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

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ORGANIZATION AND FUNCTIONS OF THE DIVISION.

The following report, embracing the operations of this division during the fiscal year 1892, is respectfully presented. The administration of the division affairs during this period continued under the nominal direction of Capt. J. W. Collins, who was the assistant in charge. His designation, however, in August, 1890, as representative of the U. S. Commission of Fish and Fisheries on the Government Board of Control of the World's Columbian Exposition, had necessitated the withdrawal of much of his attention from this division, and the supervision of the office duties and field investigations largely devolved upon the writer.

The establishment of a division having for its purpose the consideration of various questions connected with the economic fisheries, but more especially the statistics, methods, and relations of the industry, was achieved at a comparatively recent date in the history of the Commission, although from the outset the subject received such attention as the means would permit and important contributions to a knowledge of the commercial fisheries were brought out during the years preceding the formal organization of this branch of the service. At an early period the necessity for having statistical data was fully appreciated, and Prof. Baird undertook a number of minor inquiries directed to the statistical aspects of special fisheries and regions. The taking of the census of the fisheries in 1880 devolved on the Commission; and, under the direction of Dr. G. Brown Goode, the first reliable and satisfactory census of our fishing industry was then given to the country. From 1880 to 1885 a small sum was annually appropriated by Congress for carrying on statistical work. For the fiscal years 1886, 1887, and 1888 no special allotment was made by Congress, the general appropriations for the Fish Commission being apportioned among the various branches of the work at the discretion of the Commissioner. Under this arrangement the study of the fisheries received more substantial recognition than had previously been accorded. The organization of a separate force for the collection and compilation of statistics and their incorporation in descriptive reports may be said to date from 1886. It was not until the following year, however, that the establishment of a distinct office for this work was consummated, and it was not until 1888 that this division was specially noticed and appropriated for by Congress.

The nature and scope of the work included under the functions of this division may be thus summarized:

(*a*) A general study of the economic ocean, coast, river, and lake fisheries of the United States in their statistical, historical, and other aspects.

(*b*) A study of the vessels, boats, apparatus, and methods employed for the purpose of ascertaining those which are most effectual and economical, of suggesting improvements, and of discouraging the use of forms of apparatus and methods of capture that are unnecessarily destructive.

(*c*) An investigation of the fishing-grounds resorted to by American fishermen, with a view to ascertain their resources, the seasons of abundance of the fish and other water products occurring thereon, and the effects of present and past methods of fishing on the supply.

(*d*) A consideration of the economic and social conditions of the fishing population, their nationality and nativity, wages, disasters, etc.

(*e*) An investigation of the methods of curing, freezing, canning, and otherwise preparing fishery products for market, the offering of suggestions for the utilization of fish and other aquatic animals that are now regarded as of little or no value and are usually thrown away or sold at nominal prices.

(*f*) An inquiry into the condition and extent of the wholesale trades in fishery products, the sources of supply, the principal lines of distribution, and the means and methods of transportation.

(*g*) A consideration of the international relations of the fisheries and the collection of information bearing on questions involving the privileges, movements, treatment, expenditures, etc., of American fishermen in foreign waters and ports.

(*h*) The dissemination among the fishing interests, either by correspondence or printed reports, of information intended to promote the industry; the preparation for State fish commissions or other State officers of special reports illustrating the fishery resources of the States.

(*i*) The determination of the results of artificial propagation and of legislation on the abundance of fishes and other economic products.

While the functions of the division are sufficiently well marked, they nevertheless, in certain lines, necessarily overlap those of the Division of Fish-culture on the one hand and the Division of Scientific Inquiry on the other. The determination of the results of artificial propagation and of the necessity for its inauguration naturally fall to its consideration, and in the investigations of the past and present extent of the fisheries it has always been the aim to bring out these points. In the consideration of the economic resources of the fishing-grounds, of the movements and abundance of food-fishes and other aquatic products, and of other subjects connected with the objects of commercial fisheries, the division approaches the limits of the Division of Scientific Inquiry, but rather supplements than encroaches upon the functions of that branch of the Commission's work.

In the prosecution of its inquiries having in view the collection of data bearing on the foregoing topics the division depends almost wholly on the personal field investigations of its agents. While in a few instances the use of circulars and schedules has been resorted to in the prosecution of minor inquiries by mail, they have generally failed to give satisfaction, and, in the interests of completeness and accuracy, they are utilized only when other methods are especially contra-indicated, by reason of the expense involved, etc.

The prominent feature of the organization of this branch is the corps of agents whose active service in the field constitutes the chief work of the division and affords the principal basis for the preparation of reports on the various phases of the fisheries and furnishes ground for the intelligent comprehension on the part of the Commission of the condition and needs of the industry.

The number of field agents now authorized by Congress is five. By reason of previous practical connection with the fishing industry, and by virtue of lengthy service in their present capacity, the agents are able to bring to bear on their work an invaluable knowledge of the fisheries and of the best methods of conducting the canvass that greatly contributes to the reliability and completeness of the investigations. The repeated personal visits of the agents to fishing communities enables the Commission to maintain close relations with the principal fishermen and fish-dealers of the country, and facilitates the collection of more satisfactory data than would be possible under any other circumstances.

In gauging the work of the division, and in placing a proper estimate on the results accomplished, it is a matter of importance to take into account the small force available for field and office duty and the limited means at hand for carrying on investigations of the extended scope occasioned by the nature of the subject under consideration, as previously outlined. An arrangement intended to place the division on an ideal basis, which would permit an annual or biennial study of the entire fishing interests of the country and the prompt issuance of reports thereon, would require a field force at least four times as large as the present one, a corresponding increase in the number of clerical assistants, and an appropriation of about twice the amount available for the year 1892. The shore line of the States bordering on the coast and the Great Lakes is nearly 30,000 miles in length. The canvass of this extensive territory can, with the present force, be accomplished only once in three or four years, a definite geographical section or special branches of the industry being covered each year until the whole is completed. During the continuance of present conditions the work will necessarily have to be carried on along the same general lines which have heretofore been observed.

It is gratifying to be able to note that the usefulness of the division is being yearly increased, as the working forces become better trained in the field and office duties, and as a result of the accumulation of data

that puts the office in position to fully and promptly comply with the demands that are continually made upon it for information concerning the fisheries; so general and comprehensive have been the field inquiries prosecuted, that there are few phases of the commercial fisheries, or few questions that can be propounded regarding them, that are not covered by the office records.

The principal subjects that come up for notice in this report are: A history of the scope and conduct of the field investigations undertaken in 1891–92; a review of the results of those investigations; an account of the reports published by the division during the year; relations with the Eleventh Census; a consideration of the prominent events connected with the commercial fisheries, including the present conditions of the principal branches of the industry, experiments with new types of apparatus, international questions relating to the fisheries, etc.; and recommendations for the future conduct of the work of the division.

INVESTIGATIONS OF THE STATISTICS AND METHODS OF THE FISHERIES.

In planning for the field investigations to be undertaken by the division in 1891–92, the determining consideration in the selection of the regions to be canvassed was the date of the last inquiries in the several sections of the country. The fisheries of the New England and Pacific States had been studied in 1889, and those of the South Atlantic and Gulf States in 1890 and 1891; but no investigation of the Great Lakes had been made since 1885, and the Middle Atlantic States had not been covered since 1888. It was in these regions, therefore, that it was decided to place the field force, although there were other considerations, in addition to time, that prompted the selection of these sections. A minor inquiry was also made in Albemarle Sound and some of its tributaries, in North Carolina, and the regular investigations heretofore carried on by local agents at Boston and Gloucester, Mass., were continued.

THE GREAT LAKES.

When, in 1885, the Fish Commission conducted a comprehensive inquiry into the fisheries of the Great Lakes, it was found that the industry was in a flourishing condition, and the yield was probably greater than in any previous year. The results of that investigation were embodied in a report,* to which recourse should be had for a detailed account of the history, methods, and statistics of these fisheries. In 1891 the time was thought to be opportune for another canvass of this region, which was accordingly undertaken in the first half of the fiscal year. Messrs. W. A. Wilcox and T. M. Cogswell were assigned to Lake Superior; Ansley Hall, E. E. Race, and H. P. Parker to Lake

*Review of the Fisheries of the Great Lakes in 1885. Compiled by Hugh M. Smith and Merwin-Marie Snell. With introduction and description of fishing vessels and boats by J. W. Collins.

Michigan; E. A. Tulian to Lake Huron; W. A. Wilcox to Lake St. Clair and the St. Clair and Detroit rivers; Seymour Bower and C. H. Stevenson to Lake Erie; and H. M. Smith and C. H. Stevenson to Lake Ontario. Mr. Tulian and Mr. Bower, who were detailed from the Division of Fish-culture, had taken part in the investigations of 1885, and the office was fortunate in again securing their services. The preparation of the report covering this inquiry is completed and it is therefore possible at this time to give an accurate summary of the prominent features disclosed.

Since the inception of fish-culture on a large scale in the United States the Great Lakes region has been a favorite and favorable field for carrying on that work. Every State having a frontage on the lakes has appreciated the importance of artificial propagation in maintaining and increasing the supply of food-fishes and has given its appreciation practical form by establishing a board of fish commissioners and founding one or more hatching stations. The General Government has also coöperated with the States in every lake.

The species to which the greatest attention has been given are whitefish (*Coregonus clupeiformis*), lake trout (*Salvelinus namaycush*), and wall-eyed pike (*Stizostedion vitreum*). A knowledge of the present and past abundance of these fishes becomes a matter of great importance, the determination of which naturally falls to the consideration of this division. Besides the fish now propagated there are others of growing importance to which attention should be directed, in view of the probable necessity at an early date of securing their preservation and multiplication by artificial means. Chief among these is the sturgeon.

A comparison of the present and past abundance of the whitefish is not entirely satisfactory and involves some elements of uncertainty. There are at least five species of whitefish of commercial importance occurring in the Great Lakes, viz, the common whitefish (*Coregonus clupeiformis*), the lake herring or cisco (*C. artedi*), the bluefin or blackfin whitefish (*C. nigripinnis*), the Menominee or round whitefish (*C. quadrilateralis*), the whiting, or Musquaw River whitefish (*C. labradoricus*), and the tullibee, or mongrel whitefish (*C. tullibee*). While all of these are not of marked economic value, at least three are taken in considerable numbers, and the others occur in greater or less abundance in some lakes. The superficial differences between some of these are not very pronounced and not always recognized by the fishermen and others. It therefore happens that in making returns of fish taken a fisherman may give a number of species under the general name of whitefish, and being thus recorded an incorrect idea is formed of the abundance of *Coregonus clupeiformis* in a certain lake or place. There is every reason to believe that in 1880 several minor species of *Coregonus* were recorded with the common whitefish; and it is known that in 1885 the same thing was done in some lakes, the species thus combined with *C. clupeiformis* being *C. nigripinnis* and *C. quadrilateralis*.

The improper use of common names of fishes also makes difficult the

institution of satisfactory comparisons between the abundance of each fish at different periods; this applies with special force to the wall-eyed pike (*Stizostedion vitreum*), called pike and pickerel, and the true pike (*Lucius lucius*), called by the same names.

The following table shows in condensed form the extent of the fisheries of each of the Great Lakes in 1880, 1885, and 1890. The conditions prevailing in each lake are, as a rule, so distinctive that a general table of this kind conveys only an imperfect idea of the status of the industry and of the nature of the fluctuations. It is seen, however, that in 1890 the lake fisheries were somewhat less important than in 1885, but were much more extensive than in 1880, their rank being determined by the value of the products. The returns for 1890 show that 9,738 persons were employed in various capacities, $5,362,744 was invested, and the value of the catch was $2,471,768. Compared with 1880, an increase has occurred in each of these items; compared with 1885, there are to be noted a slight decrease in the number of fishermen, a substantial gain in the amount of capital invested, and a decline in the value of the catch. The details of these changes will be brought out in the consideration of the fisheries of each lake.

Comparative table showing the extent of the fisheries of the Great Lakes in 1880, 1885, and 1890.

Lakes.	Persons employed.			Capital invested.			Value of products.*		
	1880.	1885.	1890.	1880.	1885.	1890.	1880.	1885.	1890.
Superior	414	914	653	$81,380	$427,933	$366,682	$118,370	$291,523	$220,968
Michigan	1,578	3,378	2,877	551,135	1,757,831	1,437,224	668,400	878,788	830,465
Huron	470	892	726	103,730	385,349	408,858	195,277	276,397	221,067
St. Clair	356	272	611	40,580	251,081	210,145	36,273	40,193	73,577
Erie	1,620	4,298	4,482	515,100	1,562,138	2,816,302	474,880	1,109,096	1,000,905
Ontario	612	600	389	54,050	135,749	123,533	159,700	95,869	124,786
Total	5,050	10,354	9,738	1,345,975	4,520,081	5,362,744	1,652,900	2,691,866	2,471,768

* The value of all secondary products omitted.

The variations in the yield of the principal fishes, considering the entire lake region, may be seen from the following table. The species shown separately are whitefish, lake trout, sturgeon, and lake herring; other important fish, as pike perch and pike, deserve mention, but can not be exhibited in this table, owing to the fact that they were not separately recorded in 1880.

Whitefish, which in 1880 constituted the chief part of the catch, dropped to second place in point of quantity in 1885, and in 1890 were surpassed in this respect by herring and trout. The decrease in the output from 1885 to 1890 was about 30 per cent. Lake trout, which in 1885 exhibited a large increase over 1880, were taken in slightly greater quantities in 1890 than in 1885. Sturgeon have steadily decreased, the catch in the decade in question being reduced over 40 per cent. A prominent feature of the comparison is the largely augmented catch of the lake herring and its assumption of the first position among the

lake fishes. The yield in 1890 was three times as great as in 1880 and nearly twice as great as in 1885. The combined production of all other species was about the same in 1885 and 1890, which years showed about double the output of 1880. The decrease in whitefish and sturgeon is more than offset by the increase in herring, so that the total catch in the lake region in 1890 was over 14,000,000 pounds more than in 1885 and about 45,000,000 pounds more than in 1880.

Comparative tabl showing the products of the fisheries of the Great Lakes in 1880, 1885, and 1890.

Species.	1880.	1885.	1890.
	Pounds.	*Pounds.*	*Pounds.*
Whitefish	21,463,900	18,344,004	12,401,335
Lake trout	6,894,603	12,586,665	12,890,441
Sturgeon	7,557,383	7,147,642	4,289,759
Herring	15,967,517	25,869,458	48,753,349
Other fish	16,948,600	35,894,107	35,563,647
Total	68,742,000	99,842,876	113,898,531

LAKE SUPERIOR

The fisheries of this lake are less extensive than those of any other member of the Great Lakes chain with the exception of Lake Ontario. The fishing is practically confined to the taking of whitefish and trout, the catch of all other species being insignificant. The season of 1890 was, on the whole, a satisfactory one, and the output was fully up to the average in recent years. It is therefore a favorable year with which to make comparisons with 1885 and on which to base conclusions.

Considered in the aggregate, a decline is to be noticed in the extent of the fisheries of the American shores of Lake Superior in 1890 as compared with 1885. The decrease was most marked in the items of persons employed and quantity and value of products. The relatively slight decrease in the investment is explained by a large increase in shore and cash property incident upon the establishment of large fish-purchasing houses. An analysis of the returns indicates that the decrease is more apparent than real and does not necessarily represent a scarcity of fish. The decline in the fisheries has been practically confined to Minnesota and has been due to a transfer of American interests to the Canadian side of the lake.

The extent of the fisheries in the American waters of this lake in 1890 is shown in the three following tables:

Persons employed in Lake Superior fisheries.

How engaged.	Number.
Vessel fishing	58
Shore fishing	517
Shore industries	78
Total	653

Apparatus and capital employed in Lake Superior fisheries.

Items.	Number.	Value.
Vessels (tonnage, 256.70)	8	*$61,300
Boats	320	23,975
Gill nets	5,974	63,476
Pound nets	140	34,435
Seines	19	955
Fyke nets	9	415
Dip nets	10	370
Spears	54	265
Lines	.....	1,713
Shore and accessory property	.....	109,878
Cash capital	.....	69,900
Total	.....	366,682

*Includes outfit.

Products of Lake Superior fisheries.

Species.	Pounds.	Value.
Herring, fresh	199,121	$4,616
Pike, fresh and salted	26,302	1,134
Sturgeon, fresh	47,482	1,401
Trout, fresh	2,065,030	72,430
Trout, salted	548,348	15,771
Whitefish, fresh	2,423,111	94,512
Whitefish, salted	790,065	30,475
Other fish, fresh and salted	16,473	629
Total	6,115,992	220,968

The fisheries in the Canadian waters of the lake in which Americans are pecuniarily interested are of considerable importance, as shown by the table. They are prosecuted with gill nets, pound nets, and fyke nets, and the principal fish taken are whitefish and trout. In the year covered by the investigation 1,137,387 pounds of fish, valued at $34,472, were brought into the United States from these fisheries on the northern and eastern shores of the lake.

Boats, apparatus, etc.	Number.	Value.	Species.	Pounds.	Value.
Boats	29	$2,840	Pike, fresh	8,000	$240
Pound nets	22	5,950	Sturgeon, fresh	36,170	1,085
Gill nets	322	10,108	Trout, fresh	330,000	9,900
Fyke nets	35	350	Trout, salted	20,000	700
Shore property	.....	8,750	Whitefish, fresh	687,032	20,611
Cash capital	.....	13,700	Whitefish, salted	56,185	1,936
Total investment	.....	41,698	Total	1,137,387	34,472

As has been shown, the value of the fisheries of this lake in 1890 was more than in 1880, but less than in 1885. The decrease between the two later years was marked in every important fish and was especially serious in the case of whitefish and trout.

Comparison of the yield of the fisheries of Lake Superior in 1880, 1885, and 1890.

Species.	1880.	1885.	1890.
	Pounds.	*Pounds.*	*Pounds.*
Whitefish	2,257,000	4,571,947	3,213,176
Herring	34,000	324,680	199,121
Trout	1,464,750	3,488,177	2,613,378
Sturgeon	.....	182,760	47,482
Other fish	60,875	258,216	42,835
Total	3,816,625	8,825,780	6,115,992

It can not be said that the decline in the fisheries of this lake has been principally due to a noteworthy or permanent diminution in the abundance of fish. While individual localities reported a scarcity of fish in 1890, the general opinion was that the catch was fully as good as it had been for a number of years. The diminished output appears to have been due almost entirely to the following circumstances:

1. A change in the methods of preparing fish for market, as a result of the growing demand for fresh fish. In 1885 3,916,250 pounds of salt fish were prepared by the fishermen of this lake. In 1890 that part of the yield sold in a salted condition amounted to only 1,378,261 pounds. As the best fish are usually salted only when they can not be disposed of in a fresh state, it follows that an increasing demand for fresh fish and a dull market for salt fish will necessarily reduce the output of localities that are remote from shipping centers.

