

R E P O R T
OF THE
UNITED STATES COMMISSIONER OF FISH AND FISHERIES
FOR THE
FISCAL YEAR ENDING JUNE 30, 1897.

I have the honor to submit a report of the operations of the United States Commission of Fish and Fisheries for the year ending June 30, 1897, with reports from the assistants in charge of its different divisions, showing the work in detail, together with an appendix describing the methods of fish-culture pursued by the Commission.

The work of the Division of Fish-Culture has been very satisfactory, showing a gratifying increase in the propagation and distribution of the important food-fishes. In addition to the stations mentioned last year, those at San Marcos, Tex., Manchester, Iowa, and Bozeman, Mont., have been completed and are now in operation.

Attention has been paid to carrying out the policy outlined in my former report, of increasing the production of the commercial species propagated by the Commission on the Atlantic and Pacific coasts and the Great Lakes, by establishing auxiliary hatcheries in connection with the permanent stations, for the extension of the field for the collection of eggs. The use of Battle Creek Station, Shasta County, Cal., obtained through the cooperation of the California Fish Commission, resulted in the collection of over 25,000,000 salmon eggs in addition to the 5,000,000 collected at Baird Station. In the Columbia River Basin the plants of fry were increased by the establishment of temporary stations on the Salmon River in Oregon and the Little White Salmon River in Washington, the two stations yielding over 4,700,000 eggs.

The total collection at the Pacific stations, amounting to 37,000,000, was over three times greater than the collection of any previous season. 5,000,000 quinnat-salmon eggs were transferred to eastern stations, and the fry resulting from them were planted in the Hudson, Delaware, and St. Lawrence rivers, New York, and the Penobscot and Union rivers, Maine. Additional assignments of steelhead eggs were also sent east, and plants of the fry were made in the Penobscot and Hudson rivers and tributaries of Lakes Michigan and Superior.

The cod work at the Massachusetts stations was the most extensive ever accomplished by the Commission, over 178,000,000 eggs being collected. 97,419,000 fry were hatched and liberated on the natural spawning-grounds by means of the steamer *Fish Hawk* and sailing vessels chartered for the purpose.

For the maintenance of the lobster fishery, which has been steadily declining for a number of years, it was arranged not only to cover the region in the vicinity of Woods Hole and Gloucester stations, but also to make systematic collections of eggs from fishermen 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 points in Connecticut, who collected egg lobsters for transportation to the hatcheries of Gloucester and Woods Hole. As a result of this extension of the work, over 128,000,000 eggs were secured and 115,606,000 fry planted. 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 experiments were conducted in the holding of the fry during the molting stages.

Preliminary to the establishment of auxiliary shad-hatcheries on the South Atlantic Coast, the *Fish Hawk* was detailed early in the winter to make investigations on certain important rivers in that section for the purpose of determining their value as collecting fields for eggs. Proceeding to Palatka, Fla., the vessel was anchored at the mouth of the Ocklawaha River and arrangements were made to collect eggs from fishermen operating on the St. Johns between Welaka and Sanford, where most of the fishing is done. Large numbers of shad were taken daily in the nets and seines, and valuable information with reference to their habits and movements was obtained, but only three or four ripe fish were secured. At the end of March the vessel proceeded to Albemarle Sound and commenced operations at Avoca, N. C., at the mouth of the Chowan River. The work at that point resulted in the collection of over 27,000,000 shad eggs and the liberation of 16,000,000 fry at the head of the sound. During the months of April, May, and June the usual shad operations were conducted on the Delaware, Potomac, and Susquehanna rivers, the total collection of eggs for the season resulting in a distribution of 134,545,500 yearlings, fry, and eggs. From the experience gained this year there is little doubt that the collection of shad eggs can be largely increased by the establishment of auxiliary stations on other rivers of the South Atlantic Coast.

The work on the Great Lakes was attended with good results, though the collection of eggs was seriously interfered with by severe gales, which destroyed the fishing gear during the spawning season. Over 18,000,000 lake-trout eggs were secured on Lakes Superior, Michigan, Huron, and Ontario, besides 126,000,000 whitefish eggs on Lakes Huron, Michigan, and Erie; 13,509,000 yearlings, fry, and eggs of the lake trout and 95,049,000 whitefish fry were distributed.

At the interior stations devoted to the production of trout, bass, and crappie the work of restocking inland streams and lakes has progressed satisfactorily.

In continuation of the experiments of previous years, to introduce lobsters and eastern oysters on the Pacific coast, 20 adult male lobsters and 69 females, with eggs, were taken from New England and liberated near Monterey, Cal., in November, 1896, and at the same time 25 barrels of 3-year-old oysters were planted on suitable grounds in Humboldt Bay, near Eureka, Cal., and an equal number in Yaquina Bay, Oregon. On the same trip 129 diamond-backed terrapin from Chesapeake Bay and South Carolina were planted in San Francisco Bay under the direction of the California Fish Commission.

