

6.—THE WORK OF THE UNITED STATES FISH COMMISSION FROM DECEMBER 1, 1896, TO NOVEMBER 3, 1897.

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The following is a summary of the work accomplished by the United States Commission of Fish and Fisheries since December 1, 1896:

At that time the cod-spawning season on the Atlantic coast had just opened, and operations were being conducted, as usual, at the Gloucester and Woods Hole stations, Mass.; auxiliary stations having been established at Kittery Point, Me., and at Duxbury, Mass., for the collection of eggs from fish captured by the commercial fishermen. As a result of the season's operations, 180,000,000 eggs were collected, from which 98,000,000 fry were liberated on the natural spawning-grounds along the coast of Massachusetts. The results secured were 40,000,000 in excess of the previous year. Attention is particularly called to the method adopted of planting the fry on the natural spawning-grounds instead of liberating them in the immediate vicinity of the stations, where less favorable conditions of food, temperature, etc., prevailed.

At the completion of the cod work the propagation of the flatfish (winter flounder) was undertaken at Woods Hole, Mass., on a much larger scale than heretofore; as evidenced by an output of over 64,000,000 of fry from a total collection of 80,000,000 eggs, 69,000,000 in excess of the previous year.

To further extend the propagation of the lobster, the most important crustacean in the waters of the United States, which is now rapidly decreasing in numbers, it was arranged not only to cover the region in the vicinity of Woods Hole and Gloucester, but also to make systematic collections from fishermen operating on the entire coast between Rockland, Me., and Noank, Conn. The schooner *Grampus* was utilized on the Maine coast for the collection of eggs and the liberation of fry; and the steamer *Fish Hawk* was employed as a floating hatchery at Casco Bay. Agents were stationed at Kittery, Me.; Boston, Plymouth, and New Bedford, Mass., and at points in Connecticut, who collected the egg lobsters and held them in live-boxes until called for by launches and vessels from the Gloucester and Woods Hole stations. As a result of this extension of the work, notwithstanding the poor catch, over 128,000,000 eggs were secured, producing 115,000,000 fry; an increase of 20,000,000 over the number obtained the preceding year.

During the spring and summer particular attention was paid to the food, habits, and growth of the young lobster; and much valuable information was obtained at Woods Hole, where extensive experiments were conducted in the holding of the fry during the larval stages. The experiments indicate that, under natural conditions, the young lobster is much less a cannibal than has been believed, eating his fellows

only when natural food is not available. There is reason to doubt whether it lives for the most part at the surface of the water; observations have shown the young as often at the bottom and at the middle depth of the aquarium as at the surface. Reports from various sections along the coast of Massachusetts show that young lobsters are abundant; from ten to twenty, 2 to 4 inches in length, have been frequently found in a single trap. The number caught during the past season is unprecedented, and the abundance is credited to the plants made by this Commission. It is believed that if the work is continued on the same scale as in the past few years this declining fishery will be fully reestablished.

In pursuance of the plan outlined in my previous report, of testing the value for shad propagation of certain rivers along the south Atlantic coast, prior to the establishment of auxiliary hatcheries, careful observations on the movements, food, and growth of the young shad in various streams were made during the winter by scientific assistants. In February and early March the steamer *Fish Hawk* was stationed on the St. Johns River. Later in March the steamer proceeded north to Albemarle Sound, where work was undertaken at the mouth of the Chowan River with such favorable results that over 27,000,000 shad eggs were collected. This, with the collections on the Potomac, Susquehanna, and Delaware rivers, made an aggregate of over 203,000,000 for the season's work, an increase of 55,000,000 over the year preceding. With the establishment of auxiliary stations at a few points along the Atlantic coast there is little doubt, after this year's experience, that the work can be largely increased.

The lake fisheries have also received particular attention; and although, owing to restrictive legislation, the field for the collection of lake trout and whitefish eggs has been confined to Lakes Superior, Erie, and Ontario, a larger collection than in the past is anticipated, as arrangements have been made, in addition to the usual method, to pen several thousand adult whitefish in Lake Erie, with a view to stocking the hatcheries in the upper lakes.

Arrangements have also been made for increasing the production of landlocked salmon by opening an additional station on Grand Lake Stream, Maine. Owing to the partial failure in the catch of Atlantic salmon during the past spring, when the brood fish were collected for the fall work, it is doubtful whether the collection of eggs this year will exceed 3,000,000.

