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

By Hugh M. Smith.

This division was under the direction of the writer until April 7, 1897, when Mr. Charles H. Townsend, formerly naturalist on the steamer *Albatross*, was appointed in charge.

The principal work of the division comprised a canvass of the shad and alewife fisheries of the entire Atlantic coast, a reconnaissance of the fishing industry of the Pacific States, inquiries relative to the fisheries of the coastal waters of Florida, and a study of the salmon fishery of Penobscot Bay and River. Besides the general investigation of the fisheries of the Pacific States, some special inquiries were made relative to the sardine industry, the abundance of the introduced shad and striped bass, and the transplanted eastern lobster.

SHAD AND ALEWIFE FISHERIES.

The extensive canvass of the important fisheries for shad and alewives, begun in May, 1896, and noticed in the last report of the division, was completed during the present year, and the Commission was put in possession of very complete and instructive matter regarding the condition of the industry in each stream. In view of the magnitude of the fish-cultural operations with the shad, the inquiries had a special value, because of the opportunity afforded for making comparisons with previous years. The canvass was, in some respects, the most thorough examination of the shad fishery ever undertaken. It included statistics of persons employed, apparatus and boats used, and products taken in each stream or water, the extent of the fishing with each kind of appliance, the number, weight, and value of the shad of each sex, and other special data.

The canvass disclosed the fact that in 1896 the number of persons engaged in the shad and alewife fisheries was nearly 27,000, including only those who used apparatus set especially for these fish or in which they constituted an important part of the catch. Fully 3,500 other persons took more or less shad and alewives incidentally in gill nets, pound nets, and seines operated primarily for other fish. Of the 24,800 persons who may be classed as fishermen, as distinguished from those who simply transported the catch or handled it on shore, over 6,100 persons were employed in North Carolina, more than 4,400 in Maryland, nearly 4,000 in Virginia, about 2,900 in New Jersey, 1,650 in South Carolina, 1,200 in New York, and 1,100 in Pennsylvania.

The following table shows the number of persons employed in each State:

Table showing by States the number of persons employed in the shad and alewife fisheries of the United States in 1896.

States.	Fishermen.	Transporters.	Shoresmen.	Total.
Connecticut	278	.....	.....	278
Delaware	904	.....	.....	904
Florida	487	5	31	523
Georgia	888	.....	.....	888
Maine	435	.....	10	445
Maryland	4,418	17	385	4,820
Massachusetts	342	.....	46	388
New Hampshire	10	.....	.....	10
New Jersey	2,037	38	35	3,010
New York	1,180	.....	10	1,196
North Carolina	6,112	60	990	7,162
Pennsylvania	1,115	4	14	1,133
Rhode Island	66	.....	18	84
South Carolina	1,646	.....	.....	1,646
Virginia	3,972	73	42	4,087
Total	24,706	197	1,581	26,574

The investment in vessels, boats, apparatus, and shore property used in these fisheries is very large, amounting, in 1896, to about $2,172,000. This represented 56 vessels used in transporting the catch or in setting the nets, 12,400 boats, over 4,000 pound nets and similar nets, nearly 950 seines (with a combined length of 133 miles), 84,000 gill nets (aggregate length 1,970 miles), 800 fyke nets, and miscellaneous property.

In North Carolina $623,000 was invested in these fisheries, the leading item of apparatus being 1,705 pound nets. Virginia is credited with $442,000 devoted to this industry and with over 1,200 pound nets. In both New Jersey and Maryland more than $300,000 is invested.

The details of the fishery property in each State are shown in the following table:

Table showing by States the vessels, boats, apparatus, and property employed in the shad and alewife fisheries of the United States in 1896.

States.	Vessels transporting.				Boats.		Pound nets, trap nets, and weirs.	
	No.	Tonnage.	Value.	Value of outfit.	No.	Value.	No.	Value.
Connecticut	.....	.....	.....	.....	132	$3,113	3	$1,400
Delaware	2	15.20	$600	$30	442	18,805	9	535
Florida	.....	.....	.....	.....	251	9,384	.....	.....
Georgia	.....	.....	.....	.....	495	7,023	26	208
Maine	*1	51.85	4,000	498	370	8,527	178	25,255
Maryland	7	59.57	4,100	200	2,220	108,632	893	66,266
Massachusetts	.....	.....	.....	.....	88	2,974	1	150
New Hampshire	.....	.....	.....	.....	12	155	12	480
New Jersey	5	298.38	23,000	1,585	1,485	127,592	.....	.....
New York	.....	.....	.....	.....	600	28,731	18	3,800
North Carolina	14	138.56	12,225	680	2,960	102,373	1,705	138,588
Pennsylvania	.....	.....	.....	.....	468	21,340	.....	.....
Rhode Island	.....	.....	.....	.....	36	700	21	1,910
South Carolina	.....	.....	.....	.....	799	14,603	.....	.....
Virginia	27	339.85	14,167	638	2,049	76,588	1,208	227,820
Total	56	903.41	58,092	3,631	12,422	530,540	4,074	466,502

* This vessel fished for shad, using a purse seine.

Table showing by States the vessels, boats, apparatus, and property employed in the shad and alewife fisheries of the United States in 1896—Continued.

States.	Seines.			Gill nets.			Fyke nets.	
	No.	Length (feet).	Value.	No.	Length (feet).	Value.	No.	Value.
Connecticut	47	19,131	$3,718	89	60,704	$4,285	.....	.....
Delaware	102	32,853	4,501	457	371,237	14,557	60	$180
Florida	24	21,450	2,175	201	277,200	17,550	.....	.....
Georgia	.....	.....	.....	428	132,845	13,080	.....	.....
Maine	7	2,562	627	228	56,298	2,870	.....	.....
Maryland	95	104,367	26,422	7,453	1,811,119	59,567	345	5,348
Massachusetts	45	17,739	3,075	10	2,250	120	.....	.....
New Hampshire	2	360	50	.....	.....	.....	.....	.....
New Jersey	145	90,012	17,838	3,658	1,845,368	111,433	270	3,214
New York	67	35,450	7,220	1,879	670,949	34,727	54	955
North Carolina	232	232,749	56,971	58,234	3,417,263	80,002	.....	.....
Pennsylvania	96	57,015	12,285	179	217,770	11,968	.....	.....
Rhode Island	16	9,600	840	.....	.....	.....	.....	.....
South Carolina	22	4,905	931	399	283,011	18,836	.....	.....
Virginia	44	75,183	19,230	10,924	1,253,575	40,131	72	1,032
Total	944	704,276	155,883	84,139	10,399,589	409,116	801	10,729

States.	Dip and other minor nets.		Spears.		Wheels.		Value of shore and accessory property.	Total value of investment.
	No.	Value.	No.	Value.	No.	Value.		
Connecticut	.....	.....	.....	.....	.....	.....	$1,575	$14,091
Delaware	10	$40	.....	.....	.....	.....	13,467	52,715
Florida	.....	.....	.....	.....	.....	.....	4,349	33,458
Georgia	113	259	.....	.....	.....	.....	2,817	23,387
Maine	94	222	.....	.....	.....	.....	11,254	54,253
Maryland	128	625	.....	.....	.....	.....	54,140	325,299
Massachusetts	121	193	.....	.....	.....	.....	12,958	19,470
New Hampshire	.....	.....	.....	.....	.....	.....	355	1,040
New Jersey	.....	.....	.....	.....	.....	.....	90,228	374,890
New York	.....	.....	20	$20	.....	.....	6,325	81,868
North Carolina	1,278	3,781	.....	.....	75	$1,125	227,252	622,997
Pennsylvania	51	185	30	23	.....	.....	36,451	82,252
Rhode Island	.....	.....	.....	.....	.....	.....	1,170	4,620
South Carolina	450	1,162	.....	.....	*80	2,178	2,645	40,355
Virginia	.....	.....	.....	.....	.....	.....	62,253	441,859
Total	2,245	6,467	50	43	155	3,303	527,248	2,171,554

* Includes fall traps.

The shad catch of the Atlantic coast in 1896 in apparatus set primarily for this fish was 12,940,000 fish, weighing 50,000,000 pounds and valued at $1,637,000. The yield of alewives was 140,850,000 fish, weighing 58,703,000 pounds and worth $435,000. The additional output of these fish in apparatus set primarily for other fish was 207,000 shad, with a weight of 775,000 pounds and a value of $19,000, and 7,008,000 alewives, weighing 3,363,000 pounds and worth $24,600; included in these figures is the incidental catch of shad on the Pacific coast.

