VII.—REPORT OF OPERATIONS AT THE NORTHVILLE AND ALPENA STATION DURING THE SEASON OF 1884–'85.

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The following report of work at the Michigan stations for the season of 1884–'85 is respectfully submitted.

Table A combines the results of both stations in collecting and distributing eggs and young fish during the year. The supply of eggs was derived from the following sources: Brook and rainbow trout from the breeding stock at Northville ponds; lake trout from the fisheries adjacent to Alpena, Lake Huron; Loch Leven trout from a foreign shipment, through the hands of Fred Mather; grayling from the Manistee and Au Sable Rivers, Northern Michigan; and whitefish from the fisheries of Lake Erie, Lake Huron, and the north shore of Lake Michigan.

TABLE A.—*Summary of eggs and fish handled at the Michigan stations*, 1884–'85.

	Eggs received.	Eggs shipped.	Fish hatched.	Fish shipped.	Fish retained at hatchery.
Brook trout	320, 850	170, 000	20, 000	16, 000	4, 000
Rainbow trout	111, 100	47, 500	12, 000	12, 000	.....
Lake trout	465, 000	345, 000	65, 000	65, 000	.....
Loch Leven trout	100, 000	55, 000	43, 500	36, 500	7, 000
Grayling	20, 000	5, 000	12, 000	.....	12, 000
Whitefish	155, 000, 000	31, 000, 000	88, 000, 000	88, 000, 000	.....

The work of the Michigan stations during the past year was essentially similar to that of the preceding one, the chief points of difference being in extent and not in character or methods. The propagation of whitefish was the principal feature of the season's operations, and the field work for this service was largely extended. About 103,000,000 whitefish eggs were laid in at Northville from the fisheries of Lake Erie, including the penning station at Monroe; and 52,000,000 at Alpena from the Lakes Huron and Michigan fisheries. A considerable force of men was required during the spawning season, and they were stationed as follows: Lake Erie—at North Bass, Put-in-Bay, and Catawba Islands, and at Toussaint Creek and Monroe, on the main shore; Lake Huron—at Alcona, Alpena, Round Island, Scarecrow Island,

Presque Isle, Sturgeon Point, Hammond's Bay, Nine-Mile Point, Miller's Point, and Sugar Island; and at Naubinway and Epoufette, north shore of Lake Michigan. The field work of Lake Erie was under the immediate charge of Mr. S. Bower, and of Lake Huron and Michigan, under Mr. S. P. Wires. The weather was very favorable during most of the time of the spawning catch on Lake Erie, but on Lake Huron the work was interrupted November 6th by a heavy northeaster, which destroyed or badly damaged most of the nets set on the west shore, and drove the fish off the shoals. The twine was repaired and replaced to some extent, but the fishing was light, the schools having dispersed or retired to deeper waters. This storm was scarcely felt on Lake Erie. After the storm the supply of eggs for the Alpena house was derived mostly from the fisheries of northern Lake Michigan and from the gill-net fishing on the reefs near Thunder Bay.

The summer and fall catch of whitefish in Lake Erie was much larger than for several seasons. The increase was due to some extent to the favorable weather in the fall, but more to the work of propagation carried on by the United States and State Commissioners, the benefits of which are more apparent here than elsewhere on account of the heavier plantings this lake has received. A large number of Lake Erie fishermen, some of whom were before skeptical regarding the value of propagation, have given testimonials relative to the increased supply of whitefish and expressing their conviction that the increase is simply the legitimate result of the plantings. There is a decided improvement in sentiment in the fishing circles of Lake Erie regarding the practical value of the Commission's work.

The increase in field work made a demand for increased facilities at the Northville station, where the operations of the preceding year were equal to the full capacity of the hatching room and the supply of spring water available for incubating purposes. To meet the demand for more room the equipments of the hatchery were rearranged so as to accommodate more hatching jars, and a number of tanks were constructed and placed in the basement of a creamery building about 10 rods distant from the hatchery. Between the two was placed an elevated reservoir constructed like those in use at railway stations, holding about 160 barrels. This tank was filled with pure water from a small stream about 20 rods distant by means of two steam pumps placed in the boiler-room of the creamery. Suitable pipes conveyed the water from the tank to both hatcheries, the elevated position of the tank giving sufficient pressure to force it to the highest points in both buildings. Two hundred jars of whitefish eggs were placed in the creamery, and carried through to March, when they were transferred to the hatchery after the losses and shipments had made room for them.

The winter being an extremely severe one, the temperature of the creek water seldom rose more than 2 or 3 degrees above the freezing point; consequently the hatching period was from 4 to 6 weeks later than

usual. Heretofore the distribution of whitefish has begun about February 15 to 25; this year the first lot was sent out April 1.

The penning of whitefish (confining them in crates until ripe) was successfully carried on in the Raisin River, near Monroe, Mich., a place well adapted to the purpose. This stream empties into Lake Erie about 2 miles below Monroe, and is navigable for large vessels for about 1½ miles from its mouth. Numerous pound-nets are set along the coast of the lake above and below the mouth of the river. Hundreds of acres of marsh flank the river on either side nearly to the head of navigation. Several years ago, before the decay of vessel interests at this point, the Government dredged the river to the present head of navigation, and constructed rows of piles or piers on either side a good portion of this distance, to prevent the channel from filling up. The crates of fish were placed alongside of one of these piers, about 80 rods from the lake, in 6 to 8 feet of water. The men in charge were quartered on board a scow, which was fitted up for the purpose and tied to the pier, near the crates. The latter were 6½ by 16 feet in size, and 4½ feet deep, each capable of holding from 400 to 500 fish. The fish were conveyed from the nets to the crates in a "live car," 16 feet long by 3½ feet wide at the bow, 8 feet at the stern, and 4 feet deep. This car was towed by a tugboat sometimes at the rate of 6 miles an hour, and always with perfect safety to its finny passengers. To test the ability of the fish to stand a little crowding, 599 were on one occasion counted into the car from the nets, and then towed in at the usual rate of speed—about 5 miles an hour. On arriving at the pier they were all in excellent condition.

In all, 1,629 fish were placed in the crates, as follows:

October 29	37	November 8	599
October 31	80	November 11	119
November 2	253	November 12	21
November 3	185	November 16	17
November 6	318		

The penned fish were handled with no loss worthy of mention, although it was found necessary to turn over to their owners, Messrs. Dewey & Co., all that were on hand November 25, in order to prevent very serious losses. On November 22 a heavy storm set in from the westward, lasting three days, which blew the water of the lake away from the west shore until the river became so shallow that the men in charge of the crates had to push them into the middle of the channel, and even there they occasionally touched bottom. The river water soon became very muddy and foul, and it was seen that the fish could not stand it long. An attempt was then made to tow the crates out into the lake, where the fish could be kept in good condition until the lake had set back in the channel; but the water was so low that even the tugboats could not get in or out. The fish were then taken in rowboats and delivered at Dewey's fish-house. Such an occurrence has no

parallel in the experience of the oldest fishermen, and as a recurrence is not at all probable we shall continue to use the same place for penning.

