, N. Y			2,000
Trout Lake, St. Regis Falls, N. Y			1,000
Adirondack League Club Lake, Fulton Chain, N. Y			2,000
Lake George, Caldwell, N. Y			3,000
Lake Champlain, Fort Henry, N. Y			3,000
R. C. Alexander, Old Forge, N. Y	10,000		
J. Annin, jr., Caledonia, N. Y	15,000		
Rhode Island Fish Commission, Carolina, R. I	20,000		
James Sharpe, Salt Lake City, Utah	5,000		
Caspian Lake, Greensboro, Vt			7,977
Lake Dunmore, Brandon, Vt			1,600
Salisbury, Vt			2,993
Willoughby Lake, Westmore, Vt			5,619
Barton, Vt			1,000
Vermont Fish Commission, Roxbury, Vt	10,000		
Clyde River, Newport, Vt			1,000
Tuscarora Creek, Leesburg, Va			100
Total	192,500	141,875	497,971
Steelhead trout:			
Connecticut Fish Commission, Windsor Locks, Conn	21,000		
State Fish Commission, Bangor, Me			100
Alligator Lake, Great Pond, Me			1,000
Jordan Pond, Northeast Harbor, Me			500
Green Lake, Otis, Me			2,067
Heart Pond, Orland, Me			4,131
Craig Pond, Orland, Me			4,194
Alamoosook Lake, Orland, Me			4,218
Toddy Pond, Orland, Me			6,679
Surry, Me			6,706
Sweetwater and Bowman creeks, Lake County, Mich			2,500
Bitterroot River, Victor, Mont			9,996
Bell Creek Lake, Whitehall, Mont			5,000
Catlin's reservoir, Dorsey, Mont			4,999
Clear Creek, Stone, Oreg		8,625	
Lake Morey, Fairlee, Vt			1,620
Crystal Lake, Barton, Vt			2,000
Total	21,000	8,625	56,310
Loch Leven trout:			
Eagle River, Edwards, Colo			5,000
Upper Evergreen Lake, near Leadville, Colo			12,000
East Fork Chicago Creek, Idaho Springs, Colo		7,000	
Connecticut Fish Commission, Windsor Locks, Conn	8,500		
Pleasant Lake, Leslie, Mich			1,000
Strawberry Lake, Evart, Mich			1,000
Total	8,500	7,000	19,000
Rainbow trout:			
Big Nance Creek, Courtland, Ala			500
Spring Lake, Gadsden, Ala			500
Silver Lake, Seale, Ala			300
Tadlocks Lake, Seale, Ala			200
Applicants in Alabama			900
Spring Lake, Bryant, Ark			1,000
Spring Lake, Mammoth Springs, Ark			600
Illinois River, Siloam Springs, Ark			1,875
Rock Creek, Rust, Ark			1,400
Two-Mile Creek, Hatfield, Ark			1,400
Six-Mile Creek, Hatfield, Ark			1,400
Buffalo Creek, Cove, Ark			1,400
Barron Creek, Janssen, Ark			1,400
Rolling Fork Creek, Wickes, Ark			1,400

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Rainbow trout—Continued.			
West Fork of White River, Washington County, Ark			3,000
Frog Bayou, Mountainburg, Ark			3,000
Lancaster, Ark			3,000
Rudy, Ark			2,800
Whittington Park Lake, Hot Springs, Ark			1,000
Applicants in Arkansas			480
Connecticut Fish Commission, Windsor Locks, Conn	20,000		
Christiana Creek, Newark, Del			500
Spring Pond, Lanier Heights, D. C		3,000	
Sougue River, Clarksville, Ga			1,000
Mount Rest Lake, Stone Mountain, Ga			250
Mill Creek, Toccoa, Ga			500
State Fish Commission, Lagrange, Ga			600
Applicants in Georgia			450
Geo. W. Rea, Spencer, Idaho	10,000		
Black River, Sallisaw, Ind. T			1,875
Applicants in Indian Territory			1,300
Beaver Pond, Decorah, Iowa			500
Trout Run, Decorah, Iowa			5,000
Plum Creek, Earlville, Iowa			500
Volga River, Fayette, Iowa			2,000
Applicants in Iowa			500
Bear Creek, Edgewood, Iowa		5,000	
Maquoketa River, Forestville, Iowa		1,000	500
Honey Creek, Manchester, Iowa		5,000	
Spring Branch, Forestville, Iowa		4,000	
Applicants in Kansas			1,945
Swan Lake, Belfast, Me			2,000
Jordan Pond, Northeast Harbor, Me			500
Lake Pennesseewassei, Norway, Me			1,000
Canaan Lake, Camden, Me			2,000
Heart Pond, Orland, Me			2,000
Alamoosook Lake, Orland, Me			5,862
Craig Pond, Orland, Me			1,500
Toddy Pond, Orland, Me			2,395
Cherry Run, Woodbine, Md			300
Jacobs Run, Big Pool, Md			300
West Branch of Patapsco River, Henryton, Md			300
Bee Tree Creek, Parkton, Md			500
Stone Run, Rising Sun, Md			500
Laurel Brook, Fallston, Md			500
Walnut Springs, near Baltimore, Md			500
Little Seneca Creek, near Germantown, Md			300
State Fish Commission, Harrington and Deep creeks, Swanton, Md		5,143	1,500
State Fish Commission, Baltimore, Md	25,000		
Piscataway Creek, Meadows, Md			300
Applicants in Maryland			700
Long Pond, Worcester, Mass			1,000
Applicants in Massachusetts			1,000
Spring Brook, Oxford, Mich		1,000	
Boardman River, Traverse City, Mich		1,000	
Flemming Creek, Ypsilanti, Mich		1,000	
Stony Creek, Ypsilanti, Mich		1,000	
East Branch, Au Sable River, Grayling, Mich		3,000	
Ash Cave Lake, Dixon, Mo			1,000
Elm Spring, Cuba, Mo			500
Herrill Branch, Neosho, Mo			189
Cedar Gap Pond, Cedar Gap, Mo			2,400
Bryant Creek, Bryant, Mo			3,635
Mountain Grove Pond, Mountain Grove, Mo			2,000
Piney Creek, Piney Creek, Mo			1,875
Willow Grove Pond, Willow Springs, Mo			900
Cowskin River, Lanagan, Mo			1,850
Crane Creek, Neosho, Mo			2,000
Baker Creek, Dixon, Mo			1,875
Gasconade River, Gerome, Mo			2,500
Blue Spring, Bourbon, Mo			3,450
Habatonka Lake, Habatonka, Mo			1,250
Bennett Mill Spring, Bennett Mill, Mo			625
Saranac Spring, Leasburg, Mo			2,500
Indian Creek, Christopher, Mo			3,000
Elm Spring, Christopher, Mo			75
Applicants in Missouri			3,500
State Fish Commision, South Bend, Nebr			10,000
Granite Lake, Keene, N. H			500
State Fish Commission, Plymouth, N. H	20,000		
Percy's Summer Club, Percy, N. H	10,000		
Pequest Creek, Belvidere, N. J			500
Montilena Lake, Belvidere, N. J			800

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Rainbow trout—Continued.			
Spring Lake, Magdalena, N. Mex			965
Gallinas River, Las Vegas, N. Mex			1,930
Waterworks Reservoir, Raton, N. Mex			965
Hoosic River, Valley Falls, N. Y			500
Linville River, Cranberry, N. C			1,100
Sapphire and Fairfield Lakes, Sapphire, N. C			500
Stony Creek, Nashville, N. C			600
Flat Creek, Black Mountain, N. C			500
Reids Millpond, Reidsville, N. C			300
Caney Fork Creek, Sylva, N. C			400
Dicks Creek, Dillsboro, N. C			500
Junaluska Creek, Andrews, N. C			500
Hickerson Creek, Andrews, N. C			500
Poplar Hollow Creek, Mitchell County, N. C			250
Big Laurel Creek, Madison County, N. C			534
Applicants in North Carolina			700
Brushy Creek, Newark, Ohio		2,000	
Applicants in Ohio		1,000	
Medicine Bluff Creek, Fort Sill, Okla			880
Spring Lake, Enid, Okla			900
Applicants in Oklahoma			440
Trout Run, Norristown, Pa			500
Clover Creek, Williamsburg, Pa			598
Conodoquinett Creek, Chambersburg, Pa			700
Matthews Creek, Greers Depot, S. C			500
Rosehill Lake, Kollock, S. C			300
Spring Lake, Cleveland, Tenn			300
Adair Creek, Knoxville, Tenn			500
Whitecak Creek, Clarksville, Tenn			474
Pinewood Lake, Clarksville, Tenn			500
Sinking Creek, Greenville, Tenn			500
Big Pigeon River, Newport, Tenn			1,000
Rock Creek, Unicoi County, Tenn			750
Granny Lewis Creek, Unicoi County, Tenn			600
Higgins Creek, Unicoi County, Tenn			1,500
Indian Creek, Blue Noll, Tenn			332
Middle Ford, Tenn			167
Baker Ford, Tenn			167
Garlands Ford, Tenn			167
Dicks Creek, Unicoi County, Tenn			467
Spivy Creek, Unicoi County, Tenn			1,016
Rocky Fork Creek, Unicoi County, Tenn			900
Martins Creek, Bonner's Mill, Tenn			300
North Indian Creek, Unicoi County, Tenn			600
Broad Shoal Creek, Unicoi County, Tenn			300
Devils Creek, Unicoi County, Tenn			149
Applicants in Tennessee			812
Texas			940
Beaver Pond, Proctor, Vt			3,000
Tinker Creek, Roanoke, Va			400
Tate Run, Wytheville, Va			460
Big Spring, Leesburg, Va			112
Applicants in Virginia			800
Youghiogheny River, Preston County, W. Va			300
Flowing Springs, Charlestown, W. Va			300
East River, Bluefield, W. Va			300
Quarry Run, Morgantown, W. Va			200
White Oak Run, Terra Alta, W. Va			300
Mill Creek, Alderson, W. Va			1,000
Meadow Creek, Ronceverte, W. Va			1,000
Laurel Run, Ronceverte, W. Va			500
Culvertson Creek, Ronceverte, W. Va			1,000
Howards Creek, White Sulphur Springs, W. Va			500
Blackwater River, Davis, W. Va			300
Little Best Lake, Gordon, Wis			1,500
Trout Brook, Elleva, Wis			1,000
Applicants in Wisconsin			1,000
S. E. Land, Laramie, Wyo	25,000		
Hon. Moreton Frewen, Innishannon, Ireland	10,000		
August Nobre, Villa do Conde, Portugal	10,000		
William Burgess & Co., Malvern Wells, England	10,000		
F. Dill, Heidelberg, Germany	10,000		
Directeur, Jardin Zoologique d'Acclimatation, Paris, France	25,000		
Total	175,000	33,143	158,831
Brook trout:			
Brush Creek, Eagle, Colo			15,000
Fryingpan River, Norrie, Colo			1,500
Clohessy Lake, Granite, Colo			7,500

