# XXV.—REPORT ON THE PROPAGATION AND DISTRIBUTION OF SHAD (ALOSA SAPIDISSIMA) IN THE SPRING OF 1880.

Two stations for propagating shad were established and maintained during the season of 1880; one of them in Spesutie Narrows, near Havre de Grace, which had been so successfully operated in previous years by the United States and Maryland Fish Commissions jointly; the other a new one at the Washington navy-yard, through the courtesy of Commodore Richard L. Law, Chief of the Bureau of Yards and Docks, and Commodore John C. Febiger, commandant of the yard. Their hearty co-operation in placing the facilities of the navy-yard at the disposal of the Commission evidenced their interest in the work.

Nearly 30,000,000 of young shad were produced at and distributed from these stations—an increase of about 14,000,000 over the aggregate result of the several stations operated the previous year.

It was not thought practicable to continue the work on Albemarle Sound during this season, but early information of this intermission was given to the State Commissioners of North Carolina, that the station might be occupied by them. Mr. S. G. Worth, the efficient Superintendent of Fisheries of that State, pushed the work with creditable zeal and flattering success, depositing the fish hatched at this station by his corps, in the adjacent waters and in the other rivers of North Carolina.

*Havre de Grace Station.*—Mr. John S. Saunders, of Baltimore, who had with so much fidelity and zeal administered the work at the Albemarle Sound Station during the operations in North Carolina last season; and, later, had been transferred to the charge of machinery barge No. 2 with its accompanying equipment as a branch of the station at Havre de Grace, was placed this year in charge of the entire work at the mouth of the Susquehanna. The result of the hatching and distribution from this station will appear in the appended tables.

The two barges containing the machinery, and the two furnishing quarters for the operatives, were towed, on the 29th of April, from Baltimore, where they had been kept during the winter, to Spesutie Narrows, the entrance to this harbor having been improved by dredging. The towing of these barges was performed by the revenue steamer "Ewing," which had been kindly detailed for the purpose.

On the 3d of May the first eggs were taken, and the production was gradually increased until about the middle of the month, when the maximum yield was obtained. The operations were carried on with varying success up to the 10th of June, the time at which the Maryland law requires fishing to cease. Up to this date 13,355,000 eggs had been procured.

As the eggs were procured only from those fish taken for market, and as none were taken for the express purpose of obtaining their eggs, the production was dependent upon the fishermen, and when the local laws required a cessation of fishing, there was, of course, no other source of supply, and the operations at this point were necessarily discontinued.

The excessive drought during the month of May, and the prevalence of southerly winds, caused the salt or brackish water to extend unusually high up the Chesapeake Bay, the water becoming so brackish at the station as to make it advisable to move the entire equipment from Spesutie Narrows to a point above Havre de Grace where the water was entirely free from salt. This was done on the 30th of May. The advantage of having such floating apparatus as this station was provided with was demonstrated on the occurrence of this abnormal condition, as the equipment was moved without loss of fish, eggs, or time, to a locality some five miles distant.

The aggregate results of the season were materially lessened, however, as during the period when ripe breeders were most plentiful the gillers declined to let the agents of the Commission handle their catch on account of some dissatisfaction caused by a reduction in the price paid for the fish utilized for hatching purposes. The magnitude of the work having so materially increased, and the number of fish handled being so much greater than in previous years, it was found advisable to lessen the price offered for ripe shad, which, however, was always maintained above the ruling market rates. The fishermen, without due consideration of the subject, refused for a few days to allow their fish to be handled unless they were purchased at the same rate as in previous years. However, after a temporary interruption, the fishermen accepted the conditions, and the results of the season, although somewhat influenced by this interruption, were most gratifying, as the yield of this station, as already stated, aggregated between 12,000,000 and 13,000,000 of young shad, an excess of over 2,000,000 in production beyond the yield of the two stations operated in this locality the previous year.

On the 25th of May the first car-load shipment was made from this station, the car having been furnished by the Philadelphia, Wilmington and Baltimore Railroad Company. Over a million of young shad were transferred from Havre de Grace to the Nanticoke River and deposited in that stream near Seaford, in Delaware. This was effected without loss.

On the 12th of June, while the fish on hand were being transferred from the hatching vessels to the depot for a shipment to Maine, a terrific

wind storm, accompanied by heavy rain, broke the barges away from their moorings and cast them ashore, causing a loss of between 800,000 and 900,000 fish and eggs, or rather the involuntary deposit in the Susquehanna River of that number. Sufficient, however, were saved to make a good car-load, with a few additional fish which were sent from the Washington Station. Nearly a million shad were taken on this trip to Maine and divided between the Penobscot and Kennebec Rivers. The Commission is again indebted to the Philadelphia, Wilmington and Baltimore Railroad Company for the car in which this shipment was made and for the arrangements with the other companies for the movement of the car by fast passenger trains to Bangor. Mr. Stillwell, one of the State Commissioners of Maine, met the car at this point and selected the places of deposit.

During the month of May, Mr. J. P. Creveling, of the Pennsylvania Commission, by direction of the Commissioners, procured from this station nearly half a million of young shad, which were deposited in the upper waters of the Susquehanna River.

At the close of the season, half of the equipment was transferred to Baltimore to be remodeled, and from thence taken to Tangier Sound to be used in the experiments in the artificial propagation of the oyster inaugurated by Major Ferguson, Commissioner of Fisheries of Maryland, the barges finally to be transferred to Washington for future service on the Potomac River. The rest of the equipment—that is, one machinery barge, and one barge occupied as quarters—was left at Havre de Grace, to be used again the succeeding year.

The disposition of the fish produced is shown in the tables appended, the yield of this station being incorporated with the distribution of the fish hatched on the Potomac.

*Washington navy-yard station.*—In order to determine the feasibility of hatching shad by the use of hydrant water, and for the purpose of producing them in large numbers at a convenient center of distribution, a station was improvised at the Washington navy-yard by permission of the Navy Department, and through the courtesy of the commandant of the yard.

At the western end of the "ship-house" a number of cones, arranged according to the Ferguson system, were set up, a few at first, afterwards more and more, until about forty-six were in place. The number was increased as fast as the vessels could be manufactured, and they were kept to their full capacity during most of the season. It was necessary that this apparatus should be operated outside of the ship-house in the open air, as it was deemed imprudent to have lights within the building, and they were a necessity for the proper conduct of the work.

The water was supplied to this apparatus from a hydrant connection near by. The eggs were nightly collected 15 or 20 miles down the river and brought up upon the "Lookout," a small steamer in the service of the Maryland Fish Commission, which had been provided with apparatus

for the purpose. On arrival they were at once placed for final development in the cones above referred to. As soon as the fish were ready for distribution they were placed in transporting cans and then transferred to the railroad depots for shipment.

The experiment proved entirely successful, so large a percentage hatching out that the loss of eggs was scarcely appreciable, and the distribution was readily made to all parts of the country.

During the progress of the work, it was found that that section of the Potomac River immediately adjacent to Fort Washington was the most productive of ripe shad, and it was therefore deemed advisable to station a portion of the spawn-takers at this point. Permission having been obtained from the War Department, a building on the reservation was occupied as quarters for this portion of the force. The eggs when collected were placed in vessels suspended in the water, which kept them in good condition until they could be transferred to the hatching apparatus at the navy-yard.

This sub-station was occupied until the 19th of June, when it was abandoned, as shad were no longer taken in sufficient numbers to induce further work at this point.

Advantage was taken of the peculiar facilities of the navy-yard station for conducting several experiments for determining the minimum amount of water necessary for keeping young shad in good health and condition, as very often it is necessary to economize water both in the production of the fish and their transportation. These experiments demonstrated that the eggs could be as successfully hatched with less than one-fourth the amount of water if an abundance of atmospheric air was introduced with the water.

Many other experiments were conducted during this season which have resulted in material modifications in the forms of the apparatus used in the production of, and the vessels for transporting, young shad.

On the 23d of May the first large car shipment was made from Washington. Mr. George C. Wilkins, superintendent of the Pennsylvania system of railroads at Baltimore, having provided a commodious baggage car, and arranged for its movement on the passenger train as far south as the standard gauge roads extended, and also obtained from the connecting lines a similar car at this terminal, about 2,000,000 of young shad were loaded in the car at Washington from the navy-yard station. One-half of these were successfully deposited in the rivers of South Carolina and the other half in those of Georgia.

On June 6 another car-load, consisting of about 700,000, was shipped to Cincinnati in a car kindly loaned by the Baltimore and Ohio Railroad Company. There the fish were turned over to Dr. Griffith, the president of the Kentucky State Commission, who met the car in person and superintended the deposit of the fish in the rivers of Kentucky.