Up to the time of the storm the fish were in excellent condition. One hundred and sixty spawners had been stripped, and between five and six million eggs obtained and shipped to Northville, where they were received in good condition. The first eggs from penned fish were taken November 13, and the greatest number from this source in one day was 750,000. The temperature of the water where the crates were placed ranged from 46° on October 2d to 36° on November 25th.

The crate plan was tried on Lake Huron in a limited way at Alcona. One hundred and fifty fish were confined in a crate placed in a well-protected cove near Mr. Hill's fishery, and upward of 1,000,000 eggs were taken from them. This place could be fitted up in first-class shape for penning purposes, at an expense of $800 to $1,000 for dredging and enlarging the cove.

The first whitefish eggs received at Northville arrived from the Lake Erie islands November 13, and the last from the same source came December 1. The largest lot received at one shipment came from the islands on the 15th, consisting of fourteen well-filled cases and eight half-barrels.

Shipments of whitefish eggs from Northville to various States and to foreign countries were much greater than in any previous season, and were very successful, so far as reported, losses being too small to mention.

Below is the table of—

Shipments of whitefish eggs from the Northville station, season of 1884–'85.

Date.	Number.	Consignee.	Condition on arrival.
1884.			
Dec. 24	200,000	E. B. Hodge, commissioner of fisheries, Plymouth, N. H.	Good condition.
24	50,000	Dr. F. B. Tiffany, Kansas City, Mo.	Arrived in good condition.
26	1,000,000	Central Station, U. S. Fish Commission, Washington, D. C.	Prime condition.
29	1,000,000	Dr. E. W. Humphreys, commissioner of fisheries, Salisbury, Md.	All in excellent condition.
29	250,000	Otto Gramm, commissioner of fisheries, Laramie City, Wyo.	Not any loss; do not think that there were fifty dead eggs.
30	1,000,000	E. G. Blackford, Fulton Market, New York City.	In good order.
31	1,000,000	Central Station, U. S. Fish Commission, Washington, D. C.	First-class condition.
1885.			
Jan. 5	1,000,000	Ballarat Acclimatization Society, Australia; care of R. J. Creighton, San Francisco, Cal.	Reached Sydney in good condition; nearly all lost in transferring to Melbourne.
7	1,000,000	Fred Mather, Cold Spring Harbor, N. Y., and forwarded to Herr von Behr, Germany.	Reached Germany in good condition.
7	500,000	Fred Mather, to forward to Emil Frey, Switzerland, care of Deutsche Fischerei-Verein.	Arrived at Cold Spring Harbor, N. Y., in good condition.
7	250,000	Fred Mather, to forward to National Fish Culture Association, London, England.	Do.
5	2,500,000	Dr. R. O. Sweeney, commissioner of fisheries, Saint Paul, Minn.	First four lots reported all in excellent order and condition.
8	2,500,000	....do	

Shipments of whitefish eggs from the Northville station, &c.—Continued.

Date.	Number.	Consignee.	Condition on arrival.
1884.			
Jan. 12	2,500,000	Dr. R. O. Sweeney, commissioner of fisheries, Saint Paul, Minn.	
13	2,500,000	....do	
19	2,500,000	....do	
20	2,000,500	....do	No report from the last four.
26	2,500,000	....do	
27	2,500,000	....do	
Feb. 4	1,000,000	A. A. Mosher, Spirit Lake, Iowa, for Iowa fish commission.	In splendid order; never saw better.
11	250,000	Agent Smithsonian Institution, Exposition Building, New Orleans.	Received in good condition.
18	1,000,000	Fred Mather, to forward to Herr von Behr, Germany.	Received at Cold Spring Harbor, N. Y., in good condition.
23	500,000	Colonel McDonald, International Exhibit, New Orleans.	Received in good condition.
Mar. 10	1,000,000	R. E. Earll, Government Exhibit, New Orleans Exposition, New Orleans, La.	Do.
	31,000,000		

The distribution of the young whitefish by car was not attended with such uniformly good results as in previous years, through no fault, however, of the superintendent, Mr. Moore, or of his assistants. The car made twelve trips with whitefish, in nine of which no losses worthy of mention occurred. On three trips, however, Mr. Moore reported quite heavy losses, and attributed them in part to the overcrowding of fish that had been kept at the hatchery until they had become weak, and partly to the use of air-tight cans.

It is undoubtedly true that there should be no delay in the planting of whitefish hatched as late as April, as the yelk-sac is so nearly absorbed that it disappears altogether in a few days. It is also equally true that large, open cans are safer and better for large shipments than the closed ones, although the former require much more labor and attention than the latter. Mr. Moore reported the following experiment:

"Tried one can without cover, and circulated water same as in other cans. Found fish in better condition than in the closed cans, although twice as many fish were in the open can."

The whitefish hatched at the Alpena station were planted in excellent condition, without any loss in the house or in transit, being near the planting grounds, which are easily accessible by water, except a portion of the trips to Marquette. The fish were carried in large, open cans, and changes of fresh lake water were given them by connecting a hose with the steam-pumps.

Below are the tables of distribution:

FROM NORTHVILLE.

Date of deposit.	Point of deposit.	Number of fish planted.
1885.		
April 2	Lake Michigan, near Ludington, Mich	3,000,000
8	Lake Michigan, near Milwaukee and Sheboygan, Wis	6,000,000
11	Lake Erie, near Monroe, Mich	5,000,000
14	Lake Michigan, near Ludington, Mich	4,000,000
17	Lake Michigan, near Grand Haven, Mich	4,000,000
18	Lake Erie, near Monroe, Mich	4,000,000
20	Detroit River, near Detroit, Mich	4,000,000
22	Lake Michigan, near Saint Joseph, Mich	4,000,000
25	Lake Erie, near Monroe, Mich	4,000,000
27	Lake Erie, near North Bass Island	4,000,000
29	Lake Michigan, near Milwaukee, Wis	4,000,000
May 1	Detroit River, near Detroit, Mich	4,000,000
		50,000,000

FROM ALPENA.

1885.		
May 2	Lake Huron, near Black River, Mich	3,000,000
4	Lake Huron, near Oscoda, Mich	3,000,000
5	Lake Huron, near Sturgeon Point, Mich	3,000,000
6	Lake Huron, near Alcona, Mich	3,000,000
7	Lake Huron, near Cheboygan, Mich	3,000,000
9	Lake Huron, near Scarc Crow Isle	3,000,000
11	Lake Huron, near Mackinac Isle	3,000,000
14	Lake Superior, near Marquette, Mich	2,000,000
16	Lake Huron, near Thunder Bay Isle	3,000,000
18	Lake Huron, near Mackinac Isle	3,000,000
19	Lake Huron, near Partridge Point, Mich	3,000,000
20	Lake Superior, near Marquette, Mich	2,000,000
22	Lake Huron, near Black River Isle	3,000,000
23	Lake Huron, near Ossineke, Mich	1,000,000
		38,000,000

RAINBOW TROUT.

I am pleased to report a great improvement in the quality of the eggs of this species this season. Heretofore we have usually lost from 75 to 90 per cent of the eggs obtained, but this season more than half the eggs were good. The fish were fed much less, and it is supposed that this accounts for the difference. I am convinced that breeding fish when fed too much will produce weak eggs—that it is better to half starve than to overfeed them. This principle of the effect of high feeding is well understood by stock-breeders, and doubtless applies to fish as well as quadrupeds.