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Brook trout—Continued.			
Peltons Lake, Montrose, Colo		3,000	7,500
Fryingpan River, Thomasville, Colo			1,500
Ruedi, Colo			7,500
Southey Lake, Montevista, Colo			7,500
Lime Creek, Eagle and Pitkin counties, Colo		6,667	7,500
South Fork of Platte River, Park County, Colo			7,500
Fryingpan River, Eagle and Pitkin counties, Colo		6,667	7,500
North Fork of Fryingpan River, Pitkin County, Colo		6,667	7,500
Spring Lake, Montevista, Colo			7,500
Lake Creek, near Twin Lakes, Colo			40,000
Upper Brush Creek, Eagle, Colo			500
Eagle River and tributaries, Wolcott, Colo			10,000
North Fork of South Platte River:			
Bailey		14,000	7,000
Estabrook		15,000	3,000
Crosson		3,000	3,000
Cliff		5,000	3,000
Pine Grove		2,000	4,000
Lake Creek, near Leadville			10,000
Upper Evergreen Lake, near Leadville			18,000
Lake Devereux, Aspen, Colo			10,000
Silver Creek, Shirley, Colo		5,000	4,400
West Marshall Creek, Chester, Colo			4,300
Tomiche River, Mounds, Colo			4,200
Gunnison, Colo			4,100
Applicants in Colorado		20,000	5,300
Platte River, Alma, Colo		5,000	
Vendome Fish Ponds, Salida, Colo		5,000	
Mountain Lake, Montevista, Colo		5,000	
Lake Lenore, Ouray, Colo		5,000	
Hell Gate Creek, Pitkin County, Colo		6,667	
Last Chance Creek, Pitkin County, Colo		6,666	
Savage Lakes, Pitkin County, Colo		6,666	
Francisco Creek Lake, Del Norte, Colo		5,000	
Little Brothers Lake, Wolcott, Colo		5,000	
Johnson Park Lake, Cimarron, Colo		5,000	
Grand View Lake, Slaghts, Colo		5,000	
Lake San Cristobal, Lake City, Colo		10,000	
Blue River, Breckenridge, Colo		5,000	
Range and Boulder lakes, Blackhawk, Colo		5,000	
Craig Creek, Estabrook, Colo		6,000	
Platte River, Grant, Colo		15,000	
Geneva Creek, Grant, Colo		11,000	
Crystal River, Carbondale, Colo		5,000	
Naylor Lake, Georgetown, Colo		10,000	
North Fork of South Platte River, Slaghts, Colo		5,000	
South Arkansas River, Buenavista, Colo		10,000	
Big and Little Cimarron rivers, Cimarron, Colo		10,000	
Cache la Poudre River, Fort Collins, Colo		15,000	
Spring Lakes, Cimarron, Colo		5,000	
Big Thompson River, Loveland, Colo		10,000	
Deer Creek, Cliff, Colo		5,000	
North Fork of South Platte River, Buffalo, Colo		15,000	
Buffalo Creek, Buffalo, Colo		5,000	
Buckhorn Creek, Loveland, Colo		5,000	
Cook Creek, Slaghts, Colo		5,000	
Paine Creek, Slaghts, Colo		5,000	
North Platte River, Florrissant, Colo		5,000	
Derrys Ponds, near Leadville, Colo		5,000	
Lake Pittman, near Leadville, Colo		3,000	
South Platte River, Deansbury, Colo		5,000	
Lake Peterson, Fort Collins, Colo		10,000	
South Fork of Chicago Creek, Idaho Springs, Colo		10,000	
Deer Creek, Bailey, Colo		5,000	
Soda Creek, Idaho Springs, Colo		5,000	
Chicago Lakes, Idaho Springs, Colo		5,000	
East Fork of Chicago Creek, Idaho Springs, Colo		10,000	
South Platte River, Florrissant, Colo		5,000	
Fall River, Idaho Springs, Colo		5,000	
Mountain Lake, Buenavista, Colo		5,000	
Elk Creek, Pine Grove, Colo		5,000	
North Fork of South Arkansas River, Salida, Colo		10,000	
Trout and Wigwam creeks, South Platte, Colo		5,000	
White Earth Creek, Lake City, Colo		5,000	
Grand Lake, Empire, Colo		20,000	
South Clear Creek, Georgetown, Colo		10,000	
Snake and Willow creeks, Dillon, Colo		10,000	
North Fork Lake, Salida, Colo		3,000	
North Fork of South Platte River, South Platte, Colo		5,000	
Cottonwood Creek, Buenavista, Colo		5,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Brook trout—Continued.			
Alder Creek, Alder, Colo		5,000	
South Beaver Creek, Gunnison, Colo		5,000	
Elk Creek, Sapinero, Colo		10,000	
Eagle Creek, Gunnison, Colo		5,000	
Mammoth and Boulder creeks, Central City, Colo		10,000	
Sylvan Brook, New Haven, Conn		8,000	
Spring Brook, Torrington, Conn		9,980	
Cold Spring Brook, Wilton, Conn		4,000	
Stony Brook, Wilton, Conn		4,000	
Morehouse Brook, South Norwalk, Conn		4,000	
Spring Brook, Chatham, Conn		9,995	
Neck River, Madison, Conn		8,000	
Applicants in Connecticut			1,500
Connecticut Fish Commission, Windsor Locks, Conn	25,000		
Cascade Branch, Warm Springs, Ga		4,000	
Waha Lake, Lewiston, Idaho			4,000
Potacho River, Vollmer, Idaho			4,000
Bean and Lick creeks, Weiser, Idaho			4,000
Lower Fish Lakes, Rathdrum, Idaho			4,000
Big Lost and Wood rivers, Hailey, Idaho			6,000
Silver Creek, Hailey, Idaho		9,000	
Big Lost River, Ketchum, Idaho		9,000	
Applicants in Idaho		4,500	3,000
George W. Rea, Spencer, Idaho	20,000		
Spring Lake, Warsaw, Ill			200
Rough and Ready Creek, Westville, Ind		10,000	
Frames Creek, Westville, Ind		2,000	
Bowman Creek, South Bend, Ind		10,000	
Applicants in Indiana		2,500	
Bear Creek, Edgewood, Iowa			6,700
Cooley Creek, Lansing, Iowa			5,000
Bacon Creek, Lansing, Iowa			5,000
Fetketter Creek, Lansing, Iowa			5,000
Clear Creek, Lansing, Iowa			5,000
Roggensack Creek, Lansing, Iowa			2,000
Badger Creek, Decorah, Iowa			5,000
Bloody Run, McGregor, Iowa		8,484	5,000
Mill Creek, Bellevue, Iowa			3,000
Elk and Pine creeks, Elkport, Iowa			3,000
Spring Branch, Manchester, Iowa		15,000	6,500
Maquoketa River, Forestville, Iowa		10,000	1,700
Applicants in Iowa		5,000	400
Pond and Stream, Osage, Iowa		8,484	
Canoe Creek, Decorah, Iowa		8,484	
Baldwin Creek, Cresco, Iowa		4,242	
Bigall Creek, Cresco, Iowa		4,242	
Daley Pond, Cresco, Iowa		4,242	
Snymagill Creek, McGregor, Iowa		8,484	
Spring Brook, McGregor, Iowa		8,484	
Mink Creek, Wadena, Iowa		8,484	
Maquoketa River, Manchester, Iowa		15,000	
Parlin Pond, Jackman, Me		24,000	
Pierce Pond, Bingham, Me		15,000	
Green Lake, Otis, Me		20,000	8,800
Donnell Pond, Franklin, Me		5,000	
Varnum Pond, Farmington, Me		10,000	
Cobbosseecontee Pond, Augusta, Me		5,000	
Lake Anasaguntieook, Canton, Me		5,000	
Eagle Lake, Bar Harbor, Me		5,000	
Cannan Lake, Camden, Me		12,000	
Leach Brook, Oakland, Me		5,000	
Bear Pond, Shirley, Me		10,000	
Embden Lake, North Anson, Me		10,000	
Flanders and Tunk ponds, Sullivan, Me		5,000	
Reservoir, City Water Company, Belfast, Me		5,000	
Clearwater Pond, Farmington, Me		5,000	
Parmachene Lake, Camp Caribou, Me		10,000	
Moosehead Lake, Greenville Junction, Me		5,000	
Blacks Pond, Ellsworth, Me		5,000	
Long Pond, Bar Harbor, Me		5,000	
Moosehorn Lake, Calais, Me		5,000	
Pattens Pond, Ellsworth, Me		15,000	
Branch Pond, Dedham, Me		10,000	
Applicants in Maryland		4,000	400
Hunting Creek, Thurmont, Md			700
Spring Brook, Lowell, Mass		25,000	
Fox Brook, Blackstone, Mass		5,000	
Dunklins Hole, Dedham, Mass		3,988	
Powpsett Pond, Dedham, Mass		7,980	
Morris Creek, Spring Lake, Mich			500

