

XII.—REPORT OF OPERATIONS AT THE MICHIGAN STATIONS OF THE U. S. FISH COMMISSION FOR THE YEAR 1886-'87.

BY FRANK N. CLARK.

During the summer of 1886 the whitefish hatchery at Alpena was closed, as usual. At Northville the small force employed at this season was engaged chiefly in work that is current the year round—the care of ponds and stock fish, &c.—devoting such time as could be spared from this work to preparing for the operations of the ensuing season. The hatching boxes, trays, tanks, &c., were repaired or renewed, and coated with asphaltic varnish. It was necessary also to refill with flannel trays the transportation cases that had been emptied by the egg shipments of the previous winter and spring.

The following table summarizes the receipts and shipments of eggs and fish at both the stations in Michigan:

Summary of eggs and fish handled at the Michigan stations in the year 1886-'87.

Kind of fish.	Eggs received.	Eggs shipped.	Fish shipped.	Fish retained at station.
Brook trout	1186, 750	£2, 000	527	4, 000
Rainbow trout	*108, 850	50, 000	*4, 920	25, 000
Lake trout .....	.....	.....	0, 150	.....
Brown trout	*29, 400	7, 500	.....	10, 000
Satbling	*15, 000	.....	.....	15, 000
Whitefish	*120, 400, 000	32, 000, 000	62, 070, 000	.....
Total	129, 830, 000	32, 730, 500	62, 081, 597	54, 000

¹ From ponds at Northville Station.
² 198,350 from ponds at Northville, and 2,500 from Baird station.
³ Of this number 300 were shipped as fry to J. F. Miller, Richmond, Ind., the remainder being yearlings or two-year-olds.
⁴ 20,000 from Fred Mather, and 9,400 from ponds at Northville.
⁵ From Fred Mather.
⁶ From Lakes Erie, Huron, and Michigan.

WHITEFISH.

The funds available for the collection of whitefish eggs being less than in either of the two preceding years, the field-work was confined to fewer points. Operations in Lake Erie were confined to the fisheries of North Bass, Middle Bass, and Put-in-Bay Islands, and the penning of fish in Put-in-Bay; in Lake Huron to the fisheries along the west shore from Alpena to Oscoda, and at Detour and vicinity on the north shore;

and in Lake Michigan to the north shore fisheries at Thompson. The points that had heretofore furnished more or less eggs, but which were not included in last fall's programme, are Monroe, Toussaint, and Catawba Island, Lake Erie; Hammond's Bay, and some unimportant fisheries of Thunder Bay, Lake Huron; and Epoufette and Naubiquay, north shore of Lake Michigan. Penning operations were transferred from Monroe to Put-in-Bay. The only new territory worked was at Detour and vicinity, on the north shore of Lake Huron.

Whitefish commenced spawning at the Lake Erie islands on November 7. The first eggs were taken on that date from the pound-net fisheries at North Bass, while the last eggs were taken from penned fish on December 2. The pound and gill net fisheries of Lake Erie furnished 39,600,000 eggs, and the penned fish 4,000,000, all of which were received at Northville in good condition. The weather as a whole was quite unfavorable, a series of heavy blows occurring during the best of the spawning season. On December 2, Put-in-Bay was entirely frozen over, while outside large fields of ice bore down from the westward and damaged or destroyed quite a large amount of twine, nearly one-third of which was still in the lake.

The collection of spawn from the pound-net fisheries along the west shore of Lake Huron, below Alpena, occurred between November 4 and 25, and these shore fisheries furnished 38,000,000 eggs, which were forwarded to Alpena. At Detour the spawning commenced November 6, and 16,800,000 eggs were taken here and sent to Alpena. The gill-net tugs fishing out of Alpena furnished only 2,000,000 eggs, the first of which were taken November 22. The total number of eggs placed in the Alpena house was 56,800,000.