The spawning season opened January 9, and closed April 24. The first eggs were much inferior to the later takings, many of the latter showing 90 per cent good. For the first time at this station, a few eggs were taken from two-year-old trout.

Below are the tables of spawn-taking, shipping of eggs, and disposition of fry:

Daily record of spawn-taking operations in rainbow trout.

Date.	Females spawned.	Eggs obtained.	Date.	Females spawned.	Eggs obtained.	Date.	Females spawned.	Eggs obtained.	Date.	Females spawned.	Eggs obtained.
1885.			1885.			1885.			1885.		
Jan. 9	1	700	Feb. 12	1	700	Mar. 12	1	750	Apr. 5	1	800
10	4	4,000	18	2	1,600	13	1	650	6	4	4,000
12	2	2,400	21	1	800	14	1	900	7	6	4,400
13	1	800	22	1	400	15	1	400	8	1	700
15	2	3,000	23	1	600	16	1	700	9	1	900
16	2	2,800	24	3	2,800	17	1	900	11	2	1,400
17	4	5,200	26	1	1,000	18	1	800	13	2	1,600
19	2	1,800	27	2	1,600	19	2	2,100	14	1	400
20	2	2,000	28	3	2,100	23	1	700	18	2	1,800
29	4	3,800	Mar. 1	1	900	26	1	800	19	1	1,000
30	1	1,000	3	2	1,500	27	2	1,600	20	6	5,500
Feb. 2	1	500	4	4	3,100	28	1	900	21	1	1,200
3	2	2,400	5	4	3,200	29	1	1,000	22	1	700
4	4	3,800	6	2	1,400	30	1	600	23	1	800
5	1	1,200	8	1	800	31	3	2,200	24	2	2,100
8	1	500	10	1	1,000	Apr. 3	2	1,800			
9	4	3,700	11	1	600	4	3	2,400	Totals..	126	111,100
10	1	900									

Shipments of rainbow-trout eggs, from the Northville station, season of 1884–'85.

Date.	Number.	Consignee.	Condition on arrival.
1885.			
Mar. 10	2,500	R. E. Earll, Government Exhibit, New Orleans Exposition, New Orleans, La.	Arrived in good condition.
27	10,000	F. Mather, to forward to Herr von Behr, Germany.	Eggs arrived on the 30th and were all in good condition.
Apr. 9	5,000	F. Mather, to forward to National Fish Culture Association, London, England.	Eggs received in good condition.
9	10,000	F. Mather, to forward to Sir James Maitland, Stirling, Scotland.	Received by Mather in good condition.
28	5,000	A. W. Aldrich, fish commissioner, Anamosa, Iowa.	No report.
28	5,000	Dr. R. O. Sweeney, fish commissioner, Saint Paul, Minn.	Do.
30	5,000	I. G. W. Steedman, fish commissioner, Saint Louis, Mo. Re-expressed to R. O. Sweeney, Saint Paul, Minn.	No report.
May 7	5,000	Herschel Whitaker, fish commissioner, Paris, Mich.	Received in good condition.
Total ..	47,500		

Shipments of fry of rainbow trout.

Date.	Number.	Delivered to—	
1885.			
June 10	10,000	Ransom Townsend, Dicksborough, Mich.	Planted in Mosher Spring, near Northville, Mich.
July 7	2,000		
Total ..	12,000		

LOCH LEVEN TROUT.

A case of eggs of this species from a foreign consignment through the hands of Fred Mather arrived here January 7, in first-class condition, being as fine a lot of eggs as were ever handled at this station.

There was practically no loss on the eggs, and but a small loss of fry in the tanks. Fifty-five thousand eggs were shipped to other stations and 43,500 fry were hatched. Eggs and fry were disposed of as shown by the following tables:

Shipments of Loch Leven trout eggs.

Date.	Number.	Consignee.	Condition on arrival.
1885.			
Jan. 29	5,000	E. B. Hodge, fish commissioner, Plymouth, N. H.	Eggs came safely and in good condition.
Feb. 3	20,000	A. W. Aldrich, fish commissioner, Anamosa, Iowa.	Eggs came in splendid order; only four dead.
3	20,000	R. O. Sweeney, fish commissioner, Saint Paul, Minn.	No report.
4	10,000	C. G. Atkins, Grand Lake Stream, Me.	On unpacking at Grand Lake Stream they appeared in good condition; only seven dead. In transportation back to Bucksport, however, frost got in and 1,575 eggs were found dead.
Total ..	55,000		

Disposition of fry of Loch Leven trout.

Date.	Number.	Delivered to—
1885.		
Apr. 10	10,000	Michigan Fish Commission.
16	5,000	L. S. Hill & Co., Grand Rapids, Mich. Sent with car No. 2.
16	1,500	G. H. Dalrymple, Grand Rapids, Mich. Sent with car No. 2.
23	20,000	Shipped in charge of car No. 2, and planted in Crooked Lake, near Flint and Pere Marquette Railroad, Northern Michigan.
	7,000	Retained at hatchery for breeding purposes.
Total ..	43,500	

BROOK TROUT.

The first eggs were taken October 12, from the pond of 2½-year-olds, and the last January 5, from the small trout. A few eggs were taken from wild trout caught from the stream near the station and placed in the pond of small trout, but not so many as usual. Below are the tables of spawn-taking and the shipments of eggs and fry:

Daily record of spawn-taking operations in brook trout.

[From trout 20 months old.]

Date.	Females spawned.	Eggs obtained.	Date.	Females spawned.	Eggs obtained.	Date.	Females spawned.	Eggs obtained.	Date.	Females spawned.	Eggs obtained.
1884.			1884.			1884.			1884.		
Oct. 26	1	200	Nov. 12	10	2,800	Nov. 29	14	3,200	Dec. 16	6	1,000
29	1	250	13	3	700	30	6	1,000	18	7	900
31	6	950	14	1	300	Dec. 1	5	1,100	19	3	600
Nov. 1	1	225	15	41	8,200	2	28	6,200	23	5	800
2	1	150	16	20	4,800	3	24	5,600	24	4	600
3	4	550	17	16	4,400	4	6	950	27	6	950
4	1	150	18	1	350	5	41	8,400	31	2	400
5	6	1,050	19	12	2,300	6	10	1,600	1885.		
6	5	1,000	20	7	1,600	8	26	5,800	Jan. 2	6	1,000
7	7	1,100	21	8	1,500	9	14	3,200	5	1	350
8	3	500	22	8	1,400	10	12	3,000			
9	1	175	23	20	4,100	11	2	350	Totals.	486	100,250
10	26	5,300	27	9	1,900	12	10	1,800			
11	3	500	28	8	1,800	14	18	3,000			

Daily record of spawn-taking observations in brook trout—Continued.

[From trout 2½ years old.]