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Brook trout—Continued.			
Grand River, Cedarbank, Mich			500
Duck Creek, Muskegon, Mich			600
South Branch Tobacco Creek, Clare, Mich			400
Silver Creek, Clare, Mich			400
Middle Branch Tobacco Creek, Clare, Mich			400
Harriam Brook, Schoolcraft, Mich			400
Brandywine and Moosic creeks, Niles, Mich			400
Reyneys Creek, Marquette, Mich		10,000	
Hill Creek, Sidnaw, Mich		10,000	
Millers Creek, Greenville, Mich		10,000	
Clear Creek, Greenville, Mich		5,000	
Bayers and Stony creeks, Gustin, Mich		20,000	
Myers Creek, Cheboygan, Mich		10,000	
Spring Creek, Oxford, Mich		10,000	
South and Middle Forks Tobacco River, Farwell, Mich		7,000	
Upper Cedar River, Mancelona, Mich		10,000	
Rapid River, Rugg, Mich		10,000	
Tributary of Grand River, Hanover, Mich		10,000	
Silver and Gold creeks, East Tawas, Mich		50,000	
Spring Brook, Richland Junction, Mich		20,000	
Little Manistee River, Canfield, Mich		25,000	
Fellow and Merritt creeks, Hudson, Mich		10,000	
Silver Creek and Tuttle Ditch, Oscoda, Mich		30,000	
Bear Creek, Manistee Crossing, Mich		25,000	
Sanborn Creek, Nirvana, Mich		5,000	
Blood and Baldwin creeks, Baldwin, Mich		10,000	
Bowman and Dannaher creeks, Wingleton, Mich		20,000	
Sweetwater Creek, Stearns, Mich		9,860	
Weldon Creek, Branch, Mich		9,820	
Pine River, Harrisville, Mich		25,000	
Au Sable River, Grayling, Mich		125,000	
East Branch Au Sable River, Grayling, Mich		37,000	
Graham Creek, Farwell, Mich		4,850	
Huffmire and Twin creeks, Evart, Mich		6,855	
Middle Branch of Pere Marquette River, Nirvana, Mich		4,852	
Manistee River, Baldwin, Mich		9,840	
Kinney Creek, Wingleton, Mich		14,500	
Branch of Pere Marquette River, Baldwin, Mich		4,000	
Bowman and Clear creeks, Wingleton, Mich		5,000	
Washington River, Washington Harbor, Mich		8,000	
Applicants in Michigan		500	
Spring Brooks, Northfield, Minn		25,452	5,000
Little Trout Brook, Lamoille, Minn		16,975	
Pleasant Valley Creek, Winona, Minn		16,975	
Blackhoof River, Atkinson, Minn		10,000	
Poplar River, Grand Marais, Minn		5,000	
Tischer Creek, Duluth, Minn		9,308	
Knife River, St. Louis County, Minn		5,000	
French River, St. Louis County, Minn		5,000	
A. Lauth, Fanning, Mo	3,000		
Spring Creek, Leadboro, Mont			2,000
North Fork of Sun River, Craig, Mont			1,950
Bitterroot River, Victor, Mont			2,994
Lake Agnes, Browns Station, Mont			4,980
Fork and Hensley creeks, Leadboro, Mont			4,975
Box Elder Creek, Havre, Mont			2,000
J. F. Comee, Missoula, Mont	5,000		
Walnut Creek, Nebraska City, Nebr		2,000	500
Penacook Lake, Concord, N. H			225
Wild Meadow Brook, Grafton, N. H		8,000	
State Fish Commission, Laconia, N. H	25,000		
Musconetcong Creek, Washington, N. J			600
Pequest Creek, Belvidere, N. J			300
Trout Brook, Newark, N. J			500
A. M. Bigelow, Branchville, N. J	20,000		
Horse and Cow Brooks, Far Hills, N. J			500
Kaaterskill Creek, Catskill, N. Y		15,000	
Schenevus Creek, East Worcester, N. Y		20,000	
Page Brook Creek, West Winfield, N. Y		10,000	
Oriskany Creek, Waterville, N. Y		15,000	
Big Brook, Adams Center, N. Y		10,000	
East Branch of Unadilla River, West Winfield, N. Y		10,000	
Elk Creek, Schenevus, N. Y		10,000	
West Oneonta Creek, Oneonta, N. Y		10,000	
Geddes Lake, Syracuse, N. Y		10,000	
Montfredy Brook, Syracuse, N. Y		15,000	
Carpenter Brook, Syracuse, N. Y		10,000	
Fullers Creek, Adams Center, N. Y		5,000	
Chenango River, Deruyter, N. Y		15,000	
Ragged Lake, Owlshead, N. Y		10,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Brook trout—Continued.			
Budlong and Moyer Creeks, Frankfort, N. Y		10,000	
Canistor River, Hornellsville, N. Y		10,000	
Canandaway Creek, Leona, N. Y		5,000	
Applicants in New York		5,000	
P. H. Flynn, Livingston Manor, N. Y	20,000		
Adirondack League Club, Old Forge, N. Y	25,000		
R. E. Carson, Sapphire, N. C	20,000		
Spring Lake, Minot, N. Dak		10,000	
Applicants in North Dakota		5,000	
Brushy Fork Creek, Newark, Ohio		10,000	
Spring Lake, Dayton, Ohio		9,000	
West Liberty, Ohio		5,000	
Reservoir, Mantan, Ohio		10,000	
Applicants in Ohio		45,000	
Youngs River, Portland, Oreg			5,000
State Fish Commission, Portland, Oreg			6,000
Mix Run, Driftwood, Pa			399
Trout Run, Shippensburg, Pa			900
State Fish Commission, Allentown, Pa	10,000		
Beaver Creek, Buffalo Gap, S. Dak			3,000
St. Mary Lake, Rosebud, S. Dak			1,500
Branch of Spearfish Creek, Englewood, S. Dak			3,000
Ross Spring, Crown Hill, S. Dak			750
Horse Creek, Hill City, S. Dak		10,000	1,500
Castle Creek, Hill City, S. Dak			1,500
Harney Peak Lake, Hill City, S. Dak			1,500
Sylvan Lake, Custer, S. Dak			1,500
Applicants in South Dakota			3,000
Big Coolee Creek, Wilmot, S. Dak		10,000	
West Fork of Potato Creek, Pine Ridge Reservation, S. Dak		10,000	
Rapid Creek, Rapid City, S. Dak		10,000	
Whitewood Creek, Englewood, S. Dak		10,000	
Granny Lewis Creek, Unicoi County, Tenn			350
Higgins Creek, Unicoi County, Tenn			475
Broad Shoal Creek, Unicoi County, Tenn			50
Devil Creek, Unicoi County, Tenn			125
Red Butte Creek, near Salt Lake City, Utah		9,000	
Applicants in Utah		2,000	
F. M. Lyman, jr., Salt Lake City, Utah	25,000		
J. H. Tuck, Salt Lake City, Utah	5,000		
Spring Brook, Rutland, Vt			500
Bigfish Pond, Sutton, Vt			500
Caspian Lake, Greensboro, Vt		40,000	2,800
Mount Tabor Brook, Danby, Vt		20,000	
Wells River, Wells River, Vt		16,000	
Pico Pond and Brooks, Rutland, Vt		99,975	
Holland Pond, Holland, Vt		8,000	
Frog Pond and Brooks, St. Johnsbury, Vt		10,000	
Caledonia Trout Club Pond, St. Johnsbury, Vt		15,000	
Mud Pond and Brook, Randolph, Vt		5,000	
Tributaries of Deerfield River, Wilmington, Vt		7,997	
Kendall Brook, Bondville, Vt		4,000	
Lake Mitchell, Sharon, Vt		40,000	
Tributaries of Sleeper River, St. Johnsbury, Vt		30,000	
Fairbanks Pond, St. Johnsbury, Vt		5,000	
Darling Pond, Groton, Vt		40,000	
Vermont State Fish Commission, Colebrook, N. H	25,000		
Big Spring, Leesburg, Va			10
Spring Brook, Yakima, Wash			1,000
Rock Creek, Winona, Wash			3,500
Clear Lake, New Whatcom, Wash			2,500
Lake Cushman, Tacoma, Wash			2,500
Spokane River, Spokane, Wash			1,500
Wilbur Creek, Wilbur, Wash			3,000
Columbia River, Wenatchee, Wash			1,500
Little Spokane River, Sciota, Wash			1,500
Quarry Run, Morgantown, W. Va			400
Meadow Creek, Roncoverte, W. Va			500
A. G. Buller, Cheat Bridge, W. Va	20,000		
Middle Inlet, Wausaukee, Wis		10,000	
Springstead Brook, Lac du Flambeau, Wis		10,000	
Klemm Creek and Pond, Medford, Wis		8,484	
Thompson and Otter creeks, Augusta, Wis		8,484	
State Fish Commission, Laramie, Wyo	50,000		
Hon. Moreton Frewen, Innishannon, Ireland	20,000		
William Burgess & Co., Malvern Wells, England	20,000		
Total	338,000	2,354,200	388,583