The trout stations in the various sections of the country have made fair collections of eggs, and though the season is not as yet sufficiently advanced for definitely determining the output, there is little doubt that all past seasons will be exceeded. During the spring and fall the usual distributions of yearling bass and crappie were made, and a carload of tautog was sent to the Pacific and planted off the Farallone Islands.

The system of auxiliary stations inaugurated on the Pacific Coast last year, for increasing the output of salmon, has been further extended, so that the collections this season will probably double the phenomenal take of last year. Operations are now being conducted at the Baird, Battle Creek, and Fort Gaston stations, California; on the Clackamas, Rogue, and Salmon Rivers in Oregon, and on the Little White Salmon River in Washington. The results already achieved show the following increased collections:

Clackamas, 6,000,000, against 1,000,000 in 1896.

Little White Salmon, 12,600,000, against 2,125,000 in 1896.

Baird Station, 7,000,000, against 4,000,000 in 1896.

The following table shows the number of eggs of nine of the important species collected during the period under consideration.

Species.	Annual collections of eggs.			Increase over 1895.
	1897.	1896.	1895.	
Cod.....	180,000,000	140,000,000	140,000,000	40,000,000
Flatfish.....	80,000,000	11,000,000	9,263,000	70,737,000
Lobsters.....	128,000,000	105,000,000	82,000,000	46,000,000
Shad.....	203,000,000	148,000,000	118,000,000	85,000,000
Lake trout.....	* 16,000,000	16,000,000	16,400,000
Whitefish.....	* 200,000,000	125,000,000	234,000,000
Atlantic salmon.....	* 2,800,000	2,800,000	983,000	1,817,000
Landlocked salmon.....	* 1,000,000	824,000	100,000	900,000
Quinnat salmon.....	* 75,000,000	37,000,000	10,000,000	65,000,000

* Season not over; number estimated.

The total output of artificially-hatched fishes in the United States at the present time amounts to over one billion annually. This is about five times as great as the combined production of all Europe.

To further test the feasibility of the introduction of quinnat salmon in eastern waters, 5,000,000 eggs were transferred from the Battle Creek Station, California, during the fall of 1896, and as a result 4,000,000 fry were liberated during the past spring in the St. Lawrence, Hudson, and Delaware rivers in New York State, and in the Penobscot and Union rivers in the State of Maine. In addition to these plants, 250,000 fry were retained to rear as yearlings for liberation in the Penobscot River during the present fall.

The acclimatization of the steelhead trout in eastern waters was continued, and as a number of specimens have already been captured in the tributaries of Lake Superior, there is little doubt that this valuable game and food fish will be added to the food supply of this section of the country.

Owing to the wide territory over which distributions are made, it is impracticable, except in a very small proportion of cases, to obtain exact information as to the results secured. Reports are forwarded by agents of the Commission in the field, by correspondents who have been interested in the introduction of fishes in certain waters, and by the State fish commissions, as to the results of plants made under their jurisdiction. From these sources assurance has been received of the successful introduction of the Atlantic salmon in the Hudson and Delaware rivers, numbers of specimens averaging 12 pounds in weight having been captured in New York Bay, while fully 300 were reported to have been taken in the Delaware River during the season of 1895. The rainbow trout, native only to the mountain streams of the Pacific Coast, has been successfully acclimatized in nearly every State east of the Rocky Mountains. Reports from all sections of the country indicate the successful establishment of the large-mouth black bass in streams hitherto unoccupied by them. An introduction of both species of the crappie into the Potomac River has resulted from a small plant made by this Commission in 1894. As an indication of their abundance, it may be stated that 4,000 crappie, weighing between $\frac{1}{2}$ and 2 pounds, were removed from the Chesapeake and Ohio Canal during the month of March and liberated in the Potomac. Considerable numbers have also been taken in the vicinity of Analoetan Island, near the mouth of Little River, opposite Washington, D. C.

The scientific work of the Commission has an important bearing on the artificial increase of food-fishes, and is carried on with a view to determine the best methods to be pursued in fish-culture, to ascertain the results of fish propagation, and to study the habits, migrations, growth, food, enemies, and diseases of fishes.