Date.	Females spawned.	Eggs obtained.	Date.	Females spawned.	Eggs obtained.	Date.	Females spawned.	Eggs obtained.	Date.	Females spawned.	Eggs obtained.
1884.			1884.			1884.			1884.		
Oct. 12	1	50	Nov. 9	12	5,100	Nov. 23	20	9,000	Dec. 9	1	450
19	1	600	10	7	4,200	24	4	2,000	10	2	1,000
24	1	350	11	11	5,200	25	2	800	12	4	1,700
27	2	800	12	3	1,600	27	5	2,200	14	2	650
29	1	500	13	3	1,400	28	10	4,100	16	2	900
31	3	1,600	14	8	3,800	29	7	3,000	18	2	800
Nov. 1	1	1,000	15	10	5,400	30	2	900	21	2	500
2	3	1,900	16	21	11,000	Dec. 1	2	900	23	4	1,400
3	2	1,200	17	15	6,500	2	8	3,000	24	2	600
4	3	2,500	18	2	850	3	6	2,500	27	2	500
5	2	1,800	19	9	4,000	4	8	3,600	29	2	600
6	1	700	20	2	850	5	12	4,800	31	1	400
7	8	4,400	21	7	4,000	6	4	1,800			
8	4	2,200	22	19	9,500	8	3	1,300	Totals	281	132,400

[From trout 3½ years old and upwards.]

1884.			1884.			1884.			1884.		
Oct. 21	3	3,000	Nov. 2	2	2,200	Nov. 10	6	5,500	Nov. 18	1	900
24	1	900	3	10	11,000	11	10	8,100	21	2	2,600
25	1	700	4	5	5,200	12	2	2,400	Dec. 9	1	800
28	2	1,800	5	2	1,600	13	2	2,200			
29	1	800	6	2	1,800	14	2	1,000	Totals	93	94,200
30	1	1,600	7	10	12,500	15	2	1,200			
31	5	8,000	8	5	4,000	16	2	1,800			
Nov. 1	6	7,200	9	4	3,200	17	3	2,200			

Shipments of brook-trout eggs.

Date.	Number.	Consignee.	Condition on arrival.
1884.			
Dec. 31	10,000	A. W. Aldrich, commissioner of fisheries, Anamosa, Iowa.	Splendid order.
1885.			
Jan. 28	10,000	John H. Barder, commissioner of fisheries, Rockland, R. I.	Badly frozen; only 2,000 good eggs when they arrived.
28	5,000	Dr. F. B. Tiffany, Kansas City, Mo.	Good condition.
29	10,000	Seth Weeks, superintendent of Western station, Corry, Pa.	No report.
29	10,000	B. E. B. Kennedy, commissioner of fisheries, Omaha, Nebr.	Good; number dead on unpacking, 50.
29	10,000	D. W. Delawder, commissioner of fisheries, Druid Hill Hatchery, Baltimore, Md.	No report.
29	30,000	E. G. Blackford, commissioner of fisheries, Fulton Market, New York City.	Good condition.
Feb. 2	10,000	Dr. Wm. M. Hudson, commissioner of fisheries, Hartford, Conn.	Good condition, but some frozen.
3	10,000	Herschel Whitaker, commissioner of fisheries, Paris, Mich.	Good condition.
4	40,000	F. Mather, to forward to Herr von Behr, Germany.	Reached Mather in good condition.
4	25,000	F. Mather, to forward to National Fish Culture Association, London, England.	Do.
Total ..	170,000		

Shipments of brook-trout fry.

Date.	Number.	Delivered to—
1885.		
Apr. 20	3,000	P. B. Tuttle, Niles, Mich.; sent with car No. 2.
23	10,000	Shipped in charge of car No. 2, and planted in north branch of Tobacco River, near Flint and Pere Marquette Railroad, Northern Michigan.
May 4	3,000	J. Elyea, Lawton, Mich.
	4,000	Retained at hatchery for breeding purposes.
Total ..	20,000	

LAKE TROUT.

The supply of lake-trout eggs laid in was considerably larger than usual, and the greater portion was obtained near Thunder Bay, Lake Huron, from runs of fish to the coast reefs. These runs are taken with gill-nets in from 3 to 12 feet of water, the catch, however, being very light as compared with that of the "big reef" of central Lake Huron. The coast trout begin spawning September 15 to 25; the "big reef" trout about a month later.

The increased price obtained for lake trout has wrought a great change in sentiment in fishing circles at Alpena regarding the expediency of the artificial propagation of the species in Lake Huron. A few years ago the fishermen would not allow the eggs to be taken except upon a promise that the young fish should not be returned to the great lakes. It was argued that lake trout were destroying the whitefish by preying on the young, and should therefore be exterminated. But, as the two species are found almost wholly by themselves and on different grounds, it is now claimed that former opinions were largely in error. Whatever weight may be attached to these theories, it is certain that most of the Lake Huron fishermen would not now object to an increased trout supply.

In all, 465,000 eggs were sent to Northville from the Lake Huron fisheries, arriving in good condition. The tables of shipments of eggs and fish are as follows:

Shipments of lake-trout eggs.

Date.	Number.	Consignee.	Condition on arrival.
1884.			
Dec. 22	30,000	A. W. Aldrich, fish commissioner, Anamosa, Iowa.	Eggs came through in very good condition.
22	30,000	Otto Gramm, fish commissioner, Laramie City, Wyo.	Eggs were in splendid condition excepting the ones that were frozen on edges and two bottom trays.
22	10,000	G. W. Delawder, fish commissioner, Druid Hill Hatchery, Baltimore, Md.	No report.
22	20,000	Dr. E. W. Humphries, commissioner of fisheries, Salisbury, Md.	All were in excellent condition.
25	50,000	Central Station, U. S. Fish Commission, Washington, D. C.	Prime condition.
1885.			
Jan. 7	30,000	Fred Mather, to forward to National Fish Culture Association, London, England.	Received by Mather at Cold Spring Harbor, N. Y., in good condition.

Shipments of lake-trout eggs—Continued.

Date.	Number.	Consignee.	Condition on arrival.
1885.			
Jan. 12	50,000	R. O. Sweeney, fish commissioner, Saint Paul, Minn.	Eggs look well; only 130 dead ones.
21	20,000	E. B. Hodge, fish commissioner, Plymouth, N. H.	Eggs came all right and in fine condition.
26	50,000	Wytheville Fish Hatchery, Wytheville, Va.	No report.
27	50,000	William Buller, superintendent Western Station, Corry, Pa.	Good condition.
Feb. 11	5,000	Agent Smithsonian Institution, Exposition Building, New Orleans, La.	Arrived in good condition.
Total ..	345,000		

Shipments of lake-trout fry.

Date.	Number.	Delivered to—
1885.		
Apr. 18	25,000	Mr. Bassett, Ypsilanti, Mich.
23	15,000	Shipped in charge of car No. 2, and planted in Loon Lake, near Flint and Pere Marquette Railroad, Northern Michigan.
May 4	3,000	J. Elyea, Lawton, Mich.
9	10,000	Agent of N. S. Woodward, Plymouth, Ind.
June 2	10,000	Agent of J. C. Fowle, Michigamme, Mich.
9	2,000	Planted in Long Lake and Huron River, near Northville, Mich.
Total ..	65,000	

THE GRAYLING.

