
Vol. V, No. 26. Washington, D. C. Sept. 28, 1885.

134.—REPORT OF SHAD-HATCHING OPERATIONS AT BATTERY STATION, HAVRE DE GRACE, MD., SEASON OF 1885.**By WILLIAM HAMLLEN,***Superintendent of Battery Station.*

I have the honor to submit herewith my report of the operations in shad-hatching at this station during the spring of 1885, accompanied by tables showing in detail the work performed.

Although the work of the present year about trebled that done last season, the capacity of the station was by no means taxed to its utmost. It is needless to say that advantage was taken of every opportunity to make the work successful, and to accomplish all that was expected of the station.

The season was unusually backward, and we were much inconvenienced by the prolonged presence of ice in the river, which cut off communication with Havre de Grace, Md. On the island, however, the preparations for the work were steadily pushed forward.

The system pursued during the spring of 1884, of fishing the seine by contract, did not result as satisfactorily as was hoped, and it was deemed best not to attempt the same experiment this year. It being necessary to have the services of an experienced fisherman to act as captain of the seine, the position was offered to Mr. Everett Thompson, a citizen of Havre de Grace, and was accepted. Mr. Thompson reported at the station April 1st with two seine-menders and riggers, when the seine was removed from its storage, ropes taken out, and the operation of rigging the net commenced. Such dispatch was used that by the 14th of April this work was completed, although interrupted on several occasions by stormy weather. When ready for fishing the seine measured 1,280 fathoms in length.

While the seine was being rigged, attempts were made to sweep the hauls to remove any obstructions which might have lodged from the spring rains and freshets. As the ice did not leave the river until almost time for fishing operations to commence, and as the force was at this time inadequate to perform all that was necessary to be done to put the station on a proper footing for the season's work, the U. S. Fish Commission steamer Fish Hawk was ordered here for the purpose of clearing out these obstructions, and for rendering any assistance necessary to equip the station thoroughly. She arrived on April 2, and her crew was put to work with small boats and launches to clean the hauls. The work, however, was much interrupted by the heavy and continual

freshets in the river, caused by the early rains and the melting of snow and ice, so that the work was not satisfactorily completed until the 23d of the month. Mr. Piepmeyer, commanding the vessel, reported to the Commissioner, and received orders to proceed to Havre de Grace, coal ship, and leave for Washington. On the 24th the steamer left the station for the coal wharf, and on the 25th passed again on the way to Washington.

On the 2d of April, under orders from the Commissioner, Launch No. 68 left Battery Station for the Potomac River to assist in the shad work at that point. Launch No. 82 was ordered to accompany her as far as fresh water in the Potomac, because of the inability of No. 68 to travel in salt water after the supply of fresh water for her boilers had become exhausted, while No. 82 is furnished with a keel condenser. The trip was successfully made, and Launch No. 82 returned to this station on April 13.

During the first two weeks of April the force was daily increased until by the 16th the entire gang for fishing the seine was complete. The weather still continued cold and stormy, and interfered much with the success of the season's work.

On the 16th of April the first haul of the seine was made, and it was thereafter worked regularly and thoroughly until the 27th of May, when the force was discharged, and fishing operations ceased. In the period during which the seine was worked, 109 hauls were made, 50 ebb and 59 flood. The total catch of shad for the season was 3,512; only 167,125 herring were hauled, as there was no market for fresh fish, and the commission was not prepared to salt.

The catch of shad was far below that anticipated at the beginning of the season, but the cause is attributable to many unavoidable circumstances. The backward season, continual storms, muddy water in the river, and principally the condition of the apron upon which the seine was landed, all contributed to make the season as non-productive as it proved.

Much trouble was experienced with this apron last year, and one of the first moves the present season was an examination as far as practicable into its condition. It was discovered that a large portion of the apron was off the bottom, which would afford an easy avenue of escape for the fish on the landing of the seine, and efforts to remedy this were made by piling dirt and gravel along the edge of the apron to force the sill down level with the bottom, or to fill up the open space referred to. After this was done an examination showed that the apron was much improved, though by no means satisfactory. However, as the season was upon us we had to do the best possible under the circumstances. Later on will be submitted recommendations with reference to this matter.

The herring came on in the greatest abundance this year, constantly

crowding the seine to such an extent that it became necessary to allow these fish to escape, as there was no way of taking care of them.