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Black-spotted trout:			
Rainbow Lake, Gunnison, Colo			1,000
Eagle River and tributaries, Wolcott, Colo			10,000
Mountain streams in the vicinity of Central City, Colo			15,000
North Fork of South Platte River:			
Buffalo, Colo			6,000
Park Siding, Colo			3,000
Dawson, Colo			3,000
Dome Rock, Colo			3,000
Tennessee Creek, near Leadville, Colo			10,000
Tomiche River, Mounds, Colo			5,000
Gunnison, Colo			5,000
Denver & Rio Grande R. R. Co. Lake, Granite, Colo			2,000
Henry Lake, Idaho		50,000	
Applicants in Idaho			2,000
Rocky Pond, Otis, Me		8,386	
Sage Creek, Chester, Mont			5,000
Smith River and tributaries, Dorsey, Mont			4,997
Sixteen-Mile Creek, Dorsey, Mont			4,990
Prairie Grove Lake, Toston, Mont			2,000
Lake Agnes, Brown Station, Mont			4,980
Cherry Creek, Bozeman, Mont			5,000
Crandall Creek, Bozeman, Mont			5,000
Cowan Reservoir, Box Elder, Mont			5,000
Big Elk and Lebo creeks, Leadboro, Mont			4,975
Deep Creek, Townsend, Mont			2,000
Spring Branch, Livingston, Mont			5,000
Catlin Reservoir, Dorsey, Mont			4,990
Applicants in Montana			4,000
Vincent Ponds, Anaconda, Mont		56,325	
J. H. Sharp, Fish and Game Warden, Salt Lake City, Utah			11,000
Clear Lake, New Whatcom, Wash			1,500
State Fish Commission, Laramie, Wyoming	25,000		
S. Jaffe, Osnabruck, Germany	10,000		
Total	35,000	114,711	135,441
Lake trout:			
California Fish Commission, Sisson, Cal	50,000		
Lake Koppin, Cimarron, Colo		10,000	
Connecticut Fish Commission, Windsor Locks, Conn	200,000		
Partridge Lake, South Bend, Ind		20,000	
Spirit Lake, Spirit Lake, Iowa		106,800	
Lake Okoboji, Spirit Lake, Iowa		53,800	
Lost Island Lake, Ruthven, Iowa		10,000	
Silver Lake, Lake Park, Iowa		10,000	
Maquoketa River, Manchester, Iowa			400
Donnell Pond, Franklin, Me		15,000	
Lake Tompson, Oxford, Me		15,000	
Sand Pond, Farmington, Me		15,000	
Branch Pond, Dedham, Me		45,000	
Rocky Pond, Dedham, Me		45,000	
Phillips Lake, Dedham, Me		45,000	
Holbrook Pond, Holden, Me		45,000	
Little Fitz Pond, Holden, Me		30,000	
Tunk Pond, Sullivan, Me		45,000	
Green Lake, Otis, Me		34,317	
Patten Pond, Ellsworth, Me		45,000	
State Fish Commission, Enfield, Me	500,000		
Lake Brown, Swanton, Md		11,128	
Garrot Pond Hyannis, Mass		10,000	
Round Lake, Cedar Bank, Mich			10,000
Lake Huron, Alpena, Mich		1,050,000	33,000
Cheboygan, Mich		350,000	15,000
East Tawas, Mich			33,000
Lake Superior, Grand Marais, Mich			30,000
Lake Michigan, Manistique, Mich		350,000	15,000
Charlevoix, Mich		700,000	15,000
Crooked Lake, Clare County, Mich			15,000
Straits of Mackinac, Mackinaw City, Mich			9,000
Ste. Marie River, Sault Ste. Marie, Mich		350,000	
Round Lake, Hanover, Mich		20,000	
RawsonLake, Schoolcraft, Mich		20,000	
Lake Superior, Ontonagon, Mich		620,000	
Long Point, Isle Royale		240,000	
Wright Island, Isle Royale		120,000	
Washington Harbor, Isle Royale		120,000	
Tobin Harbor, Isle Royale		120,000	
Rock Harbor, Isle Royale		120,000	
Cod Harbor, Mich		120,000	
Fish Island, Mich		120,000	
Houghton, Mich		240,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Lake trout—Continued.			
Lake Superior, Grand Portage, Minn		240,000	
Chicago Bay, Minn		240,000	
Grand Marais, Minn		240,000	
Poplar River, Minn		240,000	
French River, Minn		120,000	
Two Harbors, Minn		120,000	
Beaver Bay, Minn		240,000	
Duluth, Minn		30,000	
Otsego Lake, Cooperstown, N. Y		25,000	
Lake Ontario, Cape Vincent, N. Y		200,000	
Lake Ontario, off Grenadier Island, N. Y		200,000	
Adirondack League Club, Fulton Chain, N. Y	100,000		
Spring Lake, Minot, N. Dak		10,000	
Devils Lake, Devils Lake, N. Dak		17,000	
Big Stone Lake, Wilmot, S. Dak		25,000	
Lake Kampeska, Watertown, S. Dak		33,000	
Crystal Lake, Barton, Vt		15,000	
Vermont State Fish Commission, Roxbury, Vt	300,000		
Lake Michigan, Sheboygan, Wis			15,000
Lake Superior, Bayfield, Wis		240,000	
Sand Island, Wis		240,000	
Bark Point, Wis		240,000	
Port Arthur, Ontario, Canada		240,000	
Total	1,150,000	8,235,045	190,400
Scotch sea trout:			
Heart Pond, Orland, Me			742
Alamoosook Lake, Orland, Me			22
Tuscarora Creek, Leesburg, Va			50
Total			814
Golden trout:			
Phillips Lake, Dedham, Me		1,500	
Green Lake, Otis, Me		1,574	
Total		3,074	
Grayling:			
Eagle River, Wolcott, Colo		5,000	
Rio Grande River, Wagonwheel Gap, Colo		5,000	
Platte River, Grant, Colo		5,000	
Fryingpan River, Norrie, Colo		5,000	
Spring Branch, Manchester, Iowa		10,000	
Bear Creek, Edgewood, Iowa		6,000	
Spring Creek, Forestville, Iowa		6,000	
AuSable River, Grayling, Mich		25,000	
Pere Marquette River, Baldwin, Mich		25,000	
Bridger Creek, Bozeman, Mont		500,000	
Elk Creek, Red Rock, Mont		3,000,000	
Elk Lake, Red Rock, Mont		100,000	
Picnic Springs Creek, Red Rock, Mont		800,000	
Hidden Lake, Red Rock, Mont		75,000	
State Fish Commission, Carolina, R. I	50,000		
State Fish Commission, Laramie, Wyo	25,000		
Total	75,000	4,567,000	
White-fish:			
Lake Erie, Monroe, Mich		18,070,000	
Lake Michigan, Beaver Island, Mich		3,000,000	
High Rollway, Mich		3,000,000	
Lake Superior, Ontonagon, Mich		2,000,000	
Grace Harbor, Mich		2,000,000	
Isle Royale, Mich		2,000,000	
White-fish Point, Mich		1,900,000	
Fisherman's Home, Mich		1,800,000	
Lake Huron, North Point, Mich		3,500,000	
South Point, Mich		3,000,000	
Can Buoy, Mich		1,000,000	
Thunder Bay Island, Mich		2,500,000	
Scarecrow Island, Mich		2,000,000	
Sugar Island, Mich		2,000,000	
North Fishing Ground, Mich		2,000,000	
Straits of Mackinac, at St. Ignace, Mich		3,000,000	
Antoine Lake, Iron Mountain, Mich		1,000,000	
New Hampshire Fish Commission, Ashland, N. H	216,000		
Lake Ontario, Grenadier Island, N. Y		5,000,000	
Lake Erie, Niagara Reef, Port Clinton, Ohio		5,040,000	
North Bass Island Reef, Put-in-Bay, Ohio		9,360,000	
Peach Point Reef, Put-in-Bay, Ohio		15,920,000	
Buckeye Island Reef, Put-in Bay, Ohio		5,950,000	
Middle Bass Island Reef, Put-in Bay, Ohio		5,100,000	
Port Clinton, Ohio		9,960,000	

Details of distribution—Continued.

Species and disposition.	Eggs.	Fry and fingerlings.	Adults and yearlings.
White-fish—Continued.			
Lake Erie, Rattlesnake Island Reef, Put-in Bay, Ohio		9,000,000	
Toledo, Ohio		5,950,000	
Ottawa City, Ohio		4,200,000	
Ballast Island Reef, Put-in Bay, Ohio		3,850,000	
Green Island Reef, Put-in Bay, Ohio		6,450,000	
Starve Island Reef, Put-in Bay, Ohio		1,600,000	
Light-house Point Reef, Put-in Bay, Ohio		2,880,000	
East Side, Put-in Bay, Ohio		1,600,000	
Inland Lake, White, S. Dak		125,000	
Lake Superior, Iron River, Wis		2,000,000	
Port Wing, Wis		2,000,000	
Raspberry Bay, Wis		2,000,000	
Lake Superior, Port Arthur, Ontario, Canada		1,500,000	
New Zealand Fish Commission, New Zealand	500,000		
Total	716,000	152,755,000	
Pike perch.			
Sogna Lake, Rolling Prairie, Ind		2,000,000	
Indian Lake, Kendallville, Ind		1,000,000	
Sackrider Lake, Kendallville, Ind		500,000	
Eagle Lake, Warsaw, Ind		1,000,000	
Sylvan Lake, Rome City, Ind		1,000,000	
Pleasant and Long lakes, Waterloo, Ind		1,000,000	
Devils Lake, near Addison, Mich		500,000	
Hanlon Lake, near Ludington, Mich		1,000,000	
Lake Erie, near Monroe, Mich		13,200,000	
Saginaw Bay, Saginaw Bay, Mich		7,500,000	
Thunder Bay, Alpena, Mich		4,000,000	
Devils Lake, Lenawee County, Mich		500,000	
Sand Lake, Lenawee County, Mich		500,000	
Diamond Lake, Cass County, Mich		1,000,000	
Indian Lake, Cass County, Mich		500,000	
Fisher Lake, St. Joseph County, Mich		500,000	
Duck Lake, Calhoun County, Mich		500,000	
McIntosh Lake, Barry County, Mich		500,000	
Round Lake, Barry County, Mich		500,000	
Long Lake, Barry County, Mich		500,000	
Pleasant Lake, Jackson County, Mich		500,000	
Hunton Lake, Ingham County, Mich		500,000	
Douglass Lake, Cheboygan County, Mich		1,000,000	
Crooked Lake, Emmet County, Mich		1,000,000	
Pickerel Lake, Emmet County, Mich		1,000,000	
Round Lake, Emmet County, Mich		500,000	
Pencil Lake, Antrim County, Mich		500,000	
Lost Lake, Antrim County, Mich		500,000	
Sand Lake, Antrim County, Mich		500,000	
Stoneledge Lake, Wexford County, Mich		1,000,000	
Susquehanna River, East Windsor, N. Y		1,000,000	
Raquette River, Potsdam, N. Y		1,000,000	
Lake Ontario, Wilsons Bay, N. Y		2,000,000	
St. Lawrence River, Cape Vincent, N. Y		3,000,000	
Lake Erie, Rattlesnake Island Reef, Put-in Bay, Ohio		32,840,000	
Peach Point Reef, Put-in Bay, Ohio		15,000,000	
Ballast Island Reef, Put-in Bay, Ohio		23,160,000	
North Bass Island Reef, Put-in Bay, Ohio		13,800,000	
Green Island Reef, Put-in Bay, Ohio		13,800,000	
Wehrles Point Reef, Put-in Bay, Ohio		12,000,000	
Port Clinton, Ohio		13,800,000	
Toledo, Ohio		1,000,000	
Sugar Island Reef, Put-in Bay, Ohio		14,400,000	
Honey Point Reef, Put-in Bay, Ohio		13,200,000	
Starve Island Reef, Put-in Bay, Ohio		13,200,000	
Put-in Bay, East Side Island, Ohio		11,040,000	
Kelly Island, Ohio		1,600,000	
Joes Pond, West Danville, Vt		200,000	
Silver Lake, Barnard, Vt		50,000	
Missisquoi River, Orleans County, Vt		1,000,000	
Lamoille River, Cambridge, Vt		1,050,000	
Total		232,840,000	
Yellow perch:			
Potomac River, Bathing Beach, D. C		30,000	
Cat-fish:			
Chicago, Burlington and Quincy R. R. Pond, Galesburg, Ill			1,000
Gages Lake, Grays Lake, Ill			250
Total			1,250

Details of distribution—Continued.