Having no exact data as to the spawning grounds and the time of spawning of the grayling, the work of taking eggs was largely experimental. Taking these and numerous other difficulties into consideration, the experiment may be considered as fairly successful. Twenty thousand prime eggs were taken, 12,000 on April 18 and 8,000 on April 24. Five thousand eggs were shipped to Central Station, Washington, April 27, and from ten to twelve thousand hatched. Those taken on April 18th hatched May 2 to 5; the others, May 12 to 14; period of incubation, 14 to 20 days; temperature of water, 50° to 62°. Although very successful with the hatching, we were unfortunate with the fry, fully 90 per cent of them dying within two weeks. Most of them refused to take food. The few hundred, however, that pulled through have since done remarkably well, and are now (September 15) twice the size of trout of the same age.

The grayling yields from two to six thousand eggs, according to size. The spawning season was probably later than usual this season, owing to the severe winter and backward spring.

Our operations were conducted on the Manistee and Au Sable Rivers, Northern Michigan. Three men were stationed on the Au Sable, 18 miles east of the village of Grayling, and two men on the Manistee, 12 miles west of Fredericville, moving down stream, later on, to a point about 12 miles west of Grayling. There were still 4 feet of snow in the forests when operations were begun, and it had not wholly disappeared

when the field work closed on April 28. As the route to the camps was traveled for only a portion of the way, communication with them was extremely difficult for the first ten days.

But the greatest trouble of all was to catch the fish, the streams being so completely filled with logs as almost to shut out all chances for fishing. At the rollways, where the logs are put in, the streams are filled from bank to bank with solid tiers for a space of from 10 to 50 rods. Between the rollways the logs were floated in hap-hazard, and one could occasionally catch a glimpse of the river where the logs in floating down had lodged against the bank and formed a temporary bridge. The open spaces in front of these bridges were seldom more than about five rods in extent, and not more than one space to the mile, on an average, could be found. They were also constantly changing, closing up at one point and opening at another, making it unfeasible to operate fyke-nets, or any kind of set-nets. The river was also high and the current too strong to use a seine. Constructing a boom to protect a space was also out of the question, except at a heavy expense, owing to the heavy pressure of logs behind. This was the condition of the Manistee from near the headwaters to a point 60 or 70 miles down, covering, practically, all of the grayling grounds of the main stream. The west branch was also filled with logs.

The men reached camp on the Manistee, near the headwaters, April 10. They remained there eight days, but found no grayling. They then moved down stream 35 miles, where, on the 21st, they found a school in an open space and took 11 of them with hook and line, bottom-fishing. Two of these were full of spawn, but not quite ripe. They were all sent to Northville on the 23d, and the day following the two spawners were stripped and 8,000 prime eggs obtained. The two weighed 20 ounces each. Ten fish were taken from the Manistee after this, all spent. The last day in camp, April 28, three were caught with a fly.

On the Au Sable the men had a better chance, as the logging operations were not so extensive, leaving more and larger spaces. Forty-two grayling were taken from this stream above and below Cheney Bridge, all with hook and line bottom-fishing. As on the Manistee, they were found mostly in the deeper pools, in from 5 to 10 feet of water. The eggs were taken here all in one day, April 18, from fish that had been held in crates from 3 to 14 days. Five fish were stripped and 12,000 good eggs taken. These were shipped to Northville in cans on the 22d, arriving in excellent condition. All the grayling taken from the Au Sable after the 14th were spent; the field was therefore abandoned on the 21st.

With the experience of the past season, we could doubtless obtain many more eggs another year; though the surest way, perhaps, is to catch the fish in the fall when the river is free from logs, and hold them in a suitable place until spawning time. There is an excellent place for this purpose on the Au Sable near Cheney Bridge, and Mr. Thomas

Wakely, a settler living near the river, has promised to try the experiment of holding a score or more through the coming winter.

There is a steady diminution in the number of grayling in their native streams, due to excessive fishing and to the interruption of spawning and hatching by the immense number of logs that are yearly floated, driving the fish from the beds and, in shoal places, destroying the beds themselves. Mr. R. S. Babbitt, of Grayling, an old guide and professional trout and grayling fisherman, says there is not now one grayling where there were a hundred ten years ago. It is believed by the residents of the grayling region that if the species is not protected or propagated, it will soon become extinct. This would certainly be a great misfortune, as the grayling is unsurpassed for game and table qualities by any of the freshwater species. Railroad companies whose lines reach the region where it abounds advertise this fact as a leading attraction for tourists, and the grayling has taken no small part in the settlement and improvement of the region of its habitat.

Record of temperature observations made at the Northville station from November 1, 1884, to May 1, 1885.