The hatching house had been placed in order for the reception of shad eggs, and on the 21st of April the first instalment of eggs was received. From this time until the close of the season, June 11, eggs were taken daily from the fish captured in the seine and from the floats and gilliers operating in the neighborhood. It will be seen by reference to the accompanying tables of operations that the yield of eggs from the seine was 1,253,000, and from the gilliers and other sources 12,104,000, making a total of 13,357,000. Of this number there was an aggregate loss of 3,065,000, thus leaving as fish hatched 10,292,000. This number was augmented from outside sources by 433,000, as will be shown by an examination of the table of hatching operations. With this addition the number of shad produced was 10,725,000, which were about evenly distributed between the waters about the station and streams in other localities and States. The accompanying table of distribution will show each deposit.

During the season reports were received that large numbers of ripe shad were being captured on the eastern side of the bay by the gilliers operating in that neighborhood between Carpenter's and Turkey Points. A portion of the force was sent out to attend these fishermen as far as practicable, but the distance was so great and the time of lifting the nets so inconvenient that it was found impossible to work this neighborhood as thoroughly as was desired.

Accordingly, under orders from the assistant commissioner, the steamer Lookout arrived at the station on May 13, for the purpose of gathering eggs from this locality. She left the station each night, carrying two expert spawn-takers and an extra boat, and returned next morning. The eggs which could not be accommodated in the equipment of the vessel were then transferred to the station. This work was continued until May 17, when, with Assistant Commissioner Ferguson on board, the Lookout left for a visit of inspection of the Delaware River, where it was reported shad were being caught in great abundance. The vessel returned to the station on the 20th, after a very successful trip, having obtained in the short time there nearly 2,000,000 eggs, only a portion of which, however, was transferred to the hatching house at this station. After the return of the steamer the nightly trips to the eastern shore were resumed and continued until May 27, when the vessel again left for the Delaware River, taking an expert spawn-taker.

In all cases when the steamer transferred eggs to Battery Station due credit was given for the number, and a careful reference to the table of hatching operations will show that during the season the station received from the vessel 2,087,000 eggs, and 433,000 young shad.

The work on the Delaware proving so successful, the Commissioner ordered Launch No. 82, on duty at this station, to proceed to that locality

with an extra boat and two first-class spawn-takers, to assist the steamer Lookout. The launch, under Cocksain Cleaveland, left on May 28, and returned June 7.

POOL EXPERIMENTS.—The experiment attempted in previous years of confining unripe shad in the pool until they had become sufficiently "soft" to yield spawn, was repeated this season, but with little or no success.

Several seine hauls of fish were turned into the pool, and at intervals the shad would be removed and examined. Most of those captured proved "hard" or "rotten ripe," and but a very small number of eggs was obtained from this source. The few eggs taken had the appearance of being sound and healthy at the time of stripping, but soon after being placed in the hatching jars, would form into knots. No fish were produced from the eggs thus obtained, and I again advance the opinion that this experiment is not practicable. The shad are unused to a confined space like the pool, and are eager to escape. Failing in this, they become frightened and rush against the sides of the pool and the wire grating of the gates, bruising themselves severely, causing the appearance of fungus, and afterwards death. Probably another cause of failure this season was the presence in the pool of herring in such large numbers. Their continual agitation stirred up the mud and sediment on the bottom, and the sliming of the water, in addition, made it extremely unwholesome, large numbers of fish dying daily.

Another and dangerous feature was noticed in this connection. The water used in the jars for hatching purposes was pumped from this pool into the two large tanks in the water-tower, whence it passed through pipes into the hatching house. About the 18th of May, when the pool was crowded with shad and herring, it was noticed by the attendants of the hatching house that the water was flowing less freely, and the eggs began to present a dirty and sickly appearance. A prompt investigation showed that the water contained large quantities of dirt and slime caused by the fish in the pool. The water was immediately turned off and the pipes and jars thoroughly cleaned. It was proposed to remedy this evil by running a new suction pipe outside of the pool, and sufficient pipe for the purpose was ordered; before it arrived, however, the condition of the eggs became such as to make it imperative that the cause of this pollution should be removed. Accordingly, on my earnest recommendation, the assistant commissioner instructed that the pool gates be opened and the fish allowed to escape. This was done at once, and in a short time, the eggs resumed their normal condition.