Species and disposition.	Adults and yearlings.
Black bass:	
Ewings Millpond, Gadsden, Ala	100
Spring Creek, Calera, Ala	100
Black Creek, Gadsden, Ala	100
Cahaba River, Birmingham, Ala	200
Mulberry Creek, Bangor, Ala	100
Oxford Lake, Oxford, Ala	100
Mill Pond, Benton, Ala	75
Blackwater Creek, Jasper, Ala	150
East Lake, Birmingham, Ala	100
Sandy Creek, Waverley, Ala	175
Buck Creek Millpond, Dadeville, Ala	250
Hoster Creek, Columbia, Ala	75
Pond and Stream, Oneonta, Ala	100
Barren Fork of Flint River, Keys Mills, Ala	200
Mill Creek Pond, Piedmont, Ala	50
Spring Lake, Pike Road, Ala	200
Sandy Creek, Gold Hill, Ala	175
Green Lake, Demopolis, Ala	150
Mill Creek, Thomasville, Ala	100
Applicants in Alabama	1,230
Oak Creek, Jerome, Ariz	150
Big Lake, Big Lake, Ark	240
Spring Lake, Sulphur Springs, Ark	100
Dawdy Lake, Benton, Ark	240
Clear Springs, Antoine, Ark	100
Spirit Lake, Garland City, Ark	240
Applicants in Arkansas	710
Rocky Mountain Lake, Denver, Colo	300
Lake Wauconda, Larkspur, Colo	100
Lone Tree Lake, Greeley, Colo	100
Browns Lake, Sterling, Colo	50
Reservoir, Higganum, Conn	200
Paper Mill Pond, Seymour, Conn	200
D. C. Riggs Pond, Seymour, Conn	100
Washburns Pond, Seymour, Conn	200
Sawmill Pond, Seymour, Conn	100
Applicants in Connecticut	150
Wyoming Lake, Wyoming, Del	100
White Clay Creek, Newark, Del	200
E. G. Shortlidge, Wilmington, Del	300
Lake Denman, Atlanta, Ga	55
East Lake, Atlanta, Ga	100
Lake Claramcor, Atlanta, Ga	55
Spring Lake, Tunnel Hill, Ga	275
Ocklawilla Lake, Newnan, Ga	55
Spring Lake, Stinson, Ga	55
Brier Creek, Waynesboro, Ga	100
Middle Oconee River, Athens, Ga	100
Wildwood Lake, Columbus, Ga	55
Lake Fairoaks, Atlanta, Ga	85
Lake Killarney, Augusta, Ga	100
Millpond, Cuthbert, Ga	55
Little Cedar Millpond, Rome, Ga	100
Sealys Pond, Cuthbert, Ga	55
Muckalee Creek, Americus, Ga	100
Mobley Lake, Rome, Ga	55
Mill Pond, Graves Station, Ga	100
Flint River, Albany, Ga	196
Beaver Creek, Zenith, Ga	100
Tallapoosa River, Carrollton, Ga	100
Nail Creek Millpond, Baldwin, Ga	100
Butlers Millpond, Cuthbert, Ga	55
Cemetery Ponds, Macon, Ga	110
Maddox Millpond, Dalton, Ga	55
St. Elmo Lake, Columbus, Ga	55
Clemmons Millpond, Summerville, Ga	55
Shropshire Millpond, Summerville, Ga	100
Pearl Springs Lake, Newnan, Ga	55
Lake Ormwood, Atlanta, Ga	55
Spring Lake, Stone Mountain, Ga	100
Applicants in Georgia	2,620
Reservoir, Orchard, Idaho	150
Applicants in Idaho	414
Shermans Ponds, Ringwood, Ill	300
Channel Lake, Antioch, Ill	500
Lake Purington, Galesburg, Ill	200
Spring Lake, Washington, Ill	100
Black bass—Continued.	
Willards Pond, Harristown, Ill	3,500
Bement Pond, Bement, Ill	1,500
Gage Lake, Graysiake, Ill	1,135
Chicago, Burlington & Quincy R. R. Ponds, Galesburg, Ill	75
Highland Park Lake, Galesburg, Ill	570
Applicants in Illinois	200
Lake James, Angola, Ind	500
Elkhart River, Wawasee, Ind	500
Spring Lake, Covington, Ind	515
Sylvan Lake, Rome City, Ind	300
Spring Lake, Indianapolis, Ind	200
Laughery Creek, Batesville, Ind	200
Sweeney Lake, New Albany, Ind	75
Sogna Lake, Rolling Prairie, Ind	300
Wabash and Eel rivers, Logansport, Ind	200
Kane Lake, Rome City, Ind	100
Spring Lake, Fort Wayne, Ind	75
Tippecanoe River, Lafayette, Ind	200
Twin Lakes, Plymouth, Ind	300
Cedar Pond, Auburn Junction, Ind	150
Big Indian Creek, Mott, Ind	100
Wildcat Creek, Windfall, Ind	75
Lake Maxinkuckee, Culver, Ind	800
Sugar Creek, Crawfordsville, Ind	150
White River, Noblesville, Ind	150
Applicants in Indiana	1,625
Long Lake, Porteau, Ind. T	135
Spring Lake, Durant, Ind. T	125
Applicants in Indian Territory	325
Spitznoggle Lake, Wapello, Iowa	500
West Okoboji Lake, Okoboji, Iowa	500
Wilson Lake, Harlan, Iowa	100
Middle River, Winterset, Iowa	800
Spring Ponds, Winterset, Iowa	400
Little Cedar River, Osage, Iowa	190
Upper Iowa River, Chester, Iowa	275
Lime Springs, Iowa	275
Clear Lake, Clear Lake, Iowa	500
Big Cedar River, Orchard, Iowa	190
Des Moines River, Estherville, Iowa	500
Pool of Siloam, Massena, Iowa	238
East Okoboji Lake, Okoboji, Iowa	500
Little Cedar River, Staceyville, Iowa	190
Iowa River, Iowa City, Iowa	500
Cedar River, Cedar Rapids, Iowa	4,000
Applicants in Iowa	1,062
Walnut River, Winfield, Kans	100
Crescent Lake, Valley Falls, Kans	50
Spring Pond, Hutchinson, Kans	200
Eureka Lake, Manhattan, Kans	100
Deep Creek, Manhattan, Kans	100
Lakeside Lake, Olathe, Kans	100
Tuttle Creek, Manhattan, Kans	100
Applicants in Kansas	961
Cumberland R., Cumberland Falls, Ky	200
Lake Isham, View, Ky	75
Plum Bottom Lake, Pembroke, Ky	50
Alexander Creek, Chamelion Springs, Ky	75
East Fork Little River, Hopkinsville, Ky	100
Spring Lake, Lexington, Ky	75
Kinnikinnick River, Vanceburg, Ky	200
Paradise Lake, Paducah, Ky	50
Walnut Flat Ice Pond, Stanford, Ky	75
Eden Hill Pond, Paducah, Ky	50
East Side Lake, St. Charles, Ky	100
Applicants in Kentucky	2,015
Deer Creek, Gilbert, La	125
Grand Cote Lake, Cypremont, La	200
Spring Lake, Cypremont, La	200
Homer, La	118
Sodus, La	120
Tangipahoa River, Ponchatoula, La	325
Inland Lake, Jeanerette, La	200
Greenwood Lake, Shreveport, La	1,000

Details of distribution—Continued.

Species and disposition.	Adults and yearlings.
Black bass—Continued.	
Applicants in Louisiana	1,954
Georges Run, Hampstead, Md	200
Patuxent River, Laurel, Md	200
Potomac River, Woodmont, Md	1,200
Youghiogheny River, Swanton, Md	1,000
State Fish Commission, Druid Hill Park, Md	10
Applicants in Maryland	100
Horn Pond, Woburn, Mass	150
Connecticut River, Holyoke, Mass	200
Willows Pond, Bristol, Mass	50
Lawrence Pond, West Barnstable, Mass	700
Spring Pond, Shelburne, Mass	150
Lake Huron, Alpena, Mich	350
Rush Lake, Kinde, Mich	200
Round Lake, Hanover, Mich	350
Murray Lake, Ypsilanti, Mich	200
Cheboygan River, Cheboygan, Mich	200
Twin Lakes, Grayling, Mich	200
Pleasant Lake, Leslie, Mich	200
Strawberry Lake, Evart, Mich	200
Asylum Lake, Kalamazoo, Mich	300
Lake Minnewaska, Glenwood, Minn	500
Split Rock River, Jasper, Minn	300
Meeler Lake, Aberdeen, Miss	100
Horseshoe Lake, Aberdeen, Miss	300
College Pond, Agricultural College, Miss	100
Marshal Lake, Columbus, Miss	300
Dead River, Aberdeen, Miss	300
Mill Pond, Newton, Miss	300
Lake City Waterworks Pond, Meridian, Miss	300
Swan Lake, Shuqualak, Miss	200
Spring Lake, Macon, Miss	300
Millpond, Shuqualak, Miss	100
Park Lake, Tupelo, Miss	300
Applicants in Mississippi	1,870
Big and Little Piney Creeks, Rolla, Mo	200
Park Lake, Carrollton, Mo	100
Spring Lake, Labelle, Mo	200
Cut-off Lake, Brunswick, Mo	200
Spring City Lake, Joplin, Mo	200
Herrells Spring Branch, Neosho, Mo	5,000
Applicants in Missouri	950
Lodge Pole Creek Lake, Sidney, Nebr	200
Spring Lake, Rushville, Nebr	50
Applicants in Nebraska	100
Franklin Lake, Crystal Lake, N. J	150
Stafford Lake, Manahawken, N. J	150
Echo Lake, Echo Lake, N. J	150
Green Run, Newfoundland, N. J	200
Oakford Lake, New Egypt, N. J	100
Quick Pond, Swartzwood, N. J	150
Silver Lake, Burlington, N. J	150
Lake Pohatcong, Tuckerton, N. J	150
Woods Upper Millpond, Quinton, N. J	300
Deal Lake, Asbury Park, N. J	200
Lake Carasaljo, Lakewood, N. J	200
Silver Lake, Lucaston, N. J	150
Applicants in New Jersey	200
Spring Lake, Watrous, N. Mex	150
Kroewing Lake, Las Vegas, N. Mex	100
Applicants in New Mexico	350
Reservoir, West Point, N. Y	150
Swago Lake, Callicoon, N. Y	200
Bolton Pond, Caldwell, N. Y	130
Potague Lake, Ramapo, N. Y	200
Newcomes Lake, Valley Falls, N. Y	100
Applicants in New York	600
Mallets Pond, Fayetteville, N. C	75
Cross Creek, Fayetteville, N. C	450
Lake Henry, Gates, N. C	100
Haw River Millpond, Burlington, N. C	150
Dan and Mayo rivers, Reidsville, N. C	150
Rockfish Creek, Fayetteville, N. C	75
Stony Creek, Burlington, N. C	100