Date.	Temperature of water.			Temperature of air.			Direction of wind.			Intensity of wind.			Condition of sky.		
	8 a. m.	12 m.	5 p. m.	8 a. m.	12 m.	5 p. m.	8 a. m.	12 m.	5 p. m.	8 a. m.	12 m.	5 p. m.	8 a. m.	12 m.	5 p. m.
1884.	°F.	°F.	°F.	°F.	°F.	°F.									
Nov. 1	47	48	48	40	44	40	W.	SW.	W.	Calm	Light	Light	Cloudy	Cloudy	Cloudy.
Nov. 2	46	47	46	30	36	38	W.	SW.	SW.	Light	do	do	Clear	Clear	Clear.
Nov. 3	44	46	47	26	36	44	S.	W.	W.	Calm	do	Calm	do	do	Do.
Nov. 4	46	45	46	40	38	36	NE.	NW.	NW.	Light	do	do	Cloudy	Cloudy	Cloudy.
Nov. 5	44	44	44	34	46	32	NW.	N.	NW.	do	Brisk	do	do	Clear	Clear.
Nov. 6	40	40	42	26	39	30	NW.	NW.	SW.	do	Light	do	Clear	do	Do.
Nov. 7	40	42	45	32	53	48	SW.	W.	NW.	do	do	do	do	do	Do.
Nov. 8	42	45	47	21	40	44	NW.	S.	S.	do	do	do	do	do	Do.
Nov. 9	44	46	48	24	56	52	NW.	SW.	SW.	do	do	do	do	do	Do.
Nov. 10	46	49	50	44	59	49	SW.	NW.	W.	do	do	do	do	do	Do.
Nov. 11	48	48	48	42	41	42	NW.	SW.	SW.	do	do	do	Cloudy	Cloudy	Cloudy.
Nov. 12	47	46	46	36	40	32	SW.	SW.	W.	Calm	Calm	do	do	do	Do.
Nov. 13	44	46	47	34	51	38	SW.	NW.	NW.	do	do	do	do	Clear	Clear.
Nov. 14	44	46	47	26	54	40	NW.	NW.	SW.	do	do	do	Clear	do	Do.
Nov. 15	44	47	48	36	58	32	W.	SW.	W.	do	do	do	do	do	Do.
Nov. 16	44	48	48	31	64	44	W.	SW.	S.	do	do	do	do	do	Do.
Nov. 17	48	47	44	39	34	28	N.	N.	E.	Light	Light	do	Cloudy	Cloudy	Cloudy.
Nov. 18	40	41	41	26	31	28	NE.	E.	E.	do	do	Light	do	do	Do.
Nov. 19	40	41	41	22	34	26	NE.	NW.	S.	do	do	do	Clear	Clear	Clear.
Nov. 20	40	41	41	30	39	32	S.	SW.	SW.	do	do	do	do	do	Do.
Nov. 21	40	42	44	38	42	36	SW.	SW.	S.	do	do	do	do	do	Do.
Nov. 22	40	44	42	29	51	44	N.	S.	S.	do	do	do	do	do	Do.
Nov. 23	42	46	32	32	42	30	SW.	SW.	NW.	Brisk	do	do	do	Cloudy	Cloudy.
Nov. 24	36	36	34	13	18	14	W.	W.	SW.	do	Brisk	Brisk	Rain	Clear	Clear.
Nov. 25	36	36	38	24	34	28	SW.	SW.	W.	Light	Light	do	Clear	do	Do.
Nov. 26	36	37	38	20	29	18	SW.	SW.	S.	do	do	Light	do	do	Do.
Nov. 27	36	38	39	24	37	34	SW.	E.	E.	do	do	do	do	do	Do.
Nov. 28	36	38	40	25	38	29	N.	W.	NW.	do	do	do	do	do	Do.
Nov. 29	38	40	39	24	34	20	W.	W.	S.	do	do	do	do	do	Do.
Nov. 30	38	40	40	21	27	12	N.	N.	NW.	do	do	do	do	do	Do.
Dec. 1	38	38	40	18	36	16	W.	S.	S.	do	do	do	do	do	Do.
Dec. 2	38	38	40	8	35	18	W.	S.	SW.	do	do	do	do	do	Do.
Dec. 3	38	40	42	21	42	28	S.	S.	S.	do	do	do	do	do	Do.
Dec. 4	40	41	42	28	46	34	S.	S.	S.	do	do	do	do	do	Do.
Dec. 5	44	46	46	38	50	46	S.	S.	S.	do	do	do	do	do	Cloudy.
Dec. 6	47	48	48	44	46	47	E.	E.	N.	Calm	do	do	do	Cloudy	Do.
Dec. 7	46	46	44	40	40	36	W.	W.	W.	Light	Brisk	do	Cloudy	do	Do.
Dec. 8	45	42	42	34	35	34	W.	W.	W.	do	do	do	do	do	Do.
Dec. 9	40	40	40	28	36	30	W.	W.	W.	do	do	do	Clear	do	Do.
Dec. 10	40	40	40	24	40	36	SW.	SW.	SW.	do	do	do	do	do	Do.
Dec. 11	42	42	41	30	35	30	W.	W.	N.	do	do	do	do	do	Clear.

Dec. 12	39	39	39	25	30	26	NE.	NE.	NE.	....do	Light	Calm	....do	Clear	Cloudy.
Dec. 13	38	24	39	28	34	29	NW.	SW.	SW.	....do	....do	....do	....do	....do	Do.
Dec. 14	39	39	40	28	36	29	SE.	S.	SW.	....do	....do	....do	....do	....do	Do.
Dec. 15	38	37	38	29	27	25	NW.	S.	W.	Brisk	....do	....do	....do	Snow	Snow.
Dec. 16	35	34	37	18	28	20	SW.	SW.	SW.	....do	....do	....do	Clear	Clear	Clear.
Dec. 17	35	36	38	10	17	3	NW.	NW.	W.	....do	Brisk	Brisk	....do	....do	Do.
Dec. 18	38	38	38	- 8	8	- 2	NW.	NW.	NW.	....do	....do	....do	....do	....do	Do.
Dec. 19	37	38	38	-12	14	-10	W.	NW.	W.	....do	....do	....do	....do	....do	Do.
Dec. 20	37	38	38	- 3	20	16	E.	S.	S.	....do	Calm	Calm	....do	....do	Do.
Dec. 21	38	38	38	20	28	22	NW.	NE.	S.	Calm	....do	Brisk	....do	....do	Do.
Dec. 22	39	38	38	26	24	14	W.	W.	W.	....do	....do	Calm	....do	....do	Do.
Dec. 23	38	38	38	- 2	29	14	W.	SW.	S.	Brisk	....do	....do	....do	....do	Do.
Dec. 24	38	38	38	14	27	11	E.	W.	NW.	Calm	....do	Brisk	....do	....do	Do.
Dec. 25	38	38	36	2	13	10	N.	NE.	NE.	Brisk	....do	....do	....do	....do	Do.
Dec. 26	38	38	36	Zero.	20	10	NE.	E.	E.	....do	....do	....do	....do	....do	Do.
Dec. 27	36	38	38	8	32	26	NW.	SE.	E.	....do	....do	Calm	....do	....do	Do.
Dec. 28	38	40	40	36	46	38	SW.	S.	S.	Calm	....do	....do	Cloudy ...	Cloudy ...	Cloudy.
Dec. 29	42	40	40	36	46	36	E.	SW.	SE.	....do	....do	....do	Clear	Clear	Do.
Dec. 30	42	42	42	37	44	44	NW.	E.	SW.	....do	....do	....do	Cloudy ...	Cloudy ...	Do.
Dec. 31	42	43	42	30	34	27	W.	W.	SW.	....do	....do	....do	Clear	Clear	Do.
1885.															
Jan. 1	35	36	35	18	23	14	NW.	NW.	W.	....do	....do	....do	....do	....do	Clear.
Jan. 2	33	36	36	3	16	16	NW.	W.	SW.	Brisk	Brisk	....do	....do	....do	Do.
Jan. 3	36	36	37	12	24	23	SW.	SW.	SW.	....do	....do	....do	....do	....do	Do.
Jan. 4	37	38	38	23	34	28	SW.	SW.	SW.	Light	Light	....do	Cloudy ...	....do	Do.
Jan. 5	37	37	36	25	44	34	SW.	SW.	SW.	....do	....do	....do	Clear	....do	Do.
Jan. 6	36	38	38	38	45	38	SE.	SW.	W.	....do	....do	....do	Cloudy ...	Cloudy ...	Cloudy.
Jan. 7	37	38	40	32	38	34	W.	SW.	W.	....do	....do	....do	....do	....do	Clear.
Jan. 8	40	40	42	32	42	34	SW.	S.	SW.	....do	....do	....do	....do	Clear	Do.
Jan. 9	40	40	39	35	39	26	W.	NW.	NW.	....do	....do	Brisk	Clear	....do	Do.
Jan. 10	34	36	39	16	34	39	N.	SW.	SW.	....do	....do	Calm	....do	....do	Do.
Jan. 11	38	38	39	32	38	37	SW.	SW.	S.	....do	....do	....do	....do	Cloudy ...	Cloudy.
Jan. 12	36	37	36	28	28	24	NW.	NW.	NW.	....do	Brisk	Brisk	Cloudy ...	Clear	Clear.
Jan. 13	33	34	36	6	18	14	NW.	NW.	SW.	Brisk	....do	....do	Clear	....do	Do.
Jan. 14	36	36	37	10	26	27	SW.	W.	SE.	....do	Light	Light	....do	....do	Do.
Jan. 15	36	37	36	22	31	42	E.	NE.	NE.	Light	....do	....do	....do	....do	Do.
Jan. 16	36	36	35	19	23	28	NE.	NE.	NE.	....do	....do	....do	....do	....do	Snow.
Jan. 17	34	32	33	8	15	16	NW.	NW.	NW.	Brisk	Brisk	Brisk	....do	....do	Clear.
Jan. 18	32	34	35	- 6	8	2	SW.	SW.	SW.	....do	....do	....do	....do	....do	Do.
Jan. 19	34	34	34	-21	16	2	NW.	SW.	SW.	....do	....do	....do	....do	....do	Do.
Jan. 20	34	34	34	- 8	9	3	NW.	SW.	SW.	....do	....do	....do	....do	....do	Do.
Jan. 21	34	35	34	0	19	2	SW.	NW.	NW.	....do	Light	....do	....do	....do	Do.
Jan. 22	34	34	35	-14	14	- 4	SW.	SW.	SW.	....do	....do	....do	....do	....do	Do.
Jan. 23	34	34	34	9	24	20	SW.	SW.	S.	Light	....do	Light	....do	....do	Do.
Jan. 24	35	36	36	24	35	28	E.	SW.	W.	....do	....do	....do	....do	....do	Do.
Jan. 25	36	36	36	26	32	8	NW.	W.	SW.	....do	....do	....do	....do	....do	Do.
Jan. 26	34	34	34	5	12	- 1	W.	SW.	SW.	....do	....do	Brisk	....do	....do	Do.
Jan. 27	34	34	34	- 2	5	- 4	S.	E.	NE.	....do	....do	....do	....do	....do	Do.
Jan. 28	34	34	34	-14	16	0	W.	SW.	SW.	Brisk	....do	....do	....do	....do	Do.
Jan. 29	34	34	34	-18	11	2	SW.	SW.	SW.	....do	Brisk	Light	....do	....do	Do.
Jan. 30	36	35	36	20	34	24	S.	NW.	N.	Light	Light	....do	....do	....do	Do.

Record of temperature observations made at the Northville station from November 1, 1884, to May 1, 1885—Continued.

Date.	Temperature of water.			Temperature of air.			Direction of wind.			Intensity of wind.			Condition of sky.		
	8 a. m.	12 m.	5 p. m.	8 a. m.	12 m.	5 p. m.	8 a. m.	12 m.	5 p. m.	8 a. m.	12 m.	5 p. m.	8 a. m.	12 m.	5 p. m.
1885.	°F.	°F.	°F.	°F.	°F.	°F.									
Jan. 31	34	35	36	0	26	20	NE.	E.	SW.	Light	Light	Light	Clear	Clear	Clear.
Feb. 1	35	35	34	17	22	− 2	NW.	NW.	N.	do	do	Brisk	do	do	Do.
Feb. 2	33	34	34	− 2	16	10	SW.	SW.	SW.	Brisk	Brisk	do	do	Cloudy	Snow.
Feb. 3	34	35	36	23	27	31	SW.	SE.	SE.	Light	Light	Light	do	Clear	Clear.
Feb. 4	36	36	36	33	40	32	SW.	NW.	NW.	do	do	do	do	do	Do.
Feb. 5	35	34	34	12	12	0	N.	NW.	N.	do	do	do	do	do	Do.
Feb. 6	33	34	34	−10	20	8	NE.	SE.	E.	Brisk	do	do	do	do	Do.
Feb. 7	34	34	35	6	23	20	E.	E.	SE.	Light	do	do	do	do	Snow.
Feb. 8	34	35	35	26	28	16	NW.	E.	NE.	Calm	do	do	Cloudy	do	Clear.
Feb. 9	34	34	34	13	18	18	E.	NE.	NW.	Brisk	do	do	do	Cloudy	Snow.
Feb. 10	32	32	32	− 9	7	−13	NW.	NW.	NW.	Strong	High	Gale	do	do	Do.
Feb. 11	32	32	32	−22	− 2	− 3	NW.	NW.	W.	Brisk	Brisk	Light	do	do	Do.
Feb. 12	32	33	34	0	10	− 4	SW.	SW.	W.	Light	do	Brisk	do	Clear	Clear.
Feb. 13	34	34	34	−20	15	− 3	W.	SW.	SW.	Brisk	do	do	Clear	do	Do.
Feb. 14	34	34	34	−14	28	10	NE.	SE.	SE.	do	Light	Light	do	do	Do.
Feb. 15	34	34	34	14	36	34	SE.	S.	SW.	do	Brisk	do	do	do	Do.
Feb. 16	34	34	34	− 4	4	− 9	SW.	SW.	SW.	do	do	do	do	do	Do.
Feb. 17	34	34	34	−14	6	4	SW.	SW.	SW.	do	do	do	do	do	Do.
Feb. 18	34	34	34	− 8	16	10	W.	NW.	W.	Light	Light	do	do	do	Do.
Feb. 19	34	34	34	3	17	5	SW.	SW.	NW.	do	do	do	do	do	Do.
Feb. 20	34	34	34	− 4	20	0	W.	SW.	W.	do	do	do	do	do	Do.
Feb. 21	34	34	34	− 2	21	7	SW.	SW.	NW.	do	do	Calm	do	do	Do.
Feb. 22	34	34	34	4	22	4	NW.	NW.	NW.	do	do	do	do	Cloudy	Cloudy.
Feb. 23	34	34	34	−12	32	14	NW.	SW.	SW.	Calm	do	do	do	do	Do.
Feb. 24	34	34	34	9	32	26	W.	E.	E.	Light	do	Light	Cloudy	do	Do.
Feb. 25	34	34	34	6	37	26	NE.	SE.	E.	do	do	do	Clear	Clear	Clear.
Feb. 26	35	35	35	22	44	31	E.	S.	SW.	do	do	do	Cloudy	Cloudy	Cloudy.
Feb. 27	34	36	34	26	44	30	SW.	NW.	SW.	do	do	do	Clear	Clear	Clear.
Feb. 28	36	37	36	24	50	38	NE.	S.	SW.	do	do	do	do	do	Do.
Mar. 1	36	36	36	38	40	30	NW.	W.	NW.	do	do	do	Cloudy	Cloudy	Cloudy.
Mar. 2	33	35	36	18	34	29	NW.	NW.	NW.	do	do	do	Clear	Clear	Clear.
Mar. 3	36	38	37	32	48	36	SW.	SW.	SW.	do	do	do	Cloudy	do	Cloudy.
Mar. 4	36	38	37	34	40	32	W.	NW.	NW.	do	do	do	do	Cloudy	Do.
Mar. 5	38	39	42	27	33	36	NW.	E.	NW.	do	do	do	do	Clear	Clear.
Mar. 6	38	42	42	22	40	30	E.	E.	E.	do	do	do	do	do	Do.
Mar. 7	36	38	39	16	27	17	NW.	NW.	NW.	Brisk	do	do	do	do	Cloudy.
Mar. 8	36	39	39	4	26	10	NW.	W.	NW.	do	do	Brisk	Clear	do	Do.
Mar. 9	37	38	38	20	38	38	SW.	SW.	NW.	do	Brisk	Light	do	do	Clear.
Mar. 10	36	38	39	15	22	16	N.	NW.	N.	Light	Light	do	do	do	Do.
Mar. 11	38	39	40	10	32	32	E.	SW.	S.	do	do	do	do	do	Do.
Mar. 12	38	39	39	22	24	16	E.	NE.	NE.	do	do	do	Cloudy	Cloudy	Cloudy.

Mar. 13	38	38	36	4	28	24	SW.	SW.	SW.	....do	....do	....do	.... do	....do	Snow.
Mar. 14	37	38	39	24	44	39	SE.	S.	SW.	....do	.. do	....do	....do	....do	Do.
Mar. 15	35	37	38	20	28	24	NW.	NW.	W.	....do	....do	....do	....do	Clear	Clear.
Mar. 16	36	37	38	0	6	7	N.	N.	NW.	Brisk	Brisk	....do	Clear	....do	Do.
Mar. 17	34	38	38	-10	17	12	NW.	W.	SW.	....do	Light.....	Brisk	....do	....do	Do.
Mar. 18	36	37	38	16	39	18	SW.	SW.	N.	Light.....	....do	Light.....	....do	....do	Cloudy.
Mar. 19	34	36	37	5	16	12	SW.	NW.	N.	Brisk	....do	....do	....do	....do	Do.
Mar. 20	33	34	35	-10	11	5	N.	SW.	NW.	....do	Brisk	....do	....do	....do	Clear.
Mar. 21	34	35	38	- 4	16	12	NW.	NW.	NW.	....do	Light.....	....do	....do	....do	Do.
Mar. 22	36	38	38	- 2	18	17	NE.	NE.	N.	Light.....	....do	....do	....do	....do	Do.
Mar. 23	38	38	39	0	27	23	NW.	SW.	SW.	....do	....do	....do	....do	... do	Do.
Mar. 24	36	38	39	28	37	31	SW.	NW.	N.	....do	....do	....do	Cloudy ...	Cloudy ...	Cloudy.
Mar. 25	35	38	38	0	34	29	W.	SW.	SW.	....do	....do	....do	Clear	Clear	Clear.
Mar. 26	38	40	39	32	46	42	SW.	SW.	SW.	....do	....do	....do	....do	....do	Do.
Mar. 27	42	44	46	38	44	38	SW.	NW.	NW.	....do	....do	....do	Cloudy ...	Cloudy ...	Cloudy.
Mar. 28	39	44	46	30	44	32	E.	E.	SE.	....do	....do	....do	Clear	Clear	Do.
Mar. 29	39	44	47	20	34	32	E.	NE.	SW.	....do	Calm	Calm	Cloudy ...	....do	Do.
Mar. 30	42	40	42	34	40	34	S.	SW.	SW.	....do	....do	....do	....do	Cloudy ...	Do.
Mar. 31	39	44	48	46	48	43	SW.	W.	W.	Calm	....do	....do	Clear	Clear	Clear.
Apr. 1	40	46	47	55	48	34	N.	E.	E.	....do	....do	....do	. do	....do	Do.
Apr. 2	42	43	43	32	44	38	E.	SW.	N.	....do	....do	....do	Cloudy ...	Cloudy ...	Cloudy.
Apr. 3	35	37	39	25	32	31	NE.	NE.	NE.	Light.....	....do	....do	... do	....do	Do.
Apr. 4	35	40	46	34	43	42	NE.	W.	W.	....do	....do	....do	Clear	Clear	Clear.
Apr. 5	42	49	52	36	60	51	SW.	W.	NW.	Calm	Light.....	Light.....	Cloudy ...	....do	Do.
Apr. 6	44	50	54	38	56	44	N.	S.	E.	....do	Calm	....do	Clear	....do	Do.
Apr. 7	46	47	50	43	56	55	SW.	SW.	SW.	Light.....	....do	Calm	Cloudy ...	Cloudy ...	Cloudy.
Apr. 8	46	46	47	34	34	30	NW.	NW.	NW.	Strong....	Brisk	Light.....	....do	Clear	Do.
Apr. 9	40	44	45	26	40	32	E.	SE.	SE.	Light.....	Calm	....do	... do	Cloudy ..	Clear.
Apr. 10	40	46	46	22	47	30	SE.	SW.	SE.	Calm	Light.....	....do	Clear	Clear	Do.
Apr. 11	41	43	42	37	39	33	SE.	NW.	NW.	....do	....do	....do	Snow	Cloudy ...	Snow.
Apr. 12	40	42	45	33	40	36	NW.	S.	S.	Light.....	... do	....do	Cloudy ...	Clear	Cloudy.
Apr. 13	39	39	39	26	30	32	NW.	NW.	NW.	Strong....	Strong....	Brisk	....do	Cloudy ...	Do.
Apr. 14	38	40	42	21	42	31	N.	SW.	SE.	Light.....	Calm	Light.....	....do	....do	Do.
Apr. 15	39	42	46	32	49	39	SE.	SE.	SE.	....do	....do	Calm	... do	....do	Do.
Apr. 16	44	45	47	36	40	35	SE.	NE.	NE.	....do	Brisk	Light.....	....do	....do	Do.
Apr. 17	42	46	48	35	38	36	NE.	NE.	NE.	Brisk	....do	....do	....do	....do	Do.
Apr. 18	44	47	49	42	49	46	SE.	SE.	SE.	....do	....do	....do	. do	....do	Do.
Apr. 19	45	47	56	65	70	76	SW.	SW.	SW.	Light.....	Light.....	....do	Clear	Clear	Clear.
Apr. 20	52	56	54	46	77	72	E.	SW.	SW.	....do	....do	....do	... do	... do	Do.
Apr. 21	52	60	62	60	80	75	SW.	SW.	SW.	....do	....do	....do	Cloudy ...	.. do	Do.
Apr. 22	54	60	57	63	76	73	E.	SW.	SW.	Calm	....do	Brisk	Clear	Cloudy ...	Do.
Apr. 23	55	62	64	64	78	78	SW.	SW.	SW.	....do	Brisk	Light.....	....do	Hazy	Hazy.
Apr. 24	56	56	56	55	60	59	NW.	NW.	NW.	Light.....	Light.....	....do	Rain.....	... do	Clear.
Apr. 25	47	50	54	49	60	57	NE.	SE.	SE.	....do	Brisk	Brisk	Clear	....do	Hazy.
Apr. 26	48	53	50	47	59	54	NW.	N.	N.	... do	....do	....do	....do	....do	Do.
Apr. 27	49	55	57	49	60	70	N.	NW.	NW.	....do	Light.....	Light.....	....do	....do	Do.
Apr. 28	50	50	48	54	41	43	W.	N.	N.	....do	Brisk	Brisk	Cloudy ...	Cloudy ...	Cloudy.
Apr. 29	45	52	52	44	65	60	NW.	SW.	SW.	....do	Light.....	Light.....	Clear	Clear	Clear.
Apr. 30	51	51	52	54	57	53	N.	SE.	SE.	....do	....do	....do	Cloudy ...	Rain	Rain.