The table which follows gives the results of these fisheries in each State. New Jersey is seen to take precedence in the number and the weight of shad, being credited with about 3,298,000 fish, weighing 13,746,000 pounds. Virginia ranks second, with 3,197,000 fish, with a weight of 11,146,000 pounds. In North Carolina, with a catch of 2,097,000 shad, weighing 8,843,000 pounds, the value is greater than in any other State, namely, $417,000. Maryland is the foremost State in the yield of alewives; over 44,000,000 were taken, weighing 17,641,000 pounds and valued at nearly $126,000. In North Carolina about 35,890,000 alewives were caught and in Virginia more than 30,000,000.

Table showing the shad and alewife catch of the United States in 1896 by apparatus fished primarily for these fish.

States.	Shad.			Alewives.		
	Number.	Pounds.	Value.	Number.	Pounds.	Value.
Connecticut	67,746	251,810	$13,486	2,257,798	812,119	$10,498
Delaware	467,744	1,900,694	69,160	2,057,390	822,956	7,756
Florida	460,214	1,298,605	62,589	40,000	16,000	400
Georgia	143,974	536,627	49,289			
Maine	348,757	1,334,443	29,553	4,670,581	2,598,527	19,664
Maryland	1,542,869	5,540,224	166,464	44,103,306	17,641,322	125,870
Massachusetts	3,355	13,420	934	7,370,689	3,970,274	35,050
New Hampshire				479,500	269,734	2,795
New Jersey	3,297,593	13,746,298	333,188	5,610,990	2,859,299	14,157
New York	537,543	2,181,724	73,596	2,317,070	926,828	11,225
North Carolina	2,096,804	8,842,708	417,243	35,889,798	14,355,920	115,945
Pennsylvania	621,239	2,501,143	79,445	1,572,000	638,500	4,372
Rhode Island	9,258	36,534	2,408	4,364,120	1,745,648	24,333
South Carolina	146,627	671,513	33,436	30,500	12,200	463
Virginia	3,196,672	11,145,870	306,339	30,085,617	12,034,247	62,453
Total	12,940,395	50,091,613	1,637,130	140,849,359	58,703,574	434,981

The incidental catch of shad and alewives is shown by States in the following table. This represents the yield of nearly 800 pound nets, several thousand gill and trammel nets, and about 60 seines, whose individual take was too small to warrant their inclusion in the special statistics.

State.	Shad.			Alewives.		
	Number.	Pounds.	Value.	Number.	Pounds.	Value.
California	61,861	247,445	$4,397			
Connecticut	2,542	9,380	596	472,625	189,069	$1,533
Maine	18,169	70,486	1,235	1,567,258	789,799	5,072
Maryland	347	1,275	40	64,980	25,993	180
Massachusetts	36,460	100,712	2,300	2,675,237	1,386,215	10,074
New Hampshire	100	300	15	47,000	23,937	250
New Jersey	40,887	163,528	6,868	733,050	368,775	1,408
New York	5,271	18,822	1,237	211,470	84,588	1,378
Oregon and Washington	31,311	125,246	1,252			
Rhode Island	3,374	12,912	925	828,280	331,312	3,551
Virginia	6,831	24,649	716	408,400	163,360	571
Total	207,153	774,755	19,581	7,008,300	3,363,048	24,617

The extent of the shad and alewife fishing in 1896 is shown by rivers, bays, etc., in the appended tabulation. The large number of streams into which these fishes regularly run make them the leading river fishes of the Atlantic States, considered collectively, and also the principal river fishes in each State with only two or three exceptions.

The Delaware is shown by the table to have been the most important shad stream in 1896. Over 2,800,000 fish were taken, having a value to the fishermen of $306,000. More than 1,000,000 additional shad were caught in Delaware Bay, this hydrographic area being credited with a catch of over 4,217,000 shad, valued at $425,000. The second shad stream in 1896 was the Potomac, in which 684,000 fish were obtained. Next in order are the Hudson, with 589,000; the York, with 547,000; the James, with 496,000, and the Rappahannock, with 418,000. In Chesapeake Bay and its numerous tributaries, which constitute the most important shad-fishing ground in the United States, about 4,870,000 shad were taken; these were valued at $491,000. The extensive fisheries in the basin of Albemarle Sound yielded 1,130,000 fish, worth $203,000.

More than half the alewives taken in the United States in 1896 were caught in the Chesapeake basin, in which the run of these fish was phenomenally large. More than a third of the yield of Chesapeake Bay and its tributaries was taken in the Potomac River, which is now the principal alewife stream. In 1896 the fish were so abundant that at times there was no sale for them, and the average price for the season was less than $1.20 per 1,000. The catch of 24,438,000 alewives credited to the Potomac was nearly equaled on the shores of Chesapeake Bay, where 24,112,000 were taken. The Albemarle region of North Carolina is the next important ground for alewives; 30,675,000 were secured there, of which 13,560,000 were obtained in the Chowan River. Other prominent alewife streams are the Damariscotta (2,472,000 fish), Connecticut (2,216,000 fish), Hudson (2,192,000 fish), Delaware (4,420,000 fish), Susquehanna (10,864,000 fish), and Roanoke (4,177,000 fish).

Statement by waters of the shad and alewife catch of the United States in 1896.

Waters.	State.	Shad.			Alewives.		
		Number.	Pounds.	Value.	Number.	Pounds.	Value.
St. Croix River	Maine	.....	.....	.....	11,100	6,243	$93
Dennys River	....do	.....	.....	.....	160,500	90,280	470
Machias River	....do	.....	.....	.....	91,700	51,581	570
Penobscot River	....do	114	421	$27	617,608	308,841	3,028
Medomak River	....do	.....	.....	.....	73,800	41,512	417
St. George River	....do	.....	.....	.....	686,000	385,804	3,014
Pemaquid River	....do	.....	.....	.....	206,000	115,875	1,100
Damariscotta River	....do	.....	.....	.....	2,472,100	1,390,612	9,811
Kennebec River	....do	290,122	1,160,488	26,257	494,781	277,726	2,739
Casco Bay	....do	64,690	220,020	3,592	1,391,250	701,287	3,771
Shores of Maine	....do	12,000	24,000	912	33,000	18,562	323
Piscataqua River	New Hampshire	100	300	15	47,000	23,937	250
Newmarket River	....do	.....	.....	.....	46,350	26,088	270
Exeter River	....do	.....	.....	.....	433,150	243,646	2,525
Merrimack River	Massachusetts	.....	.....	.....	945,000	472,500	4,200
Cape Cod Bay	....do	32,905	86,732	1,449	1,732,972	884,255	5,479
Taunton River	....do	3,355	13,420	934	1,897,478	1,067,324	9,478
Ponds, small rivers, and creeks	.... do	.....	.....	.....	4,528,211	2,480,450	21,372
Shores of Massachusetts	....do	3,555	13,980	851	942,265	501,960	4,595
Warren River	Rhode Island	9,258	36,534	2,408	403,200	161,280	692
Ponds and small rivers	....do	.....	.....	.....	3,960,920	1,584,368	23,641
Shores of Rhode Island	....do	3,374	12,912	925	828,280	331,312	3,551
Connecticut River	Connecticut	51,690	190,034	9,508	2,216,243	795,497	10,350
Housatonic River	....do	9,878	37,360	2,471	4,200	1,680	28
Shores of Connecticut	....do	8,720	32,800	2,103	509,980	204,011	1,653
Shores of Long Island	New York	8,786	31,680	2,241	336,540	134,616	2,840
Hudson River	N. Y. and N. J.	588,898	2,356,966	83,237	2,192,000	876,800	9,763
New York, Sandy Hook, and Raritan bays.	....do	216,425	861,653	30,941	930,800	465,400	1,374
Shores of New Jersey	New Jersey	16,240	64,937	3,518	3,482,140	1,955,234	8,873
Delaware River	N. J., Pa., and Del.	2,833,101	11,752,359	306,536	4,420,700	1,812,980	11,044
Delaware Bay	N. J. and Del	1,183,761	5,075,891	119,870	221,490	88,596	1,589
Indian River	Delaware	.....	.....	.....	550,700	220,280	3,823
Chesapeake Bay and tributaries:							
Bay shores	Md. and Va	1,742,455	6,261,967	177,742	24,112,084	9,644,835	61,709
Susquehanna River	Md. and Pa	140,087	565,037	20,153	10,864,000	4,345,600	48,983
Northeast River	Maryland	47,205	176,215	5,138	587,400	234,960	929
Elk River	....do	14,164	52,250	1,579	2,327,000	930,800	3,834
Chester River	....do	48,703	195,387	7,448	1,219,160	487,664	4,625
Choptank River and tributaries.	....do	338,420	1,115,020	35,810	1,993,560	797,424	5,598
Nanticoke River	Md. and Del	216,324	723,026	20,669	1,527,000	610,800	4,339
Wicomico River	Maryland	68,015	227,563	8,480	173,300	69,320	628
Pocomoke River	....do	29,752	95,482	4,304	32,730	13,092	223
Patuxent River	....do	52,354	199,200	5,867	1,474,330	589,732	4,008
Potomac River	Md. and Va	684,063	2,476,730	63,608	24,437,885	9,775,154	39,003
Rappahannock River	Virginia	417,789	1,442,505	35,371	2,798,826	1,119,530	6,411
York River and tributaries	....do	546,548	1,888,354	50,361	632,798	253,119	3,111
James River and tributaries	....do	495,762	1,657,203	51,247	528,230	211,292	2,539
Sassafras, Transquaking, and Blackwater rivers.	Maryland	28,144	94,202	2,933	2,321,600	928,640	4,124
Total		4,869,785	17,170,741	490,710	75,029,903	30,011,962	190,064