The spawning season at Thompson, north shore of Lake Michigan, occurs nearly one month later than elsewhere. The run is quite heavy, and usually begins from December 1 to 5 and ends December 15 to 20. The grounds are several miles out, and steam-tugs and gill-nets are employed. From December 5 to 13, Mr. Tulian, with a force of four men, secured 29,000,000 eggs from the tugs fishing out of Thompson and Manistique. The weather was very severe, the temperature frequently being at or below zero; and it was therefore impossible to effect a high percentage of impregnation, and nearly one-half of these eggs were afterwards drawn from the hatching-jars and thrown away. Mr. Tulian brought the eggs to Northville in one lot of ten large cases, by steamer from Manistique to Escanaba, thence by rail to Milwaukee, thence by steamer to Ludington, thence by rail to Northville, arriving at night on December 16. The eggs were transferred to hatching-jars the following morning, filling one hundred and forty-five jars. The total receipts of whitefish eggs at Northville, direct from the spawning grounds, were 72,600,000. The total collection of whitefish eggs at both stations was 129,400,000. On January 29, 21,000,000 were transferred from Alpena to Northville, by car No. 2, in charge of George H. H. Moore.

The whitefish eggs were carried forward in hatching jars, as usual, and no special features attended their development. On November 28 about 30,000 eggs were taken from two whitefish from the pond of three-year-olds raised at the Northville Station, and a fair percentage of impregnation was obtained. The incident is worthy of record only from the fact that it is doubtless the first and only instance of the taking of eggs from whitefish hatched and reared wholly by artificial treatment.

Shipments of whitefish eggs from Northville Station, season of 1886-'87.

Date.	Destination.	Number.
1886.		
Dec. 1	Delivered to car No. 3, Wilmington, Del.....	100,000
29	Dr. E. G. Shortlidge, Wilmington, Del.....	1,000,000
1887.		
Jan. 3	William Buller, Erie, Pa.....	5,000,000
5	Charles R. Buckland, San Francisco, Cal., for New Zealand.....	1,500,000
12	William Buller, Erie, Pa.....	5,000,000
15	E. G. Blackford, New York, for London, England.....	1,500,000
17	Fred Mather, Cold Spring Harbor, N. Y.....	1,000,000
10	Central Station, Washington, D. C.....	2,500,000
22	E. G. Blackford, New York, for Germany.....	1,000,000
26	Dr. R. O. Sweeney, Saint Paul, Minn.....	5,000,000
Feb. 3	Central Station, Washington, D. C.....	2,500,000
9	Dr. R. O. Sweeney, Saint Paul, Minn.....	5,000,000
19	E. G. Blackford, New York City, for London, England.....	1,000,000
22	Dr. E. G. Shortlidge, Wilmington, Del.....	500,000
	Total.....	32,600,000

Whitefish eggs began hatching at Northville on March 11, and the last eggs were hatched on April 12. At Alpena the hatching season commenced April 22 and closed May 8. The distribution from Northville was successfully made by car No. 2, in charge of George H. H. Moore; from Alpena, by steam-tugs and the regular lines of steamers. The tables of distribution of whitefish fry during the spring of 1887 are as follows:

FROM NORTHVILLE STATION.

Date.	Lake.	Place near which deposited.	Number of fry planted.
1887.			
Mar. 25	Lake Michigan.....	Ludington, Mich.....	3,000,000
27	Lake Huron.....	Bay City, Mich.....	3,000,000
31	Lake Michigan.....	Grand Haven, Mich.....	3,000,000
Apr. 2	do.....	Ludington, Mich.....	3,000,000
5	Lake Erie.....	Monroe, Mich.....	3,000,000
6	Lake Michigan.....	Michigan City, Ind.....	3,000,000
9	Lake Ontario.....	Oswego, N. Y.....	3,000,000
12	Lake Erie.....	North Bass Island, Ohio.....	3,000,000
13	do.....	Monroe, Mich.....	3,000,000
18	do.....	Sandusky, Ohio.....	3,000,000
20	Lake Michigan.....	Saint Joseph, Mich.....	3,000,000
	Total.....		33,000,000

FROM ALPENA STATION.