2. As has been seen, considerable capital formerly devoted to the fisheries of the American side of the lake has been diverted to Canadian waters, under the provisions of the tariff law permitting the free entry of fish owned by citizens of the United States. Several unfavorable years and the supposed greater abundance of fish on the northern side of the lake have caused some extensive dealers to transfer their plants from American to Canadian ports, the home fishing being discontinued. The statistics show a decrease in the number of fishermen and a corresponding decrease in the amount of apparatus in localities from which wholesale purchasing houses have been removed.

Gill nets are the most important apparatus employed in this lake; they yield much larger quantities of products than all other means of capture combined. In 1890 they were employed from vessels to the number of 1,318 and from small boats to the number of 4,656. The aggregate catch was 3,778,012 pounds, valued at $133,636, of which 2,709,693 pounds, valued at $92,550, were taken in the shore fishery, and 1,068,319 pounds, worth $41,086, in the vessel fishery, the last-named figures representing only whitefish and trout.

Pound nets rank next to gill nets in the amount and value of the fish taken. Five-sixths of the quantity and value of the yield consists of whitefish. Trout and sturgeon are the only other fishes that are important items in the catch. The results of the fishery in 1890 were 1,669,017 pounds, valued at $62,911.

None of the other forms of apparatus in this lake is very important.

Fyke nets, seines, set lines, spears, and dip nets are sparingly used, but the aggregate catch is small in comparison with that in gill nets and pound nets, amounting in value to less than $25,000.

The following table shows in detail the quantity and value of each of the principal fishes taken with the various kinds of apparatus in 1890:

Table showing by apparatus and species the yield of the fisheries of Lake Superior.

Species.	Pounds.	Value.
Gill nets:		
Herring, fresh and salted	169,811	$4,021
Pike perch, fresh and salted	64	2
Trout, fresh	1,621,697	56,176
Trout, salted	441,280	12,912
Whitefish, fresh	1,258,096	49,403
Whitefish, salted	287,064	11,122
Total	3,778,012	133,636
Pound nets:		
Herring, fresh and salted	3,310	55
Pike, fresh and salted	12,628	453
Sturgeon, fresh and salted	42,982	1,206
Trout, fresh	184,188	6,796
Trout, salted	48,118	1,628
Whitefish, fresh	910,663	34,642
Whitefish, salted	466,500	18,057
Other fish, salted	598	14
Total	1,669,017	62,911
Fyke nets:		
Pike, fresh	13,200	$660
Trout, fresh	3,500	175
Whitefish, fresh	4,000	200
Other fish, fresh	3,875	135
Total	24,575	1,170
Seines:		
Herring, fresh	26,000	540
Trout, fresh	2,657	93
Trout, salted	1,825	64
Whitefish, fresh	28,524	1,066
Whitefish, salted	36,471	1,296
Total	95,477	3,059
Lines:		
Pike, fresh	470	10
Sturgeon, fresh	4,500	135
Trout, fresh	242,068	8,644
Trout, salted	57,125	1,167
Total	304,163	9,965
Other apparatus:		
Trout, fresh	10,920	546
Whitefish, fresh	221,828	9,201
Other fish, fresh	12,000	480
Total	244,748	10,227
Grand total	6,115,992	220,968

LAKE MICHIGAN.

In the number of persons engaged, in the amount of capital invested, and in the value of its fisheries this lake ranks second, a position which it has always held since the fishing industry of the lake region became prominent. The principal features of the fisheries of this lake are the large numbers of pound nets and gill nets employed. The extent of the gill-net vessel fishery here prosecuted surpasses that in all the other lakes combined, the great expanse of deep water being favorable for this fishery and affording the best protection against the exhaustion of the supply. Trout are the chief fish taken in the lake as regards both quantity and value; in no other lake are these fish so important. Next to trout in value are whitefish, although the lake herring, which rank third in value, are taken in larger quantities than whitefish.

The following tables show the extent and principal features of the fisheries of the lake:

Persons employed in Lake Michigan fisheries.

How engaged.	Number.
Vessel fishing	293
Shore fishing	2,215
Shore industries	369
Total	2,877

Apparatus and capital employed in Lake Michigan fisheries.

Designation.	Number.	Value.
Vessels	50	$173,350
Tonnage	793.65	
Outfit		21,318
Boats	1,052	71,663
Apparatus of capture, vessel fisheries:		
Gill nets	18,810	106,854
Apparatus of capture, shore fisheries:		
Pound nets	844	244,880
Gill nets	22,086	109,060
Fyke nets	731	11,316
Seines	30	3,480
Lines and spears		2,144
Shore property		434,759
Cash capital		258,400
Total		1,437,224

Products of Lake Michigan fisheries.

Species.	Pounds.	Value.
Bass	143,139	$6,477
Herring	6,082,082	102,721
Perch	1,943,953	46,641
Pike and pike perch	566,021	21,987
Sturgeon	946,897	34,253
Suckers	1,800,783	27,106
Trout	8,364,167	349,193
Whitefish	5,455,079	219,059
Other fish	1,132,145	23,028
Total	26,434,266	830,465

The fisheries of Lake Michigan are more extensive than in 1880, but somewhat less so than in 1885, when, as shown in a preceding general table, more persons were engaged, more capital was invested, and more money accrued from the sale of fishery products. In 1880 whitefish constituted more than half the catch, in 1885 a little more than a third, in 1890 about a fifth. Sturgeon have decreased in a still more marked degree. Trout, however, have increased about 300 per cent, herring 200 per cent, and other fish between 300 and 400 per cent since 1880. The aggregate catch shows an increase of about 3,300,000 pounds over 1880, and 2,900,000 pounds over 1885, although, owing to the preponderance of the cheaper grades of fish, the value of the yield since 1885 has diminished $58,000. Following is a comparison of the production of this lake in the three years named:

Comparison of the yield of the fisheries of Lake Michigan in 1880, 1885, and 1890.

Species.	1880.	1885.	1890.
	Pounds.	*Pounds.*	*Pounds.*
Whitefish	12,030,400	8,682,986	5,455,079
Trout	2,059,450	6,431,208	8,364,167
Sturgeon	3,839,600	1,406,678	946,897
Herring	3,050,400	3,312,493	6,082,082
Other fish	1,562,025	3,684,693	5,586,041
Total	23,141,875	23,518,148	26,434,266

The gill net is the most important form of apparatus employed in the fisheries of this lake; it takes larger quantities of fish and yields more money returns than all other devices combined. Trout, whitefish, and herring constitute the bulk of the catch, trout predominating. Pound nets are the only other relatively important apparatus; they take about five-sevenths of the fish obtained in gill nets. Whitefish are the principal fish caught, although trout, herring, and sturgeon, are of considerable value; the yield of sturgeon by this means is much greater than in all other apparatus. Among minor devices are fyke nets, lines, seines, and spears. Fykes take chiefly herring, perch, pike, and suckers. Lines are employed mostly for perch; seines yield perch, pike, and suckers, and spears take small quantities of trout and pike.

The following table shows the quantity and value of each principal kind of fish taken in this lake with each form of apparatus:

Table showing by apparatus and species the yield of the fisheries of Lake Michigan.

Species.	Gill nets.		Pound nets.		Fyke nets.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Bass	20,179	$1,006	14,800	$755	19,310	$950
Herring	3,608,968	67,434	2,103,733	30,321	332,650	4,436
Perch	427,575	12,020	453,680	10,098	419,700	8,862
Pike and pike perch	85,110	3,462	247,905	9,939	141,060	5,557
Sturgeon	16,595	636	844,887	30,224	.....	.....
Suckers	673,216	10,613	620,033	10,266	335,410	3,887
Trout	6,409,190	263,322	1,513,229	63,761	11,980	470
Whitefish	2,873,784	111,435	2,560,456	106,792	5,285	235
Other fish	372,581	7,394	426,614	8,120	44,750	1,161
Total	14,487,198	477,322	8,785,337	270,276	1,311,045	25,558

Species.	Seines.		Lines and spears.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Bass	.....	.....	88,850	$3,766	143,139	$6,477
Herring	36,731	$530	.....	.....	6,082,082	102,721
Perch	185,117	3,086	457,881	12,575	1,943,953	46,641
Pike and pike perch	91,046	3,029	.....	.....	566,021	21,987
Sturgeon	6,250	220	79,165	3,173	946,897	34,253
Suckers	172,124	2,340	.....	.....	1,800,783	27,106
Trout	.....	.....	429,708	21,640	8,364,167	349,193
Whitefish	11,154	465	4,400	132	5,455,079	219,059
Other fish	35,910	988	252,290	5,365	1,132,145	23,028
Total	538,332	10,658	1,312,354	46,651	26,434,266	830,465

LAKE HURON.

The fisheries of this lake in 1890 exceeded those of Lake Superior by a few thousand dollars in the value of the catch, the number of persons employed was greater, and the invested capital was somewhat less. The principal fishing-ground is Saginaw Bay, where more than half the fishery products of the entire lake are taken. The extent of the commercial fisheries of this lake in 1890 was as follows:

Persons employed in Lake Huron fisheries.

How engaged.	Number.
Vessel fishing	26
Shore and boat fishing	590
Shore industries	110
Total	726

Apparatus and capital employed in Lake Huron fisheries.

Items.	Number.	Value.
Vessels (tonnage 79.05)	7	*$14,690
Boats	410	22,308
Gill nets	2,206	21,665
Pound nets	551	88,515
Seines	6	600
Fyke nets	221	6,385
Lines	.....	770
Shore and accessory property	.....	208,625
Cash capital	.....	45,400
Total	.....	408,858

*Includes outfit.

Products of Lake Huron fisheries.

Species.	Pounds.	Value.
Black bass, fresh	29,351	$2,167
Catfish, fresh	172,171	5,428
Herring, fresh	2,383,851	25,385
Herring, salted	130,700	2,796
Perch, fresh	1,817,628	20,792
Pike perch and pike, fresh	1,483,072	50,834
Sturgeon, fresh	365,718	8,924
Suckers, fresh	1,110,177	15,372
Trout, fresh	1,500,619	50,742
Trout, salted	5,000	300
Whitefish, fresh	1,002,694	37,135
Whitefish, salted	1,400	112
Other fish, fresh	54,000	1,080
Total	10,056,381	221,067

The changes in the fisheries of this lake since 1885 have consisted of a decrease in the number of fishermen, a corresponding diminution in the amount of apparatus used, a large decline in the yield of the more important fishes (viz, whitefish and trout), and a noticeable increase in the catch of lake herring. The fisheries of the north shore of the lake and the Saginaw Bay region show the most marked reduction since 1885. Compared with 1880 the only noteworthy improvement has been a larger catch of sturgeon, herring, and minor fishes. The following table is a comparative statement of the output of the Lake Huron fisheries in 1880, 1885, and 1890:

Comparison of the yield of the fisheries of Lake Huron in 1880, 1885, and 1890.

Species.	1880.	1885.	1890.
	Pounds.	*Pounds.*	*Pounds.*
Whitefish	2,700,778	1,425,380	1,004,094
Herring	246,800	1,265,650	2,514,551
Trout	2,084,500	2,539,780	1,505,619
Sturgeon	204,000	215,500	365,718
Other fish	1,969,195	6,010,860	4,666,399
Total	7,205,273	11,457,170	10,056,381

Pound nets are the most prominent apparatus now used in this lake. The number fished in 1890 was 551, of which 326 were operated in Saginaw Bay, the chief fishing-ground. The most important fish taken are whitefish, herring, trout, wall-eyed pike, and perch. The aggregate catch was 7,525,796 pounds, for which the fishermen received $150,825. Herring constituted about one-third of the yield, but was less valuable than whitefish.

Gauged by the value of the catch, gill nets rank next to pound nets in importance. They are used by both vessel and boat fishermen, though the vessel fishing is much less extensive than the boat fishing. In 1890 2,206 nets were operated, of which 336 were used on vessels. The gill-net catch consisted of 1,371,984 pounds, valued at $44,113, of which 407,075 pounds, worth $14,401, were taken with vessels. The principal fishing center for gill nets is Alpena. The only species that constitutes a prominent element in the yield is trout.

Fyke nets are important only in Saginaw Bay and River, where they take large quantities of the minor kinds of fish, notably perch and suckers. Of the total number of such nets used, viz, 221, 170 were employed in the region named, where they are set in conjunction with pound nets. The fyke-net catch in 1890 was 1,088,751 pounds, for which $23,156 was received.

The list of apparatus in this lake is completed by the enumeration of seines and lines, which are unimportant, the combined yield being only 69,850 pounds, having a value of $2,973.

The extent to which each prominent fish in this lake enters into the catch of each apparatus is shown in the following table:

Table showing by apparatus and species the yield of the fisheries of Lake Huron.

Apparatus and species.	Pounds.	Value.
Pound nets:		
Black bass, fresh	21,701	$1,402
Catfish and bullheads, fresh	167,071	5,275
Herring, fresh	2,358,301	25,065
Herring, salted	139,700	2,796
Perch, fresh	1,257,182	12,751
Pike and pike perch, fresh	1,363,072	44,224
Sturgeon, fresh	365,718	8,924
Suckers, fresh	742,622	8,321
Trout, fresh	329,292	12,167
Whitefish, fresh	776,937	29,636
Other fish, fresh	13,200	264
Total	7,525,796	150,825
Gill nets:		
Herring, fresh	18,550	290
Trout, fresh	1,122,477	35,972
Trout, salted	5,000	300
Whitefish, fresh	224,557	7,439
Whitefish, salted	1,400	112
Total	1,371,984	44,113
Fyke nets:		
Black bass, fresh	7,650	$765
Catfish and bullheads, fresh	5,100	153
Herring, fresh	1,000	10
Perch, fresh	558,446	8,021
Pike and pike perch, fresh	108,000	6,330
Suckers, fresh	367,555	7,051
Whitefish, fresh	200	10
Other fish, fresh	40,800	816
Total	1,088,751	23,156
Seines:		
Herring, fresh	6,000	20
Perch, fresh	2,000	20
Pike and pike perch, fresh	12,000	280
Trout, fresh	1,000	40
Whitefish, fresh	1,000	50
Total	22,000	410
Lines:		
Trout, fresh	47,850	2,563
Grand total	10,056,381	221,067

LAKE ST. CLAIR, ST. CLAIR AND DETROIT RIVERS.

This lake, with its two tributary rivers, although not one of the Great Lakes, is sufficiently distinct from Lake Huron on one side and Lake Erie on the other to warrant separate consideration of its fisheries, which, although less extensive than those of any of the Great Lakes proper, are nevertheless important, especially in view of the relatively small area of the fishing-grounds. The principal fishing is done with pound nets and seines, and the chief fish taken is the whitefish, the abundance of which, as judged by the catch, seems to have considerably increased in the past five years. The fisheries in 1890 were as a whole much more important than in 1885, which year exhibited an increase over 1880. The number of persons employed has increased, and the quantity and value of the catch have advanced, but the aggregate investment is somewhat less. A very important trade in fish is carried on in Detroit, and four steam vessels, fitted out with gill nets, are owned in the region, but prosecute fishing in Lakes Erie and Huron.

These fisheries had the following extent in 1890, the figures including the vessels fishing in the other lakes but owned in this section:

Persons employed in Lake St. Clair fisheries.

How engaged.	Number.
Vessel fishing	28
Boat and shore fishing	517
Shore industries	66
Total	611

Apparatus and capital employed in Lake St. Clair fisheries.

Items.	Number.	Value.
Vessels (tonnage, 38.56)	4	*$24,400
Boats	162	4,375
Gill nets	314	9,418
Pound nets	34	9,450
Seines	28	6,240
Fyke nets	148	4,480
Lines and spears	.....	1,100
Shore and accessory property	150	106,082
Cash capital	.....	44,600
Total	.....	210,145

* Includes outfit.

Products of Lake St. Clair fisheries.

Species.	Pounds.	Value.
Black bass	9,086	$544
Catfish	26,275	616
Herring	490,334	5,797
Perch	763,093	10,160
Pike and pike perch	524,669	17,533
Sturgeon	309,003	7,794
Trout	214,817	12,242
Whitefish	238,764	14,753
Other fish	388,590	4,138
Total	2,994,571	73,577

A comparison of the catch of the principal fishes in 1880, 1885, and 1890 shows, as the principal features of the changes, a large increase in whitefish in 1890 over the other years, a decrease in herring in 1890 as compared with 1885, a decrease in sturgeon as compared with 1880, and an increase in minor fishes over both the earlier years. The statistics for the three years are as follows, the figures applying only to the fish taken in the lakes and rivers and not including the vessel gill-net catch in the larger lakes:

Comparison of the yield of the fisheries of Lake St. Clair and the St. Clair and Detroit rivers in 1880, 1885, and 1890.

Species.	1880.	1885.	1890.
	Pounds.	*Pounds.*	*Pounds.*
Whitefish	77,922	41,125	209,700
Herring	250,700	1,208,150	192,400
Sturgeon	998,500	227,780	309,003
Other fish	523,805	708,740	1,636,104
Total	1,850,927	2,185,795	2,347,207

The quantities and values of the fish taken, with the various kinds of apparatus employed, in this lake in 1890 are given in the table below. It is seen that the largest yield is with pound nets, after which come gill nets, seines, fyke nets, and lines and spears. The entire gill-net production was obtained in the vessel fisheries:

Table showing by apparatus and species the yield of the fisheries of Lake St. Clair and the St. Clair and Detroit rivers.

Apparatus and species.	Pounds.	Value.
Pound nets:		
Black bass	103	$6
Catfish	15,025	306
Herring	116,000	1,740
Perch	56,750	864
Pike and pike perch	177,280	5,337
Sturgeon	284,867	7,125
Whitefish	174,000	10,440
Other fish	241,500	2,710
Total	1,065,525	28,558
Seines:		
Black bass	7,400	444
Catfish	3,250	81
Herring	76,400	1,078
Perch	136,750	1,819
Pike and pike perch	171,303	5,334
Sturgeon	20,936	581
Whitefish	35,500	2,840
Other fish	59,125	850
Total	510,664	13,027
Gill nets:		
Herring	297,934	$2,979
Perch	29,243	877
Pike and pike perch	46,276	1,851
Trout	244,847	12,242
Whitefish	29,064	1,453
Total	647,364	19,402
Fyke nets:		
Black bass	1,583	94
Catfish	8,000	229
Perch	263,850	3,245
Pike and pike perch	50,610	1,814
Sturgeon	3,200	88
Whitefish	200	20
Other fish	87,875	578
Total	415,348	6,068
Lines and spears:		
Perch	276,500	3,355
Pike and pike perch	79,170	3,167
Total	355,670	6,522
Grand total	2,994,571	73,577

LAKE ERIE.

