

XXIII.—REPORT ON THE PROPAGATION OF PENOBSCOT SALMON IN 1881-'82.

By CHARLES G. ATKINS.

The routine work of the season went on with so little novelty that there is not much to report beyond the summaries of work accomplished.

It has been the ordinary practice to defer the purchase of salmon until the market price has declined to about twenty-five cents per pound. This generally happens from June 1 to 10, depending mainly on the supply of salmon from Canadian rivers.

This year the first salmon were received June 1, and the last July 2, the supply coming from the same parties and the transfer being in the same hands as the previous year. The total number bought was 514; 5 of them died in transit, and 509 were deposited in apparently good condition in the inclosure. They were of uncommonly large size, the average being 16.55 pounds, as estimated by Mr. Whitmore—doubtless a very close approximation to the actual weight. This is the largest average that has occurred since the propagation of Penobscot salmon began, in 1871. It is thought by the fishermen to be the highest within their experience. The next highest since 1870 was the season of 1874, when the average of those purchased reached 14.03 pounds. Another phenomenon worthy of notice is the fact that the average size of the fish was as great during the last days of purchase as during the earliest. The ordinary experience of fishermen is that the mean weight of the fish decreases from the beginning to the end of the season.

The mortality in the inclosure was this year remarkable, 146 being found dead. No progress has been made toward a discovery of the cause. The symptoms were, as before, an opacity of the eyes, (accompanied, doubtless, by total blindness), subsequent protrusion and bursting of the eye, and, soon after this, of the fish. Ninety-six per cent. of these deaths occurred in June and July. This agrees with previous experience, which teaches us to expect the survival of nearly all those that reach the month of August alive. The greatest heat of the water generally occurs in August. This year the averages were as follows: from May 19 to 31, 57.8° F.; June 1 to 30, 59.4° F.; July 1 to 31, 63.5° F.; August 1 to 31, 63.7° F.; September 1 to 30, 59° F.; October 1 to 31, 45.8° F. The highest temperature noted was 73° F., August 6. The mean for the first eight days of August was 70.9° F. These averages are

based on observations made exclusively in the morning, from 5 to 7 o'clock, generally precisely at 6. Midday temperatures were undoubtedly higher.

The recapture of the salmon in October was successfully accomplished, but four fish eluding us; 358 of both sexes were manipulated, 232 females and 126 males. The females (135 were measured) averaged 33.37 inches in length; 15.67 pounds in weight before spawning, 11.85 pounds after spawning. The males (71 were measured) had a mean length of 34.8 inches and a mean weight of 13.6 pounds. There were obtained 515 pounds of spawn, counting as afterwards ascertained, 2,693,009 eggs. The average yield was 11,608 eggs from each female. As compared with former experience, these means are all much higher, indicating the accuracy of the estimate of weight made when the salmon were purchased. The first eggs were taken October 26, the last November 17.

At the hatching we had, previous to this season, used water directly from the brook, tapping it within 50 feet of the house. The original supply is from "Craig's Pond," a very pure natural lakelet as cold as ordinary lakes in this latitude. But a few hundred feet above the hatchery it receives the waters of some copious springs which have the effect of maintaining a high temperature in the lower part of the brook during the early part of the winter, and thereby forcing the eggs into early development. In 1879 and 1880 we were forced to pack and ship the most forward lots of spawn early in December—a very inconvenient date—and all of them were ready for shipment earlier than it is supposed would be best for the young fish, if hatched in northern localities. In the winter of 1880-'81 a temporary hatchery was constructed on the brook above the point where the springs enter, to retard the development of a portion of the spawn, and served an excellent purpose, although it was in many respects unsatisfactory. It appeared on the whole advisable to conduct a supply of cold water into the main hatchery, and an aqueduct was projected, tapping the brook above the springs. This was executed in August and September, 1881. It was built of cement mortar, laid around a wooden core four and a half inches in diameter, the core being drawn ahead as fast as the cement set. It is believed to be practically permanent, being laid at the bottom of a trench below the reach of frost. It is about 1,600 feet long, and cost \$737.30. In the hatchery we have, therefore, a choice, during late fall and early winter, between warm and very cold water.

In 1881 the spawn was kept at first wholly in the aqueduct water, which had a mean temperature through November of 40.7° F., and through December of 35.2° F. The brook, meanwhile, had a temperature of 47.4° F. in November and 41° F. in December. The lower temperature of the former enabled us to hold back the earliest eggs until the middle of January, more than a month later than in 1880.

The first shipments were made January 16, 1882, and to suit the con-

venience of consignees the last of them were held until March 13. The eggs were, as usual, packed in wet moss, inclosed in dry leaves or chaff, and forwarded by express.