Date.	Lake.	Place near which deposited.	Number of fry planted.
1887.			
Apr. 30	Thunder Bay, Lake Huron	Whitefish Point, Mich	3,000,000
May 2	do	Sulphur Island, Mich	3,000,000
3	Lake Huron	Alcona, Mich	3,000,000
4	do	do	3,000,000
6	Thunder Bay, Lake Huron	North Point, Mich	3,000,000
7	Lake Huron	Oscoda, Mich	3,000,000
8	do	do	3,000,000
11	do	Detour, Mich	2,000,000
16	Lake Michigan	Thompson, Mich	2,000,000
17	Thunder Bay, Lake Huron	North Point, Mich	1,000,000
18	do	Whitefish Point, Mich	1,000,000
19	Lake Huron	Sand Beach, Mich.	2,000,000
20	Long Lake	Alpena County, Mich.	20,000
24	Clear Lake	Oscoda County, Mich	50,000
	Total		29,070,000

Summary of whitefish fry distributed in the Great Lakes, spring of 1887.

Lake Huron	30,000,000
Lake Michigan	17,000,000
Lake Erie	12,000,000
Lake Ontario	3,000,000
Clear Lake	50,000
Long Lake	20,000
Total	62,070,000

Summary by States.

Michigan	50,070,000
Ohio	6,000,000
Indiana	3,000,000
New York	3,000,000

BROOK TROUT.

The spawning season of brook trout in the Northville ponds began October 14 and closed December 31, 1886. In all, 186,750 eggs were taken, from which 82,000 were shipped and 4,000 fry hatched and retained at the station.

The record of the number of eggs taken from females of different ages, and the table of shipments of brook-trout eggs, are as follows:

ONE YEAR OLD.

Date.	Females.	Eggs.	Date.	Females.	Eggs.
1886.			1886.		
October 19	1	200	November 12	11	2,000
October 21	2	350	November 14	1	1,200
October 24	2	500	November 15	6	1,000
October 25	1	200	November 17	10	2,000
October 28	2	800	November 19	25	4,200
October 30	6	2,100	November 20	14	2,800
November 1	3	1,000	November 22	18	3,800
November 2	1	400	November 23	5	1,000
November 3	3	1,000	November 24	19	4,600
November 6	12	2,400	November 27	15	2,600
November 7	2	400	November 30	10	1,800
November 8	3	600	December 3	3	400
November 9	9	2,000	December 7	17	3,000
November 10	8	1,600			
November 11	4	700	Total	213	47,250

TWO YEARS OLD.

Date.	Females.	Eggs.	Date.	Females.	Eggs.
1886.			1886.		
October 14	1	600	November 15	9	3,200
October 18	1	400	November 16	7	2,800
October 22	1	400	November 17	18	5,800
October 23	4	2,000	November 18	7	1,600
October 25	6	3,600	November 20	19	9,200
October 26	2	800	November 21	3	1,800
October 27	7	3,400	November 22	11	4,400
October 28	8	3,800	November 23	5	2,200
October 29	5	2,600	November 24	5	1,800
October 30	4	1,600	November 25	15	4,800
October 31	6	2,400	November 27	5	2,800
November 1	5	3,400	November 28	1	400
November 2	15	6,200	November 30	7	2,300
November 3	6	2,300	December 3	7	2,800
November 4	7	3,100	December 9	8	2,800
November 5	3	1,000	December 11	6	1,400
November 6	10	4,000	December 13	3	2,000
November 7	5	2,400	December 14	2	600
November 8	2	900	December 18	6	1,800
November 9	8	2,800	December 21	3	1,000
November 10	8	3,200	December 31	6	3,200
November 11	9	4,200			
November 12	21	7,400	Total	301	124,200
November 13	4	1,600			

THREE YEARS OLD.

October 14	1	1,000	November 24	1	400
October 24	1	1,200	November 25	3	2,800
October 25	1	800	November 26	1	1,200
October 31	1	800	November 27	1	1,000
November 1	8	5,500			
November 14	1	600	Total	19	13,300

Shipments of brook-trout eggs during the season of 1886-'87.