Lake Erie, though one of the smallest of the chain, maintains fisheries that are much more extensive than those of any other lake. In the items of persons employed and capital invested, Lake Erie surpasses any other three lakes combined, and the value of its products is one-and-a-half times greater than the aggregate fisheries of all the other lakes, omitting Lake Michigan; the latter it exceeds by nearly $200,000. Although surpassed by Lake Michigan in the number of vessels engaged in actual fishing, it takes the lead in the quantity of netting used and in the quantity and value of the catch. The transportation of fish from the fishing-grounds to the markets, which in all the other lakes is an inconspicuous feature of the fisheries, is here prominent, 22 steam vessels being so employed in the year covered by the investigation. One-half the pound nets, nearly one-half the gill nets and fyke nets, more than one-third of the boats, and more than one-half the shore and cash property employed in the Great Lakes fisheries are found in Lake Erie. More than one-half the fishery products credited to the entire lake region is here taken, and two-fifths of the money value of the products represents the operations of Lake Erie fishermen.

Lake Erie is peculiar in having a relatively large number of fishes of great commercial importance. In the other lakes the important species are only two to four in number, while in Lake Erie there are eight fishes of which very large quantities are taken, including several that are prominent in no other lake, as, for instance, the blue pike and the sauger.

The preëminently important fish of Lake Erie is the lake herring, which constitutes much more than half the total quantity of fish taken and about two-fifths of the value of the catch. The remaining fishes, in the order of their value, are blue pike, whitefish, wall-eyed pike, sturgeon, sauger, catfish, and perch, and in order of quantity taken, blue pike, sauger, perch, whitefish, wall-eyed pike, sturgeon, and catfish.

The following tabular statements exhibit in some detail the extent of the fisheries of this lake:

Persons employed in Lake Erie fisheries.

How engaged.	No.
Vessel fishing	315
Shore fishing	3,198
Shore industries	969
Total	4,482

Apparatus and capital employed in Lake Erie fisheries.

Designation.	No.	Value.
Vessels fishing	56	$270,100
Tonnage	1,385.34	
Outfit		32,183
Boats	1,393	217,750
Apparatus of capture—vessel fisheries:		
Gill nets	19,046	67,944
Apparatus of capture—shore fisheries:		
Pound nets	1,787	542,260
Gill nets	30,274	101,569
Fyke nets	1,175	64,450
Trap nets	106	5,840
Seines	44	5,305
Lines and spears		6,151
Shore property		749,750
Cash capital		753,000
Total		2,816,302

Products of Lake Erie fisheries.

Species.	Pounds.	Value.
Black bass	248,418	$13,521
Blue pike	7,488,903	148,201
Catfish	1,926,057	45,914
Herring	38,868,283	399,452
Perch	2,870,407	30,299
Saugers	4,179,867	51,721
Sturgeon	2,078,907	73,703
Trout	121,420	5,183
Wall-eyed pike	2,105,733	90,615
Whitefish	2,341,451	115,970
Other fish	2,621,427	22,252
Turtles and frogs		4,074
Total	64,859,873	1,000,905

The condition of the fisheries of this lake as compared with 1880 and 1885 is an important consideration, which has been the subject of much solicitude on the part of those most directly interested. It has been apparent to almost everyone that the supply of whitefish, at least, has been decreasing yearly, and that the catch has only been maintained by the use of larger quantities of apparatus. The following comparison of the output of the fisheries of this lake shows that in 1885 the yield of 3,532,000 pounds of whitefish was about 200,000 pounds more than in 1880 and 1,200,000 pounds more than in 1890. The increased apparatus in 1890 should, other things being equal, have resulted in an increase in the catch over 1885, amounting to at least 3,000,000 pounds. The output of trout, an unimportant fish in this lake, has increased slightly over 1885, owing chiefly to the larger quantity of gill-netting employed. Sturgeon show a diminished abundance, although more were taken than in 1880. Herring have more than doubled in quantity since 1885. The production of other fishes, considered in the aggregate, is somewhat less than in 1885. The large increase in herring much more than overbalances the decreases noted, and results in an augmentation in the yield of 13,400,000 pounds compared with 1885, although the value of the catch has fallen from $1,109,096 to $1,000,905.

Comparative table showing the yield of the fisheries of Lake Erie in 1880, 1885, and 1890.

Species.	1880.	1885.	1890.
	Pounds.	*Pounds.*	*Pounds.*
Whitefish	3,333,800	3,531,855	2,341,451
Trout	26,200	106,900	121,420
Sturgeon	1,970,000	4,727,950	2,078,907
Herring	11,774,400	19,154,900	38,868,283
Other fish	11,982,900	23,734,912	21,440,812
Total	29,087,300	51,456,517	64,850,873

From the following table, giving the quantity and value of each of the principal fishes taken with the different appliances, the importance of gill nets and pound nets as means of capture will be clearly seen. Gill nets yield the largest money returns and take the largest quantities of whitefish, blue pike, and sturgeon, while the pound nets have the largest aggregate catch and surpass the gill nets in the output of herring, saugers, and wall-eyed pike.

Table showing by apparatus and species the yield of the fisheries of Lake Erie.

Species.	Gill nets.		Pound nets and trap nets.		Fyke nets.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Black bass	5,730	$204	112,403	$5,887	82,585	$4,534
Blue pike	5,411,863	108,759	1,952,308	32,068	.....	.....
Catfish	500	10	470,832	12,132	376,250	7,670
Herring	18,642,800	203,787	20,210,983	194,775	.....	.....
Perch	1,101,517	14,733	1,270,700	8,038	303,670	2,440
Saugers	237,400	7,401	3,226,562	30,425	368,855	4,056
Sturgeon	1,340,790	47,777	531,243	19,626	.....	.....
Trout	120,720	5,148	.....	.....	.....	.....
Wall-eyed pike	278,342	11,771	1,309,846	57,301	318,660	15,404
Whitefish	1,402,888	69,557	937,063	46,323	.....	.....
Other fish	385,803	3,950	1,077,829	8,050	1,031,925	7,275
Total	28,848,353	473,157	31,189,769	414,625	2,481,945	41,379

Species.	Seines.		Lines, spears, grapnels, etc.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Black bass	43,000	$2,565	4,700	$271	248,418	$13,521
Blue pike	11,500	350	113,232	7,024	7,488,903	148,201
Catfish	230,375	5,275	848,100	29,827	1,926,057	45,914
Herring	.....	.....	14,500	890	38,868,283	399,452
Perch	77,100	937	117,420	4,151	2,870,407	30,299
Saugers	142,050	4,269	205,000	5,570	4,179,867	51,721
Sturgeon	.....	.....	206,874	6,300	2,078,907	73,703
Trout	.....	.....	700	35	121,420	5,183
Wall-eyed pike	55,925	3,004	49,960	3,135	2,105,733	90,615
Whitefish	.....	.....	1,500	90	2,341,451	115,970
Other fish	189,670	2,369	16,200	608	2,021,427	22,252
Turtles and frogs	.....	.....	.....	4,074	.....	4,074
Total	752,620	18,769	1,578,186	52,975	64,850,873	1,000,905

LAKE ONTARIO.

A preliminary report* on the fisheries of this lake has already been published in the Bulletin of the U. S. Fish Commission for 1890. It was issued to supply a demand for recent information during a very important discussion of the question of the condition of the industry and of the necessity for further protection to the fishes. The fisheries of this lake are less valuable than those of any other member of the system, and the threatened further reduction of their importance, due (1) to fishing abuses, or (2) inadequate fish-cultural operations, or (3) to a combination of these causes, drew an unusual amount of attention to Lake Ontario and furnished the basis for a noteworthy movement for the preservation and increase of the fish supply of the lake, for a discussion of which reference is made to the report cited.

In 1890 the fishing industry of the lake had the following extent:

Persons employed in Lake Ontario fisheries.

How engaged.	No.
Vessel fishing	11
Shore fishing	356
Shore industries	22
Total	389

Apparatus and capital employed in Lake Ontario fisheries.

Items.	No.	Value.
Vessels (tonnage 46.17)	3	*a* $9,585
Boats	373	21,577
Gill nets, feet	1,103,945	18,110
Pound nets and trap nets	288	24,577
Fyke nets	684	9,822
Seines	27	656
Set lines, feet	139,632	490
Miscellaneous		49
Shore and accessory property		25,777
Cash capital		12,890
Total		123,533

a Includes outfit.

Products of Lake Ontario fisheries.

Species.	Pounds.	Value.
Black bass	33,092	$2,364
Catfish	471,955	12,444
Eels	257,190	8,913
Herring	598,978	20,930
Perch	358,947	5,368
Pike	129,490	6,284
Pike perch	331,002	28,729
Sturgeon	641,752	22,291
Suckers	279,170	4,578
Trout	41,010	2,089
Whitefish	148,771	6,875
Other fish	235,091	3,915
Total	3,446,448	124,786

* The fisheries of Lake Ontario. By H. M. Smith, M. D. 39 pp., 30 plates of fishes.

In a preceding general table the statistics of the fisheries of this lake in 1880, 1885, and 1890 appear. The fisheries for the last year show a marked decline in the essential features of the industry as compared with 1880, although the capital invested and the value of the products were somewhat greater than in 1885. The aggregate decrease in the quantity of fish taken between 1880 and 1890 was only 193,522 pounds, an amount which is in itself insignificant; but an inspection of the statistics shows that a more unfavorable result was obviated only by a very large increase in the production of the cheaper grades of fish, while the catch of the two most valuable fishes in 1880, viz, whitefish and lake trout, was reduced nearly 90 per cent. A slight improvement, made up chiefly of minor species, such as might arise from seasonal variations in the abundance of fish, is seen to have occurred between 1885 and 1890. The following comparison of the production of the fishes in 1880, 1885, and 1890 exhibits the variations in the catch of all the species for which it is possible to give separate figures for 1880:

Comparison of the yield of the fisheries of Lake Ontario in 1880, 1885, and 1890.

Species.	1880.	1885.	1890.
	Pounds.	*Pounds.*	*Pounds.*
Whitefish	1,064,000	90,711	148,771
Lake trout	569,700	20,510	41,010
Sturgeon	545,283	386,974	541,752
Herring	611,217	403,585	598,978
Other fish	849,800	1,496,686	2,115,937
Total	3,640,000	2,398,466	3,446,448

In this lake larger quantities of fish are caught with gill nets than with any other kind of apparatus. The principal part of the catch consists of sturgeon and the minor species of whitefish usually designated herring. More common whitefish are also taken with these nets than in any other manner, although the actual yield is small. Trap nets and pound nets rank next to gill nets in the amount and value of the fish secured. Pike perch or wall-eyed pike represents more than half the value but less than one third the quantity of the trap-net production, and is the most important fish now taken in the lake. Fyke-net fishing is of considerable extent, catfish, pike, and yellow perch being the chief products. All other kinds of apparatus used are unimportant.

The following table indicates the efficiency of the different means of capture employed in Lake Ontario, the quantity and value of each fish taken being shown:

Table showing by apparatus and species the yield of the fisheries of Lake Ontario.

Species.	Gill nets.		Pound nets and trap nets.		Fyke nets.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Black bass	23,284	$1,547	6,488	$623	.....	.....
Catfish	8,530	330	49,010	1,222	400,273	$10,484
Eels	.....	.....	196,204	6,550	56,336	2,177
Herring	586,629	20,516	5,724	161	.....	.....
Perch	39,210	648	150,975	1,427	170,645	3,111
Pike	41,740	2,032	520	26	73,770	3,340
Pike perch	26,970	1,330	297,132	26,967	.....	.....
Sturgeon	428,919	17,667	26,075	992	.....	.....
Suckers	13,580	351	93,830	938	76,320	1,056
Trout	10,637	566	30,181	1,513	.....	.....
Whitefish	78,249	3,717	68,392	3,007	.....	.....
Other fish	8,968	177	120,350	1,278	122,183	2,393
Total	1,257,716	48,821	1,044,851	44,704	899,527	22,561

Species.	Seines.		Lines.		Minor apparatus.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Black bass	1,967	$118	1,353	$76	.....	.....	33,092	$2,364
Catfish	6,735	240	2,847	77	4,566	$91	471,955	12,444
Eels	.....	.....	4,050	186	.....	.....	257,190	8,913
Herring	6,625	259	.....	.....	.....	.....	598,978	20,936
Perch	6,117	162	1,000	20	.....	.....	358,947	5,368
Pike	1,685	81	9,275	730	2,500	75	129,490	6,284
Pike perch	4,718	312	2,182	120	.....	.....	331,002	28,729
Sturgeon	2,480	78	84,068	3,608	210	6	541,752	22,201
Suckers	44,580	1,230	1,250	25	49,640	918	279,170	4,578
Trout	.....	.....	192	10	.....	.....	41,010	2,089
Whitefish	2,130	151	.....	.....	.....	.....	148,771	6,875
Other fish	3,590	67	.....	.....	.....	.....	255,091	3,915
Total	80,627	2,758	106,817	4,852	56,910	1,090	3,446,448	124,786

CHESAPEAKE BASIN.*

The investigations in the Middle Atlantic States were, during the fiscal year 1891–92, confined to the Chesapeake Basin and the adjoining ocean shores of Maryland and Virginia. The canvass of this important fishing region was extended to the limits of economic fishing in all the rivers tributary to the bay. The very careful and comprehensive inquiries here made were fully warranted by the vast extent and importance of the fisheries. The Chesapeake, with its tributaries, constitutes the most productive inland fishing-ground in the United States, and probably the most important in the world. The value of the fishery objects here taken is over $10,000,000 annually, a sum equal to nearly one-fourth the value of the fisheries of the entire country.

The investigation of the fisheries of this section was begun in the first part of November, 1891, and occupied the attention of the field force for about three months. The canvass in Maryland was conducted by Messrs. Ansley Hall, E. E. Race, and Charles H. Stevenson, and in Virginia by Messrs. T. M. Cogswell, Charles H. Stevenson, and W. A. Wilcox. That part of the Chesapeake Basin extending into Delaware and Pennsylvania was visited by Mr. Race.

The canvass of the fisheries of this region disclosed the extent of the various branches of the industry in the four States supplied by the

* Including adjoining ocean shores of Maryland and Virginia.

Chesapeake and its tributaries to be as follows: The number of persons finding employment in 1891 was 64,654; the amount of capital invested was $10,474,334; the value of the products taken was $10,126,748. The extent to which the different States were represented is shown in the following tables, which give details of the industry:

THE FISHERIES OF THE CHESAPEAKE BASIN IN 1891.

Persons employed.

States.	Fishermen.	Shoresmen.	Total.
Pennsylvania	637	.....	637
Delaware	129	353	482
Maryland	28,209	11,735	39,944
Virginia	20,316	3,275	23,591
Total	49,291	15,363	64,654

Vessels, boats, apparatus, and capital employed.

Designation.	Pennsylvania.		Delaware.		Maryland.		Virginia.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Vessels*	.....	.....	15	$14,650	1,627	$1,838,249	944	$939,136	2,586	$2,792,035
Boats	383	$5,967	48	660	9,825	579,488	9,247	463,722	19,503	1,049,837
Seines	58	3,325	6	450	536	76,780	220	58,320	820	138,875
Gill nets	.....	.....	132	695	11,976	97,289	6,979	46,030	19,087	144,014
Pound nets	.....	.....	17	155	1,005	71,778	916	162,690	1,938	234,623
Fyke nets and pots	58	350	45	172	14,002	41,937	449	5,865	14,554	48,324
Dredges	.....	.....	.....	.....	4,487	121,883	658	22,850	5,145	144,733
Tongs	.....	.....	.....	.....	13,415	77,039	12,105	56,675	25,520	133,714
Other apparatus	.....	676	.....	.....	.....	7,493	.....	3,914	.....	12,083
Shore property	.....	1,957	.....	16,500	.....	2,446,327	.....	717,857	.....	3,182,641
Cash capital	.....	.....	.....	18,500	.....	2,107,455	.....	467,500	.....	2,593,455
Total	.....	12,275	.....	51,782	.....	7,465,718	.....	2,944,559	.....	10,474,334

* Value includes outfit.

Products.

Species.	Pennsylvania.		Delaware.		Maryland.		Virginia.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alewives	.....	.....	87,100	$495	17,418,850	$131,245	11,004,085	$93,819
Bluefish	.....	.....	.....	.....	516,304	22,761	1,802,674	66,004
Bonito	.....	.....	.....	.....	.....	.....	195,250	4,948
Catfish	4,500	$224	6,540	296	1,296,752	45,502	952,769	28,538
Eels	13,725	758	.....	.....	792,044	32,919	7,500	500
Menhaden	.....	.....	.....	.....	30,952,120	65,307	105,980,334	197,523
Mullet	.....	.....	.....	.....	101,540	2,974	101,700	2,196
Perch	7,800	390	20,785	928	2,494,625	105,078	415,378	16,335
Pike	4,000	600	1,550	93	563,264	35,261	9,450	615
Sea bass	.....	.....	.....	.....	113,370	4,544	9,440	475
Shad	201,080	13,420	57,533	3,186	6,224,873	211,575	6,498,242	207,394
Sheepshead	.....	.....	.....	.....	3,185	396	20,625	1,101
Spanish mackerel	.....	.....	.....	.....	44,837	5,369	739,910	50,756
Spots and croakers	.....	.....	.....	.....	273,283	12,119	1,683,457	60,863
Squeteague	.....	.....	.....	.....	750,465	25,902	3,938,019	124,891
Striped bass	14,200	1,278	150	15	1,264,693	97,770	467,861	40,953
Sturgeon	.....	.....	.....	.....	72,445	2,343	720,451	21,267
Other fish	46,500	2,904	2,300	120	816,947	24,667	2,654,419	82,589
Clams (meats)	.....	.....	.....	.....	[1]147,760	8,226	[2]550,278	36,030
Crabs	.....	.....	.....	.....	[3]7,605,770	303,716	[4]2,890,427	62,039
Crayfish and shrimp	.....	.....	.....	.....	15,394	4,655	.....	.....
Oysters (meats)	.....	.....	.....	.....	[5]69,615,406	5,295,866	[6]43,061,452	2,520,068
Terrapins	.....	.....	.....	.....	89,780	22,333	52,215	18,494
Turtles	.....	.....	.....	.....	4,060	231	187,621	3,904
Total	291,814	19,574	175,958	5,133	141,177,827	6,460,759	183,952,557	3,641,282

[1] 18,470 bushels.
[2] 69,910 bushels.
[3] 22,817,310 in number.
[4] 8,671,281 in number.
[5] 9,945,058 bushels.
[6] 6,151,636 bushels.

Products—Continued.

Species.	Total.		Species.	Total.	
	Pounds.	Value.		Pounds.	Value.
Alewives	28,510,035	$225,559	Spots and croakers	1,956,740	$72,982
Bluefish	2,319,038	88,765	Squeteague	4,688,484	150,793
Bonito	195,250	4,948	Striped bass	1,746,904	140,016
Catfish	2,260,561	74,560	Sturgeon	792,896	23,610
Eels	813,269	34,177	Other fish	3,520,166	110,260
Menhaden	136,932,454	202,830	Clams (meats)	[1]707,038	44,256
Mullet	203,240	5,170	Crabs	[2]10,496,197	365,755
Perch	2,938,588	122,731	Crayfish and shrimp	15,394	4,655
Pike	578,264	36,569	Oysters (meats)	[3]112,676,858	7,815,934
Sea bass	122,810	5,019	Terrapins	141,995	40,827
Shad	12,981,737	435,575	Turtles	191,681	4,135
Sheepshead	23,810	1,497			
Spanish mackerel	784,747	56,125	Total	325,598,156	10,126,748

[1] 88,380 bushels. [2] 31,488,591 in number. [3] 16,096,694 bushels.

Not the least important point involved in the investigation of the fisheries of this section is the question of their condition and maintenance in view of the enormous annual drain on the supply of fishes and other aquatic animals required to yield to the fishermen a yearly income of over $10,000,000.

Comparing the extent of the industry in 1891 with its extent in 1880, it appears that a large increase has occurred in the number of persons employed in fishing and in the dependent shore branches. The number of fishermen increased 12,336 in Maryland, 4,265 in Virginia; the number of shore employés increased 1,600 in Maryland and 462 in Virginia, giving a combined increase in fishing population of 18,663 in these two States.

The aggregate number of vessels now employed is apparently somewhat less than in 1880; there has been an increase of 177 in Maryland and a decrease of 502 in Virginia, giving a net decrease of 325. It may be said, however, that only approximate figures for the oyster vessels were obtained in 1880, and, in view of the increased number of oyster vessel fishermen, it is probable that the vessel estimates were too large. A large advance has occurred in the item of boats; 9,629 more of these were used in 1891 than in 1880, both States exhibiting a marked increase; the value of the boats increased $564,042. Every important form of fishing apparatus is now employed in larger quantities than in 1880; seines have increased from 293 to 756, gill nets from about 7,720 to 18,955, fyke nets and pots from 4,150 to 14,450, and pound nets and weirs from 268 to 1,921. One of the most prominent features of the fisheries is the enormous augmentation in the number of pound nets employed and the tendency in certain localities to supplant the earlier and less effective means of capture with this apparatus. The aggregate investment in fishing property has increased in both States, amounting to $1,123,285 in Maryland and $1,030,440 in Virginia.

The foregoing increase in fishing population and fishing property prepares us for a substantial advance in the results of the fisheries, provided there has been no serious impairment of the supply. The

figures at hand indicate a general maintenance of the abundance of most of the important products and show a marked advance in the case of some special objects. The value of the industry in Maryland has increased $2,819,900, that in Virginia $516,838, the aggregate increase being $3,273,640, or nearly 50 per cent. Figures for the fisheries of Pennsylvania and Delaware tributary to the Chesapeake are not available for 1880; their importance, however, is relatively so little that they may be discarded from the comparisons. The comparatively unimportant fishery interests of the ocean shores of Maryland and Virginia are included in order to make the statistics for those States complete.

Among the fishery products whose importance entitles them to special mention and concerning which some notes on the fisheries may be given are alewives, bluefish, menhaden, Spanish mackerel, squeteague, striped bass, shad, crabs, and oysters.

Alewives or herrings.—Next to shad these are the most valuable food-fishes taken in this region; the quantity annually consumed is much greater than that of any other food-fishes. They are secured principally with seines and pound nets. In 1891, 17,418,850 pounds, for which the fishermen received $131,245, were caught in Maryland, and 11,004,085 pounds, worth $93,819, were obtained in Virginia, the total yield in the two States being 28,422,935 pounds, with a value of $225,064. This is a very large increase over 1880, although it is not anomalous in view of the augmented quantities of apparatus used. In 1880 the output of alewives was 16,129,372 pounds, valued at $217,092, the proportion of the catch in each State being about the same as in 1891.

Bluefish.—This erratic species is, with one exception, the most important typically salt-water fish taken in Maryland and Virginia. The largest part of the catch is obtained with pound nets. The aggregate yield in 1891 was 2,319,038 pounds, having a value of $88,765; of this quantity, 516,364 pounds were taken in Maryland and 1,802,674 pounds in Virginia. The increase over 1880 was 762,621 pounds, worth $52,442. The increase was most noticeable in Maryland, where only 10,000 pounds were reported in 1880, while 516,364 pounds were caught in 1891.

Menhaden.—The presence of a large number of oil and fertilizer factories on the Chesapeake occasions an extensive fishery for menhaden carried on with steamers and sailing vessels. The fish are liable to seasonal fluctuations, like the bluefish, but the catch in recent years has been fairly constant. The quantity of fish taken in 1891 was 136,932,454 pounds, equivalent to about 228,220,755 fish, nearly all of which were utilized at the oil and guano works; the cost of the fish to the factory operators was $262,830, or at the rate of about $1.15 per thousand fish. In 1880 the quantity of menhaden taken was 92,116,800 pounds, valued at $246,760, or at $1.60 per thousand fish. A conspicuous feature of the fishery is the increased catch of menhaden in Maryland, owing chiefly to the establishment of factories at several places in the State and the consequent employment of fishing vessels belonging in Maryland. In Virginia the output is approximately the same as in 1880.

Spanish mackerel.—The abundance of this species in recent years presents a marked decrease as compared with 1880. In the latter year 1,627,663 pounds, worth $100,104, were taken, the fish ranking third in importance among the food-fishes of the region, while in 1891 less than half the quantity was caught and the fish declined to the ninth place. The catch in Maryland was very small in both 1880 and 1891, but was larger in the latter year than in the former. The decrease may evidently be traced to the capture, chiefly in pound nets, of large quantities of the fish early in the season in the lower part of the Chesapeake, before the fish have spawned.

Squeteague.—Two species of squeteague, locally known as weakfish and trout, rank third in importance among the food-fishes of this section. As compared with 1880, they were taken in much larger quantities in 1891, and the increase was marked in both Maryland and Virginia. The aggregate yield reported in 1880 was 1,541,000 pounds, valued at $31,140; in 1891 the catch amounted to 4,688,484 pounds, worth $150,793. Pound nets and seines are the apparatus chiefly employed in taking these fish.

Striped bass.—The supply of this fish seems to be holding out remarkably well in view of the large annual catch in fresh and salt water with seines, gill nets, and pound nets. The output in 1891 was about 410,000 pounds more than in 1880, although there was a decline of nearly 30 per cent in Virginia. The total yield in 1891 was 1,732,554 pounds, for which the fishermen received $138,723.

Shad.—Next to the oyster, the shad is the most valuable fishery product of this region; in 1880 it occupied the same rank. The maintenance of the supply may be clearly traced to large plants of fry in the waters of the region, and the increase in the output has been due to the employment of larger quantities of apparatus, especially pound nets. Following is a comparative statement of the catch of shad in Maryland and Virginia in 1880 and 1891:

Year.	Maryland.		Virginia.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1880	3,774,426	$140,926	3,171,953	$134,496	6,946,379	$275,422
1891	6,224,873	211,575	6,498,242	207,394	12,723,115	418,969
Increase	2,450,447	70,649	3,326,289	72,898	5,776,736	143,547

These figures show an increase of nearly 100 per cent between the years named, the advance being shared about equally by the two States.

Crabs.—The prominence which crabs have attained in the fisheries of this region is one of the most noteworthy features of the industry. In 1880 only 3,305,867 pounds of crabs, equivalent to about 9,917,600 individuals, were marketed; these brought the fishermen $78,938. In 1891, when the fishery was more extensive than ever before, 10,496,197 pounds, or about 31,488,590 crabs, valued at $365,755, were sold. In

1880 the fishery was more extensive in Virginia, but at the present time nearly four-fifths of the business is carried on in Maryland. Much the larger part of the catch is sold as soft-shell crabs.

Oyster.—This important resource now represents nearly eight-tenths of the value of the fisheries of this region. During the season covered by the inquiry the industry was in a prosperous condition. The foregoing table of products shows that 9,945,058 bushels, valued at $5,295,866, were taken in Maryland, and 6,151,636 bushels, valued at $2,520,068, in Virginia, the total yield being 16,096,694 bushels, for which the fishermen received $7,815,934. Compared with 1880, these figures show a decreased production, amounting to 654,942 bushels in Maryland and 685,684 bushels in Virginia, while the value of the output has increased $565,380 and $301,692, respectively. A large increase has also taken place in the number of persons engaging in the oyster industry. In 1880 Maryland had 13,748 fishermen and 9,654 shore hands, while in 1891 it had 21,280 fishermen and 12,108 shoresmen. In 1880 Virginia was credited with 14,236 fishermen and 2,079 shoresmen, and in 1891 16,352 fishermen and 2,250 shoresmen. The total increase was thus 12,273. The capital invested in the oyster industry in 1880 was $6,034,350 in Maryland and $1,351,000 in Virginia; in 1891 it was $7,269,245 and $1,927,792, respectively.

ALBEMARLE REGION, NORTH CAROLINA.

In April, 1892, the writer visited Albemarle Sound and some of the rivers debouching into it in the interests of the Division of Scientific Inquiry. The primary object of the visit was the collection of the fresh-water fishes of the region. At the same time an opportunity was afforded to inspect the commercial fisheries.

Forty-five species of fishes were ascertained to inhabit this region at the time of the inquiry; of these about thirty may be regarded as food-fishes, two or three others are sometimes eaten but have no recognized economic value, and the remainder are small fishes whose principal importance arises from the fact that they constitute a prominent part of the food supply of other fish.

This is one of the most important fishing sections on the Atlantic coast. Albemarle Sound is the largest coastal body of fresh water in the United States, and more extensive fresh-water fisheries are maintained in it and its tributaries than are prosecuted elsewhere on our coast. The most prominent fish occurring are shad, alewives, striped bass, black bass, and white perch, but many other fishes common to the section are taken in greater or less numbers and materially contribute to the income of the fisherman, among which sturgeon, catfish, eels, suckers, pike, mud shad, hickory shad, several kinds of sunfishes, yellow perch, and flounders may be mentioned.

The annual fish production of this region is about 9,000,000 pounds, of which nearly two-thirds represents alewives. The value of the catch is about $465,000, nearly half of which sum represents shad.

The changes which have taken place in the forms of apparatus used in this region are interesting. In early times the favorite means of capture, especially for shad and alewives, was the seine. This is still an important device, taking more fish than any other single form, and the most extensive seine fisheries in the country for the fish named are here carried on. After a time the gill net was brought into more general use and began to increase in importance until finally it took precedence over the seine in taking shad and one or two less valuable fish. In the past decade the introduction of the pound net in great numbers has been a very marked feature of the fisheries, and because of its efficiency it has supplanted to a considerable extent both the seine and the gill net, and will probably, within a short period, attain even greater prominence.

BOSTON AND GLOUCESTER, MASS.

The studies of the fisheries tributary to these places, as mentioned in the previous report of the division, have continued along the same general lines already referred to. The importance of the fishing industry of these cities warrants the small sums expended in keeping well informed regarding the condition of the business and in maintaining close relations with the fishermen and dealers. The inquiries here made cover the operations of about seven-eighths of the offshore fishing vessels of New England, are valuable adjuncts to the general investigation of the fisheries, and afford an excellent basis for determining the condition and resources of the great ocean fishing-grounds off the New England coast.

In Boston Mr. F. F. Dimick has continued his efficient services as local agent. He has obtained a record of each vessel arriving from the fishing-grounds, noting the kind, quantity, and value of the fish landed, the particular grounds on which caught, and other useful and interesting data concerning the fisheries.

The fish trade of Boston is of greater magnitude than that of any other city of the United States. The investigations have shown that in the calendar year 1891 the quantity of fishery products there landed by American fishing vessels was 69,945,088 pounds, mostly fresh, having an approximate value to the fishermen of $1,840,336. This quantity is in addition to very large receipts, chiefly from the provinces, over regular rail and steamer lines. The most important single product brought into Boston by our fishing vessels is the haddock, of which 33,860,197 pounds, valued at $824,132, were landed. Of the cod, the next prominent fish, 16,655,200 pounds were landed, having a value of $547,851. Hake ranks next, the receipts being 12,347,730 pounds, worth $168,817. Other fish deserving mention are halibut, cusk, pollock, and mackerel.

An analysis of the following table, giving the receipts classified by fishing-grounds, shows the great predominance of Georges Bank and South Channel as sources of supply, these two grounds furnishing nearly one-half the fish landed in Boston. The next important grounds, in their order, are the general shore grounds, La Have Bank, off Highland Light, Jeffreys Ledge, Browns Bank, Middle Bank, Cashes Bank, and the Cape Shore.

Of the 4,119 trips of fish landed in Boston in 1891 209 were from grounds off the shores of the British provinces east of the 66th meridian of west longitude, the largest number being from La Have Bank. The total catch in this region was 7,027,985 pounds, including several fares of salt mackerel from the Cape Shore; of this quantity 2,964,000 pounds were haddock and 2,155,500 pounds were cod. The average fare from the eastern grounds was 33,627 pounds. From the grounds off the New England coast 3,910 trips of fish were landed, of which 1,549 were from the general shore grounds, 738 from South Channel, 395 from Georges, 387 from Jeffreys Ledge, 281 from the grounds off Highland Light, and 258 from Middle Bank. The quantity of fish here taken was 62,917,103 pounds, including small quantities of mackerel, swordfish, eels, bluefish, herring, menhaden, and lobsters. The average fare from these grounds was 16,091 pounds.

Summary by fishing-grounds of the fishery products landed at Boston, Mass., in 1891 by American fishing vessels.

Fishing-grounds.	No. of fares of fish.	Cod.	Cusk.	Haddock.	Halibut.	Hake.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
East of 66° W. longitude:						
Quereau Bank	1	30,000			3,000	
Western Bank	8	39,000	4,700	41,500	25,000	39,000
La Have Bank	146	1,456,500	301,000	2,171,500	183,225	787,000
Cape Shore	54	630,000	102,500	751,000	10,960	226,500
Total	209	2,155,500	408,200	2,964,000	222,185	1,052,500
West of 66° W. longitude:						
Browns Bank	96	1,212,700	248,100	1,095,700	284,100	99,700
German Bank	1	45,000	15,000	20,000		
Georges Bank	395	3,066,900	209,800	8,451,400	272,805	809,000
Cashes Bank	63	340,500	365,000	499,600	12,960	743,900
Fippenies Bank	6	20,500	10,000	14,600	1,660	25,500
Tillies Bank	1	7,000		2,500		2,000
Clark Bank	4	23,000	8,500	57,000	850	63,000
Ipswich Bay	54	164,400	5,000	266,500		36,500
Jeffreys Ledge	387	658,300	82,500	2,273,750	27,130	653,000
Middle Bank	258	497,500	140,700	1,332,900	10,440	619,350
Off Highland Light	281	1,430,100	206,350	1,644,300	17,735	820,990
Off Chatham	37	114,700	5,600	348,500	2,450	31,200
South Channel	738	4,913,700	920,900	9,766,500	255,920	4,847,200
Nantucket Shoals	40	175,700	1,500	649,800	5,950	114,800
Shore, general	1,549	1,836,000	186,120	4,473,747	10,590	2,423,400
Total	3,910	14,490,700	2,405,970	30,896,197	900,530	11,295,230
Grand total	4,119	16,655,200	2,814,170	33,860,197	1,122,715	12,347,730

Summary by fishing-grounds of the fishery products landed at Boston, Mass., in 1891 by American fishing vessels—Continued.

Fishing-grounds.	Mackerel, fresh.	Mackerel, salted.	Pollock.	Swordfish.	Other fish.	Lobsters.	Total.	Average fare per trip.
East of 66° W. longitude:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Quereau Bank							33,000	33,000
Western Bank			9,700				158,900	19,862
La Have Bank			89,400				4,988,625	34,169
Cape Shore		106,000	20,500				1,847,460	34,212
Total		106,000	119,600				7,027,985	33,627
West of 66° W. longitude:								
Browns Bank			63,800				3,004,100	31,293
German Bank			5,000				85,000	85,000
Georges Bank			66,900				12,876,805	32,599
Cashes Bank			23,900				1,986,760	31,536
Fippenies Bank			1,000				72,600	12,100
Tillies Bank							5,200	5,200
Clark Bank			3,000				152,350	38,087
Ipswich Bay							475,400	8,803
Jeffreys Ledge			354,900				4,050,180	10,465
Middle Bank			57,500				2,658,390	10,304
Off Highland Light			47,900		2,000		4,169,375	14,837
Off Chatham			1,500		58,100		502,050	15,190
South Channel			245,590		17,060		20,964,870	28,407
Nantucket Shoals			24,975				972,725	24,318
Shore, general	479,325	429,850	210,940	186,146	393,730	246,360	10,881,208	7,024
Total	479,325	429,850	1,106,905	186,146	470,890	246,360	62,917,103	16,091
Grand total	479,325	535,850	1,226,505	186,146	470,890	246,360	69,945,088	16,981

The inquiries at Gloucester have had a similar scope to those at Boston. Capt. S. J. Martin, the local agent, has brought the practical experience of a long fishing career to bear on the work, and has been extremely diligent, faithful, and energetic in the discharge of his duties.

While Gloucester receives less fish than Boston, it ranks first in the extent of its salt-fish trade in home-caught fish and in the aggregate amount of fish receipts from American fishing vessels. The inquiries conducted by the division show that in 1891 the quantity of fish there landed by fishing vessels was 76,949,347 pounds, of which 49,721,248 pounds were salt, and a large part of the remainder was salted after being discharged at the wharves. The value of the receipts was $2,784,996.

The most important single kind of fish landed at Gloucester is the cod, of which 44,249,970 pounds of fresh and salted fish were received; these had a value at first hands of $1,563,452. Next to cod in quantity is hake, of which 9,726,360 pounds, valued at $103,960, were landed. Halibut, while taken in smaller quantities than hake, is much more valuable; of this species 7,414,501 pounds of fresh and salted fish, with a market value of $690,302, reached Gloucester directly from the fishing-grounds. The receipts of the remaining fish of importance were haddock, 4,294,775 pounds, worth $54,305; cusk, 3,897,420 pounds, valued at $82,245; pollock, 2,729,421 pounds, worth $27,188; mackerel, 4,366,000 pounds, with a value of $258,955; and other products, 270,900 pounds, worth $4,589.

The following table shows the fish receipts at Gloucester classified by fishing-grounds. From this it appears that 3,420 fares of fish were brought into Gloucester during the year; of these, 644 were from grounds east of the sixty-sixth meridian of west longitude and 2,776 from grounds west of that line. The largest number of trips from the more eastern grounds were from La Have, Western, and Grand banks, and from the Cape Shore, and the catch consisted chiefly of fresh halibut, salt cod, and salt mackerel. The aggregate receipts from this region were 36,373,016 pounds, of which 19,259,165 pounds were from the Grand Banks. The grounds off the coast of the United States yielded 40,576,331 pounds of fish which went to Gloucester. More fares came from the shore grounds adjacent to the New England coast than from any of the offshore banks; 1,590 arrivals from these grounds brought in 12,098,638 pounds, mostly cod, hake, pollock, and mackerel. The most important of the offshore grounds was Georges Bank; 674 fares of fish were received from there, aggregating 12,690,158 pounds, chiefly cod. Cashes Bank, South Channel, Browns Bank, and Nantucket Shoals are other important grounds in this section.

Summary by fishing-grounds of the fishery products landed at Gloucester, Mass., in 1891, by American fishing vessels.

Fishing-grounds.	No. of trips from each ground.	Halibut.				Cod.		
		Fresh.	Salted.	Fins.	Sour.	Fresh.	Salted.	
							Large.	Small.
East of 66° W. longitude:		*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
La Have Bank and ridges	104	920,870	13,600	.....	4,000	56,500	705,700	371,980
Western Bank	129	1,879,520	16,880	.....	29,300	20,000	1,514,510	960,830
Quereau Bank	55	1,013,910	2,600	.....	10,650	.....	304,680	112,320
Misaine Bank	5	156,450	.....	.....	.....	.....	40,000	160,000
St. Peters Bank	18	424,675	.....	.....	.....	.....	46,000	9,500
Greens Bank	3	82,110	.....	.....	.....	.....	.....	.....
Grand Bank	161	680,640	175,650	.....	10,200	.....	9,839,892	8,498,503
Canso Bank	6	.....	9,280	.....	.....	.....	316,800	162,020
Cape Shore	138	52,900	4,800	.....	.....	173,500	1,483,570	696,210
Iceland	11	.....	1,542,900	108,200	.....	.....	.....	.....
Cape North	3	15,500	3,000	.....	.....	.....	137,000	84,500
Gulf of St. Lawrence	10	.....	.....	.....	.....	.....	.....	.....
Off Newfoundland	1	31,020	.....	.....	.....	.....	.....	.....
Total	644	5,257,601	1,768,710	108,200	54,150	250,000	14,388,152	11,055,803
West of 66° W. longitude:								
Nantucket Shoals	91	18,200	.....	.....	.....	6,500	336,130	1,890,660
South Channel	130	.....	.....	.....	.....	176,360	.....	.....
Georges Bank	674	80,620	3,300	.....	.....	715,430	8,085,565	1,878,543
Browns Bank	43	61,060	.....	.....	.....	118,000	472,410	215,980
Cashes Bank	241	59,330	700	.....	.....	1,417,650	224,280	80,715
German Bank	7	.....	.....	.....	.....	.....	102,500	20,000
Shore, general	1,590	2,630	.....	.....	.....	1,725,412	369,400	114,420
Total	2,776	221,840	4,000	.....	.....	4,159,352	10,190,285	4,206,318
Grand total	3,420	5,479,441	1,772,710	108,200	54,150	4,409,352	24,578,437	15,262,181

Summary by fishing-grounds of the fishery products landed at Gloucester, Mass., in 1891, by American fishing vessels—Continued.

Fishing-grounds.	Haddock.		Hake.		Pollock.	
	Salted.	Fresh.	Salted.	Fresh.	Salted.	Fresh.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
East of 66° W. longitude:						
La Have Bank and ridges	.....	216,000	9,300	323,400	.....	.....
Western Bank	.....	85,000	48,000	10,000	.....	.....
Quereau Bank	3,000	.....	20,500	.....	.....	.....
Grand Bank	.....	.....	50,280	.....	.....	.....
Canso Bank	5,000	.....	46,000	.....	.....	.....
Cape Shore	107,060	176,000	614,000	166,000	18,000	.....
Total	115,060	477,000	788,080	499,400	18,000	.....
West of 66° W. longitude:						
Nantucket Shoals	7,200	10,000	4,000	.....	7,000	.....
South Channel	.....	1,158,505	.....	1,581,100	.....	.....
Georges Bank	10,500	854,100	120,500	187,400	11,500	.....
Browns Bank	.....	261,890	22,000	12,000	.....	.....
Cashes Bank	19,000	579,820	285,000	3,752,800	.....	.....
German Bank	14,580	.....	59,000	.....	4,500	.....
Shore, general	71,550	715,575	802,000	1,613,080	523,000	2,155,421
Total	122,830	3,579,885	1,292,500	7,146,380	556,000	2,155,421
Grand total	237,890	4,056,885	2,080,580	7,645,780	574,000	2,155,421

Fishing-grounds.	Cusk.		Mackerel.		Other species.		Total.
	Salted.	Fresh.	Salted.	Fresh.	Salted.	Fresh.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
East of 66° W. longitude:							
La Have Bank and ridges	34,000	95,500	.....	.....	.....	.....	2,750,856
Western Bank	7,600	2,000	.....	.....	.....	.....	4,573,040
Quereau Bank	7,000	.....	.....	.....	.....	.....	1,474,060
Misaine Bank	.....	.....	.....	.....	.....	.....	356,450
St. Peters Bank	.....	.....	.....	.....	.....	.....	480,175
Greens Bank	.....	.....	.....	.....	.....	.....	82,110
Grand Bank	4,000	.....	.....	.....	.....	.....	19,259,165
Canso Bank	4,000	.....	.....	.....	.....	.....	543,100
Cape Shore	57,200	19,700	1,108,000	.....	12,000	.....	4,688,940
Iceland	.....	.....	.....	.....	.....	.....	1,651,100
Cape North	.....	.....	.....	.....	.....	.....	240,000
Gulf of St. Lawrence	.....	.....	242,400	.....	.....	.....	242,400
Off Newfoundland	.....	.....	.....	.....	.....	.....	31,020
Total	113,200	117,200	1,350,400	.....	12,000	.....	36,373,016
West of 66° W. longitude:							
Nantucket Shoals	.....	.....	.....	.....	.....	.....	2,279,690
South Channel	.....	317,950	.....	.....	.....	.....	3,233,910
Georges Bank	57,400	83,300	.....	.....	.....	2,000	12,690,158
Browns Bank	10,000	26,000	.....	.....	.....	.....	1,199,340
Cashes Bank	134,500	2,219,220	.....	.....	55,000	.....	8,858,015
German Bank	10,000	.....	.....	.....	.....	.....	216,580
Shore, general	283,550	495,100	3,008,000	7,600	181,400	20,500	12,098,638
Total	495,450	3,171,570	3,008,000	7,600	236,400	22,500	40,576,331
Grand total	608,650	3,288,770	4,358,400	7,600	248,400	22,500	76,949,347

Attention may very properly be called to the practical value of these inquiries as represented in the information shown in the preceding tables. The preservation of the fishing-grounds resorted to by the New England fleet is the most vital question connected with the fisheries of that region, and it becomes a matter of great consequence to know their condition from time to time, and if depletion is taking place to have definite and accurate statistical data to serve as a basis for the determination of the extent of the deterioration, the special grounds and fish which it affects, and the steps that may be necessary to prevent it. The absence of such information as is here shown for an earlier year than 1889 makes all the more desirable the careful, continuous study now going on.

REMARKS ON REPORTS.

Following is a résumé of the reports and papers emanating from this division during the fiscal year 1892. These covered a variety of subjects, some general and others special in their scope. Considerable work was also done on a number of other papers dealing with our fishery interests, which will be issued during the next fiscal year.

In addition to the information which is utilized in the preparation of reports, the office is accumulating a vast amount of descriptive and illustrative matter on apparatus, boats, vessels, fish and other products, etc., which will be available when the occasion or opportunity for its utilization arises. While the elaborate studies in the Fisheries and Fishery Industries of the United States make the necessity for similar descriptive reports a remote contingency, the important subject of fishing apparatus was not treated of in that series, and constitutes, among other topics, an inviting field for a report, the material for which is now being gathered.

Notes on the King-Crab Fishery of Delaware Bay. (Bulletin, 1889, pp. 363-370, 3 plates.)

Although the king crab (*Limulus polyphemus*) occurs in greater or less abundance along the entire Atlantic coast from Massachusetts to Florida, and in many places is taken in small quantities for fertilizer, etc., it is only in Delaware Bay that the capture of the animal is accomplished by means of specially devised apparatus and becomes a matter of commercial importance. This paper shows that in 1888 the combined catch in New Jersey and Delaware was 1,822,000 crabs, valued at $8,150, of which 1,502,000 crabs, worth $7,510, were taken in New Jersey. Compared with 1880, these figures disclose a very marked decline in the abundance of the crabs, and it seems only a question of a few years, under existing conditions and methods, before the supply will become exhausted. Of late the yearly output has been maintained only by employing larger quantities of apparatus.

The Giant Scallop Fishery of Maine. (Bulletin, 1889, pp. 313-335, 5 plates, including map of scallop beds operated in 1889.)

The coast of Maine is the only region in which fishing for the giant scallop (*Pecten magellanicus*) is carried on. So far as known, this scallop has only a limited distribution in the available waters adjacent to the coast of Maine, and it is only in the section between Mount Desert Island and the Penobscot River and in the Sheepscot River that it has been found by the fishermen. The history of the fishery given in this report shows that it has been of very recent development, no record of its existence more than ten years ago being ascertained. The industry is prosecuted from Mount Desert, Tremont, Little Deer Isle, Sedgwick, Cape Rosier, Castine, and various towns on the Sheepscot River, and in 1889 the fishery was followed by 197 persons, who had $11,055 invested in boats, apparatus, and accessories, and took 45,368 bushels of scallops, for which $18,647 was received. While the fishery has certain natural limitations, it is no doubt capable of increasing consid-

erably if proper measures are adopted to develop by more improved methods the beds of the scallop which exist in deeper water, where they are now almost undisturbed, owing to imperfections in apparatus.

Notes on the Oyster Fishery of Connecticut. (Bulletin, 1890, pp. 461–497, 8 plates.

There is perhaps no State in the country in which the artificial rearing of oysters has commanded more attention and been carried to a more successful result than in Connecticut. The very full account of the history, methods, conditions, and statistics of the oyster industry in this State which is given in this paper was therefore timely, and will, it is thought, do much toward promoting the oyster fishery in several other States where the necessity for a change in present methods seems to be clearly indicated if the perpetuation of the industry is to be secured. The report has attracted much attention and received favorable criticism in the oyster districts of the Atlantic coast, and there has been an exceptionally large demand for it. The subject is discussed in detail under the heads of personnel, wages, etc.; vessels and boats; historical notes; the oyster-grounds; methods of cultivation, trade, fishing, etc.; unfavorable conditions, enemies, etc.; and financial results, in addition to which very complete tabular information is given for each town for the years 1887, 1888, and 1889.

It is seen that in the last year the industry gave employment to 593 fishermen and 651 shoresmen. The capital devoted to the industry amounted to $3,675,964, of which $1,237,695 represented the value of oyster-grounds and $1,424,855 the value of the oysters thereon. The aggregate expense of cultivating the beds and preparing the oysters for market was $436,451. An interesting table is presented showing the estimated value of the oysters on artificial beds destroyed by starfish, drills, and other agencies; in 1889 the loss by these means was considerably less than during the two preceding years, but it nevertheless amounted to $464,700. From the cultivated oyster-grounds 1,412,011 bushels of oysters, having a value of $1,024,502, were taken in 1889, while the natural beds yielded only 73,850 bushels, worth $31,305. The report concludes with a digest of the oyster legislation of Connecticut, which has had more influence than all other factors in promoting the industry.

Statistical Review of the Coast Fisheries of the United States. (Report, 1888, pp. 271–378.)

As the title implies, this report is a statistical summary of the entire commercial fisheries of the coastal waters of the United States, the 154 tables presented being supplemented with only enough descriptive matter to properly elucidate them. The fisheries are considered by geographical divisions and by States. In the introductory pages certain comparisons, averages, percentages, etc., are given, having application to the entire industry. The review shows that in the year specified 137,446 persons were engaged in the fisheries of the coast States, of whom 37,811 were vessel fishermen, 70,768 were shore or boat fishermen,

and 28,867 were shore employés. The aggregate capital invested in the industry was $45,619,546, of which $13,575,249 represented 6,099 vessels and their outfits; $3,082,395 was the value of 47,195 boats; $4,557,815 was devoted to apparatus of capture, and $24,404,083 to shore property and working capital. The products had a value at first hands of $34,234,045, of which $15,323,447 was the result of the general food-fish fisheries, $12,860,671 of the oyster, clam, and scallop fisheries; $1,843,752 of the seal, walrus, and sea-otter fisheries; $1,591,796 of the lobster, crab, shrimp, and prawn fisheries; $1,393,854 of the whale and porpoise fisheries; $798,604 of the menhaden fishery; $254,515 of the sponge fishery, and $167,406 of the alligator, turtle, terrapin, and frog fisheries. The tables making comparisons with 1880 show a generally satisfactory condition of the industry. There was an increase in the number of fishery employés of 18 per cent, an advance in the amount of investment of 27 per cent, and a decrease in the value of products of 1 per cent. The decline in the value of the catch was principally due to a diminished yield of whales and mackerel in the New England States and of oysters in the Middle Atlantic region. A very interesting and instructive comparison is made by States and sections of the catch of shad and alewives. The maintenance of the supply of shad is so important that the report may be appropriately quoted on this subject. It says:

> This comparison has a special interest, since it may fairly be taken as a basis for estimating the effect of artificial propagation of certain species of food-fish which, under natural conditions, have become noticeably depleted. It is proper to state that the supply of shad had been so much reduced by overfishing that in the years immediately succeeding 1880 there was reason to fear that the species would soon become so scarce that it would no longer be available as a reasonably cheap article of food or the object of a profitable fishery.
>
> In order to comprehend the full significance of this comparison it is well to remember that the artificial propagation of shad on a large scale by the U. S. Fish Commission was not undertaken until 1881; therefore the effect of it upon the abundance of the species could not be felt or observed until 1885, when the artificially hatched fish attained maturity and returned to the rivers for reproductive purposes. It will thus be seen that the excess of the catch of 1888 over that of 1880 practically shows the result attained by artificial propagation of shad in the third season after its effects could, by natural limitations, be observed; and the very important facts are shown that the yield of the fishery was almost double, and that its value, based on prices obtained in 1880, was increased nearly $700,000.
>
> It may be admitted that the increased catch has to some degree been due to the use of larger quantities of apparatus, but it is evident that without a marked increase in the abundance of shad, as a result of artificial hatching, the profitable employment of additional fishing gear would not be possible. But the fact should not be lost sight of that each year a larger proportion of shad is caught in the bays, estuaries, and lower reaches of the rivers, where pound nets and other gear have been multiplied to such an extent in recent years as to largely prevent anadromous species from ascending to their natural spawning-grounds in the headwaters of the streams. For this reason the maintenance of the abundance of shad is more dependent now than ever before upon artificial propagation.
>
> A comparison of the catch of the shad with that of the alewife for the years named will prove instructive, inasmuch as the latter is not hatched artificially, and these species are practically taken in the same waters on the Atlantic coast and to a large

extent at the same season and in the same forms of apparatus. It is only just to say, however, that it is claimed by good authority that the alewife has an advantage over the shad. When it is caught it is commonly in a ripe condition; the adhesive eggs are pressed out in great quantities when the fish are taken in pound nets, and masses of them can generally be seen attached to the apparatus. Nevertheless, the comparative figures in the tables show the alewife catch to have increased only about 23 per cent, while the value of the fish to the fishermen has declined about 5 per cent. This relatively slight augmentation of the catch in 1888 as compared with 1880 indicates actual diminution in the supply, when the increased quantities of apparatus used for the capture of this species are taken into consideration.

The most important single fishery product of the United States is the oyster, the quantity and value of the catch of which in 1880 and 1888 are shown by States and sections. The aggregate yield in 1880 was 22,195,915 bushels, valued at $12,029,502; in 1888 it was 21,765,640 bushels, worth $11,329,918. The decrease in output was relatively small, but the tables show that a much more unfavorable presentation was prevented only by an almost phenomenal increase in certain States having only minor oyster interests in 1880, while the most important oyster region in the country, viz, Chesapeake Bay and its tributaries, underwent a very significant decline.

Report on the Fisheries of the Pacific Coast of the United States. (Report, 1888, pp. 3–269, 49 plates, including maps of fishing-grounds.)

This is thought to be the most complete and comprehensive report ever issued on the fisheries of the Pacific States. The fisheries and the various shore branches dependent thereon are discussed by civil or natural divisions, and the history, methods, and statistics of the industry are given in great detail. The number of persons employed in the fisheries of this region is shown to be 13,850. The capital invested was $6,498,239, and the value of the products was $6,387,803. The most important objects of capture were salmon, worth $2,082,809; sea otters, fur-seals, and other pinnipeds, worth $1,832,552; whalebone, oil, and ivory, worth $690,729; and oysters, worth $601,999. The salmon-canning industry utilized 41,632,223 pounds of salmon, for which $1,783,227 was paid, and prepared 622,037 cases of canned fish, for which $3,703,838 was received. Compared with 1880, a gratifying increase in the fisheries of the region has occurred, amounting to 3,177 in persons engaged, $4,196,856 in investment, and $2,111,300 in value of catch. The usefulness of the report to the fishing interests is considerably enhanced by the incorporation of 32 plates of the principal commercial fishes and cetaceans of the region, and 15 folding charts showing the littoral and fluvial fishing-grounds. Census Bulletin 167, on the Fisheries of the Pacific States, is based entirely on this report.

The Fishing Vessels and Boats of the Pacific Coast. (Bulletin, 1890, pp. 13–48, 13 plates and 4 text figures.)

This paper is supplemental to the article on the fisheries of the Pacific coast, and was originally prepared for incorporation in that report. The vessels and boats employed in each of the more important commercial fisheries are described and figured, and their adaptation to the special branches is discussed. Special chapters treat of the whale

fleet, the fur-seal and sea-otter vessels and boats, the skin boats of the aborigines (kaiaks, bidarkas, oomiaks, etc.), the cod and halibut fleets, salmon vessels and boats, the market fleet, oyster vessels and boats, dories and sharpies, and Chinese fishing craft.

Report upon the Participation of the U. S. Fish Commission in the Centennial Exposition, held at Cincinnati, Ohio, in 1888. (Report, 1888, pp. 869–885.)

In company with the other Government departments and bureaus, the U. S. Fish Commission took part in the commemoration of the one-hundredth anniversary of the settlement of Cincinnati. The exhibit was prepared, installed, and conducted under the direction of the assistant in charge of the Division of Fisheries, and may therefore be appropriately referred to as a part of the work of this office. The report reviews the origin and objects of the Exposition, cites the legislation in pursuance of which the Federal Government participated, and gives a detailed account of the scope, preparation, management, and results of the Fish Commission exhibit. The work of the principal branches of the Fish Commission, viz, the Division of Scientific Inquiry, the Division of Fish-culture, and the Division of Fisheries, was appropriately illustrated by models, photographs, sketches, charts, specimens, apparatus, publications, statistics, etc. One of the most entertaining features of the exhibit was the aquarial display of live fish and other animals, and the hatching of 45,000 eggs of the California salmon (*Oncorhynchus chouicha*).

NOTES ON THE COMMERCIAL FISHERIES.

During the year many matters of interest and importance have arisen in connection with the economic fisheries. Some of these will be dealt with in the regular reports of the division and need not here be referred to; others, however, of special interest, may be briefly noticed in this place. While no complete investigation of the fisheries of the entire country has been made for the past year, the office has kept well informed on the most prominent features of the industry through its agents and correspondents. Owing to the methods and the season of their prosecution, it will be necessary to regard the fisheries with reference to the calendar year 1891, instead of strictly observing the period covered by this report of the division.

THE FISHERIES FOR GROUND FISH.

The great bank and ocean fisheries for cod, haddock, halibut, etc., prosecuted from New England ports did not present any specially striking features which would distinguish the past season from the conditions in recent years.

For the market fishery, which is centered at Boston, the year 1891 was a very favorable one. The ground fish for which the fishery is prosecuted were very abundant in the South Channel; and on the "Golding Ground," situated 10 miles off Swampscott, haddock were found in greater numbers than for many years. The largest single fare

of fresh fish ever taken in the market fishery was landed February 18, 1891, when the schooner *Sea Fox*, of Gloucester, as a result of a trip lasting one week, brought in 132,500 pounds of fresh cod, haddock, hake, cusk, and halibut taken on the Cape Shore. The total quantity of fish landed at Boston by the market fleet was 68,026,517 pounds, with a value to the fishermen of not less than $1,738,440. Of the foregoing catch, 20,964,870 pounds were taken in the South Channel and 12,876,805 pounds on Georges Bank. Haddock constituted 33,860,197 pounds, cod 16,655,200 pounds, hake 12,347,730 pounds, cusk 2,814,170 pounds, pollock 1,226,505 pounds, and halibut 1,122,715 pounds. The schooner *Sea Fox* was the "high liner" of the fleet, stocking $26,669, the value of 1,288,350 pounds of fresh fish.

The salt-cod fishery was somewhat less successful than in 1890. Most of the vessels that went to the Grand Banks secured only partial fares, although the prices received for the fish were usually high, being at the close of the season $4.75 per cwt. for large cod and $3.75 per cwt. for small cod, sold from the vessel. Cod were also scarce on Georges Bank and the salt fish brought the fishermen as much as $5 per cwt. for large and $3.75 per cwt. for small cod. The vessel in the bank cod fishery that had the largest stock was the schooner *William E. Morrisey*, of Gloucester, which landed 482,275 pounds, which sold for $18,277.

The salt-cod fishery carried on at the Shumagin Islands and in Okhotsk Sea by San Francisco vessels, which is one of the principal offshore fisheries of the Pacific coast, was quite successful in 1891. More fish were landed than during any year since 1885. The aggregate catch was 3,870,000 pounds of dried fish, equivalent to about 1,290,900 individual cod.

Vessels which went to Iceland for fares of fletched halibut did well, although no very large fares were landed. The aggregate yield was 1,542,900 pounds of salt fish and 541 barrels of fins. The largest catch, 214,000 pounds, was taken by the schooner *Senator Saulsbury*, of Gloucester, and sold for $13,694. The bank fresh-halibut fishery was not generally successful. On the eastern grounds the fish were scarce and were found in deeper water than usual. The best fishing was on Georges Bank, where a few good fares were taken. The product of the fresh-halibut fishery was about 7,460,000 pounds, of which about 2,060,000 pounds came from Georges Bank.

THE MACKEREL FISHERY.

Mackerel, which since 1885 have not been abundant, continued to be scarce, but the catch was about three times as large as in 1890, aggregating about 48,000 barrels of salt fish, worth $544,000, and about 4,375,000 pounds of fresh fish, valued at $491,000. The season opened auspiciously, and the prospects for a large catch were considered good, but the mackerel did not appear in the anticipated numbers. As the season advanced, the fish were found to be most abundant in the Gulf of Maine, and it was here that the principal catch was made. The

fleet in the Gulf of St. Lawrence was the smallest in many years, numbering only 13 sail, and the average yield per vessel was only 110 barrels, while on the New England and Nova Scotia shores the average catch was 270 barrels. An unusually large catch was made by the boat fishermen on the coast of Maine.

The fish were mostly of the size and quality which in salted fish represent No. 3's. The average wholesale prices per barrel of salt fish were $18 for No. 1's, $13 for No. 2's, and $8 for No. 3's. The schooner *Lizzie M. Center*, of Gloucester, made the largest stock, landing 909 barrels of salt mackerel, which sold for $13,820.

THE PACIFIC SALMON FISHERY.

The condition of this important industry received much attention from the fishing interests of the west coast and was also the subject of a Congressional inquiry addressed to the U. S. Commissioner of Fish and Fisheries, whose report,* treating especially of the salmon industry of Alaska, contains an account of the business for the year covered by this review and obviates the necessity for giving an extended notice of the subject in this place.

The salmon pack in the United States and Alaska in 1891 amounted to about 1,300,000 cases, of which 800,000 cases were prepared in Alaska and 390,000 in the Columbia River. The pack in Alaska was the largest ever made, and resulted in a flooded market, the outcome of which was an agreement among the owners of the canneries to reduce the output in 1892 to 400,000 cases and to close all but nine canneries.

It is gratifying to be able to record a tendency to a change of sentiment among the well-informed fishermen as to the possibility of greatly reducing the supply of salmon by indiscriminate methods and the necessity for permitting a fair proportion of the fish to reach their spawning-grounds unmolested. Within ten years it has been asserted by canners and fishermen on the Columbia River that the supply of salmon in that stream is inexhaustible, but the fishing in recent years has been disappointing, and the testimony of many prominent persons might be cited in support of the statistics which show a gradually diminishing output.

It is worthy of notice that at a cannery on the Karluk River, Alaska, a private hatchery was maintained and 5,000,000 fry of the red salmon (*Oncorhynchus nerka*) were liberated. This practice can not be too highly commended and should be generally carried out, on account of the cheapness and facility with which the hatching can be done and the important results which may be expected. In order to provide for the protection and maintenance of the salmon in Alaska, the U. S. Commissioner of Fish and Fisheries recommended to Congress the following measure, which became a law in March, 1892:

* Report of the Commissioner of Fish and Fisheries relative to the Salmon Fisheries of Alaska. Senate Mis. Doc. No. 192, Fifty-second Congress, first session. Washington, 1892.

AN ACT TO PROVIDE FOR THE PROTECTION OF THE SALMON FISHERIES OF ALASKA.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the erection of dams, barricades, or other obstructions in any of the rivers of Alaska, with the purpose or result of preventing or impeding the ascent of salmon or other anadromous species to their spawning-grounds, is hereby declared to be unlawful, and the Secretary of the Treasury is hereby authorized and directed to establish such regulations and surveillance as may be necessary to insure that this prohibition is strictly enforced and to otherwise protect the salmon fisheries of Alaska; and every person who shall be found guilty of a violation of the provisions of this section shall be fined not less than $250 for each day of the continuance of such obstruction.

SEC. 2. That the Commissioner of Fish and Fisheries is hereby empowered and directed to institute an investigation into the habits, abundance, and distribution of the salmon of Alaska, as well as the present conditions and methods of the fisheries, with a view of recommending to Congress such additional legislation as may be necessary to prevent the impairment or exhaustion of these valuable fisheries, and placing them under regular and permanent conditions of production.

SEC. 3. That section 1956 of the Revised Statutes of the United States is hereby declared to include and apply to all the dominion of the United States in the waters of Bering Sea; and it shall be the duty of the President, at a timely season in each year, to issue his proclamation and cause the same to be published for one month in at least one newspaper, if any such there be, published at each United States port of entry on the Pacific coast, warning all persons against entering said waters for the purpose of violating the provisions of said section; and he shall also cause one or more vessels of the United States to diligently cruise said waters and arrest all persons, and seize all vessels found to be, or to have been, engaged in any violation of the laws of the United States therein.

THE WHALE FISHERY.

Considered with reference to the number of vessels employed, this important fishery continues the decline which began many years ago, although the high price of whalebone has tended to keep up the value of the fishery. During the past thirty years, at the beginning of each decade corresponding with the year 1891, the whaling fleet was made up as follows: 1861, 423 vessels; 1871, 218 vessels; 1881, 161 vessels; 1891, 92 vessels. The average price of bone per pound during each of these years was as follows: 1861, $0.66; 1871, $0.70; 1881, $1.63; 1891, $5.38. The value of the bone may therefore be regarded as a fair criterion of the status of the fishery, the highest average price ever attained being coincident with the smallest fleet. The fishery continues to have its principal headquarters at San Francisco, which, in addition to maintaining a large local fleet, is also the rendezvous of about a third of the vessels hailing from New Bedford.

The receipts of whale products at United States ports in 1891 consisted of 13,015 barrels of oil from sperm whales, 14,837 barrels of oil from other species of whales, and 297,768 pounds of bone, the whole having a value at the wholesale market price of about $2,160,935.

The sperm oil was practically all taken in the Atlantic Ocean. It is reported that at the end of the year the pursuit of sperm whales had

been entirely abandoned by American vessels on the famous old grounds in the Pacific and Indian oceans. The great bulk of the other whale oil and of the bone was landed at San Francisco, although the high price of bone was an incentive to vessels on the east coast to seek right whales, and a fair stock of bone was taken. The smaller vessels of the Atlantic coast that engage in shore whaling off the South Atlantic States and elsewhere had a satisfactory season. This branch of the fishery has, during the past two or three years, seemed to show evidences of growth. The principal whaling grounds now frequented by American vessels are the North Pacific and Arctic oceans, although a small fleet from New Bedford and other New England ports still resort to the old grounds in the Atlantic. The pursuit of whales in the Arctic Ocean is attended with more than ordinary risk, but this is more than offset by the relative abundance of whales. A number of vessels, in order to be early on the grounds, have braved the dangers of an arctic winter by remaining within the arctic circle, and this practice is apparently becoming more common. Two steam whaling vessels that wintered at Herschel Island in 1891 had a very successful season, taking 31 whales; and it was reported that 5 steamers intended to pass the following winter there. The 2 vessels mentioned went farther west than any other whaler had ever gone, reaching Cape Bathurst and Liverpool Bay, in longitude 128° west.

THE FUR-SEAL FISHERY.

The Bering Sea dispute has continued to be one of the leading fishery topics of the west coast, and the pelagic hunting of seals by American and Canadian vessels has received more than usual attention. In June, 1891, a temporary agreement was reached with Great Britain for the protection of seals pending the settlement of the question by arbitration; by the terms of the agreement the killing of seals in Bering Sea was prohibited, and the company having the lease of the sealing privileges on the Pribilof Islands was permitted to take only 7,500 skins. On June 15, 1891, the President issued a proclamation setting forth the terms of the agreement, the text of which was as follows:

1. Her Majesty's Government will prohibit, until May next, seal killing in that part of Bering Sea lying eastward of the line of demarcation described in article No. 1 of the treaty of 1867 between the United States and Russia, and will promptly use its best efforts to insure the observance of this prohibition by British subjects and vessels.

2. The United States Government will prohibit seal killing for the same period in the same part of Bering Sea and on the shores and islands thereof the property of the United States (in excess of 7,500 to be taken on the islands for the subsistence and care of the natives), and will promptly use its best efforts to insure the observance of this prohibition by United States citizens and vessels.

3. Every vessel or person offending against this prohibition in the said waters of Bering Sea outside of the ordinary territorial limits of the United States may be seized and detained by the naval or other duly commissioned officers of either of the high contracting parties, but they shall be handed over as soon as practicable to the authorities of the nation to which they respectively belong, who shall alone have

jurisdiction to try the offense and impose the penalties for the same. The witnesses and proofs necessary to establish the offense shall also be sent with them.

4. In order to facilitate such proper inquiries as Her Majesty's Government may desire to make, with a view to the presentation of the case of that Government before arbitrators, and in expectation that an agreement for arbitration may be arrived at, it is agreed that suitable persons designated by Great Britain will be permitted at any time, upon application, to visit or to remain upon the seal islands during the present sealing season for that purpose.

Bering Sea was patrolled by a fleet of naval and revenue vessels. The high price of seal skins was a great incentive to engage in pelagic sealing, and some American and Canadian vessels followed the migrating herds into the forbidden waters and ran the risk of seizure and confiscation. A number of vessels were seized.

The submission of the Bering Sea question to arbitration, as suggested in the fourth article of the agreement, was secured by the ratification by the U. S. Senate on March 29, 1892, of a treaty formulated for that purpose. This long-standing diplomatic question has thus reached a stage where its early settlement seems probable.

The following detailed presentation of the extent and results of this fishery is based on statements furnished to the office by Mr. Henry W. Elliott, who obtained the data from Mr. Albert Fraser, of New York City, the American agent of Messrs. Lampson and the Hudson Bay Company, the English firms which handle nearly all the skins shown. The reports of the department of marine and fisheries of Canada and special inquiries conducted by this division have also supplied additional information. The tables show the operations of the American and Canadian vessels during the years 1890 and 1891, the figures for the former year being given for purposes of comparison. In 1890 the 15 vessels sailing from United States ports are reported to have taken 14,956 seals, the value of whose skins was $190,689, the average price being $12.75; by far the larger part of the catch was obtained in Bering Sea. Twenty-nine vessels belonging in Canada secured 39,547 seals, the value of which, as ascertained from the official Canadian report, was $435,017, an average of $11 per skin; somewhat less than half the catch was obtained in Bering Sea, the remainder coming from the coast in the spring and the passes through which the seals migrate into Bering Sea, the seals killed on these grounds being designated as "spring catch" and "Sand Point catch," respectively. The aggregate production was 54,503 seals, with a first value of $625,706. The yield by American vessels in 1891 is designated as "spring catch" and "fall catch." The 30 vessels shown in the table took 14,808 seals, valued at $236,928, an average of $16 per skin. The seals taken by the Canadian vessels in 1891 are separated by fishing-grounds, as in 1890. Fifty vessels were engaged and 49,863 skins were procured, of which 29,100 came from Bering Sea. The official report of the Canadian fisheries department places the value of the catch at $15 a skin, or $747,945 in the aggregate. The combined operations of the vessels of both countries yielded 64,671 skins, worth $984,873.

Pelagic fur-sealing fleet in 1890.

Names of vessels.	Ports.	Number of seals taken.			
		Spring catch.	Sand Point catch.	Bering Sea catch.	Total.
American vessels:					
Allie I. Algar	Port Townsend, Wash	185		2,459	2,644
Annie	do			400	400
Bessie Rutter	Astoria, Oreg			707	707
City of San Diego	San Francisco, Cal			579	579
Edward E. Webster	do			*500	500
George R. White	La Conner, Wash			400	400
Henry Dennis	Seattle, Wash			1,500	1,500
James Hamilton Lewis	San Francisco, Cal			*2,600	2,600
Kate and Anna	Astoria, Oreg			362	362
Lily L	San Francisco, Cal	800		1,088	1,888
Mattie T. Dyer	do		74		74
San Diego	do			*1,000	1,000
Sophia Sutherland	do			1,138	1,138
Teazer	Seattle, Wash			600	600
Venture	Port Townsend, Wash			564	564
Total		985	74	13,897	14,956
Value					$190,689
Canadian vessels:					
Annie C. Moore	Victoria, B. C	90	703	630	1,423
Ariel	do	220	349	1,137	1,706
Aurora	do	165	797		962
Beatrice	do	220	710	854	1,784
C. H. Tupper	do		571	796	1,367
E. B. Marvin	do	368	878	918	2,164
Favorite	do	356	981	1,116	2,453
Juanita	do	97	311	770	1,178
Kate	do	156	511	230	897
Katherine	do	380	345	945	1,670
Letitia	do	70			70
Lily	do	122		500	622
Maggie Mac	do		1,200	752	1,952
Mary Ellen	do	115	951		1,066
Mary Taylor	do	104	302	592	998
Minnie	do	300	764	1,467	2,531
Mountain Chief	do	60			60
Ocean Belle	do		946	480	1,426
Pioneer	do	235	716	984	1,935
Penelope	do	148	578	445	1,171
Sapphire	do	119	1,378	745	2,242
Sea Lion	do	254	817	774	1,845
Theresa	do	175	569	450	1,194
Triumph	do	182	1,018	473	1,673
Venture	do	94			94
Viva	do	262	436	2,015	2,713
W. P. Sayward	do	154	339	459	952
Walter L. Rich	do	122	562	633	1,317
Wanderer	do	82			82
Total		4,650	16,732	18,165	39,547
Value					$435,017
Grand total		5,635	16,806	32,062	54,503
Total value					$625,706

*It is not known with certainty whether all of these seals were taken in Bering Sea.

Pelagic fur-sealing fleet of the United States in 1891.

Names of vessels.	Ports.	Number of seals taken.		
		Spring catch.	Fall catch.	Total.
Allie I. Algar	Seattle, Wash	450		450
Beaver	Port Townsend, Wash	126		126
Bessie Rutter	Astoria, Oreg		206	206
C. C. Perkins	Neah Bay, Wash		200	200
C. G. White	San Francisco, Cal		1,668	1,668
C. H. White	do		438	438
Challenge	do		172	172
City of San Diego	do	514	641	1,155
Edward E. Webster	do	600	1,400	2,000
Emma and Louisa	do		1,100	1,100
Emmett Felitz	Port Townsend, Wash	279		279
Ethel	San Diego, Cal	350		350
George R. White	Port Townsend, Wash		210	210
Helen Blum	San Francisco, Cal		46	46
Henry Dennis	Seattle, Wash	750	428	1,178
James G. Swan	Neah Bay, Wash	54		54
James Hamilton Lewis	San Francisco, Cal	470		470

Pelagic fur-sealing fleet of the United States in 1891—Continued.

Names of vessels.	Ports.	Number of seals taken.		
		Spring catch.	Fall catch.	Total.
Kate and Anna	Astoria, Oreg	180	450	630
La Ninfa	San Francisco, Cal	260	.....	260
Leo	Port Townsend, Wash	180	.....	180
Lily L	San Francisco, Cal	.....	540	540
Lottie	Port Townsend, Wash	.....	460	460
Louis Olsen (steamer)	Astoria, Oreg	301	169	470
Mattie T. Dyer	San Francisco, Cal	.....	380	380
Nellie Martin	Port Townsend, Wash	200	.....	200
Rose Sparks	San Francisco, Cal	148	.....	148
San Diego	do	.....	465	465
Serena Thayer	Wilmington, Cal	.....	158	158
Sophia Sutherland	San Francisco, Cal	363	57	420
Undaunted	Kadiak, Alaska	395	.....	395
Total		5,620	9,188	14,808
Value		.....	.....	$236,928

Pelagic fur-sealing fleet of Canada in 1891.

Names of vessels.	Ports.	Number of seals taken.			
		Spring catch.	Sand Point catch.	Bering Sea catch.	Total.
Ainoko	Victoria, B. C	.....	406	25	431
Annie C. Moore	do	46	442	1,588	2,076
Annie E. Paint	do	.....	.....	154	154
Ariel	do	.....	.....	1,082	1,082
Aurora	do	53	340	47	440
Beatrice	do	.....	300	600	900
Beatrice	Vancouver, B. C	59	136	876	1,071
Borealis	Victoria, B. C	.....	473	1,547	2,020
C. D. Rand	do	.....	.....	20	20
C. H. Tupper	do	.....	235	374	609
Carmelite	do	.....	751	1,639	2,390
Charlotte G. Cox	do	.....	517	1,519	2,036
E. B. Marvin	do	216	462	.....	678
Eliza Edwards (steamer)	do	1	.....	49	50
Favorite	do	35	337	2,581	2,953
Geneva	do	3	224	267	494
Hesperus	do	2	.....	.....	2
Kate	do	32	.....	1,100	1,132
Katherine	do	.....	191	1,224	1,415
Labrador	do	.....	374	216	590
Laura	do	.....	.....	61	61
Letitia	do	4	.....	.....	4
Maggie Mac	do	137	548	3	688
Mary Ellen	do	21	609	65	695
Mary Taylor	do	54	445	264	763
Mascot	do	7	.....	79	86
Maud S	do	.....	394	1,030	1,424
Minnie	do	308	373	22	703
May Belle	do	.....	701	241	942
Mountain Chief	do	21	.....	.....	21
Ocean Belle	do	170	568	1,170	1,908
Oscar and Hattie	do	54	409	1,062	1,525
Otto	do	.....	.....	48	48
Penelope	do	229	410	691	1,330
Pioneer	do	162	712	1,484	2,358
Rosie Olsen (steamer)	do	40	176	52	268
Sapphire	do	50	974	2,435	3,459
Sea Lion	do	354	584	82	1,020
Sierra	do	886	.....	.....	886
Theresa	do	.....	307	985	1,292
Thistle (steamer)	do	9	294	82	385
Triumph	do	176	666	171	1,013
Umbria	do	.....	405	504	909
Venture	do	.....	90	659	749
Viva	do	.....	1,261	731	1,992
W. P. Sayward	do	187	734	801	1,722
Walter A. Earle	do	198	848	1,021	2,067
Walter L. Rich	do	.....	519	21	540
Wanderer	do	7	20	330	357
Winnefred	do	7	.....	98	105
Total		3,528	17,235	29,100	49,863
Value		.....	.....	.....	$747,945

THE LOBSTER FISHERY.

Among the shore fisheries of Maine and Massachusetts few have received more attention from the State authorities than the lobster fishery. Considering the importance of this branch, which ranks third in value among the fisheries of New England and holds the first position among the fisheries of Maine and the sixth in Massachusetts, it is not strange that its maintenance should be the subject for solicitude among those intrusted with the supervision of the fisheries or otherwise interested in the industry. The more or less local habitat of the lobster is the principal reason for believing that its abundance in a given coast area may be seriously affected by indiscriminate methods. The migration of lobsters is essentially a bathic one, the coastwise movements being limited, even if worthy of note. It is this fact which affords the strongest ground for reliance on rational regulation and artificial propagation for the maintenance or increase of the supply.

The protection accorded the lobster in the New England States has consisted in a limitation of the size of lobsters marketed and canned, the establishment of a close season for canning, and the prohibition of the sale of egg-bearing lobsters.

In the investigation of the fisheries carried on by this office, the lobster fishery has always received careful attention. By the personal inquiries of its agents, the Commission has obtained accurate statistics and has kept well informed regarding the methods employed, the status of the fishery, and the nature and the degree of enforcement of the State regulations. The office inquiries show that the output of the lobster fishery in this country in 1892 was 23,301,149 pounds, valued at $1,050,677. The catch was apportioned as follows among the different States:

States.	Pounds.	Value.
Maine	17,198,002	$640,891
New Hampshire	220,024	13,142
Massachusetts	3,177,295	205,638
Rhode Island	774,100	53,762
Connecticut	1,614,530	101,318
New York	165,093	15,655
New Jersey	143,905	10,861
Delaware	8,200	410
Total	23,301,149	1,050,677

The great interests of the New England States in the perpetuation of this fishery are evidenced by this table.

Since 1889, when this division made a complete canvass of this fishery, there has been a very important decrease in the catch of lobsters in New England, especially in Maine. In 1889 the Maine fishermen took 25,001,351 pounds of lobsters, for which they received $574,165. This was probably the highest point ever attained by the fishery. The decline of over 7,000,000 pounds in the production in three years indicates a catch in previous years far beyond the natural resources and

shows that the fears entertained for the preservation of this fishery are well grounded. Notwithstanding the largely diminished output, the value of the catch has not only not decreased, but has increased about $75,000.

According to the reports of the Maine fish commissioners, lobsters in that State are being rapidly caught up, the reasons assigned being an increased demand and evasions of the law consisting of the sale, canning, and pickling of short lobsters and the sale of egg-bearing lobsters. The report of the commissioner of sea and shore fisheries for 1891–92 says:

> The conclusion [of fishermen, dealers, and smack men] is unanimous that the lobster is being rapidly exterminated along the coast of Maine. Many fishermen go so far as to assert that unless measures are at once taken to prevent such wanton waste, it will speedily happen that none of these delicious crustaceans will remain to be taken by anyone.

The decrease in the lobster catch in Massachusetts between 1889 and 1892 was 176,492 pounds, while the value of the yield increased $57,146. The conditions in this State appear to be more favorable than in Maine. Although the year 1891 showed a decreased catch of 319,338 lobsters as compared with 1890, it was coincident with the withdrawal of 52 fishermen and 4,106 traps from the fishery, according to the returns made to the State authorities; and the average catch per trap in 1891 was a little over 1 per cent greater than in 1890.

In New Hampshire, Rhode Island, and Connecticut there has been an increase in the lobster catch, largely owing to increased attention to the fishery because of the higher prices commanded. The returns for the three Middle Atlantic States having a lobster fishery indicate a decrease in the abundance of the lobsters; the diminution in the catch, while actually slight, is important in view of the relatively small output in these States.

THE OYSTER FISHERY.

The oyster is the most valuable fishery product of the United States. The gross value of the fishery in 1891 was about $15,000,000. It is five times as valuable as the next important product, the salmon, and equals the combined value of the catch of cod, haddock, halibut, mackerel, menhaden, shad, alewives, herring, salmon, whales, lobsters, shrimps, and clams. It is additionally important in that it is the most generally distributed of our fishery objects, occurring in commercial abundance in every State (except Maine and New Hampshire), having a frontage on salt water. It is not especially remarkable, therefore, that the oyster should receive great attention, and that, with the large increase of population in the coast States and the improved facilities for shipping it into the interior in recent years, the question of the maintenance and increase of the supply should be kept prominent. At a comparatively early date some of the principal oyster-producing States began to appre-

ciate the importance of preventing the depletion of the natural grounds by unrestricted methods, and took steps to preserve this valuable resource, but in some of the States largely interested the possibility of a reduction of the supply was lost sight of and inadequate steps were taken to check a gradually diminishing output. The States taking the most advanced stand recognized the value and necessity of artificial methods in the oyster fishery; they provided for the lease or sale of the barren grounds to individuals, who were given proprietary rights in the oyster beds, and inaugurated a system of revenue from the sales, licenses, and taxes that was a material addition to the States' income.

During the year the oyster question was an important topic in most of the States having oyster interests, and the subject affected more or less directly nearly every State and Territory. The agitation of the condition and needs of this valuable industry constituted one of the most prominent features of the fisheries of the country during this period. Especially worthy of mention was the attention given to the subject in Maryland, Virginia, and the Southern States generally. The output in Maryland was over 1,000,000 bushels more than in the previous year, a result generally attributed to the law requiring the return to the water of oysters under 2½ inches in length, and to the recovery of the oyster beds from the deleterious effect of freshets in the spring of 1889. In Virginia an impetus was given to oyster-culture by the act, approved February 25, 1892, requiring the survey and mapping of the oyster reefs, and extending the provisions for obtaining private areas for planting purposes. The tendency of recent legislation has been to promote oyster-culture by selling, leasing, or granting lands for oyster planting for long periods or in perpetuity, and by securing protection to the planters in their operations. The success of the oyster farmers in Connecticut, New York, and New Jersey, as the result of the encouragement and assistance of modern laws, is well known, and the development of the extensive oyster resources of the Southern States has begun under auspicious legislation, but in the most important oyster region in the country, viz, the Chesapeake Bay and its tributaries, the suggestion of general private ownership of the oyster-grounds has not up to this time met with the favorable consideration which all experience teaches should be accorded, and it may be a number of years before the radical sentiment and local prejudices there prevalent will permit the formulation of a practical plan for the maintenance of the oyster industry.

The importance of the oyster industry and the attention it is receiving can be well gauged by the large number of inquiries regarding it addressed to this Commission and the very general demand for oyster literature, especially from the Southern States. Considerable correspondence, often requiring careful research, has been had with persons desiring information on the present condition of the oyster industry in

the country at large and in special States, on the methods of culture and on the benefits of artificial means in increasing the supply and in stopping the depletion of natural beds.

IMPROVEMENTS IN FISHING VESSELS.

The tendency on the part of New England vessel-owners to adopt only modern types in adding to their fleets has steadily increased, until at the present time very few vessels intended for the offshore fisheries are constructed on the old lines. In the last report of the division attention was drawn to the advantages which have accrued to the fisheries through the introduction of the new forms of vessels. Personal inquiries recently addressed to fishermen in the principal ports confirm all the claims that have been made and show that the new vessels are yearly coming more into use and favor. From numerous available records of the practical value of the improvements, the following example, quoted from the Gloucester Daily Times of April 4, 1892, may be given:

Schooner *Nannie C. Bohlin*, from the banks, Sunday, reports a most thrilling experience. On the morning of March 12, at about daylight, while bowling along by the wind, under full sail, with the usual watch on deck, a sudden squall arose. Capt. Bohlin was just coming on deck, and was standing in the companion-way, when a fierce gust from the northwest threw the vessel down. The captain managed to reach the deck. The man at the wheel, with great presence of mind, threw the wheel down, although both he and the wheel were submerged. He then rushed for the starboard side of the vessel and hung out over the stern, which was almost under water. One other of the crew also hung over the side and escaped being washed overboard. The crew in the forecastle were soon on deck (those in the cabin were unable to get out), and one of them rushed forward and let go the head sails. The vessel soon came up. It was a narrow escape, and had the *Bohlin* not been an extra good craft and the squall abated somewhat, she might have filled and sunk. The vessel had lain flat in the water, her sails half under. One of her crew walked along her side from the wheel box to the fore rigging, so flat did she lie. The bait boards were torn off the house and two of the dories floated off by the water.

Commenting on this incident, Forest and Stream of the same date makes the following statement:

The importance of the recent improvements in the fishing vessels of New England, due to the precept and example of the U. S. Fish Commission, though generally acknowledged, has never been more strongly exemplified than in the recent occurrence, the particulars of which are stated in the Gloucester Times of April 4. The *Nannie C. Bohlin* is one of the deep schooners and something like the *Fredonia* designed by the late Mr. Burgess, and has before this occasion demonstrated in the highest degree her special fitness for the business in which she engaged, so far as both seaworthiness and speed are concerned. It is evident to anyone at all familiar with naval architecture and the peculiar peril in which she was placed that had she been as shallow as the vessels in common use in the New England fisheries a few years ago none of her crew would ever have returned to tell of their experience.

ATTEMPT TO ESTABLISH A BEAM-TRAWL FISHERY.

Experiments conducted with a view to introduce new methods into our commercial fisheries, to develop new fishing-grounds, and to place new fish in the markets of the country must always be among the most important current matters connected with the fishing industry. Such was the attempt to use the beam trawl on the New England coast during the winter of 1891–92, and although the experiment was not on the whole successful and was eventually abandoned it was not without its practical results and will no doubt lead to other trials in the near future. While a few other attempts have been made to establish the beam trawl in the vessel fisheries of New England, the one in question was much more extensive and important than any other of which there is record, and it seems proper to chronicle its history.

In the spring of 1891 Capt. A. Bradford, commanding the schooner *Mary F. Chisholm*, of Boston, Mass., conducted some preliminary experiments with the beam trawl, the success of which led to the construction of the trawler *Resolute*, of 95 tons, of a type similar to the vessels employed in the fisheries of the North Sea. Capt. Bradford has furnished this office with a detailed account of his trips.

The first voyage of the *Resolute* was made in November, 1891. The first set was on Middle Bank, where fish were found to be scarce. In Ipswich Bay, where the next set was made, there was also a scarcity of fish. Some witch soles were taken on muddy bottom, but the supply of cod and haddock was very limited. The vessel then proceeded to the southern part of Georges Bank, where, in the first haul, occupying three hours, 10,000 pounds of haddock were secured, together with dogfish in troublesome numbers; a second set yielded 5,000 pounds of haddock and some soles. The next haul in the same locality was in 25 fathoms of water. The net came up full, but in being lifted the trawl was torn, owing to darkness, and every fish was lost in the same way. A final successful set was made, and the vessel proceeded to market with about 28,000 pounds, representing 20 species of fish, the largest quantities being haddock, plaice, witch soles, lemon soles, turbot, butter-fish, cod, hake, and sturgeon.

The second trip was to the same grounds. During the first night 12,000 pounds of fish were secured. Subsequent sets were unsuccessful, owing to the weakness of the nets, which would burst with a weight of only 15,000 pounds, whereas they should have held at least 25,000 pounds. The vessel made port with only 18,000 pounds.

On the third voyage the same ground was first visited, but the fish had moved, and the vessel went to the South Channel, where, in 90 fathoms of water, fish were found to be abundant, but the nets invariably tore when being lifted. Capt. Bradford states that there was one bag of fish that he was exceedingly sorry to lose, as it contained some kinds which he had never seen before and of which he intended to send specimens to the Fish Commission if he had saved them. The

large net, which had been in the water only three hours, came up full to the mouth, but when the tackles were put on the net broke, as in previous trials, and the fish were lost. The vessel made port with 15,000 pounds of fish, and the crew set to work to construct a net of superior twine.

The details of the fourth and final voyage are as follows: The first night on the bank 12,000 pounds of haddock and soles were taken at first haul; at second haul there was a calm, and only 3,000 pounds were secured. Then for nine successive nights the weather was so calm that it was useless to lower the trawl. On the tenth night a light breeze sprang up, and at 4 o'clock the net was shot in 29 fathoms of water; at 5 o'clock the trawl was so full of fish that "the vessel was almost stopped in her drift," to quote Capt. Bradford; at 7 o'clock, when the net was being hoisted, a northeast wind and a heavy sea tore the net from the beam. The vessel lay to for forty-eight hours and then proceeded to market. The parties interested with Capt. Bradford thought he had experimented enough, and declined to prolong the attempt, much to the regret of Capt. Bradford, who had faith in the ultimate success of the venture and thought that the worst had happened that could happen. The captain writes:

We had tried only one little area of water on the coast and met with success, as the crew shared $7 to $14 per trip. I can name many vessels which had 16 men which came home in debt, while we had only 7 men. We used less than a ton of coal per trip, and 900 gallons of water.

THE NEWFOUNDLAND BAIT QUESTION.

One of the most important factors in the fisheries carried on by New England vessels on the more eastern banks is the supply of fresh bait, which has been drawn to a considerable extent from Newfoundland ports. Canadian and French bank fishing vessels have also found it convenient to resort to the Newfoundland coast for bait. The regulation by the Newfoundland government of this privilege of obtaining bait from the local fishermen has long been an important question and has attained considerable prominence on account of its international bearing. The original bait laws of the province were formulated for the purpose of discriminating against the French fishermen at Miquelon and St. Pierre, who, on account of the large bounties paid by the French Government, were able to undersell the Newfoundland fishermen, and so control the trade in the common markets, especially those of southern Europe. In 1890 the local regulations permitted the purchase of bait by American and Canadian vessels on the payment of a license fee. This at first consisted of a tonnage tax, which had to be repaid on the occasion of each entry into Newfoundland ports, but later was modified to a tax of $1 per barrel on all bait secured, the licenses issued by the Canadian Government under the *modus vivendi* not being recognized by the provincial authorities. In 1891, in a spirit of retaliation against the British Government, the Newfoundland authorities granted

no privileges to the Canadian fishermen, but gave to American vessels the right to purchase bait without the payment of any fee, the only restrictions being the limitation of the amount of bait taken and of the frequency of the visits to Newfoundland ports.

SNAPPER FISHING ON CAMPECHE BANK, GULF OF MEXICO.

In the latter part of the fiscal year 1891 the Red Snapper Fishing Company, of Galveston, Tex., entered into communication with this office, with a view to have the Fish Commission secure from the Mexican Government, through the Department of State, the privilege of using as a fishing rendezvous a portion of one of the sandy islands on Campeche Bank, lying off the coast of Yucatan, in the Gulf of Mexico, about 600 miles from Galveston. The office brought the matter to the attention of the Department of State, and in August, 1891, the request was granted subject to certain simple conditions. This initial step to develop the more remote offshore fishing-grounds in the Gulf of Mexico seems worthy of more than passing notice, although it is too soon to predict what the results of the venture will be.

The abundance of snappers and other desirable food-fish in the more distant waters of the Gulf of Mexico has often been attested, but the distance of the grounds from United States ports, the impracticability of employing sailing vessels in the business, and the comparatively limited demand for fish in the local markets of the Gulf coast have up to this time deterred fishermen and capitalists from engaging in a business with so many elements of risk. The company in question, however, proposes to keep welled fishing smacks continually on the grounds and to have the fish landed in a fresh condition by one or more steamers, which will make frequent trips with the fish to Galveston or other shipping-points, whence the catch will be distributed to Northern and Northwestern States. As a matter of general interest and for the special information of those who may hereafter be disposed to take advantage of the liberal policy of the Mexican Government, the conditions imposed on the fishing company in question may be quoted. They are given in a letter which the subsecretary of the department of public works of Mexico transmitted through the American minister to the manager of the said company on August 7, 1891:

The President of the Republic has taken note of your communication, dated the 13th of May last, transmitted to this department by the department of public works, wherein, as manager of the Red Snapper Fishing Company, of Galveston, you pray for permission to occupy, during the fishing season, the arenas or Alacran inlets, for the sole purpose of meeting there to fish or to take refuge in case of bad weather, and to transfer fish from fishing vessels to steamers to be carried thereby to the port of Galveston; and in virtue thereof the said chief magistrate has decided, pending the issue of the general fishing ordinance, that the permission you seek in the name of the company may be granted under the following conditions:

1. The companies may select, in the arenas or Alacran inlets, whatever places it may consider most expedient, for the sole and exclusive purpose of anchoring there their fishing vessels, taking refuge there in case of bad weather, and transferring therefrom fish from the fishing vessels to steamers, to be carried thereby to Galveston.

2. The company shall engage to advise this department of the number and the class of the vessels which it proposes to send to the arenas or Alacran grounds for fishing purposes, also the names thereof, in order to give due advice to the departments of the treasury and of war and marine.

3. The company shall likewise engage to comply with the regulations given in the premises by the aforesaid departments of the treasury and of war and marine; furthermore, the company shall engage to comply with the instructions established under the regulations on marine fishing which may hereafter be issued, pledging not to resort to any measure not accepted among civilized nations.

4. This permit will take effect from and after the 1st of next September, and be good till April 30 of next year (1892), the company having the option to renew the same.

I advise you of the foregoing for the information of yourself and of the company you represent; praying acknowledgment of receipt of this permit, to the effect that the said company agrees to the conditions established thereunder.

MISCELLANEOUS MATTERS.

INTERNATIONAL FISHERY CONFERENCES.

The agitation of the condition of the fisheries of the international lakes, especially Lake Ontario, to which reference is elsewhere made, resulted in the call of a meeting in New York City for the purpose of discussing the question of fish protection and fish propagation in Lake Ontario. The meeting was held October 22, 1891, and was attended by special commissioners appointed by the provinces of Ontario and Quebec and by the State of New York, together with others interested in the fisheries of the Great Lakes. The attendance of the U. S. Commissioner of Fish and Fisheries was urged, but, owing to his inability to participate in the meeting, the writer was delegated for that purpose. The meeting, which was informal and simply preliminary, was called to order at the Fifth Avenue Hotel, and Hon. Robert B. Roosevelt, of New York City, was made chairman and Mr. A. D. Stewart, of Hamilton, Ontario, was designated as secretary.

On motion of Gen. Richard U. Sherman, of New Hartford, N. Y., the question of the consideration of the object of the meeting, viz, the protection, preservation, and propagation of food-fish in the Great Lakes, was referred to a committee which was to meet at Rochester, N. Y., November 10, 1891, and formulate a report to be presented to a full conference of Canadian and State representatives, to be called by the chairman. The committee, as announced, consisted of Dr. G. A. MacCallum, chairman of the Ontario Fish and Game Commission; Hon. J. W. Gregory, member of the Quebec Fish Commission; Hon. H. C. Ford, president of the Pennsylvania Fish Commission; Hon. Henry Burden, member of the New York Fish Commission; Hon. R. U. Sherman, member of the special commission to revise and codify the fish and game laws of New York; Mr. Frank J. Amsden, secretary of the Cheaper Food-Fish Association of New York; Dr. J. A. Henshall, president of the Ohio Fish Commission; Dr. J. C. Parker, president of the Michigan Fish Commission; and the writer, representing the U. S.

Commission of Fish and Fisheries. The committee was later enlarged by the selection of representatives of the fish commissions of Wisconsin, Illinois, and Minnesota.

The conference held at Rochester occupied two days and was well attended, not only by members of the committee, but by numerous public and private individuals interested in the lake fisheries. Gen. Sherman acted as chairman of the meeting. This Commission was represented as on the previous occasion, but, owing to the evident impropriety of the General Government taking part in discussions and recommendations regarding contemplated legislation on the part of Canada and the lake States, the writer, under instructions from Washington, asked to be relieved from active service on the committee. The members of the conference seemed to be satisfied with the results accomplished in the way of formulating the laws to protect the food-fish and in securing an harmonious agreement between the representatives of New York, Pennsylvania, and Michigan on the one hand and Ontario and Quebec on the other. The question of Government control of the lake fisheries was informally discussed; the sentiment of the meeting was generally inimical to the relinquishment by the States of jurisdiction over the waters. It was given out that the hope was entertained that the Canadian provinces would be allowed by the Imperial Government to assume authority over the fisheries of their side of the lakes, in order that they might be in position to reach some mutual agreement with the States. The more important recommendations which it was decided to present to the conference were as follows:

1. A resolution urging all States interested in the lake fisheries to secure the passage of laws forbidding the taking or marketing of salmon trout or lake trout weighing less than 2 pounds, of black bass weighing less than 1 pound, of pike perch weighing less than three-fourths of a pound, and of whitefish weighing less than 2 pounds.

2. A resolution providing for the prohibition of all kinds of commercial fishing in the St. Lawrence River.

3. A resolution asking Congress to authorize the United States Commission of Fish and Fisheries to make a biological survey of the great lake fisheries, including the determination of the food, habits, and migrations of the commercial fishes.

The meeting adjourned to convene on December 8, 1891, at Hamilton, Ontario, where the conference was presided over by Hon. Donald McNaughton, of Rochester. The action and recommendations of the Rochester meeting were approved, and the conference adjourned without day, with the understanding that similiar conferences were to be held each year as long as the condition of the fisheries warranted solicitude and mutual legislative action on the part of the States and provinces most interested.

PHOTOGRAPHIC WORK.

In the Great Lakes and Chesapeake Bay a large number of photographs were taken by field agents using hand cameras in conjunction with the regular fishery investigations. A very valuable series of views, representing fishing towns, vessels, apparatus, methods of catching and curing fish, etc., was obtained, which is available for illustration of reports. Several hundred of these views, with others secured during previous inquiries in the South Atlantic and Gulf States, were enlarged for use in the Fish Commission exhibit at the World's Columbian Exposition.

FISHERY MATTERS BEFORE CONGRESS.

On January 30, 1892, a bill was introduced in the House of Representatives by Mr. Lapham, of Rhode Island, entitled "A bill to regulate the fisheries, and for other purposes" (H. R. 5030). On January 26 Mr. Aldrich, of the same State, presented a similar bill in the Senate (S. 1899). The measure was intended to grant full authority to menhaden and mackerel fishermen using purse seines to fish unrestrictedly in all the coast waters of the States bordering on the Atlantic Ocean. The text of the bill was as follows:

That any citizen of the United States may at all times take menhaden and mackerel with purse seines along the seacoasts and shores of the United States, and along the shores of the several islands thereunto adjacent, and in the bays, harbors, and estuaries of the said seacoasts and shores of the United States and of the said islands, in all waters under the maritime jurisdiction of the United States where the tide ebbs and flows, subject only to such control and restriction as Congress may prescribe from time to time, any law, custom, or usage of any State to the contrary notwithstanding.

The Commissioner of Fish and Fisheries is hereby directed to make such inquiries and investigations as may be necessary for ascertaining to what extent, if any, there has been diminution in the abundance of fishes of commercial importance along the coasts of the United States and in the Great Lakes, and to report to Congress the result of these investigations, together with recommendations, if in his opinion any are necessary, as to the proper measures to be adopted for the preservation of the fisheries and the continuance of an ample supply of fish.

Section 4321 of the Revised Statutes of the United States is hereby amended by inserting immediately after the word "fisheries," whenever it occurs in said section 4321, the words "on the open ocean or along the seacoasts and shores of the United States, and along the shores of the several islands thereunto adjacent, and in the bays, harbors, and estuaries of the said seacoasts and shores of the United States and of the said islands, and in all waters under the maritime jurisdiction of the United States where the tide ebbs and flows," so that it shall read in the title of a fishing license, "License for carrying on the fisheries for menhaden and mackerel with purse seines on the open ocean or along the seacoasts and shores of the United States, and along the shores of the several islands thereunto adjacent, and in the bays, harbors, and estuaries of the said seacoasts and shores of the United States and of the said islands, and in all waters under the maritime jurisdiction of the United States where the tide ebbs and flows."

And also in the body of said section, after the description of the vessel, to read:

"License is hereby granted for the said vessel to be employed in carrying on the fisheries for menhaden and mackerel with purse seines on the open ocean or along

the seacoasts and shores of the United States, and along the shores of the several islands thereunto adjacent, and in the bays, harbors, and estuaries of the said seacoasts and shores of the United States and of the said islands, and in all waters under the maritime jurisdiction of the United States where the tide ebbs and flows, subject only to such control or restriction as Congress may prescribe from time to time, any law, custom, or usage of any State to the contrary notwithstanding, for one year from the date hereof, and no longer."

Numerous committee hearings were accorded those who favored and opposed the contemplated legislation, and in the House the matter was finally reported on adversely. A substitute bill introduced later was also unfavorably acted on, on the ground of unconstitutionality.

RELATIONS WITH THE ELEVENTH CENSUS.

On September 9, 1891, the writer was appointed special agent of the Census Office in charge of fish and fisheries, without compensation, and at once entered upon the duties connected with that position. Active connection with the Census Office was maintained until January 5, 1892, when, owing to the fact that the work was requiring much more time and attention than was anticipated, and that satisfactory work in one department was only accomplished at the expense of the other, it was decided to discontinue the writer's services, although his commission as special agent was temporarily retained at the request of the Superintendent of the Census.

Upon assuming charge of the work it was learned that Mr. Charles F. Pidgin, of Boston, Mass., was also a special agent in charge of the fisheries division, with headquarters in Boston. Under the arrangement then in force the work of compiling the statistics from the field agents' returns devolved upon the Washington office, and tabulations were prepared for publication at the branch office in Boston.

In making reference in this report to the connection established between the Census Office and the Fish Commission it will probably not be necessary to do more than briefly mention some of the more important matters that arose during the continuance of that relation.

The clerical force available for work in the fisheries division was very small and entirely inadequate to properly deal with the extensive subject. It was therefore necessary to restrict the work to a consideration of certain special branches pending an increase in the force. The principal subject to which attention was given was the compilation of statistics showing the extent of the carp industry of the United States from 1880 to 1889. The Census Office had very complete returns covering more than 60,000 carp ponds, lakes, etc., and the results of one of the most interesting and important experiments in fish-culture were exhibited. The compilation of figures for the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania was completed, and work on numerous other States was well advanced, but it was evident that many more employés would be needed in order to finish this branch of the work in a reasonable time. Another special line of work undertaken by the

office force was the preparation for publication of the material illustrative of the alligator industry of Florida, for which the Census Office had approximately complete returns.

The personal services of the special agent in charge, aside from general supervision of the office affairs, chiefly consisted of work on the bulletins elsewhere mentioned. The proof of the first of these was revised, the manuscript of the second was in part prepared, and the introduction of the third was written and the tables in the same revised. Two visits to Boston, occupying seventeen days, were made in connection with this work.

On November 30, 1891, the force in the fisheries division was practically disbanded, owing to financial considerations. It was anticipated, however, that work would be resumed with an adequate force about the 1st of March.

In a report on the census work which the writer made to his superior officer in the Fish Commission on December 19, 1891, the following statement occurs, which discloses the principal consideration which necessitated the severance of active relations between the two bureaus which took place in the next month:

From the experience I have already had with the fishery census, I am led to believe that, should the work resume with the necessary force, nearly if not quite all my time will be required to properly direct and carry on the business of the office. I feel that if the responsibility of making a creditable statistical and descriptive presentation of the fisheries of the United States is to fall on me, I should have unlimited time at my disposal, and should not be handicapped by having to divide my time and energy between two different departments. There is a great amount of work remaining to be done, and, however much of this I may be able to detail to subordinates, personal attention will have to be given to the important subjects of preparing the descriptive and tabular matter for the bulletins and the final volume, and to correspondence. I make this statement so that the conditions under which the work will be resumed may be clearly understood by you at the outset.

The following bulletins of the Census Office relating to fish and fisheries were issued during the connection of the writer with that bureau in the capacity of special agent in charge. One of these was based wholly on Fish Commission material, and in the preparation of the others recourse was had to Fish Commission records for the verification and emendation of the census returns.

Bulletin No. 123. Marine Mammalia: In the introduction to this bulletin, the Superintendent of the Census refers to this office in the following words:

It is with pleasure that the assistance rendered by the U. S. Commission of Fish and Fisheries is gratefully acknowledged. The statistical resources of that department have been placed freely at the disposal of the Census Office for the purposes of comparison and verification, and the accuracy and completeness of this bulletin are largely due to the opportunities thus afforded.

The authors also make this reference to the Fish Commission:

The most complete and reliable comparative statistics are naturally furnished by the U. S. Commission of Fish and Fisheries, which has a permanent body of experienced agents engaged in the work, and whose cordial coöperation with the Census Office work has been acknowledged.

Bulletin No. 167. Fisheries of the Pacific States: The figures in this bulletin were obtained from the proof sheets of the Fish Commission report, then going through the press, on the fisheries of the Pacific States. Concerning the utilization of this material the Superintendent of the Census says:

In 1889 the U. S. Commission of Fish and Fisheries conducted an exhaustive inquiry into the fisheries of this region, the results of which have been embodied in a report not yet published, the proofs of which have been consulted in the tabulation of this bulletin. Although the data thus made available mostly pertain to the year 1888, it is known that changes which occurred in the fisheries of this region between that time and the census year were not marked, and will not invalidate the presentation of the following figures as the census of 1889.

Bulletin No. 173. Fisheries of the Great Lakes: The authors, after referring to the field work of the census agents in the Great Lakes, say:

A similar work was done by the agents of the U. S. Fish Commission in the year 1885, and the very comprehensive report issued by that department, entitled Review of the Fisheries of the Great Lakes in 1885, furnished a most valuable basis of comparison between the returns made by the field agents of the Census Office and those made by the Fish Commission. A mass of unpublished statistical data in the possession of the Fish Commission has been placed at the disposal of this office by Hon. Marshall McDonald, Commissioner of Fish and Fisheries, and the best service of both departments has been freely used to contribute to the completeness and accuracy of this bulletin.

RECOMMENDATIONS.

In concluding this report, some suggestions will be made for the future field work of the division. The canvass of the coastal regions of the country and the Great Lakes has been so recently made, and the extent and condition of the fishing industry of those sections have been so often presented, that it is thought that the services of the regular field force may be advantageously and properly withdrawn temporarily from the consideration of this work and directed for a season toward other important branches or phases of the fisheries that have received little or no attention from this office.

One of the most inviting and important inquiries that properly fall to the attention of the Division of Fisheries is the investigation of the fisheries and fishery resources of the minor lakes and inland streams of the United States. An effort was made during the prosecution of the fishery census of 1880 to secure statistics of the inland fisheries, but the time, force, and means available were so limited that the results achieved were not satisfactory, and no figures were published except a general statement that the minor fisheries of the smaller lakes and interior rivers had an estimated annual value of about $1,500,000.

The meager information at hand goes to show that this estimate is probably very much below the actual figures, and it can be confidently asserted that an investigation of these so-called minor fisheries will demonstrate the existence of a much more extensive and important industry in interior waters than is generally supposed.

The value of the small lakes and inland water-courses as sources of food supply is already great and is increasing yearly with the increase in population; and the necessity for determining their fishery resources is thought to need no demonstration. It seems only a question of time, when, with the rapid settlement of certain inland States, the natural fishery advantages will demand and receive as much attention as is now bestowed on similar water areas on the continent of Europe. In some of the States of the Great Lake region it is probable that the present extent of the fisheries of the small lakes will compare very favorably with that in the Great Lakes, while the possibilities of the interior waters for fish production and fish-culture are no doubt much greater from many points of view. It will probably be impossible for the small available force of field agents to make a complete investigation of the inland fisheries in a single year, but the territory could be so divided into States or river basins that definite regions could be canvassed and reports issued from time to time, as has been found necessary to do in the case of the coastal States.

The following statement of the Wisconsin fish commissioners regarding the resources of the inland lakes in that State is no doubt typical of conditions in a number of other States in that region:

We have not even the pretense of official statistics of the value of fish catches from the inland waters, but from various private sources—principally railway and express companies—we are able to present a few suggestive figures. It is reported to us from the Lake Winnebago district, comprising the waters of Lakes Winnebago and Poygan, and Wolf and Fox rivers, there was shipped to outside markets, during the season of 1889, a total of 675,224 pounds. At the low estimate of 4 cents per pound, this export must have netted the fishermen $27,012.96, nearly one-tenth of the value of Wisconsin's fishing industry on the Great Lakes. It is probable that an equal amount was either sent to the home markets or consumed by the fishermen and their families.

Upon the Four Lakes at Madison, there are, from April to November, an average of 25 fishermen in daily employment, taking out $4,000 or $5,000 worth of fish in the season for the home market and for export. Throughout the winter a large number of men are engaged in fishing through the ice and earn fair wages.

It is reported that during 1888 there was shipped from Lake Koshkonong some 200,000 pounds of fish, valued at $8,000; and it is fair to say that from scores of inland lakes like Koshkonong—for instance, in Waukesha, Walworth, Racine, Kenosha and Green Lake counties—equally large shipments are annually made. It is unfortunate that we find it impossible, in the lack of proper reporting agencies, to present the statistics of this trade; were we able to do so, it would doubtless be found that the value of the inland fisheries was at least equal to that of the Great Lakes, and quite as deserving of legislative attention.—(Report of the Commissioners of Fisheries of the State of Wisconsin, 1889-90.)

There are few fisheries of the Atlantic coast that have attracted more attention and occasioned more discussion and comment in recent years than the menhaden fishery. The phases of the controversy between the advocates and opponents of the fishery need not here be referred to, but it seems proper that one of these, viz, the extent to which other fish besides menhaden enter into the catch of the vessels, should receive attention from this office, because it is one of the most import-

ant questions connected with the subject and is better adapted to consideration by this division than some of the more scientific problems which have arisen. During all the discussion which in past years has taken place regarding the effects of this fishery on the abundance of other fish, there has been an entire absence of authentic data on the quantities of food-fish captured with menhaden. This lack of information has, no doubt, often led to a misconception of the effects of the fishery and caused unjust criticism on the part of well-meaning persons. Since it appears probable that the menhaden fishery will, for some years at least, be the subject of legislative consideration and personal controversy, it seems important to secure and have available for use all information that can possibly be obtained that is calculated to aid in the solution of the very difficult problems involved.

It is therefore conceived that valuable material relating to the special point under discussion may be obtained by placing the field force of the division on vessels fishing off various parts of the coast and having the agents make actual records of the results of every seine-haul during a period of two or three months. While this plan would involve a study of a small part of the menhaden fleet, it would nevertheless afford a valuable basis for generalization.

The plan has not yet been fully elaborated, but includes the use by each agent and on each vessel of a special blank on which the following information is to be recorded for each haul of the seine during the year: Date; hour; fishing-ground; quantity of menhaden caught; number of bluefish, mackerel, Spanish mackerel, squeteague, sea bass, sheepshead, drum, cero, albicore, scup, striped bass, sharks, skates, rays, and other fish taken with menhaden; disposition made of fish, and value, if sold. There may be added to this inquiry a consideration of the dependence of the line fisheries for bluefish, sea bass, etc., on the menhaden fishery as a source of bait supply—another important question involved in the menhaden controversy.

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