The following table shows the numbers of fish and eggs furnished for distribution by the various stations:

Source of supply.	Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Green Lake, Me.	Landlocked salmon.....	77,000	61,000	2,164
	Atlantic salmon.....		33,000	
	Quinnat salmon.....	30,000	894,500	
	Brook trout.....	40,000	50,000	
	Von Behr trout.....			769
Craig Brook, Me.	Golden trout.....	10,000	35,000	
	Atlantic salmon.....	390,000	1,053,071	235,172
	Landlocked salmon.....			10,886
	Quinnat salmon.....		916,449	7,401
	Brook trout.....			2,219
	Rainbow trout.....			11,552
	Lake trout.....			10,411
	Swiss lake trout.....			36,342
	Von Behr trout.....			651
	Steelhead trout.....		55,750	11,270
St. Johnsbury, Vt.	Atlantic salmon.....		1,341	
	Quinnat salmon.....		238,044	
	Brook trout.....	140,000	495,400	
	Steelhead trout.....		10,000	
	Lobster.....		47,869,000	
Gloucester, Mass.	Cod.....		62,305,000	
	Mackerel.....		652,000	
Woods Hole, Mass.	Lobster.....		64,419,000	
	Cod.....		35,953,000	
	Flatfish.....		64,095,000	
	Tautog.....		624,000	
	Sea bass.....		193,000	
Cape Vincent, N. Y.	Rainbow trout.....		18,000	
	Lake trout.....		1,200,000	
	Steelhead trout.....		10,000	
	Quinnat salmon.....		1,058,000	
	Atlantic salmon.....		48,000	
	Whitefish.....		750,000	
	Shad.....	3,230,000	58,000,500	
Steamer Fish Hawk.....	Lobster.....		4,610,065	
Battery Island, Md.	Shad.....	1,294,000	50,802,000	
	Striped bass.....		450,000	
Fish Lakes, D. C.	Black bass, large-mouth.....			38,492
	Black bass, small-mouth.....			2,688
	Rock bass.....			5,070
	Shad.....			1,500,000
	Brook trout.....		2,202	
Central Station, D. C.	Rainbow trout.....		7,479	
	Loch Leven trout.....		2,209	
	Lake trout.....		4,338	
	Quinnat salmon.....		7,516	
	Shad.....	2,070,000	25,346,000	
	do.....	30,707,000		
	Rainbow trout.....	245,000	120,000	79,754
Bryan Point, Md.	Black bass, large-mouth.....			55
	Rock bass.....			11,615
	Whitefish.....		60,309,000	
	Lake trout.....		794,400	
	Lake herring.....		7,299,000	
Put-in Bay, Ohio.	Black bass, small-mouth.....			31
	Lake trout.....	1,252,000	5,280,000	
	Brook trout.....	12,000	97,500	
	Rainbow trout.....		6,500	
	Loch Leven trout.....	2,000	15,000	
Northville, Mich.	Steelhead trout.....		32,000	
	Whitefish.....		32,000,000	
Alpena, Mich.				

* 2,819,000 planted in Delaware River, New Jersey; 411,000 sent to Nashville Exposition.
† Shad eggs sent to Nashville Exposition.

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Statement of fish and eggs furnished for distribution, etc.—Continued.

Source of supply.	Species.	Eggs.	Fry and fingerlings.	Adults and yearlings.
Duluth, Minn.	Steelhead trout.		74, 000	
	Lake trout.		4, 769, 000	
	Brook trout.		15, 400	
	Rainbow trout.		200	
	Whitefish.		1, 990, 000	
Quincy, Ill.	Black bass, large-mouth.			32, 375
	Crappie.			3, 418
	Yellow perch.			1, 025
	Pickereel.			1, 700
Manchester, Iowa.	Rainbow trout.		41, 222	
	Lake trout.		158, 000	
Neosho, Mo.	Rainbow trout.	90, 200	27, 000	60, 125
	Black bass, large-mouth.			15, 690
	Rock bass.			32, 940
	Strawberry bass.			5, 129
San Marcos, Tex.	Black bass, large-mouth.			11, 750
Leadville, Colo.	Loch Leven trout.	30, 000		500
	Rainbow trout.	5, 000	27, 500	
	Black-spotted trout.	5, 000	42, 200	
	Brook trout.	140, 000	287, 000	94, 000
	Yellow-fin trout.		7, 931	
Baird, Cal.	Quinnat salmon.	4, 337, 500	1, 906, 088	
Port Gaston, Cal.	do.		280, 250	
	Silver salmon.		124, 750	
	Rainbow trout.		22, 000	30, 000
	Von Behr trout.		22, 100	275
Korbel, Cal.	Steelhead trout.	50, 000	202, 000	
	Quinnat salmon.		145, 365	
	Silver salmon.		173, 387	
	Steelhead trout.		55, 000	
Battle Creek, Cal.	Quinnat salmon.	13, 895, 090		
Bear Valley, Cal.	do.		635, 000	
Clackamas, Oreg.	do.		4, 042, 634	
Salmon River station, Oreg.	do.		100, 000	
Little White Salmon River station, Wash.	do.		1, 848, 760	
Mapleton, Oreg.	do.		180, 000	