The experiments designed with the pool were thus practically ended for this season, as the catch of fish after the opening of the gates was so small that the seine was stopped a few days after.

By judicious management and untiring application on the part of

experts Sauerhoff and Tolbert, who were in charge of the hatching house, the loss of eggs from the pollution of the pool water, although of considerable extent, was kept as low as possible.

Every effort was made to prove the feasibility of this pool experiment, but without success. To facilitate the hauling of the pool seine, and also to allow more space for the fish, the several interior aprons and bulkheads were removed this spring, and one apron only was placed in the northern end of the pool. This worked more satisfactorily than the first arrangement. By the direction of the assistant commissioner, a space of some 20 feet was netted off in the entrance to the pool with nets of different sized meshes. When a haul of fish was turned into this space, the small fish and herring would pass through the larger mesh into the pool, leaving the shad. At intervals the shad would be examined, but always proved "hard" or "rotten ripe."

As stated above, it is my belief that the experiment of penning shad until ripe is not practicable, experience having shown that it is only when fish are captured ready to deposit spawn that good eggs are obtained.

HERRING.—During the season attempts were made to hatch the eggs of the herring, but the apparatus used was not adapted to this work, and little success was attained. However, by careful management, some 200,000 young herring were produced, and placed in the waters about the station.

PERCH.—Several very large, ripe perch being caught in the seine, their eggs were taken and impregnated. A Chase jar was used in developing them, after which the fry were deposited in the neighborhood of the station. During the season 1,250,000 eggs of the perch were obtained, from which number 1,000,000 fish were hatched and planted.

HAVRE DE GRACE, MD., *June 30, 1885.*

TABLE I.—Record of shad-hatching operations conducted at Battery Station, Maryland, from April 16 to June 11, 1885, under direction of William Hamlen, superintendent.

Date.		Fish taken in battery seine.		Ripe shad.		Eggs from seine.	Eggs from gilliers and other sources.	Total eggs.	Loss of eggs.	Fish hatched.	Fish deposited in local waters.	Fish deposited in other waters.
Day of week.	Day of month.	Shad.	Herring.	Males.	Females.							
Thursday	Apr. 16		675									
Friday	Apr. 17	6	6,200									
Saturday	Apr. 18	5	4,000									
Monday	Apr. 20	88	6,750									
Tuesday	Apr. 21	160	28,000				10,000	10,000	5,000	5,000		
Wednesday	Apr. 22	138	13,000	2	1	14,000	50,000	64,000	4,000	60,000		
Thursday	Apr. 23	185	25,000	2	2	28,000		28,000	8,000	20,000		
Friday	Apr. 24	131	13,000	6	4	80,000	55,000	135,000	24,000	111,000		
Saturday	Apr. 25	111		3	3	112,000	125,000	237,000	61,000	176,000		
Monday	Apr. 27	80	15,000	2	2	85,000	229,000	314,000	99,000	215,000		
Tuesday	Apr. 28	153		8	7	213,000		213,000	68,000	145,000		
Wednesday	Apr. 29	38	12,000				122,000	122,000	20,000	102,000		
Thursday	Apr. 30	165	3,600	3	2	55,000		55,000	33,000	22,000	85,000	
Friday	May 1	90	5,000	4	1	35,000	48,000	83,000	28,000	55,000		
Saturday	May 2	25		2	2	65,000	50,000	115,000	7,000	108,000		
Monday	May 4	195	2,000	1	1	28,000	363,000	391,000	45,000	346,000		
Tuesday	May 5	132	4,000				322,000	322,000	79,000	243,000		
Wednesday	May 6	162		4	4	125,000	260,000	385,000	166,000	219,000		1300,000
Thursday	May 7	32		1	1	80,000		80,000	38,000	42,000		
Friday	May 8	186					60,000	60,000	4,000	56,000		
Saturday	May 9	72									473,000	
Sunday	May 10						25,000	25,000	10,000	15,000		
Monday	May 11	157	8,000	2	2	101,000	467,000	568,000	88,000	480,000		
Tuesday	May 12	68	3,000				153,000	153,000	22,000	131,000		260,000
Wednesday	May 13	61	5,000	1	1	42,000	147,000	189,000	28,000	161,000		
Thursday	May 14	² 115	⁵ 5,000	1	*1	19,000	⁴ 622,000	641,000	84,000	557,000	506,000	
Friday	May 15	151		2	2	44,000	⁵ 654,000	698,000	113,000	585,000		
Saturday	May 16	9					⁶ 1,190,000	1,190,000	219,000	971,000		
Sunday	May 17						941,000	941,000	296,000	645,000	245,000	
Monday	May 18	122		3	2	35,000	1,242,000	1,277,000	⁷ 499,000	778,000	56,000	
Tuesday	May 19	179	3,500	5	3	62,000	687,000	749,000	268,000	481,000		
Wednesday	May 20	25	5,000				⁸ 692,000	592,000	239,000	353,000	440,000	
Thursday	May 21	24					70,000	70,000	4,000	66,000	573,000	*1,250,000
Friday	May 22	¹⁰ 148					105,000	105,000	44,000	61,000	800,000	
Saturday	May 23	17					¹¹ 377,000	377,000		¹² 652,000	674,000	
Sunday	May 24						168,000	168,000	10,000	158,000	500,000	¹³ 1,500,000
Monday	May 25	176					¹⁴ 270,000	270,000	28,000	242,000	125,000	
Tuesday	May 26	63		2	1	30,000	327,000	357,000	80,000	277,000	150,000	