The recent marked development of the fisheries of the southern California coast makes it desirable that the extent, location, and resources of the principal fishing-banks be accurately determined. Accordingly, in the spring of 1897 the steamer *Albatross* conducted preliminary investigations on parts of that coast, having for their special object the pointing out of the possibilities for an extension of the offshore fisheries. This work will be continued until the fishing-grounds of the coast are thoroughly surveyed.

In the summer of 1897, the *Albatross* entered on an examination of the salmon streams of Alaska. No systematic study of the salmon in different parts of this Territory has heretofore been undertaken, and important results are expected from the researches begun this season. The very active prosecution of the fisheries in certain streams threatens to seriously reduce the supply unless effective measures are taken to overcome the destruction. The conditions are so various along the 3,000 miles of the Alaskan coast on which the salmon fishing is done that no general protective law can be framed that will apply to all regions; the determination of the proper restrictive measures for the different streams thus becomes an important matter. The inquiries progressed very satisfactorily this season and will be resumed next year.

Extended surveys of the streams and lakes in the Pacific States have been in progress, having for their object the study of the abundance, spawning habits, and spawning-grounds of the salmon and other fishes, and the examination of available sites for hatcheries.

In conjunction with the efforts to increase the mackerel supply on the New England coast by artificial propagation, important studies were conducted relative to the development of the mackerel egg and its natural distribution at the surface of the ocean by winds and tides.

At Woods Hole, Mass., the Commission has, in addition to the hatchery, a laboratory and a large, well-equipped residence building erected for the accommodation of those who are allowed the privilege of the laboratory for scientific research. During the past summer there was begun the organization of a corps of trained scientific experts who, under the direction of the chief of the Division of Scientific Inquiry of the Commission, should pursue a concerted line of research bearing directly on the habits and life-history of the commercial fishes and pertinent to the practical work of the Commission. This plan promises to be very successful, and it is believed will give to the Government a practical biological institution of great value.

Canvasses of the commercial fisheries in their statistical and other aspects have been carried on throughout the country. In order that this information may be accurately obtained and made promptly available, a plan has been adopted of locating statistical agents of the Commission at important centers where each can give attention to a certain district. From the reports received from these agents special bulletins relating to the conditions of the fishery industries are issued to those engaged in the business and to the various boards of trade, and in a like manner monthly bulletins are issued, giving the quantity and value of the catch landed at certain important

ports. This system has received general commendation, and will be extended to embrace all centers of the fishing trade. At the end of each year these statistics will be issued in complete form, and comprehensive and reliable data will be thus at once made available.

In the general deficiency bill approved July, 1897, \$4,216 was appropriated for the completion of the Manchester, Iowa, station; \$1,800 for the San Marcos, Texas, station; \$2,500 for the construction of a dwelling at the St. Johnsbury, Vermont, station; also \$10,000 for rebuilding the cars Nos. 1 and 3, and \$500 for the investigation and selection of a fish-cultural station in the State of Georgia. The Manchester station has been completed and thoroughly equipped, and is ready for operation. The necessary improvements have been made at the San Marcos station, and work at St. Johnsbury on the superintendent's residence is now in progress. Cars Nos. 1 and 3 have been thoroughly rebuilt and refitted with all modern appliances. A careful investigation has also been made of a number of available sites recommended for a fish-cultural station in the State of Georgia, and a full report thereon will be submitted to Congress. Further investigations with reference to the selection of a fish-cultural site in the State of New Hampshire, authorized by act approved March 2, 1895, have been made and a site selected. As soon as the property has been acquired the construction of the station will be undertaken as appropriated for in the sundry civil bill approved June 4, 1897.

An appropriation of \$10,000 for the establishment of a fish-cultural station in the State of South Dakota having been made on June 30, 1896, an examination of localities favorably considered by my predecessor was commenced in December, 1896. A site at Spearfish was favorably reported upon; but as this examination had been conducted during the winter months it was determined, before a final decision was reached, to make further investigation during the following summer. This resulted in the selection of Spearfish, and steps have been taken to acquire the property. As soon as the titles have been passed upon by the Attorney-General the construction of the station will be commenced.

The station provided for in the State of Tennessee, by act approved August 18, 1894, was located in Unicoi County, near Erwin, after an examination of numerous sites throughout the State. The hatchery, residence, and outbuildings have all been constructed and the ponds are partially complete. Arrangements are being made to collect the necessary brood fish, and the station will be in operation by the close of November 3.

U. S. COMMISSION OF FISH AND FISHERIES,
Washington, D. C., November 3, 1897.