Species and disposition.	Adults and yearlings.
Black bass—Continued.	
Little Alamance Creek, Burlington, N. C	100
Buttermilk Creek, Burlington, N. C	100
Big Falls Pond, Burlington, N. C	100
Glencoe Pond, Burlington, N. C	100
Jackotts Creek, Spray, N. C	75
Cotton Millpond, Kings Mountain, N. C	75
Elkin Creek, Elkin, N. C	75
Reems Creek, Alexander, N. C	75
Long Swamp, Fayetteville, N. C	75
Ewens Creek, Pine Hall, N. C	75
Fairfield Lake, Sapphire, N. C	75
Peachtree Creek, Raleigh, N. C	75
Cape Fear River, Fayetteville, N. C	150
Beaver Lake, Fayetteville, N. C	150
Ledge of Rocks Creek, Stem, N. C	50
Applicants in North Carolina	925
Scioto and Brush creeks, McCullogh Station, Ohio	400
Walhonding River, Warsaw, Ohio	300
Rogers Lake, Chesterville, Ohio	200
Little Miami River, Milford, Ohio	300
Tuscarawas River, Zoar, Ohio	200
Scioto River, Delaware, Ohio	600
Prospect, Ohio	200
Huron River, Shelby Junction, Ohio	200
Lake Eli, Oakley, Ohio	100
White Water River, Simonsons, Ohio	500
Springfield Lake, Akron, Ohio	300
Odells Lake, Lakeville, Ohio	200
West Fork of Mill Creek, Wyoming, Ohio	200
Millpond, Sardinia, Ohio	75
Applicants in Ohio	1,850
Cheadle Creek, Guthrie, Okla	150
Little Lakes, Manchester, Okla	75
Crystal Springs, Pond Creek, Okla	50
Applicants in Oklahoma Territory	925
Susquehanna River, Selin Grove, Pa	50
Susquehanna River, Susquehanna, Pa	75
Spring Lake, Roaring Springs, Pa	50
Wyoming Creek, Reading, Pa	50
Cartright Lake, East Stroudsburg, Pa	60
Conococheague Cr., Greencastle, Pa	100
Tahooka Lake, Preston Park, Pa	100
Codorus Creek, Emigsville, Pa	60
Big Conewago Creek, Emigsville, Pa	65
Conedogwinit Creek, Carlisle, Pa	100
Beech Lake, Honesdale, Pa	100
Park Creek Lake, Penllyn, Pa	67
Juniata River, Altoona, Pa	50
Ice Pond, Penllyn, Pa	33
Shawanese Lake, Outlet Station, Pa	50
Roaring River, Altoona, Pa	50
Schuylkill River, Birdsboro, Pa	50
Clarion River, Ridgway, Pa	50
City Reservoir, Washington, Pa	25
Oakford Lake, Jeannette, Pa	25
Conestoga Creek, Lancaster, Pa	100
West Branch of Brandywine Creek, Modena, Pa	50
Saylor's Lake, Bethlehem, Pa	50
Lake Grinnell, Bethlehem, Pa	50
Mountain Lake, Troy, Pa	75
Schuylkill River, Norristown, Pa	50
Allegheny River, Thompson, Pa	75
Susquehanna River, Halls, Pa	125
French Creek, St. Peter, Pa	50
Susquehanna River, Mohoopany, Pa	50
Indian Creek, Macungie, Pa	55
Water Co. Reservoir, Altoona, Pa	50
Forest Lake, East Stroudsburg, Pa	60
Penryn Lake, Penryn, Pa	25
Simms Lake, Masthope, Pa	200
Weighters Lake, Thompson, Pa	200
Applicants in Pennsylvania	200
State Fish Comm., Westerly, R. I	500

Details of distribution—Continued.

Species and disposition.	Adults and yearlings.
Black bass—Continued.	
Crowders Creek, Clay Hill, S. C	75
Spring Lake, Waterloo, S. C	50
Congaree Creek, Congaree, S. C	200
Hard Labor Creek, Greenwood, S. C	100
Seneca River, Anderson, S. C	100
Owens Millpond, Bennettsville, S. C	200
Headwaters Saluda River, Laurens, S. C	100
North Edisto River, Lightwood, S. C	150
South Edisto River, Whaleys, S. C	150
Applicants in South Carolina	650
Lake Edgemont, Edgemont, S. Dak	100
Lake Chilhomer, Dover, S. Dak	300
Artesian Lake, Chamberlain, S. Dak	500
Big Sioux River, Baltic, S. Dak	300
Flandreau, S. Dak	300
Canton, S. Dak	300
Spring Lake, Ardmore, S. Dak	300
Lake Hendrike, White, S. Dak	500
Spirit Lake, Desmet, S. Dak	225
Lake Henry, Desmet, S. Dak	225
Lake Poinset, Estelline, S. Dak	300
Artesian Lake, Hitchcock, S. Dak	300
Lake Andes, Armour, S. Dak	300
Lakes Madison and Herman, Madison, S. Dak	600
Blue Dog Lake, Wambay, S. Dak	400
Logan Lake, Mitchell, S. Dak	300
Lake Andes, Greenwood, S. Dak	300
Reservoir, Hitchcock, S. Dak	300
Lake Kamposka, Watertown, S. Dak	600
Punished Womans Lake, South Shore, S. Dak	125
Round Lake, South Shore, S. Dak	375
Reservoir, Fulton, S. Dak	150
James River, Mitchell, S. Dak	300
Spring Lake, Bonilla, S. Dak	300
Lake Artesian, Newark, S. Dak	300
Spring Lake, Springfield, S. Dak	200
Lake Campbell, Brookings, S. D	500
Swan Lake, Hurley, S. D	300
Applicants in South Dakota	500
Big Creek, Del Rio, Tenn	100
Doe River, Elizabethton, Tenn	175
Pistol Creek, Maryville, Tenn	300
Caney Fork River, Walling, Tenn	75
Sulphur Fork Creek, Cedar Hill, Tenn	100
North Chickamauga Creek, Chattanooga, Tenn	150
South Chickamauga Creek, Chattanooga, Tenn	125
Lookout Creek, Chattanooga, Tenn	125
Yellow Creek, Rockwood, Tenn	100
Hickory and Barren creeks, Viola, Tenn	175
Little River, Maryville, Tenn	300
Holston River, Side, Tenn	200
Camp Creek, Greenville, Tenn	150
Little Pigeon River, Knoxville, Tenn	300
Hickory Creek, McMinnville, Tenn	200
Charles Creek, Yeager, Tenn	100
West Fork of Forked Deer River, Jackson, Tenn	2,700
Tennessee River, Perryville, Tenn	200
Little Sequachee River, Sequachee, Tenn	175
Applicants in Tennessee	825
Woodlake, Marshall, Tex	30
Dairy Lake, Cisco, Tex	100
Spring Lake, Cisco, Tex	150
Waterworks Lake, Lufkin, Tex	150
Lytle Lake, Abilene, Tex	300
Lake Blanche, Austin, Tex	200
Medina River, Lacoste, Tex	200
Spring Lake, Dallas, Tex	150
Gatesville, Tex	100
Evans Lake, Odessa, Tex	100
Cyball's Creek, Bourne, Tex	150
Sabinas Creek, Bourne, Tex	150
Black bass—Continued.	
Willbern's Lake, Llano, Tex	400
Bold Springs, West, Tex	165
Penitentiary reservoir, Rusk, Tex	100
Leon and Salt Creeks, Marathon, Tex	200
Guadalupe River, Guahl, Tex	650
Kerrville, Tex	2,753
Comfort, Tex	67
Willard's Lake, Corrigan, Tex	150
Pecan Creek, San Angelo, Tex	600
Little Brazos River, Hearne, Tex	100
Myers Pond, San Angelo, Tex	150
Spring Creek, San Angelo, Tex	300
Millpond, Southmayde, Tex	30
Old Brazos River, Hearne, Tex	100
Guadalupe River, Cuero, Tex	5,100
Waring, Tex	133
Lipan Creek, San Angelo, Tex	300
Mill Pond, Gainesville, Tex	30
Mill Pond, Ben Arnold, Tex	100
Las Almos Lake, Taylor, Tex	100
Little Rocky Creek, Shiner, Tex	100
Santa Rosa Lake, Monahans, Tex	100
Salado River, San Antonio, Tex	300
Ackerman Lake, Cameron, Tex	10
Paton Lake, Round Rock, Tex	50
Flag Lake, Thornton, Tex	50
Millpond, Point, Tex	30
Water Valley Lake, San Angelo, Tex	250
North Concho River, San Angelo, Tex	400
Asylum Pond, Terroll, Tex	50
Burnette Lake, Wichita Falls, Tex	100
Cold Creek, San Angelo, Tex	300
South Concho River, San Angelo, Tex	800
M., K. & T. R. R. Lake, Leonard, Tex	200
Large Lake, Denison, Tex	150
Llano River, Llano, Tex	500
Washita River, Canadian, Tex	450
Spring Lakes, Canadian, Tex	450
Sweetwater Creek, Miami, Tex	200
Davis Lake, West, Tex	15
Lake McDonald, Austin, Tex	2,500
Brazos River, near Waco, Tex	2,125
North Bosque River, Waco, Tex	100
Navasota River, Groesbeck, Tex	100
Ennis Lake, Ennis, Tex	50
Lake Eloise, Waco, Tex	350
North Creek Lakes, Canadian, Tex	100
La Mota Springs, Marfa, Tex	150
Spring Creek, Miami, Tex	200
McClellan Creek, Miami, Tex	100
Coneyboy Creek, Miami, Tex	100
Lake Thorn, Long View, Tex	300
Cuero Creek, Cuero, Tex	200
Kuykendall Creek, Taylor, Tex	100
Fairland Lake, Brownwood, Tex	300
Spring Lake, Loraine, Tex	300
Lake Park Lake, Tyler, Tex	200
Horseshoe Lake, Cuero, Tex	100
Mason Lake, Kemp, Tex	100
Lake Gibbons, Paris, Tex	200
Oak Lake, Waco, Tex	100
Spring Lake, Tyler, Tex	300
Marcado Creek, Victoria, Tex	200
Lost Creek, Jacksboro, Tex	200
Groesbeck Creek, Quanah, Tex	300
Bear Creek, Vernon, Tex	200
Casino Creek, Tascosa, Tex	300
Ranch Creek, Tascosa, Tex	300
Piscaqua Creek, Tascosa, Tex	300
Spring Lake, Sherman, Tex	200
Paluxy River, Bluffdale, Tex	1,000
Clear Fork Brazos River, Cisco, Tex	400
Clear Fork Brazos R., Jacksboro, Tex	600
Elm Fork Brazos R., Jacksboro, Tex	200
Elm Creek, Seymour, Tex	342
Millers Creek, Seymour, Tex	341
Spring Creek, Seymour, Tex	114
Spring Lake, Corsicana, Tex	100
Llano, Tex	300

Details of distribution—Continued.