Date.	Destination.	No. of eggs.
1886.		
Dec. 28	Wytheville station, Wytheville, Va.	30,000
29	Dr. E. G. Shortlidge, Wilmington, Del.	10,000
29	E. H. Frisbuth, Jr., Philadelphia, Pa.	5,000
1887.		
Jan. 10	Dr. R. O. Sweeney, Saint Paul, Minn.	15,000
15	E. G. Blackford, New York city, for London, England	10,000
25	Central Station, Washington, D. C.	5,000
Feb. 9	Dr. R. O. Sweeney, Saint Paul, Minn.	7,000
	Total	82,000

RAINBOW TROUT.

The spawning of rainbow trout occurred from January 6 to April 25. The total number of eggs taken was 196,350; total results, 50,000 eggs shipped, and 25,000 fry hatched. Of the latter, 300 were shipped to J. F. Miller, Richmond, Ind., and the remainder were retained at the station.

About one-half the eggs were carried forward in hatching boxes as usual, and the remainder on gravel. The loss on the eggs in trays ranged from 80 to 95 per cent., while with those on gravel the loss in

no instance was more than 50 per cent., and in some cases only 5 per cent., the average being about 30 per cent. A number of experiments were made in carrying forward eggs of the same taking by two systems, and the results in every instance were greatly in favor of the gravel treatment. Arrangements for handling a good portion of this fall's crop of brook-trout eggs on gravel will be provided, and further comparative experiments of the two systems made.

A case of 20,000 rainbow-trout eggs arrived March 19 from Baird station, Cal., in a very poor condition. They had evidently been exposed to a high temperature in transit, as the ice was all gone and the eggs mostly hatched. About 2,500 eggs were picked out and placed in hatching boxes, where they soon hatched. The fry seemed feeble, and a large percentage of them died within a few weeks.

Shipments of rainbow-trout eggs were made as follows: March 21, 25,000 to the Michigan Fish Commission, Paris, Mich.; and April 6, 25,000 to Eugene G. Blackford, New York city, for shipment to France.

The spawning record for the rainbow trout during the season is as follows:

Date.	Females.	Eggs.	Date.	Females.	Eggs.
1887.			1887.		
January 6	3	2,400	March 5	4	1,800
January 7	1	600	March 6	4	2,500
January 9	1	600	March 7	8	4,800
January 12	1	1,000	March 8	10	5,250
January 13	1	1,000	March 9	4	3,000
January 15	1	1,200	March 10	7	3,900
January 16	1	1,500	March 11	8	4,300
January 17	1	1,200	March 12	13	7,000
January 19	2	2,400	March 13	11	5,100
January 21	1	1,300	March 14	2	1,200
January 22	3	2,300	March 15	4	2,100
January 23	4	2,700	March 16	10	3,000
January 24	1	600	March 17	2	1,050
January 25	1	400	March 18	1	450
January 28	1	1,600	March 19	6	1,000
January 29	1	400	March 20	25	10,900
January 30	3	1,800	March 21	18	6,700
February 1	2	1,200	March 22	5	2,950
February 3	5	3,600	March 24	6	1,300
February 4	1	550	March 25	2	700
February 5	1	700	March 26	6	2,500
February 6	1	900	March 27	2	1,000
February 7	1	600	March 28	2	2,500
February 9	1	600	March 29	2	750
February 11	1	150	March 30	2	550
February 12	1	900	March 31	11	3,950
February 13	4	2,800	April 1	12	5,400
February 14	6	3,550	April 2	6	3,400
February 15	9	6,800	April 3	6	3,600
February 16	9	5,800	April 4	4	2,400
February 17	3	2,400	April 5	4	1,700
February 18	6	3,000	April 7	2	700
February 19	1	700	April 8	5	1,800
February 20	1	500	April 9	2	600
February 21	4	2,000	April 10	3	1,000
February 22	4	2,900	April 11	4	1,400
February 23	5	3,000	April 12	1	300
February 24	11	6,900	April 13	3	1,200
February 26	3	1,600	April 14	3	1,000
February 27	2	900	April 15	6	2,200
February 28	1	600	April 21	3	1,500
March 1	2	1,800	April 22	1	200
March 2	4	3,000	April 25	1	150
March 3	5	3,300			
March 4	7	3,000			
			Total	375	190,350

BROWN TROUT AND SAIBLING.

A case containing 20,000 brown-trout eggs and 15,000 saibling eggs, shipped from Cold Spring Harbor, N. Y., by Fred Mather, arrived at Northville on March 17 in first-class condition. The saibling hatched soon after, but the fry refused to eat, and most of them died of "blue sac" and starvation. Shipments of brown-trout eggs were made as follows: March 21, 2,500 to Michigan fish commission, Paris, Mich.; and March 28, 5,000 to Wisconsin fish commission, Madison, Wis. There was considerable loss before hatching, but nearly 9,000 fry were hatched and retained at station.

Between November 18 and December 21 a total of 9,400 eggs of brown trout were taken from stock fish in the Northville ponds, but they turned out quite poorly, and only 1,500 fry were hatched. The spawning record is as follows:

Record of brown-trout spawning, season of 1886.

Date.	Females.	Eggs.	Date.	Females.	Eggs.
1886.			1886.		
Nov. 18	6	1,200	Dec. 13	11	5,000
22	1	250	14	5	1,000
23	1	350	18	2	400
25	1	300	21	1	100
26	1	200	Total ..	29	9,400

LAKE TROUT.

No lake-trout eggs were taken, owing to a lack of funds available for the purpose. This is greatly to be regretted, as no fish of equal rank is more easily propagated, and, if held in confinement until of suitable size and age, it is remarkably adapted for diffusion to a large range of waters into which the whitefish, brook trout, rainbow trout, and other high-grade varieties cannot be established. As compared with other trouts, the cost of obtaining the eggs is greatly in favor of lake trout, as is also the percentage of young that can be reared in confinement until of suitable size and age for distribution. During the fiscal year a total of 6,150 of the lake trout, hatched in January and February, 1886, were delivered to cars No. 2 and No. 3, and distributed chiefly in Ohio, Indiana, Kentucky, and Tennessee.

During the fiscal year a total of 11,297 trout, ranging from eight months to two years old—6,150 lake trout, 4,620 rainbow trout, and 527 brook trout—were distributed, as is shown by the following table:

Distribution of trout from December 1, 1886, to March 3, 1887.

Date.	Kind of fish.	Age of fish.	Car used.	Number of fish.
Dec. 1	Rainbow trout.....	8 months.....	No. 3.....	850
	Brook trout.....	2 years.....	No. 3.....	252
	Lake trout.....	9 months.....	No. 3.....	1,300
Jan. 18	Rainbow trout.....	2 years.....	No. 2.....	1,560
	Lake trout.....	1 year.....	No. 2.....	300
	.....do.....	2 years.....	No. 2.....	640
	.....do.....	1 year.....	No. 2.....	600
	Lake trout.....	1 year.....	No. 2.....	300
	.....do.....	1 and 2 years.....	No. 2.....	250
Feb. 1	Rainbow trout.....	1 year.....	No. 2.....	460
	Lake trout.....	1 year.....	No. 2.....	1,300
	.....do.....	2 years.....	No. 2.....	100
Mar. 2	Rainbow trout.....	1 year.....	No. 2.....	1,350
	Lake trout.....	1 year.....	No. 2.....	1,300
	.....do.....	1 year.....	No. 2.....	1,300
Mar. 2	Rainbow trout.....	1 and 2 years.....	No. 2.....	100
	Lake trout.....	1 year.....	No. 2.....	300
	Brook trout.....	1 year.....	(*).....	25
Total.....				11,297

* Delivered to Frank Elwell, Owosso, Mich.

NORTHVILLE, MICH., August 16, 1887