The following table shows, by species, the fish and eggs distributed by the Commission during the year:

Species.	Eggs.	Fry.	Adults and yearlings.	Total.
Shad.	2, 819, 000	130, 226, 500	1, 500, 000	134, 545, 500
Quinnat salmon.	18, 262, 590	13, 834, 261	7, 198	32, 104, 049
Atlantic salmon.	300, 000	1, 705, 010	234, 789	2, 329, 809
Landlocked salmon.	77, 000	61, 000	12, 506	150, 506
Silver salmon.		298, 137		298, 137
Steelhead trout.	50, 000	439, 045	10, 045	499, 090
Loch Leven trout.	32, 000	17, 209	500	49, 709
Rainbow trout.	341, 200	254, 801	172, 122	768, 123
Von Behr trout.		22, 100	1, 680	23, 780
Black-spotted trout.		42, 200		42, 200
Brook trout.	332, 000	943, 004	84, 506	1, 359, 510
Lake trout.	1, 252, 000	12, 247, 738	9, 411	13, 509, 149
Swiss lake trout.			36, 082	36, 082
Yellow-fin trout.		7, 930		7, 930
Golden trout.	10, 000	35, 000		45, 000
Whitefish.		95, 049, 000		95, 049, 000
Yellow perch.			1, 025	1, 025
Pickereel.			1, 700	1, 700
Striped bass.		450, 000		450, 000
Lake herring.		7, 299, 000		7, 299, 000
Black bass (large-mouth).			95, 358	95, 358
Black bass (small-mouth).			2, 719	2, 719
Crappie.			2, 125	2, 125
Rock bass.			42, 687	42, 687
Strawberry bass.			3, 120	3, 120
Codfish.		98, 258, 000		98, 258, 000
Flatfish.		64, 095, 000		64, 095, 000
Lobster.		115, 606, 065		115, 606, 065
Tanog.		624, 000		624, 000
Mackerel.		652, 000		652, 000
Sea bass.		193, 000		193, 000
Total.	23, 565, 790	542, 360, 000	2, 218, 252	568, 144, 042

NOTE.—3,030,000 shad fry were released in the fish-ponds at Washington, D. C., for rearing, and are not to be included in the summation.

The distributing cars traveled 87,550 miles during the year, and detached messengers traveled 119,055 miles, in the distribution of the fishes liberated.

The Commission is under continued obligations to various railroads in the United States for free transportation furnished during the year, as shown in the following statement:

Name of railroad.	Cars.	Messen- gers.	Name of railroad.	Cars.	Messen- gers.
Miles.	Miles.		Miles.	Miles.	
Ann Arbor Railroad.....	400		Kansas City, Fort Scott and		
Atchison, Topeka and Santa Fe	3,717		Memphis.....	432	
Baltimore and Ohio Railroad.....		552	Kansas City, Pittsburg and		
Baltimore and Ohio Southwestern		65	Gulf.....	308	646
Bangor and Aroostook Railroad.....	148		Louisville and Nashville Rail- road.....		3,616
Boston and Maine Railroad.....		954	Maine Central Railroad.....		2,436
Burlington and Missouri River, in Nebraska.....	1,288	104	Michigan Central Railroad.....		4,866
Burlington, Cedar Rapids and Northern.....	1,754	2,101	Mobile and Ohio Railroad.....		1,018
Central Vermont Railroad.....	123	80	Montana Union Railroad.....		116
Chicago and West Michigan.....	1,067		Montpelier and Wells River Railroad.....		188
Chicago, Burlington and Quincy.....	1,872	3,629	Minneapolis, St. Paul and Sault Ste. Marie Railroad.....	126	
Chicago, Milwaukee and St. Paul.....		272	Nashville, Chattanooga and St. Louis.....		151
Chicago, Peoria and St. Louis.....	292	170	New York, New Haven and Hartford.....		69
Colorado Midland Railroad.....	556	584	New York, Ontario and Western.....	200	
Cleveland, Cincinnati, Chicago and St. Louis.....	3,470		Northern Pacific Railroad.....	3,020	749
Cooperstown and Charlotte Val- ley.....		16	Oregon Railway and Navigation Co.....	934	
Chicago and Northwestern Rail- road.....	353		Philadelphia, Reading and New England.....		58
Chesapeake and Ohio Railroad.....	3,194	457	Rutland Railway.....		376
Delaware and Hudson River.....	750	28	San Antonio and Aransas Pass.....	126	
Denver and Rio Grande.....	554	4,639	St. Johnsbury and Lake Cham- plain.....	236	
Denver, Leadville and Gunnison.....		831	St. Louis and San Francisco.....		1,240
Detroit and Mackinac Railroad.....	2,020	188	Southern Pacific Railroad.....		256
Duluth, South Shore and Atlan- tic Railroad.....	401		Southern Railway.....	1,956	151
Flint and Pere Marquette.....	3,045	645	Texas and Pacific Railroad.....	180	1,021
Florida Central and Peninsular.....	1,124		Terre Haute and Indianapolis.....		376
Fromont, Elkhorn and Missouri Valley.....	351		Union Pacific Railroad.....	6,112	119
Fort Worth and Denver City.....	444		Union Pacific, Denver and Gulf.....	154	426
Grand Rapids and Indiana.....	375		Vermont Central Railroad.....		82
Great Northern Railroad.....	552	436	Wabash Railroad.....		3,466
Houston and Texas Central.....		1,058	West Virginia and Pittsburg.....		208
Illinois Central Railroad.....		520	Wisconsin Central Railroad.....	402	166
International and Great North- ern.....	122	1,619	Woodstock Railroad.....		28
Jacksonville, Tampa and Key West.....	500		Total.....	55,008	23,084