Statement by waters of the shad and alewife catch of the United States in 1896—Cont'd.

Waters.	State.	Shad.			Alewives.		
		Number.	Pounds.	Value.	Number.	Pounds.	Value.
Albemarle Sound and tributaries:							
Sound shores	North Carolina	735,192	3,050,809	$140,159	11,447,204	4,578,882	$34,671
Pasquotank River	do	8,757	36,015	1,599	829,000	331,600	4,167
Perquimans River	do	32,822	135,684	6,299	662,500	265,000	2,126
Chowan River	do	183,545	762,875	34,422	13,559,600	5,423,840	36,715
Roanoke River	do	169,409	678,553	20,489	4,177,000	1,670,800	19,962
Total		1,129,725	4,663,936	202,968	30,675,304	12,270,122	97,641
Croatan Sound	North Carolina	162,460	680,609	31,731	1,471,500	588,600	6,565
Roanoke Sound	do	7,081	30,878	1,470	19,400	7,760	81
Pamlico Sound	do	448,089	1,933,142	109,727	1,137,334	454,934	4,112
Pamlico River and tributaries.	do	67,082	289,421	13,316	501,204	200,482	2,374
Neuse River and tributaries.	do	207,052	905,217	39,067	2,085,056	834,022	5,172
Cape Fear River and tributaries.	do	75,315	339,505	18,964			
Winyah Bay and Waccamaw River.	South Carolina.	80,069	371,167	18,454			
Pee Dee River and tributaries.	do	11,071	49,363	2,965	10,100	4,040	167
Black River	do	5,825	24,632	1,439	17,600	7,040	264
Santee River	do	7,309	32,380	1,547			
Edisto River	do	28,273	130,933	5,843	1,800	720	22
Ashepoo River	do	6,880	30,335	1,381			
Combahee River	do	3,090	13,762	622			
Cooper River and Sampit Creek.	do	1,116	6,095	299	1,000	400	10
Savannah River	South Carolina and Georgia.	54,406	214,906	10,236			
Ogeechee River	Georgia	55,425	210,725	10,514			
Altamaha River and tributaries.	do	29,377	95,624	10,096			
Satilla River	do	1,500	5,050	240			
St. Marys River	Georgia and Florida.	10,193	37,217	1,754			
St. Johns River	Florida	456,281	1,284,556	61,924	40,000	16,000	400
Columbia River*	Oregon and Washington.	31,311	125,246	1,252			
Sacramento River*	California	1,617	6,468	212			
San Pablo and San Francisco bays.*	do	51,894	207,577	3,492			
Monterey Bay*	do	8,350	33,400	693			
Total		13,147,548	50,866,368	1,656,711	147,857,659	62,066,622	459,598

* Figures are for 1895.

SALMON FISHERY OF PENOBSCOT BAY AND RIVER.

During August and September, 1896, the writer made a personal examination of the condition of the salmon fishery in Penobscot Bay and River. The Penobscot is now the only stream on the Atlantic coast of the United States having an important run of salmon, and it has been the scene of extensive artificial propagation of that species. Most of the salmon fishermen were interviewed for the purpose of securing an account of their fishing in 1895 and 1896 and an expression of their opinion as to the condition of the fishery and the results of fish-cultural work.

The outcome of the fishery was 4,395 salmon in 1895 and 6,403 salmon in 1896, valued at $11,356 and $12,716, respectively. As has been the case for many years, practically the entire catch is taken with weirs of various types. Of the 193 weirs set in 1895 and 184 in the next year,

162 were operated in both years. Of these, 90 per cent took more salmon in 1896. The persons engaged numbered 133 each year, and the value of the investment in boats, apparatus, etc., was upward of $16,000 each season.

Notwithstanding the greatly increased catch in 1896, that season was behind a number of earlier years for which statistics are available. Thus, in 1880 about 10,000 salmon were taken in this region, and in 1887, 1888, and 1889 the catch was still larger. From 1892 to 1895 the output declined about 30 per cent, and the general tendency of late has been toward a decrease, 1896 affording a pleasing contrast.

The salmon fishermen are almost unanimous in the belief that the maintenance of the supply is dependent on artificial propagation. They think the opportunities for natural reproduction are so limited that only a few years would elapse before the supply would become exhausted without the planting of artificially hatched fry. All the eggs collected by the Commission are from fish caught for market, which eggs would otherwise be lost. There was in May and June, 1896, a noteworthy run of small salmon that had then entered the stream for the first time; a corresponding scarcity of large fish was observed. The fishermen refer to these small salmon as the hatchery school.

The interesting experiment is being tried of introducing the quinnat salmon and steelhead trout of the Pacific coast into the Penobscot and other Maine waters. Should it prove successful, two very valuable fishes will be added to the fishing resources of the region.

COASTAL FISHERIES OF FLORIDA.

In October and November, 1896, an investigation of the coastal fisheries of Florida was conducted by the writer and Mr. John N. Cobb, field agent, in conjunction with other Fish Commission representatives who were studying the natural-history features of the Florida fisheries. All the fishing communities on the west coast of the State were visited, and a number of places on the east coast. Most of the latter section, however, had recently been canvassed by agents of the division. The information thus obtained was incorporated in a report submitted to the Senate by the Commissioner on January 28, 1897.

Fishing is one of the principal industries of Florida, and the business is doubtless destined to undergo much further increase in certain lines. The approximate extent of the coastal fisheries at the present time is as follows: Persons employed, 6,100; capital invested, $1,300,000; value of catch, $1,200,000.

In this investigation special attention was given to the sponge, oyster, green turtle, and red snapper fisheries, as well as the Key West line fishing and the very extensive mullet fishing on the west coast. Florida is the only State having a sponge fishery, and surpasses all others in the yield of mullet, red snappers, green turtles, kingfish, pompano, and many other products.

The leading fishery is for sponges. It is prosecuted from Key West, Tarpon Springs, Cedar Keys, and Apalachicola, being most extensive at the first-named place. In 1895 the catch amounted to 306,120 pounds, valued at $386,871, of which 231,272 pounds, valued at $363,107, were sheepswool sponges.

The next fishery in importance is for mullets, which are caught in enormous quantities along the entire coast of the State, but are most numerous in Indian River and the southern part of the west coast. The yield of fresh and salted mullet and mullet roe in 1895 was about 20,734,000 pounds, having a value of $311,000.

The red-snapper fishery, centered chiefly at Pensacola, produced 4,899,000 pounds of snappers and a large quantity of groupers incidentally taken. The value of the snappers was $155,000. The yield and value of other important products in 1895 were as follows: Green turtles, 520,000 pounds, $28,500; oysters, 270,000 bushels, $61,723; squeteague, 1,380,000 pounds, $30,700; redfish or channel bass, 722,000 pounds, $13,900; grunts, 678,000 pounds, $16,850; pompano, 615,000 pounds, $41,000; sheepshead, 1,180,000 pounds, $19,300; Spanish mackerel, 520,000 pounds, $24,000.

FISHERIES OF GLOUCESTER AND BOSTON.

The reports of the local agents of the Commission at Gloucester and Boston, Mass., show that during the calendar year 1896 the fisheries centering at those places were somewhat less extensive than in the previous year. The quantities of fish which were brought in by the American fishing vessels aggregated 130,673,766 pounds, having a value as landed from the vessels of $3,286,898. The number of separate fares was 6,407.