The eggs rejected for lack of impregnation numbered 50,550; those rejected for whiteness, from time to time through the season, numbered 28,459; I suppose that 20 per cent of the latter may have been impregnated; and this gives us 56,242 as the whole number of eggs that failed of impregnation, being 2.2 per cent of those taken from the fish—surely a very satisfactory result.

The eggs remaining at time of shipment, measured out in tin cans, amounted to 2,614,000; if to these we add those rejected, we obtain 2,693,009 as the original number taken from the fish.

Divided pro rata among the parties supporting the establishment, the eggs were assigned as follows:

To the United States	1, 006, 500
To Maine	1, 147, 000
To Massachusetts	286, 000
To Connecticut.....	172, 000
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Total shipped.....	2, 611, 500

The transfer of all those eggs was accomplished with a loss of but 1,739, of which the greater number were probably unimpregnated eggs that escaped the scrutiny given to the spawn before shipment. The hatching was also attended with excellent success at nearly all points, and as the net result of the year's work there were planted in the waters of the country 2,397,132 salmon fry, as shown in detail in Table III.

TABLE I.—Schedule of breeding salmon bought at the Bucksport-Orland establishment, 1881.

Date.		Number of salmon received.	Aggregate weight.	Average weight.
1881.			<i>Pounds.</i>	<i>Pounds.</i>
June	1.....	18	207	16.50
	2.....	19	277	14.02
	3.....	44	694.2	15.80
	4.....	42	707.4	16.84
	5.....	35	621.2	18.03
	6.....	22	347.6	15.80
	7.....	33	537.1	16.28
	8.....	12	176.7	14.72
	10.....	20	271	13.65
	11.....	16	214	14.27
	13.....	13	252	19.38
	14.....	19	250	13.63
	15.....	80	404.6	18.40
	16.....	17	285	16.76
	17.....	21	855	17.85
	18.....	36	600	16.60
	20.....	18	296	16.44
	23.....	23	425	18.48
	25.....	20	389.5	19.97
	27.....	30	563.3	18.77
July	20.....	17	312	18.35
	2.....	10	182.7	18.27
	11.....			
Total.....		514	8, 503.3	16.55

TABLE II.—Transfer of Penobscot salmon eggs from Orland, Me., 1882.

Date.	Consignee.	Address.	Final Destination.	No. of cases	Number of eggs.			Date of unpacking.	Condition on unpacking.	No. eggs dead.
					Belonging to States.	Belonging to United States.	Total.			
1882.										
Jan. 16	A. H. Powers	Plymouth, N. H.	Plymouth, N. H.	1	80,000	.....	80,000	Jan. 18	"Good"	39
16	E. A. Brackett	Winchester, Mass.	Winchester, Mass.	1	40,000	.....	40,000	.....	"Good"	339
16	H. J. Fenton	Windsor, Conn.	Poquonock, Conn.	1	80,000	.....	80,000	Jan. 18	"Good"	17
19	E. G. Blackford	New York, N. Y.	Roslyn, N. Y.	2	.....	120,000	120,000	Jan. 29	"Excellent"	144
23	H. J. Fenton	Windsor, Conn.	Poquonock, Conn.	2	.....	95,000	95,000	Jan. 26	"Good"	26
23	E. J. Anderson	Bloombury, N. J.	Bloombury, N. J.	2	.....	95,000	95,000	Jan. 26	"Good"	8
23	E. G. Blackford	New York, N. Y.	Roslyn, N. Y.	1	.....	80,000	80,000	Feb. 5	"Excellent"	37
25	Chas. G. Atkins	Grand Lake Stream, Me.	Grand Lake Stream, Me.	1	20,000	.....	20,000	Jan. 30	"Excellent"	23
Feb. 8	do	do	do	3	120,000	50,000	180,000	Feb. 12	"Good"	3
9	E. G. Blackford	New York, N. Y.	Roslyn, N. Y.	1	.....	37,500	37,500	Feb. 19	"Excellent"	93
9	A. H. Powers	Plymouth, N. H.	Plymouth, N. H.	3	80,000	95,000	175,000	Feb. 11	"A No. 1"	145
9	H. J. Fenton	Windsor, Conn.	Poquonock, Conn.	1	85,000	.....	85,000	Feb. 14	"Good"	86
13	E. G. Blackford	New York, N. Y.	Roslyn, N. Y.	1	.....	50,000	50,000	Feb. 19	"Excellent"	115
13	Dr. R. O. Sweeny	Saint Paul, Minn.	Saint Paul, Minn.	3	.....	200,000	200,000	Feb. 19	"Good"	51
13	Seth Weeks	Corry, Pa.	Corry, Pa.	2	.....	100,000	100,000	Feb. 17	"Good"	62
14	O. A. Dennen	Mount Kineo, Me.	Mount Kineo, Me.	3	200,000	.....	200,000	Feb. 17	"Good in fine condition"	50
14	A. H. Powers	Plymouth, N. H.	Plymouth, N. H.	1	70,000	.....	70,000	Feb. 15	"Good"	250
15	F. C. Hewey	Rangely, Me.	Rangely, Me.	3	200,000	.....	200,000	Feb. 20	"Very good"	15
15	J. R. Dillingham	Songo Lock, Naples, Me.	Songo Lock	2	100,000	.....	100,000	Feb. 19	"Good"	12
16	Ellis Hanscom	Machias, Me.	Machias, Me.	1	30,000	.....	30,000	Feb. 21	"Good"	16
16	D. H. Harmon	Norway, Me.	Norway, Me.	2	100,000	.....	100,000	Feb. 18	"Good"	54
21	A. J. Darling	Enfield, Me.	Enfield, Me.	5	300,000	.....	300,000	Feb. 22	"Good"	25
Mar. 7	Chas. G. Atkins	Grand Lake Stream, Me.	Grand Lake Stream, Me.	1	67,000	.....	67,000	Mar. 11	"Good"	17
7	H. J. Fenton	Windsor, Conn.	Poquonock, Conn.	1	7,000	.....	7,000	Mar. 9	"Good"	2
7	A. H. Powers	Plymouth, N. H.	Plymouth, N. H.	1	16,000	.....	16,000	Mar. 8	"Good"	10
13	S. F. Baird	Washington, D. C.	Wytheville, Va.	1	.....	27,000	27,000	Mar. 18	"First class"	13
13	E. G. Blackford	New York, N. Y.	Roslyn, N. Y.	1	.....	57,000	57,000	Mar. 17	"Excellent"	67
			Total	47	1,605,000	1,006,500	2,611,500			1,739