Species and disposition.	Adults and yearlings.
Black bass—Continued.	
Colorado River, Smithville, Tex	5,000
Hills Lake, Longview, Tex	1,000
Leon River, Gatesville, Tex	1,000
San Saba River, San Saba, Tex	1,000
Sabine River, Mineola, Tex	600
Brazos River, San Felipe, Tex	5,000
Colorado River, Colorado, Tex	2,300
Iatan Lake, Iatan, Tex	1,000
Sulphur Draw Lake, Big Springs, Tex	1,000
San Antonio River, San Antonio, Tex	500
Frio River, near Dilley, Tex	2,000
Nueces River, Cotulla, Tex	2,500
Little River, near Temple, Tex	2,500
Bosque River, near Waco, Tex	3,000
Pecan Creek, Brownwood, Tex	700
Trinity River, near Palestine, Tex	4,600
Fort Worth, Tex	1,500
Dallas, Tex	1,500
Medina River, Medina, Tex	1,400
Applicants in Texas	17,660
Green River, Green River, Utah	100
Newton Pond, Wilmington, Vt	200
Salem Pond, Newport, Vt	100
Sabin Pond, Plainfield, Vt	100
Black Creek, Sheldon, Vt	100
Castle Creek, Arrington, Va	100
Grassey Creek, Clarksville, Va	100
James River, Lynchburg, Va	200
Millpond, Houston, Va	400
Three Otters Lake, Bedford City, Va	225
Bannister R., Franklin Junction, Va	100
Rappahannock River, Remington, Va	200
Goose Creek, Delaplain, Va	200
Falling River, Lynchburg, Va	200
Tye River, Tye River Station, Va	200
Cedar Creek, Oranda, Va	200
Robinson River, Rapidan, Va	200
North Anna River, Mineral City, Va	200
Roanoke River, Salem, Va	200
Rapidan River, Orange, Va	200
Jackson's River, Hot Springs, Va	100
Lake Kilby, Suffolk, Va	150
Cedar Creek, Cedar Creek, Va	300
Cowpasture River, Millboro, Va	300
Cherry Lake, Hardware, Va	100
Craig's Creek, Newcastle, Va	200
Mill Creek, Whittles, Va	100
Flat Creek, Lawyers, Va	100
Banister River, Houston, Va	200
Ice Pond, Haymarket, Va	100
Appomattox River, Petersburg, Va	200
Jones Millpond, Blackstone, Va	300
Baxter Pond, Petersburg, Va	200
Maple Pond, Burkeville, Va	100
Big Otter River, Bedford City, Va	200
James River, Big Island, Va	200
Millpond, Locustville, Va	50
Boulden Creek Millpond, Ridgway, Va	100
Broad Run, Bristow, Va	200
Millpond, Carson, Va	200
Middle Fork Holston R., Marion, Va	200
Ice Pond, Ellerson, Va	100
Saunders Pond, Williamsburg, Va	300
Millpond, Ninds, Va	300
Clinch River, Swords Creek, Va	200
Applicants in Virginia	3,400
American Lake, Tacoma, Wash	75
Morton Lake, Tacoma, Wash	95
Orfutts Lake, Tenino, Wash	145
Rock Lake, Winona, Wash	365
Applicants in Washington	295
Big Grave Pond, Elm Grove, W. Va	300
Wheeling Creek, Wheeling, W. Va	1,100
Deckers Creek, Morgantown, W. Va	600
West Fork Creek, Clarksburg, W. Va	500
Loop Creek, Glenjean, W. Va	225
Tygarts Valley River, Elkin, W. Va	500
Twelve-Pole River, Lavalette, W. Va	500
Black bass—Continued.	
Shenandoah River, Rippon, W. Va	300
Shenandoah R., Charlestown, W. Va	150
Greenbrier River, Caldwell, W. Va	375
Big Grave River, Moundsville, W. Va	500
Bartlett Lake, Parkersburg, W. Va	500
Spring Lake, Terra Alta, W. Va	500
Wheeling River, Elm Grove, W. Va	250
Applicants in West Virginia	550
Lake Winnebago, Oshkosh, Wis	85
South Park Lake, Sheridan, Wyo	40
Artificial Lake, Orin Junction, Wyo	50
Applicants in Wyoming	35
Total	208,938
Small-mouth black bass:	
Maquoketa River, Manchester, Iowa	26
State Fish Commission, Druid Hill Park, Md	10
Shenandoah R., Charlestown, W. Va	150
Total	186
Crappie:	
D. C. Riggs's pond, Seymour, Conn	100
Wyoming Lake, Wyoming, Del	100
E. G. Shortlidge, Wilmington, Del	200
Brier Creek, Waynesboro, Ga	100
Middle Oconee River, Athens, Ga	300
Millpond, Cuthbert, Ga	100
Little Cedar Millpond, Rome, Ga	100
Sealys Pond, Cuthbert, Ga	200
Swamp Creek, Jasper, Ga	400
Millpond, Graves Station, Ga	100
Flint River, Albany, Ga	200
Beaver Creek, Zenith, Ga	100
Tallapoosa River, Carrollton, Ga	100
Butler's Millpond, Cuthbert, Ga	50
Muckalee Creek, Americus, Ga	100
Applicants in Georgia	97
Gage Lake, Grayslake, Ill	1,600
Highland Park Lake, Galesburg, Ill	800
Iroquois Pond, Charlestown, Ind	150
Sylvan Lake, Rome City, Ind	300
Sugar Creek, Crawfordsville, Ind	200
Big Indian Creek, Mott, Ind	300
Lake Maxinkuckee, Culver, Ind	500
White River, Noblesville, Ind	300
Applicants in Indiana	100
Torg Lake, Louisville, Ky	100
Kinnikinnick River, Vanceburg, Ky	300
Paradise Lake, Paducah, Ky	200
Clear Creek, Wildie, Ky	300
East Side Lake, St. Charles, Ky	200
Applicants in Kentucky	200
Youghiogheny River, Swanton, Md	200
Potomac River, Woodmont, Md	500
Patuxent River, Sandy Springs, Md	200
Park Lake, Tupelo, Miss	260
Spring Lake, La Belle, Mo	100
Susquehanna River, Selins Grove, Pa	50
Spring Lake, Roaring Springs, Pa	50
Wyoming Creek, Reading, Pa	50
Cartright Lake, East Stroudsburg, Pa	100
Conococheague Creek, Greencastle, Pa	100
Cordorus Creek, Emigsville, Pa	75
Big Conewago Creek, Emigsville, Pa	75
Conedogwinit Creek, Carlisle, Pa	100
Juniata River, Altoona, Pa	50
Lake Maylulie, Cresson, Pa	100
Shawanese Lake, Outlet Station, Pa	50
Roaring River, Altoona, Pa	50
Schuylkill River, Birdsboro, Pa	50
North Witmer Run, Berwindale, Pa	100
Clarion River, Ridgway, Pa	50
City Reservoir, Washington, Pa	50
Conestoga Creek, Lancaster, Pa	50

Details of distribution—Continued.

Species and disposition.	Adults and yearlings.
Crappie—Continued.	
West Branch of Brandywine Creek, Modena, Pa	50
Luthers Pond, Troy, Pa	50
Saylor Lake, Bethlehem, Pa	200
Schuylkill River, Norristown, Pa	150
Allegheny River, Thompson, Pa	75
Susquehanna River, Halls, Pa	125
French Creek, St. Peter, Pa	50
Susquehanna River, Meehoopany, Pa	50
Indian Creek, Macungie, Pa	50
Water Co. Reservoir, Altoona, Pa	50
Forest Lake, East Stroudsburg, Pa	100
Applicants in Tennessee	200
Willow Lake, Pittsburg, Tex	25
Marcado Creek, Victoria, Tex	25
Meadow Brook, Waco, Tex	25
Saline Creek Lake, Tyler, Tex	25
Dallas Fishing Club Lake, Dallas, Tex	40
Lake Eloise, Waco, Tex	50
West Fork Trinity River, Fort Worth, Tex	18
Clear Fork Trinity River, Fort Worth, Tex	36
Guadalupe River, Kerrville, Tex	25
Medina River, Medina, Tex	50
San Felipe Creek, Del Rio, Tex	25
Cleveland Lake, Sugarland, Tex	25
Lytle Lake, Abilene, Tex	10
Tucker Lake, Tyler, Tex	25
Reservoir, Beeville, Tex	25
Lake Park Lake, Tyler, Tex	25
Bold Springs, West, Tex	50
Pine Lake, Palestine, Tex	25
Willard Lake, Willard, Tex	25
Applicants in Texas	470
Saunders Pond, Williamsburg, Va	100
Applicants in Virginia	150
Shenandoah R., Charlestown, W. Va	150
Wheeling River, Elm Grove, W. Va	1,000
Total	13,041
Rock bass:	
Spring Branch, Birmingham, Ala	65
Applicants in Alabama	300
Oak Creek, Jerome, Ariz	100
S. F. & P. R. R. Reservoir, Williams, Ariz	500
Silver Pond, Benson, Ariz	150
Applicants in Arizona	100
Arkansas	100
Spring Lake, Cayuga, Ind	100
Iroquois Pond, Charlestown, Ind	100
Horseshoe Lake, Wynnwood, Ind. T	300
Applicants in Indian Territory	200
Honey Creek, Manchester, Iowa	300
Crystal Lake, DeWitt, Iowa	400
Applicants in Iowa	100
Forest Lake, Bonner Springs, Kans	100
Buckner Creek, Jetmore, Kans	400
Spring Creek Lake, Meade, Kans	100
Plum Creek, Phillipsburg, Kans	200
Crow Creek, Phillipsburg, Kans	200
Eureka Lake, Manhattan, Kans	100
Deep Creek, Manhattan, Kans	100
Labette Creek, Erie, Kans	200
Tuttle Creek, Manhattan, Kans	100
Applicants in Kansas	7,500