Wednesday ¹⁶	May 27	43					212,000	212,000	14,000	198,000	100,000	16,250,000
Thursday	May 28						77,000	77,000	5,000	72,000		17,250,000
Saturday	May 30						184,000	184,000	14,000	170,000		18,250,000
Monday	June 1						705,000	705,000	133,000	572,000		19,251,000
Tuesday	June 2						454,000	454,000	69,000	385,000		
Wednesday	June 3						300,000	300,000	50,000	250,000		20,270,000
Thursday	June 4						80,000	80,000	15,000	65,000		
Friday	June 5						21,301,000	301,000	42,000	{ 22,259,000 }		23,260,000
Saturday	June 6						35,000	35,000	2,000	33,000	158,000	24,500,000
Tuesday	June 9						25,000	25,000				26,400,000
Wednesday	June 10										601,000	
Thursday	June 11									25,000	{ 26,25,000 }	
											33,000	
Total		3,512	167,125	54	42	1,253,000	12,104,000	13,357,000	3,065,000	10,725,000	5,044,000	5,681,000

¹ Delivered to Messenger Donnelly.

² 13 from pool.

³ From pool.

⁴ 165,000 from steamer Lookout.

⁵ 529,000 from steamer Lookout.

⁶ 332,000 from steamer Lookout.

⁷ Heavy losses of eggs at this time caused by impurity of water in pool, owing to the muddying and sliming of same by large number of fish therein.

⁸ 348,000 from steamer Lookout.

⁹ Car No. 3, for the Hudson River.

¹⁰ 76 shad from pool.

¹¹ 377,000 eggs from Lookout.

¹² 275,000 fish from Lookout.

¹³ Car No. 3, for Dan River.

¹⁴ 35,000 eggs from Lookout.

¹⁵ Cut out seine to-day.

¹⁶ Messenger Donnelly, for North East River.

¹⁷ Messenger Donnelly, for Gunpowder River.

¹⁸ Messenger Donnelly, for Patapsco River.

¹⁹ Messenger Donnelly, for Elk River.

²⁰ Messenger Donnelly, for Chester River.

²¹ 301,000 eggs from Lookout.

²² 158,000 fish from Lookout.

²³ Donnelly, for Bush River.

²⁴ Donnelly, for Susquehanna River, Sunbury, Pa.

²⁵ Donnelly, for _____.

²⁶ 25,000 eggs in process of hatching turned out into river by reason of stoppage of pumps furnishing jars.

• Partly ripe.

NOTE.—Excess of 433,000 fish hatched caused by transfer of that number to station by steamer Lookout—May 23, 275,000; June 5, 158,000.

TABLE II.—Record of temperature observations made at Battery Station, Maryland, on the Susquehanna River, from April 1 to June 11, 1885, by William P. Sauerhoff and George H. Tolbert.