The scientific work of the Commission has an important bearing on the artificial increase of food-fishes in determining the best methods to pursue in fish-culture, in ascertaining the results of propagation, and in the study of the habits, growth, food, enemies, and diseases of fish. The Division of Scientific Inquiry was under the charge of Mr. Richard Rathbun until December 31, 1896, when, on his resignation to accept the position of assistant secretary of the Smithsonian Institution, Dr. Hugh M. Smith was appointed assistant in charge of that division.

Many special field investigations have been made, besides the usual systematic inquiries covering interior waters.

Field parties, during the summer of 1896, continued the examination of the lakes and streams in Idaho, Washington, Oregon, and California, some of the investigations being the continuation of work begun in previous years. The inquiries have embraced studies of the habits, abundance, distribution, and spawning-grounds of the fishes found in

these waters, special attention being given to the salmon as the important commercial fish of the region. The physical features, including temperature, depth, etc., of the waters, have been studied because of their bearing on fish life, and valuable data obtained. Collections of the fishes, crustaceans, and the other inhabitants of the waters have been made. Investigations were carried on in August and September in the lower Columbia River Basin, in order to determine on a suitable site for an auxiliary hatchery to be operated in connection with the station on the Clackamas River, and a point was selected on the Little White Salmon River where salmon were observed in greatest abundance.

At the request of citizens of New Orleans, an examination of the waters at the mouth of the Pearl River, Mississippi, was made to determine if anything could be done toward increasing the abundance of food and game fishes. Similar investigations were also made in the Sabine and Neches rivers in southeastern Texas, and in the Atchafalaya River, Louisiana; and during the spring and summer months a study was made of the food of the commercial fishes found in Lake Superior. An account of these various investigations and inquiries, as well as of other studies bearing on the subject of fish culture, is found in the appended report of the Division of Scientific Inquiry.

The investigation already begun as to the condition of the coast fisheries of Florida, more particularly the sponge and oyster fisheries, pursuant to Senate resolution of February 15, 1895, has been completed. The report sent to the Senate January 28, 1897, and published, gives an account of the inquiries and the conclusions reached.

The work of the joint commission appointed to investigate the fisheries of the contiguous waters of the United States and Canada, on which Mr. Richard Rathbun, of this Commission, represented the United States, has been completed. The report of the Commissioners was transmitted to Congress by the President February 4, 1897, and certain of the conclusions and recommendations therein are quoted elsewhere in this report (pp. CV-CXVII).

The laboratory of the Commission at Woods Hole was opened as usual in the summer of 1896, its privileges being extended to a number of representatives from well-known educational institutions.

The Commission continues to receive, through its agents and from others interested, reports showing the results of fish-culture, some of which may be mentioned.

While seining the Chesapeake and Ohio Canal during the month of March, 1897, over 4,000 crappie, from $\frac{1}{2}$ to 1 pound in weight, were captured between Little Falls, District of Columbia, and Seneca, Md., and liberated in the Potomac River. These resulted from plants made by the Commission in 1894.

The superintendent of the St. Johnsbury (Vt.) station reports the capture of numbers of rainbow trout in Sleepers River in 1896-97. One of the specimens, captured in May, 1897, was 10 inches long, weighed $\frac{1}{2}$ pound, and contained ripe eggs. Specimens over 5 pounds in weight

were also taken in Otto Creek during the spring of 1897. These are generally found in the lower sections of the streams in deeper water than that usually inhabited by the brook trout. Lake trout were also reported by the same authority as being abundant in Caspian Lake, where plants of that species were made some years ago by the Commission. In certain streams in eastern Tennessee, which have been stocked with rainbow trout within the last few years, excellent fishing is now reported.

The probability of the steelhead trout becoming successfully introduced in many waters of the interior and Eastern States is indicated by the results already attained in some regions. In the spring of 1896 the Commission planted 35,000 fry in Sucker and French rivers, Minnesota, and 50,000 in other streams in that State. Mr. S. P. Wires, superintendent of the station at Duluth, reports, under date of June 14, 1897, that the number and condition of the steelhead trout in the two rivers named warrant the belief that the species is well adapted to that section. On June 13, 1897, 80 steelheads, from 6 to 8 inches long, were caught in Sucker River.

One of the most interesting attempts made by the Commission to secure the introduction of food-fishes into new waters has been the planting of young Atlantic salmon in the Delaware River, in conjunction with the Pennsylvania Fish Commission. In 1895, as shown in the last report of this Commission, over 300 full-grown salmon were taken. In 1896 record of the capture of 142 fish was obtained by the office; these weighed 1,697 pounds. Others were undoubtedly taken and not reported. The outlook for the season of 1897 was considered good, and at the first haul of a large shad seine at Gloucester, N. J., a 15-pound salmon was caught; but the record for the year was poor.

The cod fishermen of Massachusetts, with practical unanimity, ascribe their successful fishing on parts of the coast to the work of the Gloucester and Woods Hole hatcheries. The "rip fishing," which has apparently been established and maintained by the very large plants of fry, continues profitable. Many statements have been received from fishermen as to the abundance of cod in the inshore waters and their presence on new grounds, especially on the southern part of Massachusetts. The following note is typical of a number of letters that might be quoted:

Possibly it will interest you to know that the "rock" cod, as we call them, caught along our shores within a mile or so of the coast and from the bold shore itself at times, have increased in number within the last two or three years. The present season they are remarkably abundant. Early in April (1897), when the herring were in, they could be caught with hand lines by the dory load, and just recently (May) have been caught from the rocky points along the shore, which has not been the case to any extent for twenty-five or thirty years before. They weigh from 2 to 10 pounds.

Reports from various localities along the coast of Massachusetts indicate that young lobsters are abundant, and if the work is continued on the same scale as in the past three or four years it is believed that this fishery will be fully reestablished.

A plan has been adopted to bring to the knowledge of those interested reliable and prompt statistics of the fisheries, by means of monthly bulletins showing the quantity and value of the catch landed at certain important ports, as well as special bulletins relating to the condition of the fishery industries. These reports are issued to those engaged in the business and to the various boards of trade. As this plan has received general commendation from those interested, it is designed to extend the system 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 at once available.

The field inquiries, described at length in the accompanying report of the Division of Statistics, covered an extensive territory, and attention may be called to some of the more important.

The canvass of the shad and alewife fisheries, which is of special interest on account of the fish-cultural operations with shad during recent years, has been very exhaustive, including statistics of the persons employed, appliances used, extent and value of the fisheries, and other special information. It was developed that in 1896 there were 27,000 persons engaged in these fisheries and a capital invested of about \$2,172,000. The catch amounted to 50,775,000 pounds of shad and 62,066,000 pounds of alewives, valued at \$1,656,000 and \$409,000, respectively.

The results of the canvass of the fisheries of the Pacific States are embodied in a special report published as an appendix to the report for 1896. The leading fishery product of this region is the chinook salmon, and the next most important is the oyster. In 1895 17,305 persons were engaged in the various branches of the industry and \$7,275,000 were invested. In some sections the fisheries are largely increased, San Diego and Los Angeles counties especially having built up considerable new trade with the interior States, though San Francisco continues to be the chief trade center for the reception and distribution of the products.

For the calendar year 1896 there has been a falling off in the quantities of fish landed by American fishing vessels at the ports of Boston and Gloucester, as compared with the prior year, the decrease affecting both ports. The aggregate receipts were 130,673,766 pounds, valued at \$3,286,898. Each species participated in the decrease, except halibut and mackerel, though at Boston the amount of cod landed was in excess of the previous years.

Inquiries during the summer of 1896 confirm the previous reports that the shad and striped bass introduced on the Pacific coast continue to increase, the former being so plentiful as to retail at very low prices. The striped bass are specially numerous in the San Francisco Bay region, and their rate of increase is such that at present their artificial propagation need not be considered.

The regular annual investigations of the fur-seal rookeries, under the direction of this office, were carried on during the summer of 1896 in

connection with the special commission appointed by the President in accordance with the joint resolution of Congress approved June 8, 1896, to investigate into the condition of the fur-seal herd. The Fish Commission representatives on the fur-seal commission were Lieut. Commander J. F. Moser, U. S. N., and Mr. C. H. Townsend.

During the summer of 1896, the steamer *Albatross* was engaged in Alaskan waters, having been detailed by the President to the Treasury Department for the use of the special commission. The vessel returned via Japan and Honolulu, arriving at Sausalito, Cal., December 11. On the 15th she was relieved from further duty in connection with the Treasury Department, and, after pressing repairs had been completed, sailed for San Diego December 30.

The recent very marked development of the fisheries off the coast of southern California makes it desirable that the extent, resources, and location of the principal fishing-banks be ascertained, and during the early part of the year 1897 the *Albatross* was engaged in provisional examinations of the fishing-grounds off the coast of Los Angeles County, Monterey, and in the vicinity of the Farallone Islands, to discover the possibilities of a further extension of the off-shore fisheries. For the first time in many years the vessel was available for exclusive fishery work, and accordingly preparations were made for a systematic study of the streams of southeast Alaska, to determine their resources and the abundance, movements, and habits of their fishes.

The active prosecution of the fisheries in certain streams threatens to seriously reduce the supply unless effective measures are taken to offset the destruction. The conditions are so different along the 3,000 miles of Alaskan coast that no general law is applicable to all parts of the Territory. The *Albatross* was prepared for this cruise at Sausalito, Cal., and on May 8 set sail for the Straits of Fuca. Observations and dredgings were made off Cape Flattery and in the Puget Sound region, and on May 29 the vessel, having been docked, started on a northern cruise. Inquiries were begun at Mary Island, southeast Alaska, and at the close of the fiscal year were being systematically carried on along the coast.

In accordance with the act of Congress approved December 22, 1896, the United States Fish Commission took part in the Tennessee Centennial Exposition, which opened at Nashville May 1, and is now in progress. Mr. W. de C. Ravenel was appointed representative on the board of management having charge of the Government exhibit. Fifteen thousand five hundred dollars and 5,000 square feet of space were allotted for the exhibit of the Fish Commission, which was arranged to show the character of the work performed by each of its divisions, the methods and apparatus employed, and the results attained. The material was collected and installed by the time of opening of the Government building May 17, 1897.

An aquarium 120 feet long, containing 22 tanks, has been provided, with an equal number of tanks for salt and fresh water, respectively, arranged in an ornamental manner on each side of a grotto. The

live-fish exhibit is intended to show the food-fishes propagated by the Commission, as well as a large number of important economic fishes of the Mississippi River Valley and the Southern States.

In the section of scientific inquiry are exhibited models of the vessels of the Commission, models and types of apparatus for collecting, assorting, and preserving specimens, and samples of the various appliances used in physical observations. The results of the scientific work are shown by means of charts, specimens of corals, starfish, sea-urchins, and various invertebrate animals, besides an extensive collection of oysters.

Models of pound nets, seines, spears, hooks, trawls, etc., illustrate the methods employed in the fisheries of the Southern States, and a series of models of fishing vessels shows their development from the crude craft first used in this country to the vessels now employed.

In the fish-cultural section hatching apparatus has been erected to illustrate practical fish-culture, and during the summer eggs of various species will be sent to the exposition and hatched.

In the office of the architect and engineer various maps, charts, and illustrations have been made, and plans and specifications prepared for the alterations and additions authorized, and repairs necessary at the different stations. Work at the new stations in Texas, Montana, and Iowa, which was in progress at the beginning of the year, has been completed.

At San Marcos, Tex., contracts were given out during the summer for the various constructions necessary to complete the station, and by the middle of November the office and workshop were finished. During the fall and early winter a concrete basin was built around the well, 4,000 feet of pathways were laid out, a roadway 3,000 feet long was built, the grounds were graded and fenced, and a number of suitable ornamental trees were set out. Ponds were excavated and the station was in condition for fish-cultural work in December.

At Bozeman, Mont., the work was completed with the funds made available by the appropriation of June, 1896, and the station turned over to the superintendent on the 1st of January, 1897. The station consists of a hatchery with a capacity of about 500,000 eggs, an eight-room cottage for the superintendent, an ice-house, a barn, and other outbuildings. Four stock ponds, eight rectangular ponds for rearing yearling fish, and twelve nursery ponds were at this time ready for use.

Work on the Manchester Station was promptly begun after July 1, and a hatchery, superintendent's dwelling, mess-house, barn, and other necessary buildings were erected, and an old farm-house on the site remodeled for foreman's quarters. Twelve small rearing-ponds were completed and eight large ones excavated; a wagon bridge was built across the Spring Branch, the hatchery connected with the water supply by a 14-inch pipe, and, though the large ponds were not lined, the station was in condition to begin active work in January.

An act of Congress approved June 8, 1896, provided for improvements at Northville Station, Michigan, and in accordance therewith arrange-

ments were made for building a new hatchery and superintendent's residence; by December 1 both buildings were completed. The hatchery is a two-story building, 69 feet long by 40 wide. The first floor is utilized for hatching operations and is equipped with the Clark-Williamson and also with ordinary gravel troughs. It has a capacity for about 12,000,000 eggs. The cottage is a two-story frame structure with a cellar and attic, 40 by 31 feet, and contains four rooms and a hall on the first floor and six rooms on the second. Improvements to the water supply were made so that the flow from one spring was increased from 180 to 438 gallons per minute, and as it appeared that the rotting timber in the old rearing-house was injuriously affecting the water from the other spring, the building was torn down, the ground graded, and a stone wall built around the spring. Another artesian well was also driven, which furnishes 50 gallons of clear, cold water per minute, which will be of value in regulating the temperature of the creek water used for the ponds. The cottage formerly used as a superintendent's residence was moved to a new location and remodeled for foreman's quarters.

For the new station in Tennessee, authorized by act of Congress approved August 8, 1894, after an examination of various localities throughout the State a site was selected at Erwin, Unicoi County, which appeared to combine all the important features necessary for a fish-cultural station, there being an ample supply of cold spring water, railroad connections, and facilities for collecting brood fish and eggs. The property was surveyed and, as soon as a title was obtained, was transferred to the Fish Commission. Plans and specifications for the buildings, ponds, and water supply were made and a railroad siding arranged for. A telephone line was constructed, and at the close of the fiscal year contracts for the construction of the hatchery and buildings had been let and some progress made in excavating for the water supply and ponds.

Early in the summer steps were taken to have the station at Wytheville, Va., formally turned over to the Commission by the State of Virginia, the necessary appropriation having been secured for this purpose. Upon an investigation by the Department of Justice, however, it was found that the act passed by the Virginia legislature on March 2, 1894, was defective, and an arrangement was accordingly entered into between the Commissioner and the board of public works of the Commonwealth of Virginia, by which the Commission assumed control of the property pending the completion of the title.

The act approved June 11, 1896, provided for the establishment of a station in the Black Hills of South Dakota, and accordingly in December, 1896, a careful examination of a number of available localities was made, and a site in the vicinity of Spearfish was found to be most suitable. An abundant supply of clear, cold spring water, with a sufficient fall for a gravity system for the hatchery and ponds, is available. The point is close to a railroad line and easy of access, and the topography of the land is such that the necessary constructions can be economically made.

A further examination will be made during the dry summer season, to determine if the water supply will be sufficient at all times of the year.

Further investigations with reference to the selection of a fish-cultural station in the State of New Hampshire, authorized by an act approved March 2, 1895, were made in December and January, and as soon as an examination during the dry season can be completed a site will be definitely selected and the construction of the station begun.

Necessary alterations and additions to the machinery of the Commission have been made under the direction of the naval engineer, who also prepared drawings and specifications for new boilers for the steamer *Fish Hawk*. This office also prepared plans for the pumps and other machinery for the exhibit of the Commission at the Nashville Exposition and superintended the installation of the plant.

During the year the bound Bulletin for 1896, the bound reports of the Commission for the years 1893, 1894, and 1895, and the report for 1896 in pamphlet form were issued, and, in addition, the following pamphlet extracts from the Reports for 1893, 1894, 1895, and 1896, and the Bulletin for 1896:

- Report of the Commissioner for the fiscal year ending June 30, 1894, including the reports on the divisions of fish-culture, scientific inquiry, and fisheries, by Marshall McDonald. Report for 1894, xx, pp. 1-175. 1896.
- The Russian fur-seal islands, by Leonard Stejneger. Bulletin for 1896, xvi, pp. 1-148, plates 1-66. 1896.
- Remarks on the movements and breeding-grounds of the fur-seal, based on observations made while on the United States naval patrol of Bering Sea in 1894, by John J. Brice. Report for 1894, xx, pp. 573-577.
- A report upon salmon investigations in the headwaters of the Columbia River, in the State of Idaho, in 1895; together with notes upon the fishes observed in that State in 1894 and 1895, by Barton W. Evermann. Bulletin for 1896, xvi, pp. 149-202, plates 67-72.
- The artificial propagation of the rainbow trout, by George A. Seagle. Bulletin for 1896, xvi, pp. 237-256, plates 88-94. 1896.
- The artificial propagation of salmon on the Pacific Coast of the United States, with notes on the natural history of the quinnat salmon, by Livingston Stone. Bulletin for 1896, xvi, pp. 203-235, plates 73-87.
- Report upon the operations of the U. S. Fish Commission steamer *Albatross* for the year ending June 30, 1894, by Z. L. Tanner and F. J. Drake. Report for 1894, xx, pp. 197-278, plates 6-8. 1896.
- Description of a closing tow net for submarine use at all depths, by C. H. Townsend. Report for 1894, xx, pp. 279-282, plates 9, 10. 1896.
- The whitefishes of North America, by Barton W. Evermann and Hugh M. Smith. Report for 1894, xx, pp. 283-324, plates 11-28. 1896.
- A report upon the fishes of the Missouri River Basin, by Barton W. Evermann and Ulysses O. Cox. Report for 1894, xx, pp. 325-429. 1896.
- A review of the foreign fishery trade of the United States, by Charles H. Stevenson. Report for 1894, xx, pp. 431-571. 1896.
- The ichthyological collections of the U. S. Fish Commission steamer *Albatross* during the years 1890 and 1891, by Charles H. Gilbert. Report for 1893, xix, pp. 393-476, plates 20-35. 1896.
- An annotated catalogue of the fishes known from the State of Vermont, by Barton W. Evermann and W. C. Kendall. Report for 1894, xx, pp. 579-604.
- A report upon the fishes of southwestern Minnesota, by Ulysses O. Cox. Report for 1894, xx, pp. 605-616. 1896.
- List of publications of the U. S. Commission of Fish and Fisheries from its establishment, in 1871, to February, 1896, by Charles W. Seudder. Report for 1894, xx, pp. 617-706. 1896.
- Deep-sea explorations: A general description of the steamer *Albatross*, her appliances and methods, by Z. L. Tanner. Bulletin for 1896, xvi, pp. 257-428, plates 1-XI. 1897.
- Report of the Commissioner for the fiscal year ending June 30, 1895, including the reports on the divisions of fish-culture, scientific inquiry, and fisheries, by Marshall McDonald. Report for 1895, xxi, pp. 1-123. 1896.

- Report upon the investigations of the U. S. Fish Commission steamer *Albatross* for the year ending June 30, 1895 (abstract), by F. J. Drake. Report for 1895, xxi, pp. 125-168. 1896.
- Notes on Biscayne Bay, Florida, with reference to its adaptability as the site of a marine hatching and experiment station, by Hugh M. Smith. Report for 1895, xxi, pp. 169-191. 1896.
- The transplanting of eastern oysters to Willapa Bay, Washington, with notes on the native oyster industry, by C. H. Townsend. Report for 1895, xxi, pp. 193-202, plate 1. 1896.
- Description of a new species of shad (*Alosa alabama*) from Alabama, by Barton W. Evermann. Report for 1895, xxi, pp. 203-205. 1896.
- A check-list of the fishes and fish-like vertebrates of North and Middle America, by David Starr Jordan and Barton Warren Evermann. Report for 1895, xxi, pp. 207-584. 1896.
- Report of the Commissioner for the fiscal year ending June 30, 1896, including the reports of divisions of fish-culture, scientific inquiry, and fisheries, by John J. Brice. Report for 1896, xxii, pp. 1-145, plates 1-10. 1897.
- Report of the representative of the U. S. Fish Commission at the Cotton States and International Exposition at Atlanta, Ga., in 1895, by W. deC. Ravenel. Report for 1896, xxii, pp. 147-167, plates 11-21. 1897.
- Notes on the extension of the recorded range of certain fishes of the United States Coast, by Hugh M. Smith and William C. Kendall. Report for 1896, xxii, pp. 169-176. 1897.
- Notes on the food of four species of the cod family, by William C. Kendall. Report for 1896, xxii, pp. 177-186. 1897.
- The fisheries of Indian River, Florida, by John J. Brice et al. Report for 1896, xxii, pp. 223-262, plates 22-60. 1897.
- Report on the fish and fisheries of the coastal waters of Florida, by John J. Brice. Report for 1896, xxii, pp. 263-342. 1897.
- Report of a survey of the oyster regions of St. Vincent Sound, Apalachicola Bay, and St. George Sound, Florida, by Franklin Swift. Report for 1896, xxii, pp. 187-221. 1897.

There have been distributed 4,340 bound and 11,473 pamphlet copies of the publications of this Commission.

The United States National Museum has published the following reports, based on collections of fish made by the Fish Commission steamer *Albatross*:

- Report on the fishes dredged in deep water near the Hawaiian Islands, with descriptions and figures of twenty-three new species, by Charles Henry Gilbert and Frank Cramer. Proceedings of the U. S. National Museum, vol. xix, pp. 403-435 (with plates XXXVI-XLVIII).
- Descriptions of twenty-two new species of fishes collected by the steamer *Albatross*, of the U. S. Fish Commission, by Charles Henry Gilbert. Proceedings of the U. S. National Museum, vol. xix, pp. 437-457 (with plates XLIX-LV).

Appropriations were made by Congress for the operations of the Commission for the fiscal year ending June 30, 1896, as follows:

Salaries.....	\$182,060
Miscellaneous expenses:	
Administration	9,000
Propagation of food-fishes	115,000
Maintenance of vessels.....	30,500
Inquiry respecting food-fishes	10,800
Statistical inquiry	5,000

A report, showing in detail the expenditures of these appropriations, was submitted to Congress December 6, 1897.

J. J. BRICE,

U. S. Commissioner of Fish and Fisheries.