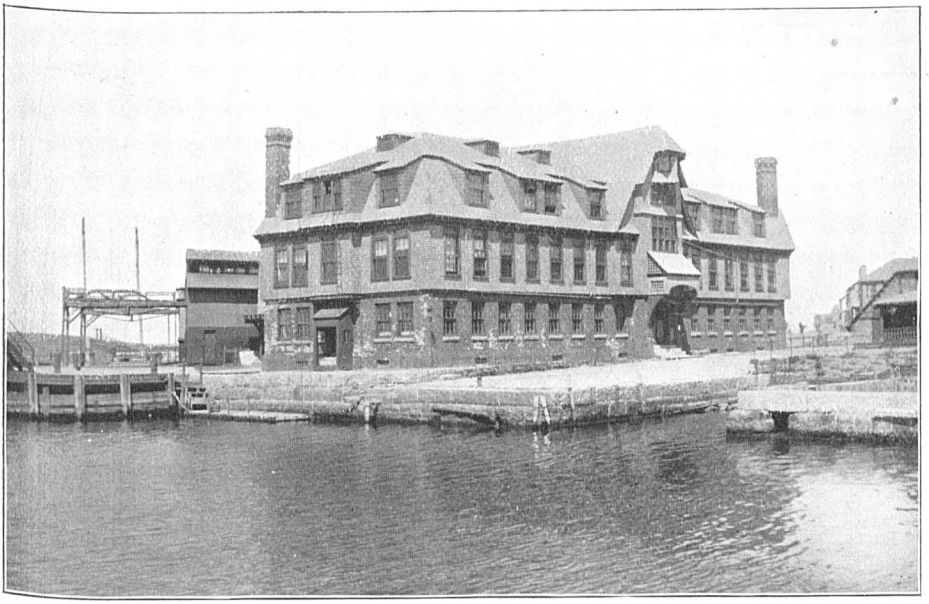
Species and disposition.	Adults and yearlings.
Rock bass—Continued.	
McKenna Lake, Taylorsville, Ky	100
Applicants in Kentucky	175
Lake Tasse, Cypremont, La	200
Grand Cote Lake, Cypremont, La	200
Tangipahoa River, Ponchatoula, La	500
Inland Lake, Jeanerette, La	200
Applicants in Louisiana	700
Van Etton Lake, Au Sable, Mich	500
Applicants in Michigan	250
Swan Lake, Shuqualak, Miss	200
Spring Lake, Macon, Miss	200
Millpond, Shuqualak, Miss	150
Applicants in Mississippi	815
Cut-Off Lake, Brunswick, Mo	100
Spring City Lake, Joplin, Mo	40
Applicants in Missouri	800
Spring Lake, Watrous, N. Mex	200
Applicants in Ohio	200
Oklahoma	900
West Branch of Susquehanna River, Milton, Pa	200
Codorus Creek, Emigsville, Pa	100
Big Conewago Creek, Emigsville, Pa	100
Lake Rowena, Cresson, Pa	200
Beech Lake, Honesdale, Pa	200
Applicants in Pennsylvania	400
Sioux River, Sioux Falls, S. Dak	25
Crooked Creek, Maryville, Tenn	138
Buffalo River, Perryville, Tenn	100
Applicants in Tennessee	1,000
Caloway Lake, Arlington, Tex	200
Wendemire Lake, Waco, Tex	400
Elm Lake, Cameron, Tex	300
Canyon Lake, Cisco, Tex	25
Spring Lake, Cisco, Tex	300
Lake Wallace, Cisco, Tex	200
Clear Fork Trinity River, Fort Worth, Tex	285
Spivey Lake, Kerens, Tex	25
Lake Como, Brenham, Tex	100
Blue Spring, Argyle, Tex	100
Spring Lake, Mount Pleasant, Tex	100
Lytle Lake, Abilene, Tex	15
Indian Lake, Palestine, Tex	200
Spring Lake, Palestine, Tex	200
Catfish Lake, Tyler, Tex	100
Reservoir, Beeville, Tex	100
Spring Lake, Tyler, Tex	200
Pine Lake, West, Tex	15
Cleveland Lake, Sugarland, Tex	100
Rider Lake, Weatherford, Tex	100
Old Brazos River, Hearne, Tex	200
Spring Lake, Alvarado, Tex	100
Goodnight Lake, Kerens, Tex	25
Ackerman Lake, Cameron, Tex	20
Spring Lake, Hillsboro, Tex	200
Pinnell Lake, Weatherford, Tex	225
Davis Lake, West, Tex	15
Ennis Lake, Ennis, Tex	25
Applicants in Texas	4,609
Total	29,192
Strawberry bass:	
Little Prairie Creek, Newburg, Mo	100
Spring City Lake, Joplin, Mo	160
Applicants in Missouri	50
Total	310

Details of distribution—Continued.

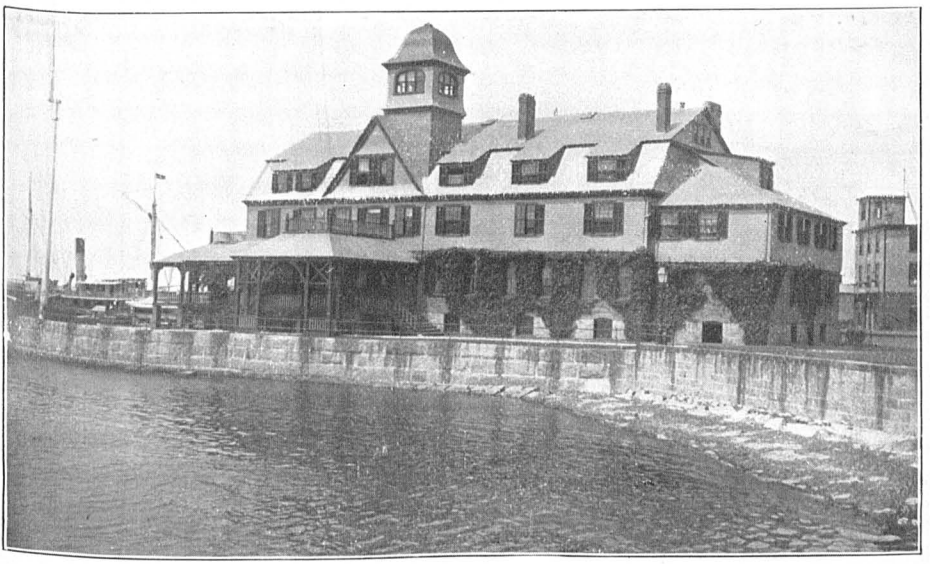
Species and disposition.	Fry and fingerlings.
Cod:	
Vineyard Sound, off—	
Jobs Neck, Mass	16,698,000
Tarpaulin Cove, Mass	14,292,000
Robinsons Hole, Mass	17,823,000
Gayhead, Mass	13,536,000
Woods Hole, Mass	608,000
Quicks Hole, Mass	3,408,000
Cuttyhunk, Mass	2,605,000
Nashawena Island, Mass	2,272,000
Cedar Tree Neck, Mass	478,000
Nonamesset Island, Mass	1,559,000
Massachusetts Bay—	
Gloucester, Mass.[1]	41,003,000
Magnolia, Mass	3,084,000
Provincetown Harbor, Mass	2,404,000
Massachusetts coast waters, Rockport, Mass	10,928,000
Ipswich Bay, Rockport, Mass	9,305,000
Eel Pond, Woods Hole, Mass	2,266,000
Atlantic coast waters—	
Gloucester, Mass	18,840,000
Rockport, Mass	23,285,000
Woods Hole Harbor, Mass	14,194,000
Total	198,588,000
Pollock:	
Massachusetts Bay, Gloucester, Mass	834,000
Flat-fish:	
Woods Hole Harbor, Mass	36,098,000
Eel Pond, Woods Hole, Mass	1,228,000
Buzzards Bay, Woods Hole, Mass.	6,312,000
Quissett Harbor, Quissett, Mass.	2,391,000
Cuttyhunk Pond, Gosnold, Mass.	2,200,000
Greenwich Bay, East Greenwich, R. I	4,212,000
Total	52,441,000
Lobster:	
Fisher Island Sound, off—	
Noank, Conn	1,962,000
Stonington, Conn	1,540,000
Fisher Island, Conn	2,215,000
Gulf of Maine, off Wood Island, Me	1,000,000
Casco Bay—	
Northeast side Pumpkin Knut, Me	1,200,000
Off Long Island, Me	2,400,000
Diamond Island, Me	2,400,000
Peak Island, Me	1,200,000
Orr Island Me	600,000
Wells Strait, Me	600,000
Off Ram Island, Me	1,200,000
Cousin Island, Me	1,200,000
Little John Island, Me	1,200,000
Chebeag Island, Me	1,200,000
Pemequid Bay, off Burnt Island, Me	1,500,000
Boothby Harbor, off Mouse Island, Me	500,000
Gulf of Maine, off Damascove Island, Me	600,000
Linekin Bay (eastern part), Me	600,000
Gulf of Maine, off—	
Petitmanan Island, Me	200,000
Beal Island, Me	200,000
Great Wass Island, Me	200,000
Libby Island, Me	200,000
Portland, Me	2,525,000
Atlantic Ocean—	
Off Kittery Point, Me	1,200,000
York Harbor, Me	1,200,000
Wheeler Bay, off High Island, Me	400,000
Seal Harbor, off Spruce Head, Me	800,000
Muscle Ridge Channel, off Ash Island, Me	500,000

Species and disposition.	Fry and fingerlings.
Lobster—Continued.	
Penobscot Bay, off—	
Long Island, Me	1,500,000
Metinick Island, Me	900,000
East Penobscot Bay, off Deer Island, Me	200,000
Muscongus Sound, off Harbor Island, Me	900,000
Blue Hill Bay—	
Swan Island Harbor, Me	200,000
North Point, Long Island, Me	200,000
Frenchman Bay, off—	
Southeast shore of Baker Island, Me	200,000
North Point, Schoodic Island, Me	200,000
Prospect Harbor, off light-house in outer Prospect Harbor, Me.	200,000
Moosabec Reach (western entrance), Me	200,000
Bay of Fundy, off Eastport wharf, Me	200,000
Atlantic Ocean—	
Off York Harbor, Me	2,400,000
Low Eddy, York Harbor, Me.	1,200,000
Buzzards Bay—	
Gosnold, Mass	620,000
Off Long Neck, Mass	702,000
New Bedford, Mass	484,000
Uncatina Island, Mass	867,000
Weepecket Island, Mass.	1,899,000
Cuttyhunk, Mass	2,540,000
Black Rock, North Ledge, Mass	811,000
Hadley Harbor, off—	
Gosnold, Mass	123,000
Nanshon Island, Mass	522,000
Woods Hole Harbor, Mass	1,164,000
Vineyard Sound—	
Lackeys Bay, Mass	1,622,000
Menemsha Bight, Mass	548,000
Off Can Buoy, Mass	2,000,000
Cedartree Neck, Mass	3,152,000
Great Harbor, Mass	2,207,000
Nobska Point, Mass	723,000
Gosnold, Mass	410,000
Massachusetts Bay—	
Gloucester, Mass	12,525,000
Off Manchester, Mass	2,420,000
Boston, Mass	1,750,000
Hospital Point, Beverley, Mass	770,000
Provincetown Harbor, off Cape Cod, Mass	1,110,000
Massachusetts coast waters, Gloucester, Mass	1,150,000
Wellfleet Harbor, Wellfleet, Mass.	1,107,000
Plymouth Harbor, Plymouth, Mass	1,232,000
Woods Hole Harbor, off Grassy Island, Mass	1,728,000
Scituate Harbor, Scituate, Mass.	1,038,000
Cape Cod Bay, Monomet, Mass.	1,110,000
Atlantic Ocean, Gloucester, Mass.	3,000,000
Atlantic coast waters off—	
Gloucester, Mass	1,590,000
Rockport, Mass	2,500,000
Rockport Harbor, off Rockport, Mass	3,100,000
Gloucester Harbor, off Gloucester, Mass	1,255,000
Boston Harbor, off Boston, Mass.	1,750,000
Ipswich Bay, off Gloucester, Mass.	1,875,000
Atlantic Ocean, Newcastle, N. H.	3,600,000
Newport Harbor, Newport, R. I.	1,150,000
Wickford Harbor, Wickford, R. I.	755,000
Narragansett Bay, Wickford, R. I.	755,000
Sakonnet River, off Sakonnet Point, R. I	1,157,000
Total	108,463,000

[1] 9,669,000 eggs were planted at this point.



LABORATORY, HATCHERY, AQUARIUM, AND MUSEUM, U. S. FISH COMMISSION, WOODS HOLE, MASS.



RESIDENCE, U. S. FISH COMMISSION, WOODS HOLE, MASS.