Date.	Temperature of air.			Temperature of surface water.			Temperature of hatching-house.			Direction of wind.			Intensity of wind.			Condition of sky.			Condition of water.	State of tide.			
	7 a. m.	12 m.	6 p. m.	7 a. m.	12 m.	6 p. m.	7 a. m.	12 m.	6 p. m.	7 a. m.	12 m.	6 p. m.	7 a. m.	12 m.	6 p. m.	7 a. m.	12 m.	6 p. m.		7 a. m.	12 m.	6 p. m.	
1885.																							
Apr. 1 ¹	43	60	58	38	39	39				NE.		NE.	Calm	Calm	Light	Clear	Clear	Clear	Muddy	Flood	Ebb	Flood.	
2 ¹	42	50	49	38	39	39				SE.	SE.	Fresh	Fresh	Light	Calm	Cloudy	do	do	do	do	do	Ebb.	
3 ¹	46	60	58	38	39	39				S.	SW.	Light	Fresh	Light	Clear	do	do	do	do	do	do	Flood.	
4 ¹	40	45	44	38	38	39				NW.	NW.	Strong.	Strong.	Strong	Cloudy	Cloudy	Cloudy	do	do	do	do	Do.	
5 ¹	36	52	50	38	40	40				SW.	SW.	Moderate	Fresh	Fresh	Clear	Clear	Clear	do	do	do	do	Ebb.	
6 ¹	38	58	54	39	40	40				W.	NW.	do	do	do	do	do	do	do	do	do	do	Do.	
7 ¹	42	56	47	40	40	41				W.	NW.	Light	Calm	Light	Clear	Cloudy	Cloudy	do	do	Ebb.	Flood	Do.	
8 ¹	49	58	50	42	43	43				NE.	SW.	do	Light	Strong	Clear	do	do	do	do	do	do	Do.	
9 ¹	40	44	43	42	42	48				NW.	NW.	Fresh	Fresh	Light	Clear	Clear	Clear	do	do	do	do	Flood.	
10 ¹	38	50	44	42	43	48				NE.	NE.	Light	Light	do	Cloudy	Cloudy	Cloudy	do	do	do	do	Ebb.	
11 ¹	40	38	42	42	42	42				SE.	SW.	do	Strong	Fresh	Clear	do	do	do	do	do	do	Do.	
12 ¹	43	48	46	41	41	41				SW.	W.	Fresh	Fresh	do	do	Clear	Clear	do	do	do	do	Do.	
13 ¹	38	50	40	41	41	41				W.	NW.	Light	Light	Strong	Cloudy	Cloudy	do	do	do	do	Ebb	Flood.	
14 ¹	34	49	48	40	41	41				NW.	NW.	Strong.	Strong	Light	Clear	Clear	do	do	do	do	do	Do.	
15 ¹	42	48	47	41	41	42				E.	S.	Light	Light	Calm	Cloudy	Cloudy	Cloudy	do	Flood	do	do	Do.	
16 ¹	41	54	55	42	44	44				NE.	SE.	do	do	Light	do	Clear	Clear	Clear	do	do	do	Do.	
17 ¹	44	56	52	44	46	46				NE.	SW.	do	do	do	do	Cloudy	Cloudy	do	do	do	do	Do.	
18 ¹	46	60	54	46	47	49				NE.	SE.	Fresh	do	Fresh	do	Clear	do	do	do	do	do	Do.	
19 ¹	42	62	58	47	50	53				NE.	S.	Light	Calm	Light	Clear	do	Clear	do	do	do	do	Do.	
20 ¹	51	61	64	50	54	54					SW.	S.	Calm	Fresh	do	do	do	do	do	Ebb	Flood	Ebb.	
21 ¹	52	66	63	53	58	57		59			SE.	do	do	Light	Calm	do	do	do	do	do	do	Do.	
22 ¹	61	72	80	55	58	64	60	60	60	NE.	SE.	Light	do	do	do	do	do	do	do	do	do	Do.	
23 ¹	60	78	75	58	60	62	60	61	63	NE.	do	do	Calm	Light	do	do	do	do	do	do	do	Do.	
24 ¹	60	74	69	60	60	63	61	62	64	SE.	do	do	do	do	do	Cloudy	do	do	do	do	do	Do.	
25 ¹	64	74	67	61	62	63	62	63	64	NE.	N.	Fresh	Light	do	do	do	do	do	do	do	do	Do.	
26 ¹⁰	56	60	59	60	60	60	60	60	60	SE.	NE.	Strong.	do	Fresh	do	Cloudy	do	Muddy	do	Ebb.	Flood.		
27 ¹	59	69	68	58	60	61	59	60	61	W.	WNW	Fresh	Fresh	Light	Clear	Clear	Clear	do	do	do	do	Do.	
28 ¹¹	59	64	58	60	60	60	60	60	60	E.	SE.	do	do	Strong	Cloudy	Cloudy	Cloudy	do	Flood	do	do	Do.	
29 ¹²	44	58	58	58	58	58	58	58	58	NW.	NW.	Violent	Storm	Light	Clear	do	Clear	do	do	do	do	Do.	
30 ¹	58	66	68	56	57	54	56	58	58	W.	W.	Light	Light	do	do	Clear	do	do	do	do	do	Do.	
May 1 ¹	58	54	50	56	56	55	56	56	55	NE.	NE.	Light	Fresh	Fresh	Cloudy	Cloudy	Cloudy	Muddy	Flood	Ebb	Flood.		
2 ¹	62	68	67	53	56	55	59	56	55	NW.	NW.	Fresh	Strong	do	Clear	do	Clear	do	do	do	High	Ebb.	
3 ¹²	64	68	68	54	54	55	54	54	55	NW.	NW.	Light	do	do	do	do	Cloudy	do	do	do	Flood	Do.	
4 ¹	51	64	61	53	54	56	53	54	57	NW.	NW.	do	Light	do	Cloudy	do	Clear	do	do	do	do	Do.	
5 ¹	53	72	70	54	57	57	55	57	58	NE.	S.	do	do	Calm	do	Clear	Clear	Clear	do	Fbb	do	Do.	