The success at these stations in procuring shad in large numbers led to the inauguration of this system of shipping young shad by the car-

load, in place of the single messenger shipments, limited as they were to one or two hundred thousand fish.

Although in previous seasons the production amounted to many millions of fish, this was the aggregation of only one or two hundred thousand daily. Large shipments of one or two millions were impracticable, as before this number could be produced the earlier hatched were so far developed that they would require a much more abundant supply of food than that found in the limited amount of water to which they were necessarily confined.

The production of previous years was necessarily scattered in comparatively small lots throughout the country, no streams except those on which the hatching stations were located receiving a sufficient number to have their presence decidedly marked.

Far greater results can be anticipated from the deposits of one or two millions of fish in a stream during a single season, and this is entirely within the possibilities, so great has been the advancement in the methods employed in collecting the eggs, their development, and the transfer of the young fish produced.

Shipment by car-loads was, therefore, a marked feature in the operations of this season. By this method, it is confidently hoped that the work of distribution, not only of shad, but of carp and other fishes, can be made much more systematically, much more efficiently, and at much less cost.

Having demonstrated the practicability of securing young shad of uniform ages in sufficient numbers to warrant shipments by car-loads, it now becomes necessary to secure properly arranged cars for this purpose. The essentials of a car for this duty are:

First. Arrangements for maintaining even and constant temperatures.

Second. Capacity for conveniently storing special carrying vessels.

Third. Automatic arrangements for change and circulation of water and aeration.

Fourth. Comfortable living, accommodations for the messengers attending the fish, so that they can be constantly at their post of duty.

Designs are being prepared for the construction of such cars, which will be built as the work develops and the means are provided.

The detail of operations at this station with accompamying tables, by Mr. F. N. Clark, who was in charge, will be found in the following pages.

The fish produced at Washington, as well as the yield from the Havre de Grace station, were, as heretofore, transferred to various parts of the country. The places of deposit are given in the accompanying tables, which have been arranged both geographically and chronologically for easy reference.

TABLE 1.—*Record of temperature observations at Spesutie Narrows, made May 3 to June 15, 1880, under the direction of the United*

| Date. | Temperatures. | | | | | | | | | Depth of water at station. | Wind. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Air, 7 a. m. | Surface water, 7 a. m. | Bottom, 7 a. m. | Air, 12 m. | Surface water, 12 m. | Bottom, 12 m. | Air, 7 p. m. | Surface water, 7 p. m. | Bottom, 7 p. m. | | Direction, 7 a. m. | Intensity, 7 a. m. | Direction, 12 m. | Intensity, 12 m. |
| | ° | ° | ° | ° | ° | ° | ° | ° | ° | *Feet.* | | | | |
| Monday, May 3 ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | S.W. | Strong | S.W. | Strong |
| Tuesday, May 4 ..... | 60 | 65½ | 63 | 72 | 66 | 63 | 65 | 66 | 63 | 15 to 25 | S.W. | ..do .. | S.W. | Gentle |
| Wednesday, May 5 .. | 62 | 65 | 63 | 73 | 66 | 63 | 72 | 65 | 65 | ..... | N.E. | ..do .. | E. | ..do .. |
| Thursday, May 6..... | 61 | 64½ | 65 | 81 | 67 | 67 | 72 | 67 | 67 | ..... | S.W. | ..do .. | N.W. | Strong |
| Friday, May 7 ..... | 64½ | 65 | 65 | 79 | 68 | 68 | 64 | 67 | 67 | ..... | S.E. | Gentle | S.E. | Gentle |
| Saturday, May 8 ..... | 63 | 65 | 64 | 68 | 68½ | 67 | 75 | 70 | 69 | ..... | S.E. | ..do .. | W. | ..do .. |
| Sunday, May 9..... | 63 | 67 | 67 | 83 | 71½ | 69 | 79 | 72 | 72 | ..... | S. | Calm | S.W. | Strong |
| Monday, May 10 ..... | 73 | 69½ | 69½ | 83 | 72½ | 71½ | 78 | 73½ | 73½ | ..... | S. | Gentle | S. | ..do .. |
| Tuesday, May 11..... | 71 | 71½ | 71½ | 81 | 73 | 72½ | 79 | 73½ | 73½ | ..... | S.W. | ..do .. | S.S.W. | ..do .. |
| Wednesday, May 12.. | 66 | 70½ | 70½ | 73 | 69 | 71 | 72 | 73½ | 73½ | ..... | N.W. | Strong | N.W. | Gale .. |
| Thursday, May 13 ... | 61 | 68 | 67 | 62½ | 70 | 69 | 61 | 69 | 69 | ..... | N.W. | High | N.W. | High |
| Friday, May 14 ..... | 58 | 64 | 64 | 63 | 67 | 65 | 61 | 67 | 66 | ..... | N. | ..do .. | N.E. | Strong |
| Saturday, May 15 .... | 52 | 60 | 60 | 60 | 64 | 64 | 63 | 65 | 64 | ..... | N.E. | ..do .. | N.E. | ..do .. |
| Sunday, May 16..... | 62 | 61½ | 61½ | 72½ | 64 | 63½ | 76 | 66 | 65½ | ..... | N.W. | Strong | S.S.W. | ..do .. |
| Monday, May 17 ..... | 63 | 64½ | 64 | 85 | 67 | 66½ | 77 | 68 | 68 | ..... | W. | Gentle | N.W. | ..do .. |
| Tuesday, May 18..... | 70 | 67 | 66 | 82 | 71 | 71 | 79 | 72 | 71½ | ..... | S.W. | Light | S.E. | Light |
| Wednesday, May 19.. | 61 | 67 | 66½ | 82 | 70 | 68 | 75 | 72 | 71½ | ..... | N.E. | ..do .. | N.E. | ..do .. |
| Thursday, May 20 ... | 71½ | 69 | 69 | 85 | 73 | 71 | 80 | 72½ | 71½ | ..... | N.E. | ..do .. | N.E. | Strong |
| Friday, May 21 ..... | 73 | 71 | 71 | 80 | 73½ | 73 | 79 | 74½ | 74½ | ..... | S.E. | Strong | S. | ..do .. |
| Saturday, May 22 .... | 73 | 71 | 69 | 81 | 73½ | 73½ | 69 | 74 | 74 | ..... | S.W. | ..do .. | S.W. | ..do .. |
| Sunday, May 23..... | 68 | 72 | 72 | 74 | 72½ | 72½ | 69 | 73½ | 73½ | ..... | E. | Light | S.E. | Light |
| Monday, May 24 ..... | 71 | 73 | 73 | 85 | 75 | 74 | 80 | 75 | 75 | ..... | N.E. | ..do .. | S.E. | ..do .. |
| Tuesday, May 25..... | 76 | 74 | 74 | 86 | 77 | 76½ | 82 | 79 | 79 | ..... | S.W. | ..do .. | S.E. | ..do .. |
| Wednesday, May 26.. | 76 | 77½ | 78 | 96 | 82 | 79½ | 83 | 82 | 81½ | ..... | S.W. | ..do .. | S.W. | ..do .. |
| Thursday, May 27 ... | 83 | 80 | 79½ | 95 | 80 | 79½ | 87 | 82 | 81½ | ..... | S.W. | ..do .. | S.W. | ..do .. |
| Friday, May 28 ..... | 79 | 79 | 79 | 87 | 80½ | 80½ | 73 | 80 | 79½ | ..... | W. | ..do .. | S.E. | Strong |
| Saturday, May 29 .... | 68 | 76 | 76 | 85 | 78 | 78 | 70 | 77 | 77 | ..... | N.E. | Strong | E. | Gentle |
| Sunday, May 30..... | 73 | 76 | 76 | 70 | 78 | 78 | 68 | 76 | 76 | 35 to 40 | S.E. | ..do .. | S.W. | ..do .. |
| Monday, May 31 ..... | 73 | 76 | 76 | 83 | 77 | 76 | 80 | 77 | 77 | ..... | N.W. | ..do .. | N.W. | Strong |
| Tuesday, June 1 ..... | 73 | 73 | 72½ | 80 | 77 | 75 | 74 | 75 | 74 | ..... | S.E. | Light | S.E. | ..do .. |
| Wednesday, June 2 .. | 58 | 74 | 74 | 80 | 74 | 74 | 76 | 72 | 72 | ..... | N.W. | Strong | N.E. | ..do .. |
| Thursday, June 3 .... | 63 | 72 | 71½ | 86 | 69 | 68 | 78 | 71 | 71 | ..... | N.W. | Light | N.W. | ..do .. |
| Friday, June 4 ..... | 72 | 71 | 70 | 84 | 71 | 71 | 80 | 71 | 71 | ..... | N.W. | ..do .. | N.E. | Light |
| Saturday, June 5..... | 69 | 74½ | 74 | 77 | 75 | 74 | 74 | 72 | 71½ | ..... | S.E. | ..do .. | S.E. | Strong |
| Sunday, June 6 ..... | 73 | 74 | 73½ | 78 | 74 | 73½ | 76 | 72 | 71½ | 35 to 40 | S.W. | Strong | S.W. | High |
| Monday, June 7..... | 84 | 74 | 74 | 89 | 77 | 75 | 79 | 75½ | 75 | ..... | N.W. | Gentle | N.W. | Light |
| Tuesday, June 8 ..... | 75 | 73½ | 73 | 87 | 79 | 77 | 75 | 78 | 76 | ..... | N.E. | Light | N.E. | ..do .. |
| | | | | | 3 p.m. | | | | | | | | | |
| Wednesday, June 9 .. | 68 | 76 | 76 | 79 | 77 | 76 | 71 | 77 | 76 | ..... | N.E. | ..do .. | S.E. | ..do .. |
| Thursday, June 10 .... | 67 | 76 | 75 | 72 | 74 | 74 | 69 | 74 | 73 | ..... | S.E. | ..do .. | S.E. | ..do .. |
| Friday, June 11 ..... | 64 | 72 | 71½ | 71 | 72 | 71½ | 80 | 73 | 72 | ..... | S.E. | ..do .. | S.E. | ..do .. |
| Saturday, June 12.... | 82 | 74 | 73½ | 92 | 79 | 77 | 82 | 78 | 76 | ..... | N.W. | ..do .. | N.W. | ..do .. |
| Sunday, June 13 ..... | 83 | 78 | 76 | 92 | 79 | 78 | 80 | 79 | 78 | ..... | S.W. | ..do .. | S.W. | ..do .. |
| Monday, June 14..... | 75 | 79 | 77 | 81 | 79 | 77 | 73 | 77 | 75 | ..... | N.W. | Strong | N.W. | ..do .. |
| Tuesday, June 15 .... | 64 | 76 | 72 | 65 | 75 | 71 | 65 | 74 | 70 | ..... | N.E. | ..do .. | E. | Strong |