TABLE III.—Planting of Penobscot salmon fry reared from eggs gathered in 1881.

S. Mts. 110—69	State.	Where hatched.	Water stocked.	Tributaries in which fry were placed.	Locality of deposit.	Date of transfer.	Number of fish set free.
	Connecticut	Poquonock	Mill River		Southport, Fairfield County		10,000
			Connecticut River	West Branch Farmington River	Riverton		235,439
	Maine	Enfield	Penobscot River	Cold Stream	Enfield	June 10	10,000
			do	do	do	June 11	20,000
			do	do	do	June 15	30,000
			do	Mattawamkeag River	Danforth	June 13	40,000
			do	do	do	June 14	40,000
			do	do	do	June 15	55,000
			do	do	Bancroft	June 16	40,000
			do	do	do	June 19	40,000
			do	Main River	Lincoln	June 20	22,000
		Grand Lake Stream	Saint Croix River	Grand Lake	Hinkley, Washington County	May 22, 30	268,214
		Machias	Machias River	Brooks and streams	Near Machias	June —	29,800
		Mount Kineo	Kennebec River	Moosehead Lake and tributaries	do	June —	198,000
		Naples	Presumpscot River	Tributaries Sebago Lake	Cumberland County	May —	30,000
		Norway	do	Crooked River	Rye Field Bridge	May —	40,000
			do	do	Steep Falls	May —	58,919
		Rangely	Androscoggin River	Kennebago and Rangely streams	Rangely, Franklin County	June 15	194,600
	Massachusetts	Winchester	Merrimac River	Nashua River			36,000
	New Hampshire	Plymouth	do	Pemigewasset River			334,302
	Minnesota	Saint Paul	Saint Louis River		Fond du Lac	Apr. 27	70,000
			do		do	May 3	70,000
			do		do	May 10	50,750
	New York	Roslyn	Hudson River	Carr's Brook	Warren County		35,000
			do	Balm of Gilead Brook	do		40,000
			do	Glen Brook	do		50,000
			do	Ramont Brook	do		45,000
			do	Gulf Brook, &c	do		55,000
			Salmon River	Beaver-dam Brook	Oneida County		25,000
			do	Trout Brook	do		20,000
			Clapham's Brook		Glen Head, L. I.		10,500
			Stream tributary to South Bay		Long Island		1,000
	Pennsylvania		Delaware River	Marshall's Creek	Near Shawnee, Monroe County	Apr. 22	30,000
			do	do	do	Apr. 24	30,000
			do	do	do	Apr. 25	32,417

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