6 ¹⁴	58	76	68	58	61	60	58	60	59	NE.	SW.	SW.	do	do	Fresh	do	do	Cloudy	do	do	do	Do.
7 ¹⁵	58	60	59	59	59	60	59	59	59	NE.	NE.	N.	Strong	Strong	do	do	Cloudy	do	Muddy	do	do	Do.
8	56	61	62	59	59	60	59	59	60	NE.	SE.	NW.	Light	Light	do	do	Clear	do	do	do	do	Do.
9 ¹⁶	50	68	68	56	58	60	57	58	60	SW.	S.	NW.	Fresh	do	Strong	do	Clear	Cloudy	do	do	do	Do.
10	56	60	59	58	60	60	58	60	60	NW.	NW.	NW.	do	Fresh	Fresh	Clear	Cloudy	do	do	do	Flood	
11	51	56	60	56	57	57	56	57	57	NW.	SW.	SW.	do	Strong	Light	do	do	Clear	Flood	Ebb.	Do.	
12	67	68	67	57	57	57	57	57	57	SW.	NE.	NE.	Calm	Light	Fresh	do	do	do	do	do	do	Do.
13 ¹⁷	54	55	54	57	57	57	57	54	57	SE.	NE.	NW.	Fresh	Fresh	Light	Cloudy	do	do	Muddy	do	do	Do.
14 ¹⁸	53	68	62	57	58	58	57	58	58	NW.	NW.	NW.	do	Light	Calm	do	do	do	do	do	do	Do.
15	70	76	73	57	58	61	57	58	61	NW.	NW.	SE.	do	do	Fresh	Clear	Clear	Clear	do	do	do	Do.
16	76	78	72	58	61	62	58	61	62	NW.	NE.	E.	Light	Fresh	Light	do	do	Clear	do	do	do	Do.
17	64	70	64	60	62	62	60	62	62	SE.	SE.	SE.	do	Light	Calm	do	Cloudy	Cloudy	do	do	do	Ebb.
18	66	72	67	61	62	62	61	62	62	SW.	SW.	SW.	do	Fresh	Fresh	do	do	Clear	do	Ebb.	Flood	Do.
19	65	70	69	60	61	61	60	61	61	W.	SW.	SE.	do	Light	do	do	do	Clear	do	do	do	Do.
20	70	75	72	61	62	62	61	62	62	SW.	SW.	SE.	do	Fresh	do	do	Cloudy	Cloudy	do	do	do	Do.
21 ¹⁹	67	71	67	62	62	62	62	62	62	SW.	SE.	SE.	do	do	do	Cloudy	do	do	do	do	do	Do.
22 ²⁰	72	69	67	68	68	68	68	68	68	NE.	SE.	SE.	Fresh	do	Light	do	do	do	do	do	do	Do.
23 ²¹	60	70	72	67	69	72	67	69	72	NE.	SE.	N.	Light	Light	do	do	Clear	do	do	do	do	Do.
24	61	62	60	68	68	68	68	68	68	E.	E.	NE.	Fresh	Fresh	do	do	Cloudy	do	do	do	Flood	Do.
25 ²¹	59	67	69	66	66	67	66	66	66	NE.	SE.	SW.	do	Light	do	do	Clear	do	do	Flood	Ebb.	Do.
26 ²²	65	72	72	68	68	70	68	68	70	NE.	NE.	NE.	Light	do	do	do	do	do	do	do	do	Do.
27 ²²	70	72	70	68	68	68	68	68	68	NW.	NW.	NE.	do	Fresh	do	do	do	Cloudy	do	do	do	Do.
28	67	69	68	68	68	68	68	68	68	NE.	NE.	NE.	Fresh	do	Fresh	do	do	Clear	do	do	do	Do.
29 ²³	58	62	58	67	67	65	67	67	65	NE.	NE.	NE.	do	do	do	do	Cloudy	Cloudy	do	do	do	Do.
30 ²⁴	60	61	64	63	63	63	63	63	65	NE.	N.	N.	do	Calm	do	do	do	do	do	do	do	Do.
31 ²⁵	68	71	68	64	66	66	64	66	66	NE.	SW.	SE.	Light	Light	Light	do	do	do	do	do	Flood	Ebb.
June 1	69	71	70	65	67	65	67	67	67	NW.	NW.	W.	do	Fresh	do	Clear	do	do	Ebb.	do	Do.	
2	68	70	73	66	68	69	66	68	69	NW.	NW.	N.	do	Light	do	do	Clear	Clear	Muddy	do	do	Do.
3	69	70	72	67	68	70	67	68	70	NE.	SE.	do	do	do	Calm	do	do	do	do	do	do	Do.
4 ²⁶	69	70	72	68	69	70	68	69	70	SE.	do	do	do	Calm	do	do	do	Cloudy	do	do	do	Do.
5	72	76	70	70	70	70	70	70	70	SW.	SW.	SW.	Fresh	Fresh	Fresh	do	do	Clear	Clear	do	do	Do.
6	70	69	71	68	70	70	68	70	70	NW.	SE.	S.	do	do	Light	Light	do	do	do	do	do	Do.
7	68	74	76	70	72	73	70	72	73	SW.	SW.	SW.	do	Fresh	Fresh	do	do	do	do	do	do	Do.
8	75	77	76	72	73	73	72	73	73	NW.	SW.	SW.	Light	Light	do	do	do	do	do	do	Ebb.	Flood.
9	64	67	69	68	68	72	68	68	72	NW.	NW.	NW.	Fresh	Fresh	do	Cloudy	Cloudy	Cloudy	do	Flood	do	Do.
10	67	71	69	68	70	71	68	70	71	NE.	do	SE.	Light	Calm	Light	do	do	Clear	do	do	do	Do.
11 ²⁷	69			72		72		72														Do.

¹ Current in river.

² River full of floating ice.

³ Rained all night from NE. Rain stopped at 10 a. m.

⁴ Rain from 4 p. m. to 10 p. m.; from 4 a. m. to 5 a. m.

⁵ Current in river and very low tide.

⁶ Rain and snow 11.30 a. m.; stopped snowing 2 p. m.; stopped raining at 6 p. m.

⁷ Rain in afternoon; current in river.

⁸ Slight current in river.

⁹ First eggs for season to-day.

¹⁰ Thunder storm from 3 to 7 a. m.

¹¹ Rain 12.45 p. m.; stopped 5 p. m.

¹² Tide very low; water muddy.

¹³ Light rain 7 to 8 p. m.

¹⁴ Rain at 9.30 p. m.

¹⁵ Rain all day; stopped 11 p. m.

¹⁶ Rain squall from northwest 6 p. m.

¹⁷ Rain all day.

¹⁸ Rain stopped 2 a. m.

¹⁹ Rain 8 p. m.

²⁰ Rain stopped 5 a. m.

²¹ Rain 11.50 p. m.

²² Rain 9 a. m.; stopped 1 p. m.

²³ Rain all night.

²⁴ Rain stopped 11 a. m.

²⁵ Rain 3 p. m.; stopped 6 p. m.

²⁶ Rain from 4.30 p. m. to 6.15 p. m.

²⁷ Ceased operation in hatching-house at 9 a. m.

TABLE III.—Record of distribution of shad fry made from April 30 to June 11, 1885, by Battery Station, Maryland.

Date.		Number of fish.		State.	Place.	Stream.
		Originally taken.	* Actually planted.			
1885.						
Thursday..	April 30	85,000	85,000	Maryland....	Battery Station ¹ .	Susquehanna River.
Wednesday	May 6	300,000		Pennsylvania.	Harrisburg ²	Do.
Sunday....	May 10	473,000	473,000	Maryland....	Battery Station ³ .	Do.
Tuesday...	May 12	260,000	260,000 ⁶	Alabama.....	Montgomery.	Alabama River.
Thursday..	May 14	506,000	506,000	Maryland....	Battery Station ³ .	Susquehanna River.
Sunday....	May 17	245,000	245,000	do.....	do ⁴	Do.
Monday....	May 18	56,000	56,000	do.....	do ⁴	Do.
Wednesday	May 20	440,000	440,000	do.....	do ⁴	Do.
Thursday..	May 21	573,000	573,000	do.....	do ³	Do.
Thursday..	May 21	1,250,000	1,250,000 ⁷	New York....	Mechanicsville.	Hudson River.
Friday....	May 22	300,000	300,000	Maryland....	Battery Station ³ .	Susquehanna River.
Saturday...	May 23	674,000	674,000	do.....	do ³	Do.
Sunday....	May 24	500,000	500,000	do.....	do ³	Do.
Sunday....	May 24	1,500,000	1,500,000 ⁷	Virginia.....	Danville.	Dan River.
Monday....	May 25	125,000	125,000	Maryland....	Battery Station ³ .	Susquehanna River.
Tuesday...	May 26	150,000	150,000	do.....	do ³	Do.
Wednesday	May 27	100,000	100,000	do.....	do ³	Do.
Wednesday	May 27	250,000	250,000	do.....	North East ²	North East River.
Thursday..	May 28	250,000	250,000	do.....	Railroad cross- ing. ²	Gunpowder.
Saturday..	May 30	250,000	250,000	do.....	Relay House ² ...	Patapsco River..
Monday....	June 1	251,000	251,000	do.....	Elkton ²	Elk River.
Wednesday	June 3	270,000	270,000	do.....	do.....	Chester River. ³
Friday....	June 5	200,000	200,000	do.....	Bush Station	Bush River. ²
Saturday...	June 6	158,000	158,000	do.....	Battery Station ⁵ .	Susquehanna River.
Saturday...	June 6	500,000	500,000	Pennsylvania.	Sunbury ²	Do.
Tuesday...	June 9	400,000	400,000	do.....	do..... ²	Do.
Wednesday	June 10	601,000	601,000	Maryland....	Battery Station ⁵ .	Susquehanna River.
Thursday..	June 11	33,000	33,000	do.....	do ⁵	Do.
Thursday..	June 11	25,000	25,000 [*]	do.....	do ⁵	Do.
Total	10,725,000				

¹ By William Hamlen.² By F. L. Donnelly.³ By Sauerhoff & Tolbert.⁴ By G. H. Tolbert.⁵ By W. P. Sauerhoff.⁶ Delivered to N. Simmons.⁷ Delivered to car No. 3.^{*} This deposit was of eggs almost on the point of hatching.

135.—SALTING ROE IN NORWAY.*

Roe did not become an article of commerce in Norway until the second half of the seventeenth century. About the year 1650 the quantity of roe annually exported from Bergen was only 9 barrels, and from Trondhjem in 1665, about 200 barrels. At the close of the seventeenth century Bergen annually exported 800 barrels, Christiansund 100, and Trondhjem 700. About the middle of the eighteenth century the quantity of roe exported from Norway had increased to 8,000 barrels per year, and toward the end of the century to nearly 13,000 barrels. From 1830 to 1850 it was a little above 20,000; from 1851 to 1865, about 30,000, and from 1866 to 1875, about 40,000 barrels annually. Since then it has risen to 50,000, and in 1880 to 70,000 barrels. On an average since the middle of the last century one barrel of roe has been exported annually to a thousand kilograms of fish.

*"Saltning af Rogn." From the *Norsk Fiskeritidende*, vol. iv, No. 1, Bergen, January, 1885. Translated from the Danish by HERMAN JACOBSON.