*by John S. Saunders, on the United States Fish Commission barges, from States and Maryland Commissions of Fish and Fisheries.*

| Wind. | | Sky. | | | Water. | Tide. | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| Direction, 7 p. m. | Intensity, 7 p. m. | 7 a. m. | 12 m. | 7 p. m. | | 7 a. m. | 12 m. | 7 p. m. | |
| S.W. | Gentle | Clear ... | Clear ... | Clear ... | Muddy | Ebb | Ebb | Flood | No thermometer to take temperature. |
| S.W. | ..do .. | ..do .... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| S.E. | ..do .. | Cloudy | Cloudy . | ..do .... | Clear .. | Flood | ..do . | ..do . | |
| N.W. | ..do .. | Clear ... | Clear ... | ..do ... | ..do .... | ..do . | ..do . | ..do . | |
| S.E. | Strong | Overcast | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| S.W. | Gentle | ..do .... | ..do .... | ..do .... | ..do .. | ..do . | Slack | Ebb . | |
| S.W. | ..do .. | ..do .... | ..do .... | ..do .... | ..do ... | ..do . | Flood | ..do . | |
| S.S.W. | Strong | ..do .... | ..do .... | ..do .... | ..do .... | Slack | ..do . | ..do . | |
| W. | Gentle | ..do .... | Overcast | ..do .... | ..do ... | Ebb . | ..do . | ..do . | |
| W. | Gale .. | Clear ... | Clear ... | ..do .... | ..do ... | ..do . | ..do . | ..do . | Very low tide. |
| N. | High . | ..do .... | ..do .... | ..do .... | Muddy | ..do . | ..do . | ..do . | |
| N.E. | ..do .. | ..do .... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| W. | Gentle | ..do .... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| S.W. | ..do .. | Smoky .. | ..do .... | ..do .... | Clear .. | ..do . | ..do . | ..do . | |
| S.E. | ..do .. | Clear ... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| N.E. | Light . | ..do .... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| S.E. | ..do .. | Rain .... | ..do .... | ..do .... | ..do ... | ..do . | Slack | ..do . | |
| S.E. | Strong | Overcast | ..do .... | ..do .... | ..do ... | Flood | Ebb . | Flood | |
| E. | ..do .. | Clear ... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| N.W. | Light . | Overcast | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | Very high tide and water brackish. Rain about 3 p. m. |
| S.W. | ..do .. | ..do .... | Showery | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| S.W. | ..do .. | Clear ... | Clear ... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| S.W. | ..do .. | ..do .... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| S.E. | ..do .. | ..do .... | ..do .... | ..do .... | ..do ... | Ebb . | Flood | Ebb . | |
| N.W. | ..do .. | ..do .... | ..do .... | ..do .... | ..do ... | ..do . | ..do | ..do . | |
| S.E. | ..do .. | ..do .... | Overcast | ..do .... | ..do ... | ..do . | ..do . | ..do . | Rain about 5 p. m. |
| S.W. | ..do .. | ..do .... | ..do .... | Cloudy . | ..do ... | ..do . | ..do . | ..do . | |
| | ..do .. | Cloudy . | Rain .... | Rain .... | ..do ... | ..do . | ..do . | ..do . | Moved barges to Watson's Island, above Havre de Grace, on account of salt water, at 10 a. m. |
| S.E. | ..do .. | Clear ... | Clear ... | Clear ... | ..do ... | ..do . | ..do | ..do . | |
| N. | Strong | ..do .... | Overcast | Squall .. | ..do ... | ..do . | ..do . | ..do . | |
| N.E. | ..do .. | Rain .... | ..do .... | Clear ... | Muddy | ..do . | ..do . | ..do . | |
| N.W. | ..do .. | Clear ... | Clear ... | Stormy . | ..do ... | ..do . | Slack | ..do . | |
| N.E. | Light . | ..do .... | ..do .... | Clear .... | ..do ... | Flood | Ebb . | ..do . | |
| S.E. | High . | Overcast | Overcast | ..do .... | Clear .. | ..do . | ..do . | Flood | |
| S.W. | Light . | Clear ... | Clear ... | ..do .... | ..do ... | ..do . | ..do . | ..do . | Very little tide; caused by river backing it down. |
| N.W. | Gentle | ..do .... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| E. | ..do .. | Clear ... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| S.E. | ..do .. | Overcast | Overcast | Overcast | ..do ... | Slack | ..do . | ..do . | |
| N.W. | ..do .. | Rain .... | ..do .... | Rain .... | ..do ... | Flood | ..do . | do . | |
| S.W. | ..do .. | ..do .... | Clear.... | Clear .... | ..do ... | ..do . | ..do . | Ebb . | |
| | ..do .. | Clear ... | ..do..... | ..do .... | ..do ... | ..do . | Flood | ..do . | Terrible storm at 2.15 p. m., with terrific wind, causing barges to go adrift, losing 8 anchors and be driven high on rocks ashore. |
| N.W. | ..do .. | ..do .... | ..do .... | ..do .... | ..do ... | Ebb . | ..do . | ..do . | Moved alongside Cochran's ice-house wharf, having lost anchors in gale. |
| N.W. | ..do .. | ..do .... | ..do .... | ..do .... | ..do ... | ..do . | ..do . | ..do . | |
| N.E. | Strong | Rain .... | Rain .... | Rain .... | ..do ... | ..do . | ..do . | ..do . | Heavy N. E. storm all day. |

TABLE 2.—*Record of temperature observations at Navy-Yard station, Wash from May 4 to June 18, 1880; under the direction of the*

| Date. | Temperatures. | | | | | | | | | Wind. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Air, 6 a. m. | Surface water, 6 a. m. | Bottom, 6 a. m. | Air, 12 m. | Surface water, 12 m. | Bottom, 12 m. | Air, 6 p. m. | Surface water, 6 p. m. | Bottom, 6 p. m. | Direction, 6 a. m. | Intensity, 6 a. m. | Direction, 12 m. | Intensity, 12 m. |
| | ° | ° | ° | ° | ° | ° | ° | ° | ° | | | | |
| Tuesday, May 4 | .... | .... | .... | .... | .... | .... | 76 | 68 | 67 | S. E. | Light. | S. E. | Light. |
| Wednesday, May 5 | 67 | 67 | 66 | 82 | 72 | 70 | 78 | 69 | 68 | E. | ..do .. | E. | ..do .. |
| Thursday, May 6 | 68 | 67 | 66 | 84 | 73 | 66 | 81 | 71 | 70 | W. | ..do .. | W. | ..do .. |
| Friday, May 7 | 65 | 67 | 66 | 80 | 71 | 70 | 78 | 72 | 70 | S. W. | ..do .. | E. | ..do .. |
| Saturday, May 8 | 61 | 68 | 66 | 85 | 73 | 71 | 81 | 72 | 70 | N. E. | ..do .. | N. | ..do .. |
| Sunday, May 9 | 72 | 70 | 67 | 90 | 74 | 72 | 85 | 76 | 75 | S. | ..do .. | S. | Fresh. |
| Monday, May 10 | 72 | 71 | 70 | 91 | 76 | 75 | 83 | 75 | 74 | S. | ..do .. | S. | ..do .. |
| Tuesday May 11 | 71 | 73 | 72 | 82 | 76 | 75 | 61 | 74 | 73 | S. E. | ..do .. | N. | Light. |
| Wednesday, May 12 | 62 | 71 | 70 | 75 | 74 | 73 | 71 | 73 | 72 | W. | ..do .. | N. W. | ..do .. |
| Thursday, May 13 | 61 | 70 | 70 | 73 | 73 | 73 | 60 | 72 | 72 | W. | ..do .. | N. | Fresh. |
| Friday, May 14 | 57 | 70 | 70 | 67 | 70 | 70 | 65 | 69 | 69 | N. W. | Fresh. | N. W. | ..do .. |
| Saturday, May 15 | 52 | 65 | 65 | 70 | 71 | 71 | 67 | 71 | 71 | N. E. | Light. | N. W. | ..do .. |
| Sunday, May 16 | 68 | 67 | 67 | 84 | 72 | 71 | 81 | 72 | 71 | S. W. | ..do .. | S. W. | Light. |
| Monday, May 17 | 71 | 70 | 70 | 90 | 72 | 71 | 83 | 73 | 72 | W. | ..do .. | W. | ..do .. |
| Tuesday, May 18 | 69 | 70 | 70 | 86 | 74 | 73 | 83 | 75 | 74 | N. W. | ..do .. | N. W. | ..do .. |
| Wednesday, May 19 | 66 | 73 | 72 | 88 | 75 | 74 | 81 | 76 | 75 | N. E. | ..do .. | N. E. | ..do .. |
| Thursday, May 20 | 78 | 75 | 74 | 87 | 76 | 75 | 87 | 76 | 75 | S. W. | ..do .. | S. W. | Fresh. |
| Friday, May 21 | 71 | 74 | 74 | 88 | 77 | 76 | 86 | 76 | 75 | S. | ..do .. | S. W. | Strong. |
| Saturday, May 22 | 71 | 74 | 75 | 73 | 75 | 75 | 70 | 75 | 75 | S. E. | ..do .. | S. E. | Light. |
| Sunday, May 23 | 70 | 74 | 75 | 68 | 74 | 75 | 67 | 74 | 75 | N. E. | ..do .. | N. E. | ..do .. |
| Monday, May 24 | 71 | 75 | 75 | 88 | 75 | 75 | 85 | 75 | 75 | N. E. | Calm. | S. | ..do .. |
| Tuesday, May 25 | 80 | 76 | 76 | 85 | 76 | 76 | 88 | 77 | 76 | S. | Light. | S. | ..do .. |
| Wednesday, May 26 | 75 | 77 | 77 | 87 | 79 | 78 | 89 | 77 | 66 | S. | ..do .. | S. W. | ..do .. |
| Thursday, May 27 | 72 | 79 | 78 | 89 | 82 | 81 | 89 | 79 | 78 | S. | ..do .. | S. W. | ..do .. |
| Friday May 28 | 75 | 78 | 78 | 85 | 80 | 80 | 78 | 79 | 78 | S. | ..do .. | S. W. | Fresh. |
| Saturday, May 29 | 75 | 79 | 78 | 75 | 80 | 80 | 74 | 78 | 78 | N. E. | ..do .. | N. E. | Light |
| Sunday, May 30 | 73 | 78 | 78 | 74 | 77 | 77 | 73 | 77 | 78 | S. E. | ..do .. | N. E. | Fresh |
| Monday, May 31 | 72 | 77 | 77 | 78 | 77 | 77 | 83 | 78 | 78 | N. W. | Fresh. | N. W. | ..do .. |
| Tuesday, June 1 | 75 | 77 | 77 | 94 | 78 | 78 | 85 | 78 | 78 | S. W. | Light. | S. W. | Light. |
| Wednesday, June 2 | 60 | 73 | 73 | 68 | 73 | 73 | 62 | 73 | 73 | N. W. | Fresh. | N. W. | Fresh. |
| Thursday, June 3 | 60 | 75 | 74 | 78 | 77 | 77 | 80 | 77 | 77 | N. W. | Light. | N. W. | Light. |
| Friday, June 4 | 62 | 75 | 74 | 87 | 76 | 76 | 84 | 77 | 77 | N. W. | ..do .. | S. W. | ..do .. |
| Saturday, June 5 | 70 | 74 | 75 | 79 | 76 | 75 | 80 | 77 | 76 | S. W. | ..do .. | S. | ..do .. |
| Sunday, June 6 | 69 | 75 | 74 | 78 | 76 | 75 | 77 | 76 | 75 | S. | ..do .. | S. | Fresh. |
| Monday, June 7 | 76 | 74 | 74 | 88 | 79 | 78 | 83 | 76 | 75 | S. | ..do .. | W. | Light. |
| Tuesday, June 8 | 73 | 74 | 74 | 83 | 79 | 76 | 86 | 79 | 77 | N. W. | ..do .. | N. W. | ..do .. |
| Wednesday, June 9 | 70 | 75 | 74 | 78 | 75 | 75 | 76 | 75 | 75 | N. E. | ..do .. | N. E. | ..do .. |
| Thursday June 10 | 68 | 75 | 75 | 72 | 75 | 75 | 74 | 75 | 75 | S. E. | ..do .. | S. E. | ..do .. |
| Friday, June 11 | 74 | 74 | 74 | 88 | 77 | 77 | 87 | 79 | 78 | ..... | Calm. | S. | ..do .. |
| Saturday, June 12 | 76 | 77 | 77 | 94 | 79 | 78 | 79 | 79 | 78 | S. | Light. | N. W. | ..do .. |
| Sunday, June 13 | 80 | 78 | 77 | 95 | 79 | 78 | 90 | 82 | 81 | N. W. | ..do .. | N. W. | Fresh |
| Monday, June 14 | 77 | 78 | 78 | 85 | 79 | 78 | 83 | 78 | 78 | N. W. | ..do .. | N. | Light. |
| Tuesday, June 15 | 67 | 78 | 78 | 66 | 77 | 77 | 65 | 76 | 77 | N. E. | ..do .. | N. E. | Fresh |
| Wednesday, June 16 | 65 | 76 | 76 | 74 | 77 | 77 | 75 | 77 | 77 | N. E. | ..do .. | N. E. | Light. |
| Thursday, June 17 | 70 | 75 | 76 | 85 | 77 | 77 | 84 | 78 | 78 | N. W. | ..do .. | N. W. | ..do .. |
| Friday, June 18 | 68 | 75 | 75 | 80 | 77 | 77 | 85 | 79 | 78 | S. | ..do .. | S. | ..do .. |

*ington, made by W. P. Sauerhoff and Wm. Hamlen, on the steamer Lookout, United States and Maryland Commissions of Fish and Fisheries.*

| Wind. | | Sky. | | | Water. | Tide. | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| Direction, 6 p. m. | Intensity, 6 p. m. | 6 a. m. | 12 m. | 6 p. m. | | 6 a. m. | 12 m. | 6 p. m. | |
| S. E. | Light .. | Clear ... | Clear .. | Clear .. | Muddy | ..... | Flood | Ebb . | Left navy-yard 12.45 p. m. Returned at 9.50 p. m. 650,000 eggs. |
| E. | ..do ... | ..do .... | ..do ... | ..do ... | ..do ... | Flood | Slack | ..do . | |
| N. W. | ..do ... | ..do .... | ..do ... | ..do ... | ..do ... | ..do . | Ebb . | Flood | Thermometer 98° at 2.30 p. m. |
| S. E. | ..do ... | Cloudy . | ..do ... | ..do ... | ..do ... | ..do . | ..do . | ..do . | |
| N. E. | ..do ... | ..do .... | ..do ... | Cloudy | ..do ... | ..do . | ..do . | ..do . | Left navy-yard 5.40 p. m. |
| S. | ..do ... | Clear .. | ..do ... | Clear .. | ..do ... | ..do . | Flood | Ebb . | Returned to navy-yard 1.20p.m. |
| S. | Strong . | ..do .... | ..do ... | ..do ... | ..do ... | ..do . | Ebb . | Flood | Left navy-yard 4.15 p. m. Returned 11.10 p. m. |
| N. W. | ..do ... | ..do .... | ..do ... | Cloudy | ..do ... | ..do . | ..do . | ..do . | Left navy-yard 12.50 p. m. Rain 5.30 p.m. Stopped 7 p.m. |
| N. W. | Fresh .. | ..do .... | ..do ... | Clear .. | ..do .. | ..do . | ..do . | ..do . | Returned to navy-yard 8.53 a. m. Left navy-yard 3 p. m. |
| N. E. | ..do ... | ..do .... | ..do ... | Cloudy | ..do ... | ..do . | ..do . | ..do . | Returned navy-yard 9.25 a. m. Left navy-yard 4. p. m. |
| N. | Light .. | ..do .... | ..do ... | Clear .. | ..do ... | ..do . | ..do . | Slack | Returned to navy-yard 11.35 a. m. |
| N. W. | ..do ... | ..do .... | ..do ... | ..do ... | ..do ... | ..do . | ..do . | Ebb . | Left navy-yard 1.35 p. m. Returned 10.30 p m. |
| S. W. | ..do ... | ..do .... | ..do ... | ..do ... | Clear .. | Ebb . | Flood | ..do . | Remained at navy-yard. Left navy-yard 1.22 p. m. |
| W. | ..do ... | ..do .... | ..do ... | ..do ... | ..do ... | ..do . | ..do . | ..do . | Returned 12.30 p. m. |
| S. W. | ..do ... | ..do .... | ..do ... | ..do ... | Muddy | ..do . | ..do . | ..do . | Left navy-yard 5.40 p. m. Returned 11.15 p. m. |
| N. E. | ..do ... | Cloudy . | ..do ... | ..do ... | ..do ... | ..do . | ..do . | ..do . | Remained at navy-yard. |
| S. W. | Fresh .. | Clear ... | ..do ... | ..do ... | ..do ... | ..do . | ..do . | ..do . | Left navy-yard 3.27 p. m. |
| S. E. | Strong . | ..do .... | Cloudy | ..do ... | ..do ... | ..do . | ..do . | ..do . | Returned to navy-yard 9.05 a. m. Left navy-yard 4.10 p. m. |
| N. W. | Light .. | Cloudy . | ..do ... | Cloudy | ..do ... | Flood | Ebb . | ..do . | Returned to navy-yard 7.20 a. m. Left navy-yard 5.30 p. m. |
| N. E. | ..do ... | ..do .... | ..do ... | ..do ... | ..do ... | ..do . | ..do. | Flood | Returned navy-yard 9.10 a m. Left 5.55 p. m. |
| S. W. | ..do ... | ..do .... | Clear .. | Clear .. | ..do ... | ..do . | ..do . | ..do . | Returned navy-yard 8.05 a. m. Left navy-yard 6.15 p. m. |
| S. | ..do ... | Clear ... | ..do ... | ..do ... | ..do ... | ..do . | ..do . | ..do . | Returned navy-yard 6.25 a. m. Left navy-yard 6.30 p. m. |
| S. | ..do . . | ..do .... | Cloudy | Cloudy | ..do ... | ..do . | ..do . | ..do . | Returned navy-yard 6.45 a. m. Left navy-yard 8.17 p. m. |
| S. W. | ..do ... | ..do .... | ..do ... | Clear .. | ..do ... | ..do . | ..do . | ..do . | Returned to navy-yard 7 a. m. Left navy-yard 12.50 p. m. |
| W. | Strong | ..do .... | ..do ... | Cloudy | Clear .. | ..do . | ..do . | ..do . | Returned to navy-yard 7.15 a.m. Left 3 p. m. Returned to navy-yard 9.05 p. m. Rain. |
| N. E. | Light .. | ..do .... | Clear ... | ..do ... | Muddy | Ebb . | Flood | Ebb . | Left navy-yard 3.20 p. m. Returned navy-yard 9.40 p. m. Rain. |
| S. E. | Fresh .. | Cloudy . | Cloudy | ..do ... | ..do ... | ..do . | ..do | ..do . | Left navy-yard 4 p. m. Returned navy-yard 10.10 p. m. |
| N. W. | Light .. | Clear ... | Clear .. | Clear .. | Clear .. | ..do . | ..do . | ..do . | Left navy-yard 6.30 p. m. Returned navy-yard 12.25 p. m. |
| S. W. | ..do ... | ..do .... | ..do ... | Cloudy | Muddy | ..do . | ..do . | ..do . | Left navy-yard 5 p. m. |
| N. W. | ..do ... | Cloudy . | Cloudy | ..do ... | ..do ... | ..do . | ..do . | ..do . | Stationed at Fort Washington. |
| S. | ..do ... | Clear ... | Clear .. | Clear .. | ..do ... | ..do . | ..do . | ..do . | |
| S. W. | ..do ... | ..do .... | ..do ... | ..do ... | ..do ... | ..do . | ..do . | ..do . | |
| S. | Fresh .. | Cloudy . | ..do ... | Cloudy | Clear .. | ..do . | ..do . | ..do . | |
| ..... | Light .. | Clear ... | ..do ... | do ... | ..do ... | Slack | Ebb | Flood | |
| N. W. | Calm .. | ..do .... | ..do ... | Clear .. | ..do ... | Flood | ..do . | ..do . | |
| N. E. | Light .. | ..do .... | ..do ... | Cloudy | ..do ... | ..do . | ..do . | ..do . | |
| S. E. | ..do ... | Cloudy . | Cloudy | ..do ... | ..do ... | ..do . | ..do . | ..do . | |
| S. | ..do ... | ..do .... | ..do ... | ..do ... | ..do ... | ..do . | ..do . | ..do . | Rain 6.30. Stopped 11 a. m. |
| S. E. | ..do ... | ..do .... | Clear .. | ..do ... | ..do ... | ..do . | ..do . | ..do . | |
| W. | ..do ... | Clear ... | Cloudy | ..do ... | ..do ... | ..do . | ..do . | ..do . | Rain storm 3 p. m. Stopped 4.30 a. m. |
| N. E. | ..do ... | ..do .... | Clear .. | ..do ... | Muddy | ..do . | ..do . | ..do . | |
| N. E. | ..do ... | ..do .... | ..do ... | ..do ... | ..do ... | Ebb . | Flood | Ebb . | Rain 9.30 p. m. |
| ..... | ..do ... | Cloudy . | Cloudy | ..do ... | ..do ... | ..do . | ..do . | ..do . | Rain. |
| N. W. | Calm .. | ..do .... | ..do ... | ..do ... | ..do ... | ..do . | ..do . | ..do . | Rain stopped 7.30 a. m. |
| | Light .. | Clear ... | ..do ... | Clear .. | ..do ... | ..do . | ..do . | ..do . | Strong current with the ebb tide. Water very muddy at 7 p. m. |
| S. | ..do ... | ..do .... | Clear .. | ..do ... | ..do ... | ..do . | ..do . | ..do . | Water very muddy. |

TABLE 3.—*Record of hatching operations at Spesutie Narrows, Md., con from May 3 to June 10, 1880, under the direction of the United*

| Date. | Total length of haul-seines visited, in fathoms. | Total length of gill-nets visited, in fathoms. | Fish taken by haul-seines— | | | Fish taken by gill-nets— | Ripe fish. | |
|---|---|---|---|---|---|---|---|---|
| | | | Shad. | Herring. | Rock. | Shad. | Males. | Females. |
| | | | *No.* | *Lbs.* | *No.* | *No.* | | |
| Monday, May 3 | 1,860 | | 220 | 20,000 | | | 4 | 2 |
| Tuesday, May 4 | 1,860 | | 354 | 15,000 | 250 | | 10 | 13 |
| Wednesday, May 5 | 2,060 | 850 | 396 | 30,800 | | 88 | 13 | 9 |
| Thursday, May 6 | 3,610 | | 464 | 26,000 | | | 33 | 20 |
| Friday, May 7 | 3,610 | | 689 | 36,300 | 24 | | 26 | 17½ |
| Saturday, May 8 | 2,600 | 2,200 | 258 | 23,000 | | 316 | 49 | 30½ |
| Sunday, May 9 | | 2,150 | | | | 271 | 21 | 15 |
| Monday, May 10 | 2,010 | 225 | 201 | 8,835 | 49 | 11 | 16 | 11½ |
| Tuesday, May 11 | 1,110 | 1,825 | 199 | 650 | 20 | 110 | 11 | 10 |
| Wednesday, May 12 | | 3,425 | | | | 230 | 17 | 13 |
| Thursday, May 13 | | 1,750 | | | | 159 | 19 | 13 |
| Friday, May 14 | | 2,100 | | | | 316 | 26 | 17 |
| Saturday, May 15 | | 4,900 | | | | 329 | 57 | 40 |
| Sunday, May 16 | | 2,350 | | | | 232 | 24 | 17 |
| Monday, May 17 | 2,010 | 3,195 | 172 | 748 | | 380 | 53 | 39 |
| Tuesday, May 18 | | 2,650 | | | | 167 | 24 | — 21 |
| Wednesday, May 19 | | 3,150 | | | | 252 | 40 | 30 |
| Thursday, May 20 | | 3,300 | | | | 249 | 40 | 32 |
| Friday, May 21 | | 2,100 | | | | 180 | 30 | 24 |
| Saturday, May 22 | | 2,925 | | | | 219 | 33 | 27 |
| Sunday, May 23 | | 2,575 | | | | 257 | 33 | 26 |

*ducted by John S. Saunders on the United States Fish Commission barges States and Maryland Commissions of Fish and Fisheries.*

| Eggs obtained. | Loss. | | Results. | | | Remarks. |
|---|---|---|---|---|---|---|
| | Eggs. | Fish. | Fish hatched. | Fish deposited in local waters. | Fish deposited in other waters. | |
| 40,000 | 30,000 | ..... | 10,000 | 10,000 | ..... | Eggs badly impregnated and a great many taken too young. |
| 275,000 | 25,000 | ..... | 250,000 | 250,000 | ..... | |
| 190,000 | 27,000 | ..... | 163,000 | 163,000 | ..... | |
| 475,000 | 75,000 | ..... | 400,000 | 400,000 | ..... | |
| 420,000 | 175,000 | ..... | 245,000 | 245,000 | ..... | 150,000 eggs lost by some one dropping coal oil in cone. Placed 10,000 young fish out in the Narrows from eggs taken on 3d. |
| 600,000 | 60,000 | ..... | 540,000 | 540,000 | ..... | |
| 300,000 | 30,000 | ..... | 270,000 | 270,000 | ..... | |
| 230,000 | 15,000 | ..... | 215,000 | 215,000 | ..... | Placed 413,000 fish in Spesutie Narrows on evening of 10th, hatched from eggs taken 4th and 5th. |
| 200,000 | 10,000 | ..... | 190,000 | ..... | 200,000 | Placed 250 000 fish in Spesutie Narrows. Placed 150,000 fish above Havre de Grace, from eggs taken on 6th. Delivered to Mr. Creveling on 17th. |
| 260,000 | 25,000 | ..... | 235,000 | 225,000 | ..... | Placed 190,000 eggs in Spesutie Narrows. Placed 145,000 fish above Havre de Grace from eggs taken on 7th. |
| 220,000 | 10,000 | ..... | 210,000 | 210,000 | ..... | Placed 190,000 eggs in Spesutie Narrows. Placed 300,000 above Havre de Grace from eggs taken on 8th. Shad taken very hard and not yielding full number of eggs. |
| 345,000 | 20,000 | ..... | 325,000 | 325,000 | ..... | Placed 270,000 above Havre de Grace from eggs taken on the 9th. |
| 790,000 | 40,000 | ..... | 750,000 | 750,000 | ..... | Placed 215,000 above Havre de Grace from eggs taken on 10th. Shad taken small and not yielding full number of eggs. Scarcity of males reported by some of men taking spawn. |
| 340,000 | 15,000 | ..... | 325,000 | 75,000 | 250,000 | On 21st delivered to Mr. Creveling. |
| 780,000 | 20,000 | 300,000 | 760,000 | 460,000 | ..... | Delivered to Commissioner of Fisheries of Pennsylvania 200,000 young fish at 6 p. m. from eggs taken 11th and 12th. Lost 300,000 young fish by salt water being backed up by heavy southeast storm on 21st. |
| 420,000 | 40,000 | ..... | 380,000 | 240,000 | 140,000 | Placed in cylinder overboard on 22d to keep, as per Major Ferguson's order. Placed 225,000 young fish in Spesutie Narrows about 6 p. m. from eggs taken on 12th. |
| 600,000 | 40,000 | ..... | 560,000 | ..... | 560,000 | Placed 250,000 young fish above Havre de Grace from eggs taken on 13th and 14th, at 10 a. m. |
| 640,000 | 40,000 | ..... | 600,000 | ..... | ..... | Placed 285,000 young fish above Havre de Grace from eggs taken on 14th, at 10 a. m. Placed 200,000 young fish above Havre de Grace from eggs taken on 15th. Placed 200,000 young fish in Swan Creek from eggs taken on 15th. |
| 480,000 | 30,000 | ..... | 450,000 | ..... | ..... | Placed 350,000 young fish above Havre de Grace from eggs taken on 15th. Placed 50,000 young fish above Havre de Grace from eggs taken on 16th. Delivered 25,000 young fish to Pennsylvania commissioner on 16th. |
| 540,000 | 15,000 | ..... | 525,000 | 525,000 | ..... | Placed 460,000 young fish above Havre de Grace from eggs of 17th. |
| 560,000 | 15,000 | ..... | 545,000 | 545,000 | ..... | |

TABLE 3.—*Record of hatching operations at Spesutie Narrows, Md., con from May 3 to June 10, 1880, under the direction of the United*

| Date. | Total length of haul-seines visited, in fathoms. | Total length of gill-nets visited, in fathoms. | Fish taken by haul-seines— | | | Fish taken by gill-nets— | Ripe fish. | |
|---|---|---|---|---|---|---|---|---|
| | | | Shad. | Herring. | Rock. | Shad. | Males. | Females. |
| | | | *No.* | *Lbs.* | *No.* | *No.* | | |
| Monday, May 24 | | 700 | | | | 38 | 7 | 5 |
| Tuesday, May 25 | | 1,900 | | | | 131 | 14 | 12 |
| Wednesday, May 26 | | 825 | | | | 52 | 6 | 4 |
| Thursday, May 27 | | 1,000 | | | | 143 | 5 | 5 |
| Friday, May 28 | | | | | | | | |
| Saturday, May 29 | | 1,400 | | | | 169 | 13 | 11 |
| Sunday, May 30 | | 400 | | | | 50 | 6 | 4 |
| Monday, May 31 | | 2,100 | | | | 229 | 27 | 25½ |
| Tuesday, June 1 | | 675 | | | | 58 | 10 | 9 |
| Wednesday, June 2 | | 2,700 | | | | 179 | 20 | 17 |
| Thursday, June 3 | | 400 | | | | 45 | 3 | 3 |
| Friday, June 4 | | 3,000 | | | | 210 | 37 | 34 |
| Saturday, June 5 | | 1,700 | | | | 62 | 12 | 8 |
| Sunday, June 6 | | 1,825 | | | | 241 | 29 | 22 |
| Monday, June 7 | | 4,600 | | | | 557 | 40 | 32 |
| Tuesday, June 8 | | 1,400 | | | | 52 | 13 | 11 |
| Wednesday, June 9 | | 1,580 | | | | 91 | 17 | 11 |
| Thursday, June 10 | | 2,400 | | | | 86 | 24 | 19 |
| Total | 20,730 | 48,201 | 2,953 | 161,333 | 343 | 6,109 | 871 | 660 |

*ducted by John S. Saunders on the United States Fish Commission barges States and Maryland Commissions of Fish and Fisheries*—Continued.

| Eggs obtained. | Loss. | | Results. | | | Remarks. |
|---|---|---|---|---|---|---|
| | Eggs. | Fish. | Fish hatched. | Fish deposited in local waters. | Fish deposited in other waters. | |
| 100,000 | 25,000 | 75,000 | 75,000 | ..... | ..... | Strike among gillers for 50 cents apiece for ripe fish, which accounts for few eggs taken. Placed 240,000 young fish in Narrows from eggs of 18th. |
| 240,000 | 90,000 | ..... | 150,000 | 1,050,000 | 150,000 | Sent to Havre de Grace for shipment 1,750,000 young fish from eggs of 18th, 19th, 20th, and 21st. Great scarcity of male fish reported. |
| 80,000 | 60,000 | ..... | 20,000 | ..... | ..... | Eggs taken, very bad, being badly impregnated by scarcity of males. Lost good quantity by new hatching boxes of Mr. Wright. |
| 100,000 | 70,000 | 50,000 | 30,000 | ..... | ..... | Placed out in Narrows 1,070,000 young fish from eggs of 22d and 23d. Could not send above Havre de Grace for want of cans. Eggs badly impregnated. |
| 220,000 | 10,000 | ..... | 210,000 | ..... | 210,000 | Sent 150,000 young fish for distribution to Bush River from eggs of 25th. |
| 80,000 | 5,000 | ..... | 75,000 | ..... | 75,000 | Storm at night; few gillers out. Moved barges to Watson's Island on account of salt water at 10 a. m. |
| 510,000 | 25,000 | ..... | 485,000 | 485,000 | ..... | |
| 180,000 | 20,000 | ..... | 160,000 | 160,000 | ..... | Heavy storm preventing many gillers from going out. |
| 340,000 | 40,000 | ..... | 300,000 | 300,000 | ..... | |
| 60,000 | 5,000 | ..... | 55,000 | 55,000 | ..... | Heavy squall preventing gillers from laying out. |
| 680,000 | 30,000 | ..... | 650,000 | 650,000 | ..... | Placed 285,000 young fish in Bush River from eggs taken on 29th and 30th May. |
| 160,000 | 20,000 | ..... | 140,000 | 140,000 | ..... | Lost out in river 485,000 young fish by overflow of cylinders and break in wire bottom, from eggs of 31st May. Heavy gale from southwest prevented gillers from going out. |
| 440,000 | 40,000 | ..... | 400,000 | 400,000 | ..... | Placed in river 460,000 young fish from eggs of 1st and 2d. |
| 640,000 | 40,000 | ..... | 600,000 | ..... | 600,000 | Placed in river 55,000 young fish from eggs of 3d. |
| 220,000 | 20,000 | ..... | 200,000 | ..... | 200,000 | Placed in river 650,000 young fish from eggs of 4th. |
| 220,000 | 20,000 | ..... | 200,000 | 100,000 | 100,000 | Placed 140,000 young fish in river from eggs of 5th. |
| 380,000 | 20,000 | ..... | 360,000 | 360,000 | ..... | Placed 400,000 young fish on flats opposite Watson's Island on 12th, from eggs of 6th. |
| | | | | | | Shipped 900,000 young fish at 2 p. m. on 12th, to go to Maine, from eggs of 7th, 8th, and 9th. |
| | | | | | | Turned out 100,000 young fish, which were intended to be shipped to Maine, but storm prevented. |
| | | | | | | Had terrific storm on 12th at 3.15 p. m., causing barges to drag anchor (and break chains of three), causing us to lose eggs of 10th, which were nearly out, and barges to go ashore. |
| 13,355,000 | 1,297,000 | 425,000 | 12,058,000 | 9,148,000 | 2,485,000 | |

TABLE 4.—*Record of hatching operations at Navy-Yard station, Washington, D. C., conducted by Messrs. F. N. Clark and C. W. Schuermann; and by Messrs. Sauerhoff and Hamlen, on the steamer Lookout, from May 4 to June 27, 1880, under the direction of the United States and Maryland Commissions of Fish and Fisheries.*

| Date. | Total length of haul-seines visited, in fathoms. | Total length of gill-nets visited, in fathoms. | Fish taken by haul-seines. | | | | Fish taken by gill-nets. | Ripe fish. | | Eggs obtained. | Results. | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of shad. | Number of herring. | Pounds of rock. | Other fish. | Number of shad. | Males. | Females. | | Fish hatched. | Fish deposited in local waters. | Fish deposited in other waters. | |
| Tuesday, May 4 | 300 | ..... | 400 | 700 | ..... | 400 | ..... | 30 | 35 | 650,000 | ..... | ..... | ..... | Eggs obtained at Moxley's Point, Captain Skidmore. |
| Wednesday, May 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Remained at navy-yard. Cones overcrowded. |
| Thursday, May 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Remained at navy-yard. |
| Friday, May 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Fish hatching out. |
| Saturday, May 8 | 300 | ..... | ..... | 75,000 | ..... | 500 | ..... | ..... | ..... | ..... | 635,000 | 635,000 | ..... | |
| Sunday, May 9 | 300 | ..... | 103 | 30,000 | ..... | 300 | ..... | 17 | 16 | 320,000 | 314,000 | 50,000 | ..... | Obtained 1,220,000 herring eggs at Moxley's Point; lost 120,000 herring eggs at Moxley's Point. |
| Monday, May 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Seines not hauling on account of tide. |
| Tuesday, May 11 | ..... | ..... | 227 | 20,000 | 15 | 1,000 | 320 | 23 | 19 | 360,000 | 360,000 | 310,000 | ..... | 320 eggs from gill-nets; 60,000 eggs from haul-seines; 300,000 herring deposited in the Potomac. |
| Wednesday, May 12 | ..... | ..... | ..... | 17,000 | 25 | 450 | 430 | 27 | 25 | 500,000 | 470,000 | ..... | ..... | Obtained 180,000 herring eggs at stake net. |
| Thursday, May 13 | 200 | ..... | 166 | 23,000 | 18 | 200 | 179 | 67 | 50 | 1,000,000 | 850,000 | ..... | ..... | |
| Friday, May 14 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Remained at navy-yard. |
| Saturday, May 15 | ..... | ..... | 376 | 3,000 | 30 | 75 | 135 | 47 | 38 | ..... | 725,000 | 360,000 | ..... | 180,000 herring deposited at Cumberland, Md. |
| Sunday, May 16 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 760,000 | ..... | 320,000 | ..... | |
| Monday, May 17 | 537 | ..... | ..... | 1,500 | 17 | 125 | 425 | 115 | 104 | 2,070,000 | 2,036,000 | 400,000 | ..... | |
| Tuesday, May 18 | ..... | ..... | 979 | 400 | 25 | 150 | 150 | 63 | 57 | 1,114,000 | 1,064,000 | 200,000 | ..... | |
| Wednesday, May 19 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 160,000 | Remained at navy-yard. Cones overcrowded. |
| Thursday, May 20 | ..... | ..... | ..... | 100 | 37 | 200 | 73 | 87 | 76 | 1,530,000 | 1,300,000 | 400,000 | ..... | |
| Friday, May 21 | 300 | ..... | 735 | 250 | 75 | 200 | 325 | 130 | 119 | 2,320,000 | 2,200,000 | 800,000 | ..... | |
| Saturday, May 22 | 300 | ..... | 650 | 400 | 25 | 150 | 197 | 70 | 53 | 1,100,000 | 1,000,000 | 825,000 | ..... | |
| Sunday, May 23 | 300 | ..... | 475 | 250 | 20 | 400 | 250 | 29 | 20 | 530,000 | 450,000 | ..... | 2,000,000 | |
| Monday, May 24 | 300 | ..... | 560 | 100 | 15 | 600 | ..... | 25 | 20 | 400,000 | 350,000 | 800,000 | ..... | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tuesday, May 25 | 300 | ..... | 227 | 150 | 8 | 700 | 297 | 19 | 15 | 300,000 | 250,000 | 1,400,000 | ..... |
| Wednesday, May 26 | 300 | ..... | 36 | 25 | 50 | 400 | 97 | 2 | 2 | 80,000 | ..... | 2,400,000 | ..... |
| Thursday, May 27 | 300 | ..... | 187 | 125 | 60 | 125 | 129 | 2 | 2 | 40,000 | ..... | 450,000 | ..... |
| Friday, May 28 | 300 | ..... | 199 | 200 | 40 | 50 | 179 | 15 | 14 | 280,000 | 230,000 | 150,000 | 200,000 |
| Saturday, May 29 | ..... | 400 | ..... | ..... | ..... | ..... | 325 | 21 | 18 | 325,000 | 275,000 | 250,000 | ..... |
| Sunday, May 30 | ..... | 525 | ..... | ..... | ..... | ..... | 393 | 22 | 38 | 760,000 | 675,000 | ..... | ..... |
| Monday, May 31 | ..... | 575 | ..... | ..... | ..... | ..... | 257 | 39 | 53 | 1,010,000 | 900,000 | ..... | ..... |
| Tuesday, June 1 | ..... | 425 | ..... | ..... | ..... | ..... | 127 | 19 | 23 | 430,000 | 300,000 | 30,000 | 200,000 |
| Wednesday, June 2 | ..... | 350 | ..... | ..... | ..... | ..... | 251 | 46 | 50 | 840,000 | 700,000 | 275,000 | ..... |
| Thursday, June 3 | ..... | 575 | ..... | ..... | ..... | ..... | 249 | 23 | 23 | 410,000 | 375,000 | ..... | ..... |
| Friday, June 4 | ..... | 500 | ..... | ..... | ..... | ..... | 157 | 23 | 25 | 430,000 | 400,000 | 675,000 | ..... |
| Saturday, June 5 | ..... | 275 | ..... | ..... | ..... | ..... | 37 | 5 | 5 | 95,000 | 90,000 | 900,000 | ..... |
| Sunday, June 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300,000 | 700,000 |
| Monday, June 7 | ..... | 450 | ..... | ..... | ..... | ..... | 202 | 32 | 37 | 650,000 | 615,000 | 375,000 | ..... |
| Tuesday, June 8 | ..... | 775 | ..... | ..... | ..... | ..... | 254 | 37 | 39 | 670,000 | 600,000 | 400,000 | ..... |
| Wednesday, June 9 | ..... | 725 | ..... | ..... | ..... | ..... | 114 | 18 | 24 | 400,000 | 375,000 | 100,000 | ..... |
| Thursday, June 10 | ..... | 500 | ..... | ..... | ..... | ..... | 157 | 5 | 6 | 100,000 | 85,000 | ..... | ..... |
| Friday, June 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300,000 |
| Saturday, June 12 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 575,000 | 240,000 |
| Sunday, June 13 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 475,000 | ..... |
| Monday, June 14 | ..... | 375 | ..... | ..... | ..... | ..... | 205 | 29 | 31 | 520,000 | 450,000 | 85,000 | ..... |
| Tuesday, June 15 | ..... | 175 | ..... | ..... | ..... | ..... | 72 | 9 | 10 | 140,000 | 100,000 | ..... | ..... |
| Wednesday, June 16 | ..... | 250 | ..... | ..... | ..... | ..... | 276 | 20 | 24 | 315,000 | 300,000 | ..... | ..... |
| Thursday, June 17 | ..... | 275 | ..... | ..... | ..... | ..... | 108 | 11 | 10 | 180,000 | 180,000 | ..... | ..... |
| Friday, June 18 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *50,000 | 400,000 |
| Saturday, June 19 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *100,000 | ..... |
| Monday, June 21 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20,000 | 15,000 | ..... | ..... |
| Tuesday, June 22 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 120,000 | 85,000 | *180,000 | ..... |
| Sunday, June 27 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *100,000 | ..... |
| | 4,037 | 7,180 | 5,420 | 172,200 | 440 | 6,025 | 6,370 | 1,136 | 1,089 | 20,749,000 | 18,550,000 | 14,350,000 | 4,200,000 |

| | |
|---|---|
| Tuesday, May 25 | |
| Wednesday, May 26 | Eggs of the 26th and 27th were so poor that none were hatched. |
| Thursday, May 27 | |
| Friday, May 28 | |
| Saturday, May 29 | |
| Sunday, May 30 | |
| Monday, May 31 | |
| Tuesday, June 1 | |
| Wednesday, June 2 | |
| Thursday, June 3 | |
| Friday, June 4 | |
| Saturday, June 5 | Eggs placed in hatching-boxes at Fort Washington. |
| Sunday, June 6 | No boats gilling. |
| Monday, June 7 | |
| Tuesday, June 8 | |
| Wednesday, June 9 | 100,000 shad placed in the Potomac at Fort Washington. |
| Thursday, June 10 | |
| Friday, June 11 | Steamer remained at navy-yard. |
| Saturday, June 12 | Do. |
| Sunday, June 13 | 175,000 shad used for experimental purposes. |
| Monday, June 14 | Used for experimental purposes. |
| Tuesday, June 15 | |
| Wednesday, June 16 | |
| Thursday, June 17 | |
| Friday, June 18 | Steamer remained at navy-yard. |
| Saturday, June 19 | Do. |
| Monday, June 21 | Steamer remained at navy-yard on 20th. |
| Tuesday, June 22 | |
| Sunday, June 27 | |

*Used for experimental purposes.

TABLE 5.—*Chronological record of distribution of shad made from May 7, 1880, to June 27, 1880, by United States Fish Commission, under direction of T. B. Ferguson.*

| Date of leaving station. | | Date fish placed in the stream stocked. | | Number of fish. | | State. | Place. | Stream. | Tributary of— | Transfer in charge of— |
|---|---|---|---|---|---|---|---|---|---|---|
| Day of week. | Day of month. | Day of week. | Day of month. | Originally taken. | Actually planted. | | | | | |
| Friday | May 7 | Friday | May 7 | 10,000 | 10,000 | Maryland | Spesutie Narrows | Susquehanna | Chesapeake Bay | John S. Saunders. |
| Saturday | May 8 | Saturday | May 8 | 335,000 | 335,000 | do | Washington, D.C. | Eastern Br. Potomac | Potomac | William P. Sauerhoff. |
| Do | May 8 | do | May 8 | 300,000 | 300,000 | do | Laurel | Patuxent | Chesapeake Bay | C. W. Schuermann. |
| Sunday | May 9 | Sunday | May 9 | 50,000 | 50,000 | do | Washington, D.C | Eastern Br. Potomac | Potomac | William P. Sauerhoff. |
| Monday | May 10 | Monday | May 10 | 413,000 | 413,000 | do | Spesutie Narrows | Susquehanna | Chesapeake Bay | John S. Saunders. |
| Tuesday | May 11 | Tuesday | May 11 | 250,000 | 230,000 | do | do | do | do | Do. |
| Do | May 11 | do | May 11 | 150,000 | 150,000 | do | Havre de Grace | do | do | Do. |
| Do | May 11 | do | May 11 | 110,000 | 110,000 | do | Washington, D.C. | Eastern Br. Potomac | Potomac | C. W. Schuermann. |
| Do | May 11 | do | May 11 | 200,000 | 200,000 | do | Savage | Patuxent | Chesapeake Bay | W. H. Jenkins, jr. |
| Wednesday | May 12 | Wednesday | May 12 | 145,000 | 145,000 | do | Havre de Grace | Susquehanna | do | John S. Saunders. |
| Do | May 12 | do | May 12 | 100,000 | 100,000 | do | Spesutie Narrows | do | do | Do. |
| Thursday | May 13 | Thursday | May 13 | 190,000 | 190,000 | do | do | do | do | Do. |
| Do | May 13 | do | May 13 | 350,000 | 350,000 | do | Havre de Grace | do | do | Do. |
| Friday | May 14 | Friday | May 14 | 270,000 | 270,000 | do | do | do | do | Do. |
| Saturday | May 15 | Saturday | May 15 | 215,000 | 215,000 | do | do | do | do | Do. |
| Do | May 15 | do | May 15 | 60,000 | 60,000 | do | Washington, D.C. | Potomac | do | C. W. Schuermann. |
| Do | May 15 | do | May 15 | 300,000 | 300,000 | do | Cumberland | do | do | H. E. Quinn. |
| Sunday | May 16 | Sunday | May 16 | 20,000 | 20,000 | do | Washington, D.C. | Eastern Br. Potomac | Potomac | C. W. Schuermann. |
| Do | May 16 | do | May 16 | 300,000 | 300,000 | do | Savage | Patuxent | Chesapeake Bay | Newton Simmons. |
| Monday | May 17 | Monday | May 17 | 100,000 | 100,000 | do | Washington, D.C. | Eastern Br. Potomac | Potomac | C. W. Schuermann. |
| Do | May 17 | do | May 17 | 300,000 | 300,000 | do | Point of Rocks | Potomac | Chesapeake Bay | J. F. Ellis. |
| Do | May 17 | do | May 17 | 200,000 | 200,000 | Pennsylvania | Georgetown | Susquehanna | do | J. P. Creveling. |
| Tuesday | May 18 | Tuesday | May 18 | 200,000 | 200,000 | Maryland | Washington, D.C | Eastern Br. Potomac | Potomac | C. W. Schuermann. |
| Do | May 18 | do | May 18 | 225,000 | 225,000 | do | Spesutie Narrows | Susquehanna | Chesapeake Bay | John S. Saunders. |
| Wednesday | May 19 | Wednesday | May 19 | 250,000 | 250,000 | do | Havre de Grace | do | do | