

REPORT OF THE DIVISION OF STATISTICS AND METHODS OF THE FISHERIES.

By HUGH M. SMITH, *Assistant in Charge.*

PERSONNEL AND RESOURCES.

The regular force of this division during the fiscal year ending June 30, 1896, consisted of an assistant in charge, 6 clerks, 5 statistical field agents, and 2 local agents. The field force was augmented by the temporary detail of employees from other divisions and by the employment for short periods of persons outside the service. Mr. William Barnum, of the Commissioner's office, was assigned to field work in Idaho, Utah, Oregon, and Washington; Mr. E. A. Tuliau, superintendent of the United States Fish Commission station at Leadville, Colo., was detailed for duty in Colorado and Utah; Mr. A. B. Alexander, fishery expert on the *Albatross*, was ordered to make some inquiries in Nevada and California; Mr. C. E. Ingersoll, of Cambridge, Mass., a former employee of the division, and Mr. Burnside Clapham, of Fort Wayne, Ind., were employed for several months in investigating the fisheries of the Ohio Valley. Mr. F. O. James, of the car and messenger service, was employed for several months in this division on general clerical work pending repairs to the car of which he was in charge. Mr. W. A. Roberts, field agent, who had been detailed in May, 1895, for duties in connection with the Atlanta Exposition, returned to the division in April, 1896.

The appropriation for the field inquiries and miscellaneous expenses of this division was \$5,000. This sum was expended as follows:

Field investigations.....	\$4,578.58
Miscellaneous.....	112.09
	4,690.67
Total.....	4,690.67
Balance unexpended.....	309.33
	5,000.00

FIELD INVESTIGATIONS.

INTERIOR WATERS.

At the beginning of the fiscal year the investigation of the fisheries of the minor interior waters of the United States, begun in the latter part of the previous year and suspended on account of lack of funds, was resumed and actively pushed during the entire year. The order in which the major investigations were taken up had special reference to the seasons. During the warmer months the field force was placed in the States drained by the upper tributaries of the Mississippi and Ohio

ivers. As the season wore on the agents worked southward, and during the colder months the inquiries in the Southern States were resumed. Some special examinations of the fisheries of certain extreme Eastern and Western States were also made.

By the close of the year the canvass of the interior streams and lakes had been completed. A full report on the investigation is in preparation and will soon be issued. The States in which inquiries were conducted during the present year were Vermont, New York, West Virginia, Ohio, Kentucky, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, Nevada, Utah, Idaho, and California. A brief account of the extent of the fisheries in each of these will be given. In the last report of the division an outline of the extent of the fresh-water fisheries of Louisiana, Mississippi, Alabama, Arkansas, and Tennessee was presented.

The agents participating in the canvass of these States and the territory covered by them were as follows: John N. Cobb, Vermont and New York; W. A. Wilcox and T. M. Cogswell, all of Minnesota and Kansas, and parts of Illinois, Iowa, Kentucky, Missouri, Nebraska, and Wisconsin; C. H. Stevenson, South Dakota and parts of Illinois, Iowa, Missouri, and Nebraska; Ansley Hall, parts of West Virginia, Ohio, Indiana, Kentucky, Illinois, Wisconsin, Missouri, and Iowa; C. E. Ingersoll, parts of Indiana, Ohio, and Kentucky; B. Clapham, parts of West Virginia, Ohio, and Indiana; William Barnum, part of Idaho; E. A. Tulian, Colorado, Utah, and part of Idaho; A. B. Alexander, Nevada and California.

It was not considered necessary to prosecute inquiries in any other interior States, owing to the small amount of economic fishing carried on because of the limited resources, the existence of restrictive laws, or other conditions militating against the industry.

The fisheries of the interior waters of the country, as shown by the inquiries of this division, had the following extent in 1894. These figures are given provisionally, and are liable to slight changes when the final tabulations are made. In these statistics, it should be understood, no account is taken of the fisheries of the Great Lakes nor of any of the coast rivers, which have been covered in previous reports of the Commission.

Persons employed.....	11, 282	Value of other property.....	\$104, 203
Boats used.....	8, 844	Total capital invested.....	\$722, 328
Value of boats.....	\$241, 367	Pounds of products taken....	55, 415, 400
Value of apparatus of capture..	\$376, 748	Value of yield to fishermen...	\$1, 791, 145

Vermont.—An examination of the commercial fisheries of Vermont was made in January and February, 1896. The only fishing of a business character is done in Lake Champlain and the tributary streams. The industry has varied considerably in extent in recent years, owing to the fact that in 1893 and 1895 seining was permitted, while in 1894 the use of seines was prohibited. In 1894 and 1895, the two years covered by the investigation, the fisheries had the following extent,

respectively: Persons engaged, 93 and 169; capital invested, \$979 and \$4,794; products taken, 58,639 pounds and 208,139 pounds; value of catch, \$3,275 and \$7,166. In 1894 the principal products taken for market in Vermont were bullheads, wall-eyed pike, and frogs; in 1895 the three most prominent species were whitefish, bullheads, and yellow perch. In his canvass, Mr. Cobb received valuable advice and assistance from Mr. John W. Titcomb, superintendent of the Government hatchery at St. Johnsbury.

New York.—The economic fishing interests of the interior lakes and rivers of this State were investigated in February, 1896. The extent of the fisheries of New York carried on in the ocean, coastal waters, coast rivers, and Great Lakes was well known, but no data were available showing the importance of the business in the interior sections. Of more than 100 lakes and ponds of sufficient size and importance to show on good general maps, only a comparatively small number support fishing which can be considered as a business. The State authorities have naturally regarded the preservation of the fishery resources of these waters in the interests of anglers as of vastly more importance than the temporary advantage which might accrue to the fishermen if unrestricted fishing were permitted. Consequently the market fishing is of very limited extent, the use of any forms of nets is rarely sanctioned, and most of the catch is taken with lines.

The lakes showing the most important fishing are George, Champlain, Oneida, Onondaga, Cayuga, Seneca, Canandaigua, Otsego, and Chautauqua, the last-named being considerably in advance of the others in the value of the catch. The number of persons ascertained to be dependent on fishing for a part of their livelihood was 422 in 1894 and 543 in 1895. The capital invested in apparatus, boats, and other property was \$16,103 in 1894 and \$19,745 in the following year. The quantity of products taken was 591,119 pounds, worth \$55,072, in 1894, and 754,730 pounds, valued at \$60,086, in 1895. The most prominent species and the value of the catch of each in 1895 are as follows: Black bass, \$5,078; bullheads, \$8,492; lake trout, \$4,627; muskellunge, \$15,920; smelt, \$4,506; frogs, \$6,572.

The work in this State was much facilitated by the advice and assistance of Mr. A. N. Cheney, State fish-culturist. Aid was also rendered by other members of the State Fish Commission board.

West Virginia.—In 1894, about 70 persons living in 7 counties of West Virginia made a business of taking fish in the Ohio River for market. The principal fishing was done with seines and set lines, but gill nets and fyke nets were also used. The investment in fishing property was \$4,075. The most prominent fishes taken in this part of the Ohio River are catfish, fresh-water drum, suckers, and wall-eyed pike. The aggregate catch was 162,000 pounds, valued at \$8,700, of which more than a third was catfish.

Ohio.—The fisheries of this State are rather important and are peculiar in that they are chiefly prosecuted in artificial bodies of water.

Aside from the Ohio River, practically all the fishing is done in Grand, Lewiston, Loramie, and Licking reservoirs, two of which have more extensive interests than the river named.

Of the 309 persons engaged in the fisheries of Ohio (exclusive of Lake Erie) in 1894, 96 fished in the Ohio River, 107 in Grand Reservoir, 57 in Lewiston Reservoir, 40 in Licking Reservoir, and 9 in Loramie Reservoir. Seines, fyke nets, and set lines are the principal apparatus used, the first-named being restricted to the Ohio River and the fyke nets being especially numerous in the reservoirs. The capital invested, amounting to \$14,016, represented 231 boats, 23 seines, 2,879 fyke nets, 541 set and other lines, 3 gill nets, and other property. The yield of the fisheries in 1894 was 1,239,300 pounds, for which the fishermen received \$59,400.

Buffalo-fish and fresh-water drum, which in other States of the Mississippi Basin enter largely into the catch, are only sparingly taken in the fisheries of Ohio. The most prominent species are catfish, sunfish, black bass, and yellow perch, while cruppy, carp, wall-eyed pike, sturgeon, rock bass, warmouth bass, paddle-fish, and eels are taken in limited quantities. Nearly three-fifths of the entire yield was obtained with fyke nets and more than one-half the remainder with lines. The former apparatus took 701,000 pounds, worth \$31,900, and the latter 351,400 pounds, worth \$15,650. The output of some of the most prominent fish was as follows: 320,360 pounds of catfish, \$9,590; 185,850 pounds of black bass, \$17,150; 188,300 pounds of yellow perch, \$4,275; 315,875 pounds of sunfish, \$9,590; 100,600 pounds of suckers, \$4,465. Turtles, terrapins, and frogs are taken in considerable quantities, all of the latter being from Grand and Lewiston reservoirs. The value of the catch in the different waters was: \$26,151 in Grand Reservoir, \$12,602 in the Ohio River, \$10,750 in Licking Reservoir, \$7,820 in Lewiston Reservoir, and \$2,080 in Loramie Reservoir.

Indiana.—Indiana has fisheries that are among the most important in the interior States. The Ohio and Wabash rivers are the principal grounds, although fishing is also done on the Kankakee, White, and Tippecanoe rivers, and numerous lakes, among which are Maxinkuckee, Chapman, Pike, Center, Crystal, Huffman, Palestine, Andricks, Oswego, Barber, Shriner, Cedar, Round, Manitou, Little Eagle, and Big Eagle. About four-fifths of the quantity and value of the yield are from the two rivers first named.

The persons employed in the fisheries of the State in 1894 numbered 889, of whom 490 fished in the Ohio, 200 in the Wabash, 82 in the Kankakee, and 117 in other waters. The investment in fishing property was \$25,590, divided as follows: \$7,505 in 868 boats; \$11,067 in 2,050 fyke nets; \$1,460 in 2,363 set lines; \$2,230 in 82 seines; \$778 in 83 gill nets, and \$2,550 in miscellaneous and shore property. Of the total yield of 2,504,775 pounds, valued at \$124,169, over 2,000,000 pounds, worth \$103,000, were taken in the Ohio and Wabash rivers. Catfish constituted about one-third the catch, or 802,025 pounds, valued at

\$43,325. Between 350,000 and 400,000 pounds each of buffalo-fish, suckers, and fresh-water drum were taken. Other products obtained, in quantities ranging from 20,000 to 100,000 pounds, are wall-eyed pike, sturgeon, sunfish, black bass, crappy, pike, white and rock bass, paddle-fish, moon-eye, frogs, turtles, and terrapins.

Kentucky.—For an interior State, Kentucky has comparatively important fisheries. Fishing is carried on in the Ohio, Mississippi, Kentucky, Cumberland, Tennessee, and Green Rivers, the industry being most extensive in the first-named stream. In 1894, 587 persons were engaged in the economic fisheries of the State, 447 of whom fished in the Ohio River, 44 in the Kentucky River, 49 in the Cumberland River, 12 in the Tennessee River, 14 in the Green River, and 21 in the Mississippi River. About \$35,000 was invested in fishing property, divided as follows: Eighty-one seines, \$3,323; 2,825 fyke nets, \$17,975; 1,985 set lines, \$1,458; 639 boats, \$10,175; other apparatus and shore property, \$2,563. Fresh-water drum, buffalo-fish, catfish, and suckers comprise the bulk of the catch, the yield of these four species alone amounting to nearly 2,000,000 pounds. Other fish taken in lesser abundance are sturgeon, 82,000 pounds; paddle-fish, 78,000 pounds; white, yellow, and rock bass, 37,000 pounds; wall-eyed pike, 36,000 pounds; black bass, 24,000 pounds; moon-eye, 13,000 pounds; crappy, 13,000 pounds; carp, 12,000 pounds; eels, 3,000 pounds; turtles and terrapins, 4,281 pounds. The aggregate catch, amounting to 2,273,585 pounds, was worth \$90,024. Fyke nets take one-half the entire catch. Set lines and seines come next in order of importance, while the catch of cast nets, dip nets, drift nets, and other apparatus is insignificant. Nearly four-fifths of the entire yield are from the Ohio River.

Illinois.—Illinois has the distinction of maintaining more important fisheries in its interior waters than any other State. The State is well supplied with water-courses containing food-fishes in large variety and quantities, and permitting the employment of numerous fishing devices. In allusion to the abundance of suckers, Illinois is popularly known as the "Sucker State," an appellation which is well warranted, since fishes of the sucker tribe constitute much more than half the total annual production. Very important fisheries are prosecuted in the Mississippi, Ohio, and Illinois rivers, and interests of less extent center in the Wabash, Kankakee, Sangamon, Kaskaskia, and Big Muddy rivers and in Horseshoe and Pittsburg lakes.

In 1894 the fisheries of this State (excluding those in Lake Michigan) were engaged in by over 1,650 persons, of whom about 770 were on the Mississippi, 610 on the Illinois, and 160 on the Ohio. The value of the boats, apparatus, and other property used in the industry in that year was about \$156,000; this sum was apportioned approximately as follows: \$52,000 in 1,459 boats, \$58,780 in 11,276 fyke nets, \$3,290 in 126 trammel nets, \$19,310 in 203 seines, \$5,660 in gill nets, set and other lines, small traps, etc., and \$16,765 in shore and accessory property. The quantity of fishery products taken and sold was over 11,537,000

pounds, for which the fishermen received about \$332,975. The species most prominent in the catch are buffalo-fish and other suckers (6,237,200 pounds, \$156,000), catfish (1,962,400 pounds, \$81,615), fresh-water drum (1,113,158 pounds, \$26,300), carp (860,300 pounds, \$21,300), black bass and other basses (253,700 pounds, \$15,100), crappy (168,200 pounds, \$7,700), sunfish (205,500 pounds, \$5,200), wall-eyed pike (77,300 pounds, \$5,100), turtles and terrapins (198,500 pounds, \$3,190).

Wisconsin.—Economic fishing in this State is important in the Mississippi River and Lake Winnebago. The extent of the business in the remaining waters (except Lakes Superior and Michigan) is very limited, considering their number and area. The yield in the river and lake named is sufficiently large, however, to give Wisconsin prominent rank among the States of the Mississippi Basin.

The persons engaged in the fisheries in 1894 numbered 466; of these, 229 fished in the Mississippi and 137 in Lake Winnebago. The invested capital amounted to about \$55,000, of which \$25,600 represented 3,676 gill nets, \$8,300 represented 820 fyke nets, and \$11,800 represented 291 boats. Other prominent appliances are seines and set lines. The quantity of fish taken was 3,504,000 pounds; for this the fishermen received \$91,980. About 980,000 pounds, worth \$27,650, were obtained in the Mississippi River, and 1,598,100 pounds, valued at \$39,975, in Lake Winnebago. The wall-eyed pike is the most important fish in this State; over 555,000 pounds were taken, having a value of \$27,880. The next prominent fish is the catfish, of which 506,000 pounds, worth \$14,130, were caught. The species taken in largest quantities is the fresh-water drum; about 858,000 pounds were secured, but the value was only \$4,900. Among the other fish taken for market are the buffalo-fish (211,000 pounds, \$4,680), pike (246,500 pounds, \$10,805), saugers (129,300 pounds, \$5,960), and sturgeon (185,400 pounds, \$5,500). Gill nets, fished chiefly in Lake Winnebago, take about half the fish credited to the State, and fyke nets catch about half the quantities obtained in gill nets, or about the same as all the other apparatus combined.

Minnesota.—In the importance of its fisheries Minnesota ranks next to Illinois among the States under consideration. It has extensive fisheries in the Mississippi River and the Lake of the Woods, and also in the St. Croix River, Big Stone Lake, and numerous other lakes. About four-fifths of the catch credited to the State comes from Mississippi River and Lake of the Woods, which waters have a corresponding proportion of the persons engaged and capital invested.

There were 936 persons employed in the fisheries in 1894, of whom 325 were on Mississippi River, 190 on St. Croix River, 173 on the Lake of the Woods, and 248 on other lakes. The capital invested was \$123,975, of which \$38,473 represented vessels and boats, \$53,871 apparatus of capture, and \$31,605 shore and accessory property. A prominent feature of the fisheries was the employment of 148 pound nets in Lake of the Woods. The aggregate catch, amounting to 6,401,280 pounds, had a market value of \$162,782.

The yield in the Mississippi River was 2,934,068 pounds, valued at \$69,968; in the St. Croix River, 701,938 pounds, \$14,873; in Lake of the Woods, 2,198,984 pounds, \$56,747; and in other lakes, 566,290 pounds, \$21,194. The Mississippi and St. Croix catch was made up largely of buffalo-fish, catfish, saugers, shovel-nose sturgeon, and suckers. In the Lake of the Woods the bulk of the output was pike, lake sturgeon, wall-eyed pike, and whitefish, about half being sturgeon. In the other lakes black bass, pike, and wall-eyed pike predominated. The production of the principal species in the entire State was as follows: Sturgeon, 1,560,448 pounds, \$43,190; buffalo-fish, 1,587,802 pounds, \$31,228; catfish, 747,274 pounds, \$18,200; wall-eyed pike, 651,850 pounds, \$20,128; whitefish, 422,198 pounds, \$10,648; suckers, 324,999 pounds, \$6,031; and pike, 396,165 pounds, \$10,042.

Iowa.—This is one of the foremost States of the interior as regards commercial fishing. The industry is important on the Mississippi, Big Sioux, Des Moines, and Skunk rivers, and on Okoboji and Spirit lakes, although by far the most extensive interests are on the Mississippi. The business gave employment to 944 persons, of whom 680 fished in the Mississippi River. The invested capital was \$46,710, of which \$40,100 represented the value of boats, apparatus, etc., used in the Mississippi. The aggregate catch was 4,079,704 pounds of fish and other products, having a value of \$124,851; of this amount, 3,367,497 pounds, worth \$96,190, were from the Mississippi.

The number and value of the principal forms of apparatus used in this State were as follows: Seines, 103, \$6,515; trammel nets, 80, \$2,204; fyke nets, 3,106, \$14,285; set lines, 1,783, \$1,646; 695 fishing boats and 44 house boats, \$14,837.

The prominent fishes of the State are buffalo-fish, catfish, fresh-water drum, suckers, and carp. The quantity and value of the yield of each of these in 1894 were as follows: Buffalo-fish, 1,350,144 pounds, \$33,209; catfish, 985,983 pounds, \$43,934; fresh-water drum, 704,744 pounds, \$15,916; suckers, 209,545 pounds, \$3,789; carp, 203,377 pounds, \$5,218. Other fish taken in less quantities than 100,000 pounds were wall-eyed pike, paddle-fish, yellow perch, black bass, crappie, sunfish, sturgeon, eels, saugers, white and yellow bass. Nearly 150,000 pounds of mussel shells for use in the manufacture of buttons were gathered by the fishermen; these brought \$2,072. Seines were credited with taking the largest amount of products, although the fyke-net and set-line catches were nearly as great.

Missouri.—The fisheries of this State are carried on principally in the Mississippi and Missouri rivers. Little River, Big Lake, and Pemiscot Lake, the remaining waters having commercial fisheries, are situated in the extreme southeastern portion of the State. Swamps and sunken lands, formed from overflows of the Mississippi, also in this portion of the State, are hunted for frogs. In 1894, 575 persons engaged in the fisheries, of whom 379 fished in the Mississippi River, 143 in the Missouri River, and 53 in the Little River, Big Lake, and

Pemiscot Lake. The investment in boats, apparatus, and other property was \$44,205, divided as follows: 523 boats, \$11,221; 95 seines, \$5,237; 120 trammel nets, \$3,654; 3,014 fyke nets, \$14,207; 1,235 set lines, \$1,056; 375 drift and hand lines, \$95; 58 spears, \$68; shore and accessory property, \$8,667. More than one-half the investment was on the Mississippi River. The products of the fisheries amounted to 3,821,654 pounds, with a value to the fishermen of \$119,786. The species taken in largest quantities were buffalo-fish and catfish, 1,724,078 pounds of the former, and 757,566 of the latter, or nearly two-thirds of the aggregate yield, being obtained. Fresh-water drum, suckers, paddle-fish, crappy, black bass, and carp were each taken in quantities of over 100,000 pounds. Sturgeon, sunfish, white bass, rock bass, pikeperch, eels, and moon-eye are obtained in limited quantities; 154,818 pounds of frogs, having a value to the fishermen of \$9,676, were also secured.

Kansas.—The fisheries of this State are restricted to the Missouri and Kansas rivers, and are comparatively unimportant. In 1894 only 61 persons followed the business. These had \$3,411 invested and took 242,387 pounds of fish, valued at \$11,022. The investment was made up of \$683 in 61 boats, \$715 in 12 seines, \$1,210 in 190 fyke nets, and \$803 in other apparatus and shore property. The principal fish caught for market are catfish, buffalo-fish, fresh-water drum, suckers, carp, paddle-fish, sturgeon, and eels. Catfish constituted nearly two-thirds of the aggregate catch.

Nebraska.—The fisheries of this State, which are prosecuted in the Missouri and Platte rivers, have not attained much development. In 1894 they gave employment to only 76 persons; the capital invested was \$2,721 (chiefly in seines), and the value of the yield was \$14,015. The fishes taken in largest quantities are buffalo-fish, catfish, fresh-water drum, and paddle-fish, which comprised over 306,000 pounds in a total catch of 340,400. Over 311,000 pounds, worth \$12,490, came from the Missouri River, and more than half the aggregate output of the State is obtained with seines.

South Dakota.—The Missouri River and its tributaries, the Vermilion, Big Sioux, and Dakota rivers, are the principal fishing-grounds in this State, although considerable fishing is, in the aggregate, done in Big Stone, Madison, Wall, and Herman lakes. The physical conditions are not favorable to the development of important fisheries, and the industry is further curtailed by the interdiction of net fishing except in the Missouri River. The 121 persons engaged in fishing in 1894 had 97 boats, 26 seines, 15 gill nets, 18 trammel nets, 48 fykes, 136 set and hand lines, which, with other property, had a value of \$2,911. The catch was 416,920 pounds, valued at \$13,261. Only two kinds of fish are taken in noteworthy quantities, buffalo-fish and catfish, of which 196,000 pounds and 125,000 pounds, respectively, were obtained.

Colorado.—Mr. E. A. Tulian, superintendent of the United States Fish Commission station at Leadville, Colorado, was detailed in March, 1896, for an examination of the economic fisheries of this State. The

report of the Eleventh Census showed that in 1889 the fisheries of Colorado had the following extent: Persons employed, 27; value of boats and apparatus, \$673; value of products, \$4,564. During March and April Mr. Tulian visited all parts of Colorado, but failed to find any commercial fishing, with the exception of a small business in fish taken from private ponds. The enactment of restrictive legislation since 1889 had caused the suspension of all fishing for market purposes.

Utah.—On the completion of Mr. Tulian's inquiries in Colorado, he was ordered to the adjoining State of Utah, in which commercial fishing was known to exist. During the month of April, Mr. Tulian visited Utah Lake, and Bear Lake, and took an account of the fishing there carried on. The Eleventh Census returns for this State indicated that in 1889 the number of persons engaged in this branch was 18, the capital invested was \$388, and the value of the catch was \$5,167. The examination of the State waters by Mr. Tulian showed that fishing as a business is carried on in Utah Lake, Bear Lake, Panguitch Lake, Weber Lake, Ogden River, and numerous small lakes and streams. The industry is most important in the first-named lakes, and in Utah Lake is especially interesting because two introduced fishes, black bass and carp, are the principal products. The semiprofessional fishing with rod and line in the smaller waters of Utah is, in the aggregate, very extensive, suckers constituting the bulk of the catch. It is only in Bear Lake and Utah Lake that any apparatus except lines is employed; in the former, gill nets and seines are operated for trout and suckers, respectively, and in the latter, seines are used for carp and suckers.

The extent of the fisheries of Utah in 1895 was as follows: Persons engaged, 630, of whom 145 were professionals; capital invested, \$11,735; pounds of fish sold, 1,230,124; value of catch, \$37,480. The quantities of the different fishes composing the yield are: Suckers, 962,400 pounds; trout, 85,800 pounds; carp, 133,324 pounds; black bass, 300,000 pounds, and whitefish, 18,600 pounds.

Idaho.—The commercial fisheries of this State are of limited extent. They are prosecuted in Snake River and Bear and Pend d'Oreille lakes, the last-named water having quite unimportant interests. The bulk of the fishing in Snake River is done with seines for salmon and steelheads; a few thousand pounds of sturgeon are taken with set lines and some salmon are caught with wheels. In Pend d'Oreille Lake there is a trout line fishery. Seines and gill nets are employed for the capture of trout and suckers in Bear Lake. The fisheries of the State were investigated by Mr. William Barnum in August, 1895, with the exception of those of Bear Lake, which were covered by Mr. E. A. Tulian in April, 1896. It was ascertained that in 1894 57 persons were engaged in the industry; \$2,375 was invested in 30 boats, 20 seines, 4 wheels, and other property; 235,058 pounds of fish were taken, for which the fishermen received \$11,929. Of the products, 89,160 pounds, worth \$3,991, were salmon; 36,698 pounds, valued at \$1,638, were steelheads; 4,500 pounds, valued at \$230, were sturgeon; 37,200 pounds, worth \$3,570, were trout, and 67,500 pounds, valued at \$2,500, were suckers.

Nevada.—The commercial fisheries of this State were canvassed in April, 1896, by Mr. A. B. Alexander, fishery expert on the *Albatross*, who was detailed to make this investigation while on his way from Washington, D. C., to the Pacific Coast. The water area of this State is very limited, and the fisheries are of little value, although they appear to have been more extensive some years ago than they are at present.

The fishing of commercial importance reported by Mr. Alexander is done in Pyramid Lake and Truckee River. There is also some fishing carried on by Indians and others for home consumption in various lakes, rivers, and sloughs, of which no record was obtained. The persons who can be regarded as fishermen numbered only 39 in 1894 and 40 in 1895, 30 of these each year fishing in Pyramid Lake. The value of the boats and lines used was about \$685. The catch, consisting wholly of trout, was worth \$3,056 in 1894 and \$2,083 in 1895, these sums representing 42,820 pounds and 28,700 pounds, respectively.

Winnemucca Lake was at one time a rather important fishing-ground, but no fishing is now done in it, owing to the scarcity of water, which began to recede in 1891; but lately the water has been slowly increasing and the fishermen are looking forward to a resumption of business.

California.—While the Commission had on several occasions canvassed all commercial fishing in the coast rivers of California, it had never inquired into the extent of the industry in the interior lakes. Therefore, Mr. Alexander, in conjunction with his examination of the lakes and rivers of Nevada, was ordered to visit lakes Tahoe, Tulare, and such other lakes in California as supported any fishing for market purposes.

The principal fishing was found to exist in Lake Tahoe, where there is a rather important line fishery for cut-throat trout, the catch being shipped to San Francisco and also sold locally to hotels. About 40 men made a business of taking trout by trolling; in 1894 these caught 47,800 pounds, valued at \$7,169, and in the following year 41,590 pounds, worth \$6,035. In Independence and Donner lakes and the Truckee River, a small amount of line fishing for trout was met with. In Lake Tulare, a large shallow body of water in the south-central part of the State, there was some terrapin fishing in 1894, which in 1895 was supplemented by seine fishing for Sacramento perch.

The total number of persons ascertained to be employed in the fisheries of the waters was 50 in 1894 and 68 in 1895. The capital invested was \$3,236 and \$5,693, respectively, of which \$2,710 in 1894 and \$2,965 in 1895 represented boats. The total catch was 55,714 pounds worth \$8,246 in 1894, and 76,960 pounds worth \$8,542 in 1895.

INDIAN RIVER, FLORIDA.

The sundry civil bill making appropriations for this Commission for the fiscal year 1895–96 contained a provision for “a special investigation as to the extermination of migratory fishes in the Indian River of Florida.” The investigation was conducted in January and February,

1896. Mr. W. A. Wilcox, field agent of this division, was detailed to study the commercial aspects of the fisheries of that water in conjunction with Prof. B. W. Evermann, who had in charge the scientific features of the subject. Mr. Wilcox's report of his inquiries was submitted to the Commissioner on March 31, 1896. He visited all the fishing centers on the river, and obtained, in addition to descriptive notes, data showing for each locality the number of persons employed, the number and value of each kind of fishing appliance used, and the quantity and value of the fish and other products taken. His report treats of the development of the Indian River fisheries, the fishing centers and grounds, the fishery resources, the fishing apparatus and methods, the fishermen, prices, shipments, markets, etc., and the statistics of the industry.

The Indian River fisheries in 1895 gave employment to 254 persons, represented an investment of \$41,512, and yielded 2,659,815 pounds of products valued at \$37,657. The most prominent fishery objects are mullet, pompano, sheepshead, squeteague, and oysters. The catch of mullet was 1,610,869 pounds, worth \$12,251. The most valuable fish—and the most highly esteemed of all the species in the river—was the pompano, of which only 149,000 pounds were taken, but which brought the fishermen \$9,475.

PASSAMAQUODDY BAY, MAINE.

In February, 1896, Mr. Ansley Hall, field agent, was sent to the eastern coast of Maine to obtain certain data regarding the fishing industry of the contiguous waters of Maine and New Brunswick for the use of the International Fishery Commission. The information specially desired by the Commission was as follows: The quantity of herring caught in the American and Canadian weirs in the Passamaquoddy region, the number of boxes of smoked herring prepared, and the number of cases of sardines manufactured during the calendar years 1893, 1894, and 1895; and, for 1895, the number and location of the weirs operated in American and Canadian waters. Advantage was taken of this opportunity to have a very full and complete study made of the present aspects and condition of the sardine, smoked herring, and related branches at Eastport, Lubec, and other centers of that region. Besides very detailed statistical matter, secured largely from the books of the firms, descriptive notes were obtained relating to the methods pursued and the recent changes therein. Mr. Hall completed his inquiries in April. The material desired by the joint commission was furnished in May. The remaining information will be incorporated in a special paper treating of the herring fishery and dependent industries of the eastern Maine coast.

NEW ENGLAND MACKEREL FISHERY.

In July, 1895, Mr. F. F. Dimick, local agent of the Commission at Boston, Mass., was instructed to obtain, for the use of the International Fisheries Commission, certain information regarding the New England

mackerel fishery during the season of 1895. In February, 1896, Mr. Dimick submitted a report on this subject, which was transmitted to the United States representative on the joint commission. The report covered the general extent and results of the vessel fishing on the various grounds and during the different months; the methods employed and the quantities of mackerel taken by each method; the average prices received for mackerel; the monthly importations of mackerel from the British provinces; the extent of the fishing carried on with traps and from small boats.

SHAD FISHERIES OF THE ATLANTIC COAST.

In May, 1896, a general canvass of the shad fisheries of the entire Atlantic coast was begun. The work was inaugurated in Florida, and by June 30 had embraced Georgia, South Carolina, and North Carolina. The intention is to take up the canvass in the various remaining streams about the time shad fishing is suspended, in order that a full account of the business during the season of 1896 may be obtained. The investigation will cover the following statistical details for each stream, in addition to full descriptive notes on the condition and methods of the fisheries: Number of persons employed in each branch of the shad fishery; the number and value of the boats and various kinds of apparatus employed; the number, weight, and value of the shad taken with each kind of apparatus. Coincident with the investigation of the shad fishery a canvass of the alewife and salmon fisheries will be made.

PACIFIC STATES.

About three years having elapsed since the last general canvass of the Pacific States, another investigation of the important interests of that region appeared opportune and was accordingly begun in the latter part of the fiscal year. Mr. W. A. Wilcox, who had twice before covered the fisheries of the west coast, was assigned to the work. The inquiries began in the Columbia River in May, and by the close of the fiscal year had progressed satisfactorily.

There were certain features of the fishing industry of this section which the Commissioner desired to have specially considered. The investigation was assigned to the writer, who left for San Francisco on May 15 and was engaged in the work at the close of the year. The subjects to which special attention was given were the condition and extent of the shad and striped-bass fisheries, the results of the attempts to introduce lobsters into Pacific waters, and the development of the sardine industry of southern California.

INQUIRIES AT GLOUCESTER AND BOSTON, MASS.

Capt. S. J. Martin and Mr. F. F. Dimick, the local agents of the Commission at Gloucester and Boston, respectively, have continued their inquiries relative to the fishery products landed at those places by American fishing vessels. Following is an outline of the results of their

inquiries during the calendar year 1895. A more detailed exhibition of the extent and importance of the fisheries centering at these ports will appear in a special paper. The work of the agents included the procuring of accurate data for each of the 7,491 fares of fish landed, the observations covering over 150,000,000 pounds of fresh and salt fish, with a first value of over \$3,550,000.

The fish discharged at Gloucester in 1895 by American fishing vessels consisted of 26,064,664 pounds of fresh fish and 50,566,813 pounds of salt fish, the aggregate receipts being 76,631,477 pounds, with a value of \$2,205,619. The receipts were about 3,000,000 pounds less than in the previous year. The principal decrease occurred in the mackerel, halibut, cusk, and hake, while there was a noteworthy increase in the cod.

Cod is the preeminent fish in the Gloucester fisheries, constituting much more than half the quantity and value of the catch. Over 43,000,000 pounds of salt fish, worth about \$1,050,000, and more than 4,100,000 pounds of split fresh fish, valued at over \$85,000, were brought in. The combined yield of fresh and salt cod exceeded the yield in 1894 by about 5,430,000 pounds and in 1893 by 8,781,000 pounds. The grounds contributing to the increase were the Grand Banks and Nantucket Shoals. From the former grounds over 21,440,000 pounds of cod were landed and from the latter 3,666,000 pounds. From Georges Bank 13,086,000 pounds were brought in.

Other members of the cod family were represented as follows in the Gloucester receipts: Cusk, 2,515,000 pounds, \$37,000; haddock, 5,405,000 pounds, \$31,500; hake, 4,843,000 pounds, \$28,000; pollock, 1,782,000 pounds, \$9,400. The principal quantities of cusk and hake came from Cashes Bank, of haddock from Georges Bank, and of pollock from the New England shore.

The halibut is the next important fish to the cod. In 1895 the halibut receipts aggregated 7,418,000 pounds of fresh fish, valued at \$571,000, and 1,062,000 pounds of salt fish, valued at \$52,000. Compared with 1894, these figures show a decrease in quantity of 755,000 pounds and in value of \$68,000. There were fewer fish caught on Western Bank and on the Greenland and Iceland grounds, while there were more taken on the Grand Banks.

The Gloucester mackerel fishery in 1895 was even poorer than in 1894, when the outcome was very disappointing. The decrease in the catch, however, was more than compensated for by an increase in the price of the fish, owing to the quality of the yield and a more active demand, so that the value of the fishery was greater than in the previous year. The fishery on the Cape shore and in the Gulf of St. Lawrence resulted in the taking of 12,962 barrels of salt mackerel, having a value of \$194,947. The fishery on the New England shore yielded 6,226 barrels of salt fish, worth \$103,574. The fresh mackerel brought to Gloucester amounted to 206,407 pounds, valued at \$19,099.

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A summary of the receipts at Gloucester, specified by fishing-grounds and the condition in which the fish were brought in, is given in the following table:

Summary by fishing-grounds of certain fishery products landed at Gloucester in 1895 by American fishing vessels.

Fishing-grounds.	Cod.				Cusk.			
	Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:								
La Have Bank	145,100	\$2,537	2,065,422	\$49,089	120,000	\$2,205	9,120	\$214
Western Bank	1,000	28	688,720	16,480			5,000	100
Quereau Bank	1,000	30	678,580	13,027				
Sambro Bank			60,000	1,675				
St. Peters Bank			54,400	1,443				
Green Bank			21,500	621				
Burgo Bank			340,580	6,570				
Grand Bank			21,441,745	450,792				
Canso Bank			43,780	1,020				
Greenland and Iceland			57,000	1,058				
Cape North			787,500	15,287				
Cape Shore	111,500	2,461	410,180	10,942	71,000	978	30,000	651
Gulf of St. Lawrence			421,000	8,715				
Total	258,600	5,056	27,070,407	577,319	191,000	3,183	44,120	965
West of 66° W. longitude:								
Browns Bank	233,988	4,405	597,070	18,203	103,000	1,404	8,000	170
Georges Bank	1,304,620	22,844	11,781,438	358,447	89,500	1,224	198,220	4,532
Cashes Bank	752,100	11,156			1,542,480	21,045		
German Bank	5,600	90	102,200	2,684	6,200	81	5,000	125
Pippenies Bank	6,000	105			8,000	116		
Tillies Bank	9,000	130			18,000	262		
Jeffreys Ledge	19,000	394			74,400	1,058		
Ipswich Bay	157,640	4,766	5,000	138				
Middle Bank	2,000	32						
Off Chatham	17,500	262	10,000	213				
South Channel	77,500	1,016			193,400	2,731		
Nantucket Shoals	10,000	160	3,056,248	93,679				
Shore, general	1,251,978	35,018	5,000	133	33,000	462		
Total	3,846,926	80,378	16,157,556	473,587	2,067,080	28,383	211,220	4,827
Grand total	4,105,526	85,434	43,227,963	1,050,906	2,250,580	31,566	255,340	5,792

Fishing-grounds.	Haddock.				Hake.			
	Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:								
La Have Bank	36,000	\$210			366,000	\$2,071	20,000	\$250
Western Bank							5,000	50
Cape Shore	2,000	10	7,000	\$70	42,000	248	41,000	573
Total	38,000	220	7,000	70	408,000	2,319	66,000	873
West of 66° W. longitude:								
Browns Bank	105,500	813			135,000	790	12,000	150
Georges Bank	4,795,660	25,987	8,200	120	120,400	816		
Cashes Bank	169,000	988			2,989,600	16,018		
German Bank	4,000	24	8,000	101	25,000	130	75,000	901
Pippenies Bank					21,000	120		
Tillies Bank					105,600	634		
Jeffreys Ledge	9,000	130			204,500	1,242		
Ipswich Bay	6,200	40						
Middle Bank	7,000	56			8,000	40		
Off Chatham	15,000	75						
South Channel	28,600	162			369,000	2,076		
Shore, general	199,728	2,732	5,000	60	291,670	1,901	12,000	150
Total	5,339,686	31,007	21,200	281	4,270,370	23,857	99,000	1,201
Grand total	5,377,686	31,227	28,200	351	4,678,370	26,176	165,000	2,074

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Summary by fishing-grounds of certain fishery products landed at Gloucester, etc.—Cont'd.

Fishing-grounds.	Pollock.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:								
La Have Bank	2,000	\$10			463,666	\$44,891		
Western Bank					748,400	73,404	1,400	\$84
Quereau Bank					2,078,205	169,312		
St. Peters Bank					358,585	25,064		
Green Bank					337,615	26,310		
Burgeo Bank					193,600	11,748	5,400	324
Grand Bank					1,089,125	111,165	86,810	5,402
Greenland and Iceland							958,000	45,500
Off Newfoundland					53,990	4,310		
Cape North					26,000	1,470	4,400	264
Cape Shore					27,200	2,492		
Gulf of St. Lawrence					81,860	4,298	6,100	366
Total	2,000	10			6,358,246	474,530	1,062,110	52,000
West of 66° W. longitude:								
Browns Bank	1,000	7			17,825	1,459		
Georges Bank	18,200	115			1,039,040	94,768		
Cashes Bank	5,000	28			750	73		
German Bank					980	118		
Jeffreys Ledge	128,155	810						
Off Chatham	25,000	188	118,000	\$1,290				
Nantucket Shoals			4,000	40	1,570	151		
Shore, general	1,381,069	6,931						
Total	1,558,424	8,088	122,000	1,330	1,000,165	96,569		
Grand total	1,560,424	8,098	122,000	1,330	7,418,411	571,099	1,062,110	52,000
Fishing-grounds.	Mackerel.				Other fish.			
	Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:								
La Have Bank					1,240	\$50		
Cape Shore			1,512,000	\$95,400				
Gulf of St. Lawrence			1,080,400	99,547				
Total			2,592,400	194,947	1,240	50		
West of 66° W. longitude:								
Georges Bank	3,250	\$338	10,800	878			11,000	\$79
Jeffreys Ledge							10,000	90
Ipswich Bay	6,200	757			21,850	167	111,000	1,071
Middle Bank	3,947	336						
Race Point	1,575	143	18,200	1,206			2,600	39
South Channel	1,650	154	263,400	18,440			8,000	521
Nantucket Shoals	15,900	1,438	12,400	837				
Shore, general	173,885	15,933	940,400	82,213	435,170	2,824	1,720,000	17,096
Total	206,407	19,099	1,345,200	103,574	457,020	2,991	1,868,000	18,806
Grand total	206,407	19,099	3,837,600	298,521	458,260	3,041	1,868,000	18,806

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Summary by fishing-grounds of certain fishery products landed at Gloucester, etc.—Cont'd.

Fishing-grounds.	Total products.				Total number of trips from each ground.
	Fresh.		Salted.		
	Pounds.	Value.	Pounds.	Value.	
East of 66° W. longitude:					
La Have Bank	1, 134, 606	\$51, 974	2, 094, 542	\$49, 553	126
Western Bank	749, 400	73, 492	700, 120	16, 714	63
Quereau Bank	2, 079, 205	169, 342	678, 580	13, 027	-130
Sambro Bank			60, 000		1
St. Peters Bank	358, 585	25, 064	54, 400	1, 443	17
Green Bank	337, 615	26, 310	21, 500	621	12
Burge Bank	193, 600	11, 748	345, 980	6, 894	8
Grand Bank	1, 989, 125	111, 165	21, 528, 555	456, 194	161
Causo Bank			43, 780	1, 020	1
Greenland and Iceland			1, 015, 000	47, 227	11
Off Newfoundland	53, 990	4, 316			3
Cape North	26, 000	1, 470	701, 900	15, 551	4
Cape Shore	253, 700	6, 189	2, 000, 180	107, 636	81
Gulf of St. Lawrence	81, 800	4, 298	1, 507, 500	108, 628	64
Total	7, 257, 086	485, 308	30, 842, 037	826, 183	682
West of 66° W. longitude:					
Browns Bank	506, 313	8, 878	617, 670	18, 013	37
Georges Bank	7, 370, 670	146, 092	12, 009, 658	364, 056	734
Cashes Bank	5, 458, 930	49, 308			150
German Bank	41, 780	443	190, 200	3, 811	7
Fipponies Bank	35, 600	341			2
Tillies Bank	132, 000	1, 026	10, 000		6
Jeffreys Lodge	435, 055	3, 643	10, 000	90	34
Ipswich Bay	191, 890	5, 730	116, 000	1, 200	59
Middle Bank	20, 947	464			10
Race Point	1, 575	143	20, 800	1, 246	4
Off Chatham	57, 500	525	128, 000	1, 503	6
South Channel	670, 150	6, 139	271, 400	18, 901	46
Nantucket Shoals	27, 470	1, 740	3, 672, 648	94, 556	112
Shore, general	3, 766, 498	65, 891	2, 688, 400	99, 652	1, 331
Total	18, 806, 978	290, 372	19, 724, 776	603, 696	2, 538
Grand total	20, 064, 664	776, 740	50, 566, 813	1, 429, 870	3, 220

The following table shows, by fishing-grounds and species, the receipts of fish at Boston in 1895:

Summary by fishing-grounds of certain fishery products landed at Boston, Mass., in 1895 by American fishing vessels.

Fishing-grounds.	Cod.		Cusk.		Haddock.		Hake.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:								
La Have Bank	1, 842, 500	\$38, 972	557, 700	\$7, 357	1, 426, 000	\$10, 047	701, 500	\$6, 344
Quereau Bank	33, 000	735						
Western Bank	353, 500	7, 836	110, 000	1, 506	92, 500	6, 302	104, 000	810
Cape Shore	646, 800	13, 128	81, 000	1, 039	427, 000	6, 989	147, 200	1, 221
West of 66° W. longitude:								
Browns Bank	835, 800	17, 131	451, 000	5, 997	1, 183, 500	12, 774	241, 400	2, 015
Georges Bank	4, 604, 900	98, 618	340, 000	4, 859	12, 440, 000	122, 335	752, 000	9, 234
Cashes Bank	770, 000	10, 885	548, 000	7, 365	552, 200	8, 921	936, 000	7, 050
Fipponies Bank	130, 400	3, 227	137, 000	2, 010	153, 000	2, 724	230, 000	2, 708
Tillies Bank	3, 000	103	500	10	19, 000	620	4, 500	80
German Bank	26, 000	510	33, 000	450	21, 000	415	10, 000	150
Clark Bank	82, 000	1, 242			69, 700	600	14, 000	150
Ipswich Bay	192, 000	4, 079	1, 000	13	126, 000	2, 187	3, 400	38
Jeffreys Lodge	821, 000	20, 827	121, 700	1, 009	2, 354, 400	53, 887	919, 800	8, 105
Middle Bank	740, 200	17, 904	46, 000	782	2, 660, 500	52, 556	763, 000	5, 471
Platts Bank	6, 500	163	3, 000	45	4, 500	68	7, 500	113
Off Race Point	260, 500	7, 383			348, 500	5, 797	10, 700	67
Off Highland Light	879, 400	21, 019	65, 000	827	2, 495, 700	46, 927	817, 300	6, 062
Off Chatham	698, 900	14, 171	18, 000	239	1, 952, 900	31, 549	497, 500	3, 651
South Channel	4, 291, 100	90, 086	651, 800	8, 653	7, 382, 000	127, 866	3, 500, 400	25, 202
Nantucket Shoals	1, 787, 600	36, 130	12, 000	141	806, 100	14, 300	164, 500	1, 210
Shore, general	953, 250	22, 693	129, 600	1, 734	1, 579, 400	38, 693	622, 700	4, 767
Total	19, 965, 150	432, 842	3, 308, 400	44, 696	36, 199, 900	550, 008	10, 497, 400	85, 524

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Summary by fishing-grounds of certain fishery products landed at Boston, etc.—Cont'd.

Fishing-grounds.	Pollock.		Halibut.		Mackerel.			
					Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:								
La Have Bank	71, 100	\$1, 097	387, 500	\$40, 976				
Quereau Bank			22, 000	1, 845				
Western Bank	9, 100	89	198, 000	20, 890				
Cape Shore	10, 500	175	20, 200	2, 930	32, 000	\$3, 200	57, 800	\$3, 830
West of 66° W. longitude:								
Browns Bank	30, 200	356	153, 300	13, 385				
Georges Bank	57, 700	774	281, 325	28, 962	25, 650	2, 156		
Cashes Bank	52, 400	601	8, 586	944				
Pippenies Bank	30, 000	498	7, 000	732				
Tillies Bank	500	8						
German Bank			500	60				
Clark Bank			19, 900	1, 943				
Ipswich Bay	400	10						
Jeffreys Ledge	186, 000	2, 054	5, 400	602				
Middle Bank	50, 800	546	7, 309	515	28, 000	2, 285		
Platts Bank	100	2						
Off Race Point	8, 000	80	1, 800	191	41, 085	4, 050	6, 200	400
Off Highland Light	25, 900	367	8, 400	734	15, 925	1, 403		
Off Chatham	14, 800	164	7, 660	782	6, 250	450		
South Channel	148, 600	1, 070	88, 250	9, 089	5, 250	540		
Nantucket Shoals	56, 500	552	8, 600	935				
Shore, general	43, 400	561	7, 100	879	192, 757	18, 038	131, 800	9, 772
Total	795, 900	9, 604	1, 241, 821	127, 400	346, 917	32, 122	196, 800	14, 011

Fishing-grounds.	Other fish.		Total products.		Number of trips from each ground.
	Pounds.	Value.	Pounds.	Value.	
East of 66° W. longitude:					
La Have Bank	5, 000	\$100	5, 051, 300	\$114, 793	135
Quereau Bank	5, 000	75	60, 000	2, 755	3
Western Bank	27, 125	546	894, 225	37, 085	40
Cape Shore	18, 000	315	1, 440, 500	32, 824	42
West of 66° W. longitude:					
Browns Bank	2, 000	30	2, 897, 200	51, 688	60
Georges Bank	638, 275	31, 513	19, 130, 850	298, 451	440
Cashes Bank	100	4	2, 867, 286	42, 070	95
Pippenies Bank			693, 400	11, 050	34
Tillies Bank			27, 500	821	4
German Bank			90, 500	1, 585	2
Clark Bank			185, 000	3, 095	10
Ipswich Bay			322, 800	6, 327	38
Jeffreys Ledge	10, 513	613	4, 419, 713	87, 317	516
Middle Bank	4, 330	118	4, 300, 730	80, 177	560
Platts Bank			21, 000	391	2
Off Race Point	47, 900	1, 103	724, 685	19, 170	137
Off Highland Light	6, 400	568	4, 314, 925	77, 007	382
Off Chatham	450	51	3, 196, 460	51, 057	280
South Channel	90, 002	2, 284	16, 166, 802	265, 850	627
Nantucket Shoals	6, 400	336	2, 931, 690	53, 004	181
Shore, general	397, 280	12, 120	4, 057, 287	104, 247	745
Total	1, 258, 775	49, 886	73, 808, 063	1, 346, 073	4, 271

The quantity of fish landed at Boston by American fishermen in 1895 was about 73,808,000 pounds, valued at \$1,346,000. With the exception of a few salt mackerel, practically the entire receipts consisted of split fresh fish. Compared with 1894 the foregoing figures represent a decrease in quantity of about 13,657,000 pounds and in value of \$322,000. An analysis of the returns shows that 266 fewer fares of fish were landed in 1895, and that cod, cusk, haddock, hake, pollock, halibut, and mackerel were all taken in smaller quantities. About 5,000,000 pounds of the decrease was in the catch on the more eastern grounds.

Haddock is the most prominent fish in the fisheries centering at Boston. Half the quantity and two-fifths the value of the receipts consist of this fish. The amount discharged in 1895 was about 36,200,000 pounds, valued at \$550,000. The figures for 1894 were 39,500,000 pounds, worth \$639,000, the principal decrease being in the yield in the South Channel, which, next to Georges Bank, is the most productive ground, these two places yielding nearly 20,000,000 pounds of haddock in the year under consideration.

The quantity of fresh cod landed at Boston in 1895 was 19,965,000 pounds, having a value of \$432,800. Georges Bank, South Channel, and Nantucket Shoals contributed about half of this quantity. The decreased output compared with 1894, amounting to 1,722,000 pounds, worth \$66,000, was generally distributed among the various banks.

In point of value, halibut ranks next to cod; 1,241,000 pounds were landed, having a value of \$127,400. The principal halibut grounds resorted to by the fresh-fish fishermen of Boston are La Have, Western, Georges, and Browns banks. The slight decrease, as compared with 1894, was due chiefly to a smaller catch on Western Bank.

Hake comes next to haddock and cod in quantity. About 10,500,000 pounds, worth \$85,500, were brought to Boston in 1895, against 14,863,000 pounds, worth \$134,775, in 1894. One-third of the yield is from the South Channel.

The other prominent fish in the Boston vessel receipts are cusk (3,306,000 pounds, \$44,700), pollock (795,900 pounds, \$9,600), mackerel (347,000 pounds fresh, \$32,000, and 979 barrels salted, \$14,000), and swordfish, menhaden, herring, sea catfish, etc. (1,258,775 pounds, \$49,870).

SOME RESULTS OF FISH ACCLIMATIZATION.

Owing to the wide territory over which the distributions of the Commission are made and the numerous applicants yearly supplied with fish, it is entirely impracticable to keep well informed regarding the results except in a very small proportion of cases. The employees of the Commission, when in the field, secure some information as to the outcome of plants, especially when public waters are concerned; correspondents who have been interested in the introduction of fishes into certain waters often voluntarily report regarding the success of the deposits, and the State fish commissions, in the official reports, frequently notice the results of plants of fish made in their respective waters by this Commission, but as to the success or failure of a large majority of the plants no information is ever received.

The following notes embody some of the data relative to this subject that have come into the possession of the Commission during the year 1896, the files of the division of fish-culture contributing a number of the items:

Salmon in the Middle States.—Great interest has been manifested in the attempts to stock the rivers of the Middle Atlantic States with

salmon, and the interest has been heightened by the success which has attended the experiments in the Hudson and Delaware rivers during the past few years. In July, 1895, the writer, while in New York City, made some inquiries regarding the catch of salmon in that vicinity during the previous months. The existence of a law prohibiting the retention of salmon accidentally caught in Hudson River prevented the ascertainment of thorough knowledge as to the abundance of the fish in that stream, although there is every reason to believe that the species is increasing and that the Hudson will in time, under proper restrictions, be a self-sustaining salmon river. About twenty salmon from New York Bay, having an average weight of 12 pounds, and twelve from pound nets on the northern coast of New Jersey, reached the New York market in June. A few were also received from Peconic Bay, Long Island.

The run of salmon in Delaware River in 1895 was noteworthy. The Philadelphia *Ledger* of May 30 reported that during the previous week hundreds of salmon were caught on their way to the spawning-grounds in the shad nets between Chester and Delaware Water Gap. These fish were grilse and appeared to represent a plant of 60,000 fry in 1890. The weight of the salmon taken was from 9 to 15 pounds. At nearly every fishery, from 1 to 4 or more fish were caught and readily sold at 75 cents to \$1 a pound. The existence of a law prohibiting the use of nets for salmon made it difficult to obtain from the fishermen an accurate account of the number taken. Mr. W. deC. Ravenel, of the United States Fish Commission, was informed by Hon. H. C. Ford, of the Pennsylvania Fish Commission, that fully 300 salmon were caught in the Delaware during the season of 1895.

Rainbow trout.—This native of the mountain streams of the Pacific Coast has been successfully acclimatized in almost every State east of the Rocky Mountains, and in some of them has attained noteworthy prominence as a game and food fish. In a paper on the artificial propagation of this species, prepared by Mr. George A. Seagle, superintendent of the United States Fish Commission station at Wytheville, Va., correspondence on this subject is published from which some of the following notes are abstracted. Similar references might be made to numerous other States, but it is thought the notes given will be sufficient to show the general adaptability of the rainbow trout to the colder waters of the United States, the rapid growth and propagation of the fish, its superior game qualities, and its value as food.

Mr. W. D. Noel, of Lebanon, Mo., wrote under date of April 7, 1896, that the rainbow trout planted about twelve years ago in Bennett's Spring (which flows into Neangua River) have increased to a wonderful extent in the spring, and also in the river, in which they have been caught 8 miles above and 25 miles below the spring branch. Mr. Noel states that it is the gamiest fish they have, that it takes the fly more readily than any bait, and that for eating qualities it is not equaled by any fresh-water fish.

In parts of Missouri the rainbow trout distributed from the Neosho hatchery are doing well. Mr. W. J. Barrows, game and fish warden, writing from Waynesville, Mo., June 13, 1896, states that on February 17, 1895, he placed 1,000 young rainbow trout in Roubidoux Creek at that place and that they are now biting well, some weighing a pound being caught. In Hickory Creek and Crane Creek a number of adults were taken in 1896.

The Laramie River, in Wyoming, has been very successfully stocked with rainbow trout, from eggs sent from the McCloud River, California, in 1895 and 1896, and from Neosho, Mo., and the State hatchery in recent years. Mr. Gustav Schnitger, fish commissioner of Wyoming, reports in letters dated October 16 and December 4, 1895, that the Big and Little Laramie rivers and the upper waters of the North Platte River have proved excellent for rainbow trout, and that some are reported as weighing as much as 9 pounds. By use of a seine, Mr. Schnitger ascertained the presence of many fine rainbow trout in holes in the Big Laramie River, and forwarded to the Commission a photograph of 13 thus secured; the largest was $24\frac{1}{2}$ inches long and weighed over 7 pounds, several others weighed 6 pounds, and the smallest weighed over 4 pounds. It is reported that over 100 were taken from a hole at one haul of the seine. In Wyoming the rainbow trout is regarded as "truly a fine food-fish, as well as an excellent fish for anglers."

Mr. J. D. Phipps, of Longs Gap, Grayson County, Va., states that the young rainbow trout deposited in Peach Bottom Creek, a tributary of the New River (which, in turn, is a branch of the Kanawha), have grown and propagated as fast as any fish he ever saw, much faster, in fact, than the brook trout. The stream was posted and no fishing allowed for four years; in 1895 the creek was full of the finest trout, examples 22 inches long having been caught. Their flavor is fine and they are the gamiest fish Mr. Phipps ever met with.

In the Holston River, in Smyth County, Va., the rainbow trout is abundant. The reports received from this stream several years ago announced excellent line fishing. One 24 inches long and weighing $6\frac{3}{4}$ pounds was taken in the river at the mouth of Staley Creek by Mr. Coalson, of Marion, in 1892; and Mr. A. H. Gibboney, of the same place, has, with a friend, taken 110 rainbow trout from Staley Creek in two days' fishing, the fish averaging a foot in length.

Mr. Frank N. Clark, superintendent of the United States Fish Commission station at Northville, Mich., writes as follows regarding the rainbow trout in parts of Michigan:

The Au Sable River was first planted with rainbow trout about seventeen or eighteen years ago, I think, from eggs forwarded from the collecting station in California to the Michigan Fish Commission, hatched at their hatchery, and planted by them. Since that time there have been several plants made at different times, but not in large numbers. The success of this river is probably the most marked of any of the rivers of Michigan where rainbow trout have been planted. In certain portions of the river large rainbows are taken with hook and line, often weighing from 5 to 7 pounds, and in our net fishing for brook trout during October, 1895, the trout caught would run

about one-third rainbow; in addition to this we would catch from 100 to 1,000 last spring's hatch, and they would run a larger number rainbow than brook trout. The rainbow caught in the Au Sable are considered by sportsmen as more gamy than either brook trout or grayling, and it requires heavier tackle for this fish than for a brook trout of equal weight. Rainbow trout are also taken quite frequently with hook and line in Pere Marquette River; also the branches of that stream.

According to Mr. W. K. Hancock, of the United States Fish Commission station at Leadville, Colo., the rainbow trout is not plentiful in the streams throughout that part of the State, and its average size would probably be only three to five fish to a pound, although one is occasionally taken weighing one-half to three-fourths of a pound. In the streams and small ponds in the immediate vicinity of the station their growth is very slow. In the lower parts of the State, however, south and southwest of Leadville, they are more abundant and of much larger size. In Twin Lakes, 12 miles south of Leadville, the rainbow attains a weight of 12 or 13 pounds. Some 25 to 28 inches long and weighing 8 to 13 pounds have been taken by station employees. They are very gamy and are excellent for the table.

Among other waters in which the rainbow trout have been successfully acclimatized are the Tippecanoe River, near Monticello, Ind.; tributaries of the Susquehanna river in Maryland; the Green River, North Carolina, where large examples have been caught; Silver Creek and a tributary of the Chattooga River, Georgia; Broad River, South Carolina; Battenkill River, Vermont; and Spring River, near Mammoth Spring, Ark.

Shad and striped bass in California.—The remarkable success attending the introduction of these fish into Pacific waters has been frequently referred to in publications of the Commission. Their recent history in California warrants brief notice.

The consumption of shad in California has been diminishing for several years, and in 1895 the receipts at San Francisco, the principal market, were very much less than in the two preceding years. The returns for the first six months of 1896, however, show a substantial increase, the receipts being more than in the corresponding period of the three preceding years, and more than in the whole year of 1895, as shown in the following table:

Shad received in the San Francisco market.

Years.	Pounds.
1893.....	405,301
1894.....	209,379
1895.....	146,399
1896 (first six months).....	224,500

The following is from the report of the California Fish Commission for 1895-96:

The shad fisheries continue to be influenced by the demand for the fish. The fishermen are limited by the marketmen to that amount which is daily consumed, this

being deemed the only means by which they can keep the market from being overstocked. Little do our people appreciate the fact that one of the best and most sought-for fish in the East is always here at hand and is to be obtained many months in the year at a price which places it within the reach of all.

Notwithstanding a very active fishery, the striped bass continues to increase in abundance, as shown by a greatly augmented catch. The receipts at San Francisco during each of the recent years have been almost double those of the preceding year, and in 1895 nearly twice as much striped bass as shad was sold in the San Francisco market. This fish is very popular in California, is generally regarded as one of the best of food-fishes, and from present appearances its capture will in time constitute one of the principal fisheries. A comparison of the quotations of the New York and San Francisco markets discloses the interesting fact that striped bass are selling at a much lower price on the west coast than in the East.

A comparison of the receipts of striped bass in San Francisco for several years is given in the following table. It is seen that the quantity during the first half of 1896 was more than in the whole of 1893 and 1894 and only 20 per cent less than in 1895.

Striped bass received in the San Francisco market.

Years.	Pounds.
1893	80, 793
1894	149, 997
1895	252, 177
1896 (first 6 months)	204, 316

The market value to the fishermen of the shad and striped bass taken in the Pacific States between 1888 and 1896 (to July 1) was about \$192,000, of which \$112,000 represents shad and \$80,000 striped bass. The aggregate expense of introducing these fish to the Pacific Coast was under \$5,000.

Catfish and carp on the Pacific Coast.—These fishes continue to increase in the waters of the Pacific States to which they have been acclimatized; and while the demand is much less than the supply, the consumption seems to be growing yearly. In the first six months of 1896 the receipts by San Francisco dealers were much larger than for any previous corresponding period, and in the case of the carp greatly exceeded the total receipts during any other year. As the dealers restrict the quantities shipped in by the fishermen, it is apparent that the consumption is increasing in San Francisco. While no figures are now at hand for points on the San Joaquin, Sacramento, and Columbia rivers, it is thought that the sales of both of these fish were larger in 1895 and 1896 than previously. The California fish commissioners say that “these fish, though little considered by most of our people, furnish food for a large number, and figure to a large extent as a market fish.”

A comparison of the receipts of these fish in San Francisco during the years 1893, 1894, 1895, and 1896 follows. This shows that 154,784 pounds of carp and 129,159 pounds of catfish were disposed of, the approximate value of which was \$6,000.

Pounds of carp and catfish received in the San Francisco market.

Years.	Carp.	Catfish.
1893.....	33,084	36,544
1894.....	42,580	31,465
1895.....	20,864	32,282
1896 (first 6 months).....	52,256	28,868

Eastern fish in Lake Cuyamaca, California.—In January, 1896, the California Fish Commission instructed one of its deputies, Mr. Arthur G. Fletcher, to proceed to Lake Cuyamaca, near San Diego, Cal., to ascertain what results, if any, had attended the planting of fish by the United States Fish Commission in the fall of 1891. The plants then made consisted of 250 spotted catfish, 3,980 yellow perch, 1,990 large-mouth black bass, 285 crappie, 400 rock bass, and 400 pike. Mr. Fletcher visited the lake on January 14, 1896, and reports as follows on the results of his examination:

In order that definite results might be obtained, I took a small seine with me as well as my rod, and as I found the prospects of obtaining help to operate the net later in the day were not encouraging, I determined to make the trial with that the first thing in the morning. Like all mountain lakes in California, this proved to be full of hidden snags, and although we made but three hauls, nearly the whole day was spent in so doing, not without fair success, however. The first haul resulted in the taking of three pike, two perch, and two large-mouth black bass. We secured one more pike the second haul, and failed to get anything but snags the last time.

All of these fish were small, running from 4 to 8 inches, and all were in splendid condition. Had my net permitted of our hauling in deep water, we would no doubt have secured larger specimens. Later I secured a crappie which had been killed by being washed through one of the gates in the dam. All of these specimens have been forwarded to the board at San Francisco.

I am told that the pike are the most numerous, although not taken by hook as often as the crappie. Both of the pike which I forwarded to San Francisco were females and had spawn well advanced. The black bass are doing very well and a great many have been taken the last two years. The same can be said of the catfish. I found the head and skeleton of one on the shore, the same being about a foot long. Both the perch and crappie have done splendidly and large numbers have been taken, although I gather they were not large fish. I have not been able thus far to learn anything about the rock bass.

The distance of the lake from here [San Diego], the greater part of the 55 miles being covered by stage, made it impossible to make the thorough investigation at this time that I would like to have made, but I am satisfied that all of the fish planted—aside from the rock bass, and I hope later information will show otherwise—have done unusually well.

In a conversation with J. E. Friend, of this place, who has but recently returned from a fishing excursion to Lake Cuyamaca, where he remained with a party of campers some six weeks, I learn that they took large numbers of perch, three black bass of from 2½ to 3½ pounds, two pike of about 2 pounds, and several catfish of about

1½ pounds. They did not take any rock bass, nor am I able to learn that any have been taken.

I am told that fish were taken from Lake Cuyamaca and placed in Sweetwater Dam, of this county, and I shall try to get the particulars and results.

Later, the California commission transferred a number of adult fish from Lake Cuyamaca to other waters of the State, some of the bass being fine specimens weighing as much as 5 pounds. The distribution from this lake consisted of 541 large-mouth black bass (*Micropterus salmoides*), 454 yellow perch (*Perca flavescens*), 116 sunfish (*Lepomis cyanellus*), 27 pickerel (*Lucius vermiculatus*), and 253 shiners (*Abramis crysoleucas*). The last-named species has apparently been accidentally introduced, as it is not referred to in the record of the original plants.

Crappies.—Both species of this excellent food and game fish have been very successfully introduced into the Potomac River, as the result of a small lot supplied by this Commission. In March, 1894, Mr. Joseph H. Hunter, of Washington, D. C., was assigned 62 crappies from Quincy, Ill., which he deposited in the Wide Water of the Chesapeake and Ohio Canal about 14 miles above Washington, in the Potomac River at the same place, and in Black Pond, Virginia, which is about 20 feet above low-water mark in the river.

The first known result of this plant was a small fish taken on a line in the spring of 1896 at Four-Mile Run, Virginia, an arm of the Potomac River between Washington and Alexandria. Since then the fish has been taken in comparatively large numbers in the vicinity of Washington and elsewhere in the Potomac basin. Some of these have been caught by anglers and some have been secured with collecting seines by representatives of the Fish Commission.

These fish are abundant in Little River, a branch of the Potomac River separating Analostan Island from the mainland of Virginia; as many as 36 crappies, weighing from ½ to 1½ pounds, were taken there by an angler one day in the summer of 1896, and 6 or 8 specimens have been obtained in a single haul of a small collecting seine. In the Potomac, near the Seven Locks, 65 crappies, weighing about half a pound each, were taken by two anglers during a part of one afternoon in 1896; the fish bit at both live and dead minnows with great avidity. The lower part of the canal contains a great many of these fish, and some have been observed in the canal above Harpers Ferry.

In Black Pond crappies are very common. Mr. Hunter has watched their multiplication, and states that now (1896) thousands may be seen in the shallow waters, and that one day in July, 1896, he took 14 crappies with a fly in a short time. In Cat Pond, Maryland, 14 miles above Georgetown, crappies have been taken in large quantities. This pond is about 100 feet from the bank of the Potomac and connects with the river at high water. In the summer of 1896, two gunny sacks full of large crappies were reported taken there with a seine by some fishermen. Several weeks later fifty, 3 or 4 inches long, were seined by an agent of the Commission.

While both species of crappie have been obtained, the strawberry bass (*Pomoxis sparoides*) is as yet comparatively rare. The largest specimens have been about 10 inches long, while a great many have been 6 to 7 inches long; those only 3 or 4 inches long are common, plainly indicating that the fish have spawned. By local fishermen the fish are called crappies, strawberry bass, and strawberry perch.

Black bass.—During the past few years a number of plants of large-mouth black bass have been made by the Commission in the Potomac River and its tributaries, the effects of which have been marked. In 1896 bass were more abundant and taken in larger numbers in the Potomac River in the vicinity of Washington than ever before. They are found as far down the Potomac as Mattawoman Creek, 25 miles below Washington, and are especially numerous in Little River, where they are found in company with crappies. During the fall of 1896, the fisherman for the first time took noteworthy quantities of bass for market. One fisherman secured 150 pounds of bass at one haul of a small seine in Piscataway Creek. Many bass of large size were caught by boys around Washington, and during the summer of 1896 it was no uncommon sight to see boys and men passing through the streets of the city with long strings of bass which they had taken from the Long Bridge and elsewhere. In making collections of fishes for the aquarium at Central Station, Mr. Harron seined large numbers of bass of all sizes in the vicinity of Washington. On November 14, 1896, in nine hauls of a 150-foot seine in Little River, near the Aqueduct Bridge, 200 large-mouth bass, from 6 to 8 inches long, were taken.

As an illustration of the magnitude of the results that may accrue from comparatively small plants of bass in suitable waters, the following is quoted from a letter from the Tanning Extract Company, of Deming, N. Mex.:

Two years ago you kindly furnished us about three dozen small black bass from Quincy, Ill., for our pond. They have done well, and now (1896) we have thousands from 1 to 3 inches long, spawned this season. Should you have applications for stock from this vicinity we will be glad to supply them free of any charge and will publish a notice in the paper here to that effect.

MISCELLANEOUS MATTERS.

Reports issued.—During the year several reports of the division relating to the commercial aspects of the fisheries and based on original field inquiries were printed.

A paper* by Mr. W. A. Wilcox on the fisheries of the Pacific States represents the results of investigations made by the author in 1892 and 1893, which were outlined in the annual report of this division for 1893.

The special inquiries regarding the menhaden fishery, fully outlined

* The Fisheries of the Pacific Coast. Rept. U. S. Fish Com. 1893, pp. 139-304, pl. 1-14.

in the last annual report, were brought together in a paper* prepared from the agents' returns and printed in the Fish Commission Bulletin for 1895.

The outcome of the past 25 years' work of the national and State fish commissions in increasing the fish supply of the Pacific States by the introduction of non-indigenous species was considered in a report† by the writer, which is based on original observations by the Commission employees, supplemented by valuable data supplied by the various State commissions.

Atlanta Exposition.—In July and August the writer, in conjunction with Prof. B. W. Evermann, prepared for the Fish Commission exhibit at the Atlanta Exposition a series of articles on the principal food and game fishes of the South Atlantic and Gulf States. For each of the principal species a plate was shown, accompanied by brief descriptive text relating to distribution, size and weight, natural history, and commercial importance, the entire collection being neatly mounted in swinging screens. Some general notes on the extent of the fisheries, the nature of the aquatic resources, and the methods of the fisheries of the regions named, extracted from printed reports of the Commission, served as an introduction to the regular series.

Utilization of weakfish sounds.—In March, 1896, the office entered into correspondence with a number of fishermen relative to the saving of the sounds or swim-bladders of weakfish. The initial step in the inquiry was a communication from a prominent isinglass manufacturer of Massachusetts, who reported that he would purchase large quantities of sounds if they could be obtained at a price warranted by the market value of the product prepared therefrom. At one time the income of the fishermen of the Atlantic coast was considerably increased by the sales of weakfish sounds. The dried sounds sometimes brought as much as a dollar a pound, but of late the price has been so low (about 25 cents) that the fishermen have, as a rule, ceased to save them. Weakfish are taken in large quantities in all the seaboard States from Massachusetts to Texas, the catch in New York, New Jersey, Virginia, and North Carolina being especially important, and many thousands of pounds that are now wasted could be easily saved if there were any inducement. The letters received from various fishing centers indicated that the fishermen would be glad to resume the practice of utilizing the swim-bladders if the prices rose to 50 cents or more per pound for dried sounds.

Courtesies extended and received.—In March, 1896, at the request of Mr. A. N. Cheney, State fish-culturist, Glens Falls, N. Y., the division prepared for the New York Fish Commission a summary of the com-

* Notes on an investigation of the Menhaden Fishery in 1894, with special reference to the food-fishes taken. By Hugh M. Smith. Pp. 285-302.

† A Review of the History and Results of the Attempts to acclimatize Fish and other Water Animals in the Pacific States. By Hugh M. Smith. Bull. U. S. Fish Com. 1895, pp. 379-472, pl. 73-83.

mercial fisheries of the interior waters of New York, as determined by Mr. John N. Cobb, field agent.

Mr. Oscar Andrews, of the firm of Ayers & Andrews, Gloucester, Mass., forwarded samples of prepared cod and other ground fish.

Mr. John P. Babcock, chief deputy of the California Fish Commission, forwarded a sample of canned striped bass, prepared at Black Diamond, Cal. Mr. Babcock also sent data regarding receipts of shad, striped bass, carp, catfish, and salmon by San Francisco dealers, and furnished much useful information regarding the results of the attempts to acclimatize fish in California waters.

Mr. Arthur G. Fletcher, of the California Fish Commission, furnished information regarding results of planting fish in 1891 in Lake Cuyamaca, California.

The inquiries of the writer and Mr. W. A. Wilcox in the Columbia River were greatly aided by Mr. Frank M. Warren, of Portland, Oreg., who extended special facilities for the examination of the wheel fisheries in the vicinity of the Cascades.

Mr. C. B. Trescott, of Portland, Oreg., furnished plans of his newly constructed fish-refrigerating establishment, located at Goble, Oreg., on the Columbia River, probably the most complete and modern plant of the kind in the United States.