Comparing these figures with those for 1895, it appears that there was a decrease of 19,765,774 pounds and $264,794, with 1,084 fewer fares. The falling off in receipts was shared by both ports.

The vessel fisheries centering at Gloucester yielded 21,924,701 pounds of fresh fish and 45,672,713 pounds of salt fish, a total of 67,597,414 pounds, having a value of $2,001,904. The aggregate receipts were 9,034,063 pounds less than in 1895, the decrease in value being $203,715. The number of fares of fish brought into Gloucester was 2,220, of which 1,616 were from grounds off the New England coast, and 604 from the eastern banks, Gulf of St. Lawrence, Greenland, and Iceland. The former grounds yielded 33,604,727 pounds of fish, having a value of $892,990, and the latter 33,992,687 pounds, worth $1,108,914.

In the preceding year there were just 1,000 more fares, mostly from the banks lying off the coast of New England, which grounds yielded 38,531,754 pounds of fish, valued at $894,068, while from the eastern grounds 38,099,723 pounds of fish were brought, having a market value of $1,311,551.

In the following table the receipts of the different fishes from each ground are given.

Summary by fishing-grounds of certain fishery products landed at Gloucester, Mass., in 1896 by American fishing vessels.

Fishing-grounds.	No. of trips from each ground.	Cod.				Cusk.			
		Fresh.		Salted.		Fresh.		Salted.	
		Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:									
La Have Bank	89	313,640	$4,594	1,647,772	$44,694	47,660	$617	.....	.....
Western Bank	48	.....	.....	302,830	8,503	.....	.....	.....	.....
Quereau Bank	75	.....	.....	77,840	2,188	.....	.....	.....	.....
Green Bank	23	.....	.....	18,500	548	.....	.....	.....	.....
Grand Bank	119	.....	.....	17,603,616	320,574	.....	.....	.....	.....
St. Peters Bank	3	.....	.....	3,000	98	.....	.....	.....	.....
Burgeo Bank	16	.....	.....	30,100	821	.....	.....	.....	.....
Bacalieu Bank	52	3,000	60	22,600	602	.....	.....	.....	.....
Off Newfoundland	1	.....	.....	.....	.....	.....	.....	.....	.....
Cape North	3	.....	.....	.....	.....	.....	.....	.....	.....
Cape Shore	86	393,000	5,849	702,440	10,218	.....	.....	.....	.....
Gulf of St. Lawrence	55	.....	.....	146,620	3,922	35,000	484	10,640	$197
Greenland and Iceland	4	.....	.....	20,100	579	.....	.....	.....	.....
Total	604	709,640	10,503	20,575,418	392,747	82,660	1,101	10,640	197
West of 66° W. longitude:									
Browns Bank	51	974,535	15,573	657,844	16,802	213,580	2,557	.....	.....
Georges Bank	700	825,340	14,828	11,070,631	324,709	178,200	2,395	294,430	6,379
Cashes Bank	94	934,930	13,766	.....	.....	875,000	10,540	.....	.....
Fippenies Bank	1	.....	.....	.....	.....	3,000	38	.....	.....
Middle Bank	9	3,500	92	.....	.....	.....	.....	.....	.....
Jeffreys Ledge	25	34,500	584	7,600	222	51,400	605	.....	.....
Ipswich Bay	14	116,736	2,155	8,000	260	.....	.....	.....	.....
South Channel	82	1,167,555	17,084	15,000	168	449,170	5,094	.....	.....
Nantucket Shoals	52	40,000	540	1,705,495	34,975	.....	.....	.....	.....
Off Chatham	3	.....	.....	.....	.....	.....	.....	.....	.....
General shore grounds	585	389,775	7,845	.....	.....	.....	.....	.....	.....
Total	1,616	4,486,871	72,467	13,464,570	377,136	1,770,350	21,238	294,430	6,379
Grand total	2,220	5,196,511	82,970	34,039,988	769,883	1,853,010	22,339	305,070	6,576

Fishing-grounds.	Haddock.		Hake.				Pollock.			
	Fresh.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:										
La Have Bank	10,000	$42	190,480	$940	.....	.....	.....	.....	.....	.....
Cape Shore	.....	.....	30,000	130	10,000	$85	.....	.....	.....	.....
Total	10,000	42	220,480	1,070	10,000	85	.....	.....	.....	.....
West of 66° W. longitude:										
Browns Bank	11,000	69	200,000	1,005	.....	.....	4,000	$18	.....	.....
Georges Bank	1,050,200	4,877	158,000	821	3,500	26	.....	.....	.....	.....
Cashes Bank	92,000	403	2,034,100	10,338	.....	.....	.....	.....	.....	.....
Fippenies Bank	.....	.....	3,000	21	.....	.....	.....	.....	.....	.....
Middle Bank	7,300	222	20,800	100	.....	.....	.....	.....	.....	.....
Jeffreys Ledge	11,400	436	245,500	1,377	2,500	25	50,860	182	.....	.....
Ipswich Bay	.....	.....	.....	.....	2,000	20	18,000	81	.....	.....
South Channel	40,000	154	1,102,240	4,924	.....	.....	.....	.....	.....	.....
Nantucket Shoals	.....	.....	.....	.....	.....	.....	.....	.....	25,000	$133
Off Chatham	.....	.....	.....	.....	.....	.....	.....	.....	230,000	4,353
General shore grounds	36,186	735	7,000	35	.....	.....	682,322	2,969	.....	.....
Total	1,248,086	6,896	3,770,640	18,621	8,000	71	755,182	3,250	255,000	4,486
Grand total	1,258,086	6,938	3,991,120	19,691	18,000	156	755,182	3,250	255,000	4,486

Summary by fishing-grounds of certain fishery products landed at Gloucester, Mass., in 1896 by American fishing vessels—Continued.

Fishing-grounds.	Halibut.				Mackerel.			
	Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:								
La Have Bank	312,495	$23,952	.....	.....	.....	.....	.....	.....
Western Bank	728,375	76,628	3,800	$212	.....	.....	.....	.....
Quereau Bank	984,747	77,391	20,080	831	.....	.....	.....	.....
Green Bank	417,895	29,029	.....	.....	.....	.....	.....	.....
Grand Bank	2,054,593	102,890	341,325	13,538	.....	.....	.....	.....
St. Peters Bank	78,040	6,536	.....	.....	.....	.....	.....	.....
Burgeo Bank	312,588	18,163	7,530	452	.....	.....	.....	.....
Bacalieu Bank	2,493,209	102,967	494,400	20,425	.....	.....	.....	.....
Cape North	.....	.....	5,430	326	.....	.....	.....	.....
Cape Shore	96,007	7,635	.....	.....	4,375	$520	2,852,000	$158,550
Gulf of St. Lawrence	9,960	521	.....	.....	.....	.....	623,000	46,823
Greenland and Iceland	.....	.....	334,000	13,530	.....	.....	.....	.....
Total	7,487,909	445,712	1,206,565	49,314	4,375	520	3,475,000	205,373
West of 66° W. longitude:								
Browns Bank	26,530	1,671	.....	.....	.....	.....	.....	.....
Georges Bank	1,208,998	99,737	.....	.....	8,720	848	1,446,400	96,125
Cashes Bank	8,000	585	.....	.....	.....	.....	.....	.....
Middle Bank	.....	.....	.....	.....	875	92	16,000	1,120
Jeffreys Ledge	4,080	234	.....	.....	.....	.....	.....	.....
Ipswich Bay	.....	.....	.....	.....	1,425	228	1,600	96
General shore grounds	.....	.....	.....	.....	58,080	3,532	4,288,700	173,345
Total	1,248,208	102,227	.....	.....	69,700	4,700	5,752,700	270,686
Grand total	8,736,117	547,939	1,206,565	49,314	74,075	5,220	9,227,700	476,059

Fishing-grounds.	Other fish.				Total.			
	Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:								
La Have Bank	.....	.....	.....	.....	874,275	$30,145	1,647,772	$44,604
Western Bank	.....	.....	.....	.....	728,375	76,628	306,630	8,715
Quereau Bank	.....	.....	.....	.....	984,747	77,391	97,920	3,019
Green Bank	.....	.....	.....	.....	417,895	29,029	18,500	584
Grand Bank	.....	.....	.....	.....	2,054,593	102,890	17,944,941	334,112
St. Peters Bank	.....	.....	.....	.....	78,040	6,536	3,000	98
Burgeo Bank	.....	.....	.....	.....	312,588	18,163	37,630	1,273
Bacalieu Bank	.....	.....	.....	.....	2,496,209	103,027	517,000	21,027
Off Newfoundland	.....	.....	200,000	$2,250	.....	.....	200,000	2,250
Cape North	.....	.....	.....	.....	.....	.....	707,870	10,544
Cape Shore	.....	.....	.....	.....	558,382	14,618	3,019,260	162,754
Gulf of St. Lawrence	.....	.....	.....	.....	9,960	521	643,100	47,402
Greenland and Iceland	.....	.....	.....	.....	.....	.....	334,000	13,530
Total	.....	.....	200,000	2,250	8,515,064	458,948	25,477,623	649,966
West of 66° W. longitude:								
Browns Bank	.....	.....	.....	.....	1,429,645	20,893	657,844	16,802
Georges Bank	.....	.....	.....	.....	3,429,458	123,506	12,814,961	427,239
Cashes Bank	.....	.....	.....	.....	3,944,030	35,641	.....	.....
Fippenies Bank	.....	.....	.....	.....	6,000	59	.....	.....
Middle Bank	.....	.....	.....	.....	32,475	506	16,000	1,120
Jeffreys Ledge	.....	.....	.....	.....	398,340	3,418	10,100	247
Ipswich Bay	.....	.....	.....	.....	136,161	2,464	11,600	376
South Channel	.....	.....	.....	.....	2,758,965	27,256	15,000	168
Nantucket Shoals	.....	.....	.....	.....	40,000	540	1,730,495	35,108
Off Chatham	.....	.....	.....	.....	.....	.....	230,000	4,353
General shore grounds	60,600	$247	420,390	4,586	1,234,563	15,363	4,709,090	177,931
Total	60,600	247	420,390	4,586	13,409,637	229,646	20,195,000	663,344
Grand total	60,600	247	620,390	6,836	21,924,701	688,594	45,672,713	1,313,310

The quantity of fishery products landed at Boston by American fishing vessels in 1896 was 63,076,352 pounds, valued at $1,284,994. Compared with 1895, there was a decrease in the receipts amounting to 10,731,711 pounds, worth $61,079. This decrease was participated in by every important fish except cod and mackerel. The number of fares of fish landed was 4,187, which was 84 less than in the previous year. The following table shows, by fishing-grounds, the quantities of each species landed:

Summary by fishing-grounds of certain fishery products landed at Boston, Mass., in 1896 by American fishing vessels.

Fishing-grounds.	Number of trips from each ground.	Cod.		Cusk.		Haddock.	
		Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:							
La Have Bank	112	1,051,000	$18,849	243,100	$3,172	1,267,700	$24,543
Western Bank	37	330,000	6,915	31,300	474	139,000	3,830
Cape Shore	75	664,500	13,203	72,500	875	853,500	16,570
Gulf of St. Lawrence	1						
West of 66° W. longitude:							
Browns Bank	51	495,000	9,605	187,300	2,342	640,000	9,507
Georges Bank	578	4,282,400	84,652	289,000	3,674	10,537,700	153,016
Cashes Bank	70	362,700	7,181	215,700	3,239	383,200	6,736
Clark Bank	6	68,000	1,043			47,000	818
Fippenies Bank	12	34,700	800	24,000	372	50,800	1,225
Ipswich Bay	4	33,000	700			3,000	90
Jeffreys Ledge	298	516,350	12,489	48,500	684	1,458,800	31,712
Middle Bank	377	652,500	13,760	30,000	537	1,648,000	37,104
Race Point	6	5,700	253			16,500	445
Off Highland Light	190	547,000	12,543	5,500	69	1,172,900	22,228
Off Chatham	115	375,300	7,729	8,000	101	1,016,400	17,033
South Channel	556	4,341,400	82,403	250,500	3,083	6,153,600	127,808
Nantucket Shoals	247	3,550,800	67,213			387,600	7,940
General shore grounds	1,452	2,940,210	68,265	83,700	1,012	3,133,500	60,981
Total	4,187	20,251,160	407,693	1,469,100	19,634	28,909,200	521,676

Fishing-grounds.	Hake.		Pollock.		Halibut.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude:						
La Have Bank	319,000	$2,022	53,700	$344	160,450	$16,547
Western Bank	100,000	680	14,500	158	133,270	11,687
Cape Shore	141,000	1,278	28,000	307	44,700	3,880
West of 66° W. longitude:						
Browns Bank	92,200	672	15,000	135	113,950	9,376
Georges Bank	547,900	5,998	45,100	389	363,825	30,153
Cashes Bank	345,000	3,611	55,300	231	4,500	623
Clark Bank	5,000	50			22,400	1,644
Fippenies Bank	41,000	563	14,000	70	2,600	321
Ipswich Bay	3,000	30	1,000	5		
Jeffreys Ledge	402,900	4,218	126,100	951	7,200	576
Middle Bank	566,700	6,175	122,200	930	2,500	294
Race Point	1,000	15				
Off Highland Light	240,600	1,653	25,700	220	200	22
Off Chatham	90,200	639	19,400	228	2,200	207
South Channel	2,848,600	19,106	202,700	1,265	80,950	8,408
Nantucket Shoals	13,000	65	135,500	1,077	1,500	90
General shore grounds	778,200	5,476	294,300	1,062	12,220	1,172
Total	6,535,300	52,251	1,152,500	8,272	952,465	85,000

Summary by fishing-grounds of certain fishery products landed at Boston, Mass., in 1896 by American fishing vessels—Continued.

Fishing-grounds.	Mackerel.				Other fish.		Total.	
	Fresh.		Salted.					
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
East of 66° W. longitude								
La Have Bank							3,094,950	$65,477
Western Bank							748,070	23,744
Cape Shore	79,450	$7,140	248,200	$14,439			2,131,850	57,692
Gulf of St. Lawrence			30,000	1,650			30,000	1,650
West of 66° W. longitude								
Browns Bank							1,543,450	31,637
Georges Bank	461,545	42,096	138,000	9,661	946,260	$30,571	17,591,730	360,210
Cashes Bank							1,366,400	21,621
Clark Bank							142,400	3,555
Fippenies							167,100	3,351
Ipswich Bay							40,000	825
Jeffreys Ledge					1,200	86	2,561,050	50,716
Middle Bank	50,425	2,563			1,925	130	3,074,250	61,583
Race Point							23,200	713
Off Highland Light							1,992,500	36,735
Off Chatham	1,000	45					1,512,500	25,982
South Channel	53,900	4,770	12,000	780	15,400	375	13,959,050	248,088
Nantucket Shoals	3,150	315					4,091,550	76,700
General shore grounds	412,187	26,933	827,900	34,479	524,085	14,435	9,096,302	214,715
Total	1,061,657	83,862	1,256,100	61,009	1,488,870	45,597	63,076,352	1,284,994

Following is a condensed comparative statement of the fishery products brought into Gloucester and Boston by American fishing vessels in each of the four years ending 1896. Each important species is shown separately, the weights representing the fish as they are landed from the vessels, in a fresh or salted condition. The catch of cusk and hake was much less in 1896 than in any of the other years; that of cod was less than in 1894 or 1895, but more than in 1893; that of haddock was markedly less than in the two preceding years and somewhat less than in 1893. The yield of mackerel was larger in 1896 than in any of the other years shown, and that of halibut and pollock presented no special change. The aggregate catch in 1896 was nearly 12,000,000 pounds less than in 1893, over 36,000,000 less than in 1894, and nearly 20,000,000 less than in 1895, with a corresponding decrease in values.

Species.	1893.	1894.	1895.	1896.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
Cod	54,627,104	63,590,830	67,298,639	59,487,659
Cusk	9,283,370	10,645,640	5,821,320	3,627,180
Haddock	33,908,780	45,611,956	41,605,786	30,167,286
Hake	19,991,600	23,343,815	15,340,770	10,544,420
Pollock	3,614,626	2,181,221	2,478,324	2,162,682
Halibut	9,792,911	10,905,122	9,722,342	10,895,147
Mackerel	9,296,220	8,013,400	4,586,724	11,619,532
Other fish	1,881,837	2,824,933	3,585,635	2,169,860
Total	142,396,448	167,116,817	150,439,540	130,673,766
Total value	$4,090,847	$3,897,071	$3,551,692	$3,286,898

FISHERIES OF THE PACIFIC STATES.

A general canvass of the important commercial fisheries of this region, begun in May, 1896, was completed in February, 1897. Mr. W. A. Wilcox, the agent making the investigation, visited every fishing community in the coast regions and rivers (except remote points in their headwaters), and obtained statistical and other data which are embodied in an appendix to the report for 1896. The inquiry related chiefly to the calendar year 1895, but embraced a notice of the changes in the various branches of the fishing industry since the time of the last canvass, in 1892.

The extent of the industry, as determined by this investigation, is shown in the following tables. It appears that in 1895, 17,305 persons were engaged in various branches of the fisheries in California, Oregon, and Washington. Of these, over 2,000 were employed on vessels, about 11,500 in shore and boat fisheries, and 3,800 in canneries, fish-houses, etc. The investment in the fishing industry amounted to about $7,275,000, of which $1,380,000 represented vessels and their outfits, $505,000 boats, about $1,300,000 apparatus of capture, and over $4,000,000 the shore property and cash capital. The first value of products was $4,470,000, representing over 147,000,000 pounds of fish, crustaceans, mollusks, etc. The leading fishery product was the chinook salmon, of which 38,392,000 pounds, valued at $1,682,000, were taken. The next in importance is the oyster, the product being valued at $650,000.

Persons employed in the fishing industry of the Pacific States in 1895.

How engaged.	California.	Oregon.	Washington.	Total.
In vessel fisheries	1,451	92	515	2,058
In shore and boat fisheries	2,716	4,230	4,493	11,439
On shore	603	2,001	1,204	3,808
Total	4,770	6,323	6,212	17,305

Vessels, boats, apparatus, shore property, and cash capital employed in the fisheries of the Pacific States in 1895.

Designation.	California.		Oregon.		Washington.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Vessels	66	$705,530	23	$45,950	59	$127,350	148	$878,830
Tonnage	9,796.87		468.07		1,420.56		11,685.50	
Outfit		449,155		8,059		33,034		490,248
Boats	1,442	121,670	2,022	212,925	2,646	170,155	6,110	504,750
Apparatus:								
Seines	111	14,805	56	21,050	176	71,449	343	107,304
Gill nets and trammel nets	2,373	158,376	2,235	319,705	3,729	183,555	8,337	661,636
Pound nets and trap nets			178	127,700	245	181,975	423	309,675
Bag nets and paranzella nets	139	5,380					139	5,380
Fyke nets	830	4,700					830	4,700
Reef nets					39	1,365	39	1,365
Minor nets and traps		3,898		1,255		470		5,623
Beam trawls	4	300					4	300
Wheels			33	92,800	25	71,800	58	164,600
Lines		18,192		8,397		22,583		49,132
Tongs, rakes, and hoes		558		150		2,861		3,569
Guns and spears		15,104		2,913		5,752		23,769
Shore property		659,830		803,048		473,620		1,936,498
Cash capital		454,800		993,500		678,500		2,126,800
Total		2,612,298		2,637,412		2,024,469		7,274,179

Products of the fisheries of the Pacific States in 1895.

Species.	California.		Oregon.		Washington.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Catfish	276,605	$3,965	99,399	$1,347			376,004	$5,312
Cod	2,783,550	83,506			484,250	$13,934	3,267,800	97,440
Cultus-cod	139,495	4,213	6,000	240	223,278	4,193	368,773	8,646
Flounders	3,308,334	69,995			106,850	1,502	3,415,184	71,497
Halibut			5,000	400	1,714,315	39,418	1,719,315	39,818
Herring	3,180,960	24,360			344,670	2,201	3,525,630	26,561
Rockfish	1,527,344	31,033	37,000	1,780	38,420	796	1,602,764	33,609
Salmon, blueback	192,000	4,800	565,913	18,315	7,292,588	166,818	8,050,501	189,933
Salmon, chinook	4,398,044	126,601	21,056,926	977,901	12,936,886	574,975	38,391,856	1,679,477
Salmon, dog			2,125,115	10,627	5,471,897	28,956	7,597,012	39,583
Salmon, humpback					2,269,766	15,326	2,269,766	15,326
Salmon, silver	164,413	4,403	9,457,355	142,143	12,361,721	141,460	21,983,489	288,006
Salmon, steelhead	461,225	18,449	3,220,324	80,825	4,971,385	135,040	8,652,934	234,314
Smelt	1,739,600	53,303	31,125	1,245	528,455	7,706	2,299,180	62,254
Striped bass	252,454	13,037					252,454	13,037
Sturgeon	299,729	8,393	956,239	23,767	1,883,543	47,934	3,139,511	80,094
Other fish	4,781,467	86,144	125,246	1,252	245,480	5,983	5,152,193	93,379
Oysters	14,727,240	539,497	88,800	2,220	6,484,035	109,232	21,300,075	650,949
Clams	1,582,959	15,457	280,700	2,475	1,405,000	8,550	3,268,659	26,482
Abalones	302,292	7,173					302,292	7,173
Other mollusks	520,590	5,531			23,650	208	544,240	5,739
Crabs	2,565,000	61,750	23,520	637	163,000	4,241	2,751,520	66,628
Spiny lobster	558,054	12,575					558,054	12,575
Crawfish			58,970	3,369			58,970	3,369
Shrimp and prawn	5,425,000	162,749			36,088	1,804	5,461,088	164,553
Terrapins, turtles, and frogs	144,566	21,606	4,000	400			148,566	22,006
Fur-seal, sea-lion, and sea-otter pelts		120,061		13,093		86,291		219,445
Whale oil	549,517	19,944					549,517	19,944
Other oil	4,500	180			104,250	4,865	108,750	5,045
Whalebone	98,517	287,227					98,517	287,227
Algæ	26,565	531					26,565	531
Total	50,010,020	1,786,483	38,141,632	1,282,036	59,089,527	1,401,433	147,241,179	4,469,952

Comparing the extent of the fishing industry in 1895 with that in 1892 (the year covered by the previous canvass), it appears that 3,260 more persons were engaged, $881,515 more capital invested, and $357,012 less products taken. Notwithstanding the decrease in the output, the canvass of 1895 showed a substantial gain in the fisheries for food products. In Washington and Oregon there was an increase of more than 1,900 persons engaged and over $400,000 in the value of the catch in each State, with a corresponding increase in capital. This gain was chiefly in the salmon fishery. The building of cold-storage plants has also largely increased the utilization of fresh salmon, of which extensive shipments have been made to Eastern States as well as to European countries.

In the varied fisheries of California there have been more marked changes. In some sections the food-fish fisheries show large gains, San Diego and Los Angeles counties especially having greatly increased their fishing business by building up a trade with the interior States of the Southwest. San Francisco continues to be the chief center for the reception and distribution of a vast amount of canned, dried, pickled, and fresh fish, besides the products of the whale and seal fleets. The decline in the yield of whales and seals has been marked, amounting to nearly $1,000,000 compared with 1892; the number of vessels engaged becomes less yearly; some vessels are lost, some are not put in commission, and there are no new additions to the fleet. This branch may be expected to still further decline.

The canning of salmon is the most important industry depending on the fisheries. In 1895 there were 47 establishments in operation. These employed over 33,300 persons, and represented an investment of more than $2,760,000. The fresh salmon utilized amounted to 64,648,000 pounds, for which $1,968,000 was paid. The canned goods comprised 955,000 cases, holding 48 one-pound cans or the equivalent, the market value of which was $4,224,000. The extent of this industry in each State is outlined in the following table:

Summary of the salmon-canning industry of the Pacific States in 1895.

States.	Persons employed.	No. of canneries.	Value.	Cash capital.	Total investment.	Salmon utilized.		Salmon canned.	
						Pounds.	Value.	Cases.	Value.
California....	198	4	$62,000	$64,000	$126,000	1,906,525	$52,091	29,035	$128,632
Oregon.....	1,960	26	719,225	942,500	1,661,725	35,299,241	1,184,029	525,839	2,456,698
Washington .	1,146	17	374,650	601,000	975,650	27,441,724	731,922	400,752	1,638,938
Total...	3,304	47	1,155,875	1,607,500	2,763,375	64,647,490	1,968,042	955,626	4,224,268

LOBSTER INQUIRIES ON THE PACIFIC COAST.

As noticed in the last report of the division, some special inquiries relative to eastern lobsters on the Pacific coast were begun by the writer in the latter part of the fiscal year 1895–96. The inquiries were especially addressed to the region of Monterey Bay, where the largest plants of adults, young, and eggs had been made in 1888.

The supposed capture of lobsters in this locality has from time to time been reported, but no specimens have ever been seen by persons competent to identify them. No apparatus adapted to the taking of the eastern lobster is used here or elsewhere on the western coast where lobsters have been planted, and the absence of results may represent simply a lack of knowledge.

There is a widespread belief on the Pacific coast, especially in California, that, through an oversight, the lobsters brought from the East were planted with their claws tied together, and that consequently all must have soon perished by starvation. This story, originally told as a joke at the expense of a member of the California Fish Commission, has by many come to be accepted as a fact. It is hardly necessary to say that there is absolutely no foundation for the rumor; the lobsters were not tied in any way whatever during transportation from the East, and they were deposited under the most favorable conditions.

While at San Pedro, Cal., in June, 1896, the writer secured 3 lobster traps that had been constructed by an eastern lobster fisherman some years before. These had been set for the spiny lobster, but had been discarded as being non-effective for that species. The traps were sent to Monterey for the purpose of setting them in that bay for eastern lobsters. After securing the services of a local boatman and fisherman, there was begun a series of trials for lobsters in various parts of the bay. Fresh rock-cod and flounders were used for bait and the lobster traps were rigged and set as on the New England coast. The experi-

ments were continued for seven days in June. During that time the traps were set once or twice daily in water from 18 to 125 feet deep, on rocky and sandy bottoms, at distances from the shore varying from 100 feet to 1½ miles. The ground covered was from one-half mile off Pacific Grove to the Hotel Del Monte wharf. The conditions seemed favorable for the existence of lobsters, the bottom consisting of rocky ledges, loose rocky patches, and hard sand, with giant kelp and other vegetation. Sometimes the traps were left down 24 hours; sometimes they were lifted in 7 to 12 hours. The results, so far as lobsters were concerned, were entirely negative. Sometimes the traps were empty, with bait unmolested; sometimes the bait would be taken, with no clew to the animal removing it; but generally the traps contained starfish, rock-crabs, and spider-crabs, often in large numbers. On one occasion a trap was completely filled by an octopus, which had insinuated its body between the slats and whose arms projected from the sides of the trap.

As much time was given to the experiment as could then be properly devoted to it, but the trials should be continued with more traps and in other parts of the bay before the absence of lobsters is conceded. No evidence of the presence or absence of lobsters in the region may be expected of the fishermen, as they set no apparatus in which a lobster is apt to be caught.

Several other reports of the capture of lobsters in Monterey Bay have been made to the writer. Mr. R. Duarte, a fish-dealer of Monterey, states that about January, 1896, while in the Chinese village near Monterey, he saw a large lobster that a Chinese fisherman had snagged on a trawl line. He engaged to take it for 25 cents, but during a short absence the Chinaman became suspicious that it was unlawful to sell it and made away with it. It weighed between 5 and 7 pounds, and Mr. Duarte is confident it was an eastern lobster. No spiny lobsters are caught here. Mr. James McMann, superintendent of a fish-cannery at San Pedro and formerly of Maine, states that in 1893 he saw a lobster at Monterey that he is confident was a genuine eastern lobster; it was 6 inches long.

Inquiries relative to the lobsters planted off the Oregon and Washington coasts elicited only negative information.

In July, 1896, the Canadian Fisheries Department had a consignment of eastern lobsters planted on the coast of British Columbia. The shipment was in charge of Mr. C. A. Stayner, inspector of lobster fisheries, and consisted of 600 adults and 2,000,000 eggs; some of the lobsters weighed 10 pounds. All but 196 died in transit; the survivors were deposited in deep water at Nanaimo, Vancouver Island, on the Strait of Georgia, the eggs being planted near Vancouver, on the mainland. Mr. Stayner reports that about September 1 a lobster was caught at Victoria and fully identified. Victoria is on Fuca Strait, on the southern side of Vancouver Island, and about 80 miles from Nanaimo. The opinion of the local government fishery inspector is that the lobster was a representative of plants made by this Commission in Puget Sound in 1889, but the matter can not be definitely decided.

STRIPED BASS IN CALIFORNIA.

In the summer of 1896 the writer made some special studies of the striped bass in the waters of California, supplemental to the inquiries carried on in 1894, an account of which has been published by the Commission.*

Distribution.—The striped bass continues to be most numerous in San Francisco Bay and its tributaries; it is also taken in small numbers in Monterey Bay, and regularly ascends the coast as far as Russian River, which stream it enters. A few have been taken as far south as Los Angeles County. Up to 1896 Russian River was the supposed northern limit of its range, but in February of that year two medium-sized bass were taken in the Gualala River, which divides Sonoma and Mendocino counties and is nearly 100 miles north of Russian River. From time to time in 1896 small shipments of striped bass reached the San Francisco market from Alviso, in Santa Clara County; these were taken in the sloughs which connect with the extreme southern end of San Francisco Bay, into which they are supposed to run for the purpose of spawning. This is the first year the species has been reported from this locality. Very few are caught at Sacramento, and none in salmon gill nets; the few obtained are taken in seines hauled on the bars for catfish. They are found from June to October. In weight they range from 4 to 10 pounds, no large fish being observed.

Abundance.—The abundance of this fish in the San Francisco Bay region is remarkable and shows no signs of diminution; in fact, the receipts in the markets have been steadily increasing from year to year, and 1896 showed a large gain over 1895. The increased catch is due entirely to increased abundance, and does not represent more active fishing operations or the employment of more apparatus; on the contrary, it is probable that less fishing is now done than formerly, when the good prices received for bass were an incentive that is now lacking.

In April, 1896, a deputy of the California Fish Commission seized a lot of nets that had a mesh below the size permitted by law. They had been set in Honker Bay, an arm of Suisun Bay, and consisted of 200 fathoms of 5-inch gill net and about 180 fathoms of trammel net, all belonging to one fisherman. The nets, when seized, had a large number of striped bass in them, weighing from 7½ to 25 pounds, and averaging 10 or 12 pounds. The deputy making the seizure reports that about 465 fish were taken out and given away, the total catch thus being not less than 5,000 pounds.

So abundant was the fish in the Sacramento-San Joaquin delta in the spring of 1896 that one salmon fisherman reported that "the spring run of salmon this year was all striped bass." In the fall of 1895, while fishing for salmon off Sherman Island, in the San Joaquin River, this fisherman had the following experience: He had set a large-

*A review of the history and results of the attempts to acclimatize fish and other water animals in the Pacific States. By Hugh M. Smith, M. D. Bull. U. S. F. C. 1895, pp. 379-472.

meshed salmon gill net near one of the breaks in the island, through which the water pours from a tule lake. No salmon had been caught, and he was taking the empty net into his boat (having stowed fully half of it), when suddenly the water was churned into foam near his boat and around his net by a school of striped bass that had evidently just come out of the tule lake. He realized that a large number of fish had struck his net and set about to secure them. One end of his net was close to shore, and he hailed some fishermen on the bank, who began to lift that end of the net, throwing the fish on land, while he emptied the other end into his boat. The catch consisted of 700 fish of nearly uniform size, and averaged 30 pounds each. This fisherman states that if his whole net had been out he would probably have lost all or part of it from the weight of the fish. This catch of 21,000 pounds was sold at less than 5 cents a pound, in San Francisco.

Grounds, movements, spawning, etc.—Evidence is accumulating to show that the striped bass remain in the tule lands for long periods, or, at least, do not move to and from salt water, as they do on the Atlantic coast. Schools are often found in the delta, and large catches are made without any fish having been caught below, and the fishermen think the fish have suddenly emerged from some tule lake. The opinion is entertained that the striped bass often become landlocked in the tule lakes, to be liberated by some freshet or high tide, thus explaining their sudden occurrence in a certain place when nets above and below have taken none. Above the Strait of Karquines the fish are usually of uniform size in the different schools, while in the straits they are apt to vary. Large catches are often made at the outlets of the tule lakes.

With few exceptions, the food of the striped bass in the fresh waters consists of carp.

Additional information has been obtained indicating a protracted spawning period for the fish on the California coast. On June 4, 1896, a 15-pound striped bass, examined by the writer in the San Francisco market, was found to be a nearly spent male from which ripe milt was running. On July 3 both male and female ripe fish (sent from Benicia) were observed in the San Francisco market. In October, 1895, a San Joaquin River fisherman, while taking a bass from a salmon net, observed a large quantity of ripe eggs to fall into the bottom of his boat.

The present abundance and rate of increase of striped bass in California render almost unnecessary at this time the consideration of the question of their artificial propagation. It can not be said that those now taken form a large part of the run. Few persons fish especially for them, the largest part of the catch being taken incidentally in salmon nets. When the conditions change, as they probably will in time, the artificial propagation of striped bass in California may become desirable.

Striped bass trade of San Francisco.—Practically the entire catch of striped bass is consigned to the San Francisco dealers, whose receipts afford an accurate basis for determining the catch. Their receipts during recent years have increased almost 100 per cent annually, and in 1896 amounted to about 364,000 pounds.

The following table shows the number of pounds of striped bass handled in San Francisco in 1893, 1894, 1895, and 1896:

Statement by months of the pounds of striped bass handled by San Francisco dealers in 1893, 1894, 1895, and 1896.

Months.	1893.	1894.	1895.	1896.
January	3,448	14,177	28,328	27,179
February	3,087	12,572	15,611	36,107
March	5,403	9,002	11,281	38,340
April	8,351	9,638	22,000	41,740
May	7,232	9,413	12,639	45,903
June	4,353	4,820	11,532	15,047
July	2,950	7,521	13,782	13,531
August	2,655	6,863	12,419	15,574
September	8,507	10,218	21,063	24,214
October	6,820	23,192	28,724	40,704
November	10,473	17,950	50,245	40,089
December	17,514	24,631	24,553	25,319
Total	80,793	149,997	252,177	363,747

Receipts in 1890, 5,000 pounds; in 1891, 25,000 pounds; in 1892, 50,000 pounds (estimated).

The prices received by the fishermen did not average more than 5 cents per pound in 1896, and at times were much lower. In April, for instance, only 3 cents a pound could be obtained.

SHAD ON THE PACIFIC COAST.

Distribution, abundance, etc.—Inquiries by the writer in 1896 disclosed the fact that the shad is becoming more evenly distributed along the Pacific coast of the United States, although the San Francisco Bay region and the Columbia River are still the centers of greatest abundance. The fish seems to range regularly as far south as Los Angeles County, Cal., and as far north as Stikine River, in southeast Alaska. Following are a few special notes regarding the shad's distribution and abundance supplemental to the information given in the report* based on an examination of this subject in 1894:

In April, 1895, a 5-pound shad was caught in a seine in San Pedro Bay, Los Angeles County, Cal., and three or four others were taken during the same year at San Pedro. In Monterey Bay this fish is found from August to December. It is taken chiefly in gill nets having a 3 to 4 inch mesh set for perch and horse-mackerel (*Trachurus*). Shad are very abundant in the bay and are increasing yearly. In that part of the bay adjacent to Santa Cruz and Capitola they are more numerous than at Monterey. There are some small fresh-water streams near Santa Cruz which may attract them. It is reported that a good many 7 to 9 pound fish are taken in that section, while the average for the bay is only 5 pounds.

In the vicinity of Sacramento, shad are taken mostly in April and May, although some are caught in June and a few throughout the summer and fall months. The heaviest run is in May, which is the

* Bull. U. S. F. C. 1895, pp. 379–472.

spawning time; after that the fish are of poor quality. The largest shad taken in this vicinity weighed 8 pounds, and 5 to 7 pound fish are not rare. The fish-dealers of Sacramento obtain all the shad they can handle from salmon fishermen, in whose nets the shad are snagged by being caught by their maxillary bone, the mesh of the nets being too large for the shad to gill. Shad now ascend the Sacramento as far as Chico, about 120 miles above Sacramento. They were caught there in large numbers in dip nets in June, 1896, and it is probable that they have pushed their way for a considerable distance beyond Chico.

In the Columbia River the shad is extremely abundant, and was perhaps more numerous in 1896 than in any previous year. Its movements in this river conform with those on the Atlantic coast; that is, there is a definite run into the river for spawning purposes. The fish are in greatest numbers in May and the first half of June. In the region of the Cascades but few are caught in July, and none in August. Here, in the season of 1896, the fish was more abundant and larger than ever before.

Shad are taken in salmon wheels in the vicinity of the Cascades. In May, 1896, 200 were caught in one wheel in a single day. The largest ever seen here weighed 7 or 8 pounds, the usual weight being from 4 to 6 pounds.

Near the mouth of the river shad are taken in salmon traps from early spring to the end of the fishing season, probably more being caught in June than in any other month. Examples weighing as much as 7 pounds are not infrequently taken, although the average in trap nets is only about 4 pounds. Usually only 3 or 4 are taken at each lift of the net, but sometimes 30 or more are obtained. A great many shad too small to mesh are seen in the traps. In May, 1896, 7 of the largest brought in by the Ilwaco trap fishermen on one day ranged in weight from 7½ to 11 pounds. The 11-pound shad was the largest ever observed on the Columbia of which any record may be had.

In a salmon seine at Wallace Island, Columbia River, in May, 1896, from one to two thousand shad were sometimes caught daily in six or eight hauls, and in another seine operated 15 miles below Mapledell, Oreg., 15,637 pounds were caught and marketed in the same month. In 1895, between April 25 and July 13, a salmon seine at Quinn, Oreg., took 25,791 pounds of shad, that were shipped to Portland, and in the following year, between April 13 and June 17, the same seine took 22,792 pounds.

The monthly catch was as follows:

Months.	1895.	1896.
April	1,304	2,639
May	14,070	15,335
June	9,307	4,818
July	1,110	.....
Total	25,791	22,792

Shad are numerous in most of the rivers and bays on the coast of Washington. Many have been taken in Chehalis River, in tributaries of Willapa Bay, and in Grays Harbor. Mr. A. B. Alexander reports that shad have made their appearance in considerable numbers in the vicinity of Point Roberts. At almost every lift of the salmon traps during the summer of 1896 from 30 to 40 shad were taken. One trap lifted in Mr. Alexander's presence in July contained 55; their average size was about 3½ pounds, but several weighed fully 5 pounds apiece. There is little or no demand for them, and those caught are returned to the water. At the present rate of increase it will be only a short time when the waters of Puget Sound will teem with this fish.

In July, 1887, Capt. D. Markham, of Ilwaco, Wash., while experimenting with salmon traps just below the mouth of the Stikine River, Alaska, caught a dozen shad.

Commercial value of shad.—The prices received for shad by the California fishermen in 1895 and 1896 rarely reached 5 cents a pound, and were usually much lower. In April, 1896, many hundred pounds consigned to the San Francisco market brought only $\frac{a}{10}$ cent or 1 cent a pound, and even these prices were maintained only by restricting the catch. In Monterey Bay about 75 per cent of the catch goes to San Francisco. The fish sold locally bring the fishermen 3 to 6 cents a pound, but sometimes the prices fall very low, and a box of 100 or 125 pounds of shad will often yield only $1. At Sacramento there is little sale for shad. They bring the fishermen only 2 to 2½ cents a pound at the height of the season, and retail for 4 or 5 cents a pound.

The quantity of shad handled by the San Francisco dealers in 1894 was much less than in 1893. The receipts in 1895 were but little more than half those in 1894, but 1896 showed a large gain over both 1894 and 1895. Mr. John P. Babcock, the chief deputy of the California Fish Commission, thinks that the decline noted between 1893 and 1895 was more apparent than real, owing to the fact that in recent years the practice has been growing among dealers of buying directly from the fishermen at the city wharves, of which receipts no full account is kept.

The following statement, taken from the books of the San Francisco dealers who purchased directly from the fishermen, shows by months the quantities of shad handled in 1893, 1894, 1895, and 1896:

Months.	1893.	1894.	1895.	1896.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
January	6,588	41,266	369	4,800
February	19,185	11,767	2,106	6,000
March	19,546	17,747	14,257	14,353
April	32,389	39,115	23,960	65,625
May	80,557	57,823	36,729	95,392
June	36,184	22,027	25,787	38,020
July	3,319	7,941	3,213	18,151
August	2,796	2,020	805	3,527
September	698	475	3,317	9,264
October	53,652	24,229	5,788	5,383
November	96,340	38,110	23,534	24,926
December	77,882	8,278	0,534	20,404
Total	429,136	270,807	146,369	306,245

In the Columbia River shad will bring the fishermen 3 or 4 cents a pound early in the season, but in the middle of the season the price drops to 1 cent, and even at that price the demand is limited. The absence of a good market necessitates the throwing away of far the larger part of the catch. The fishermen save a few for home consumption and for the use of their neighbors. The shad is regarded as a good fish and is much liked, but it can not compete with salmon as a marketable species.

A few shad have been canned on the Columbia River for experimental purposes and home consumption. Mr. M. J. Kinney, of Astoria, in 1895 canned shad for winter use on his own table. He states that they were very good, but of course lacked the color and oil which add to the value of the canned salmon.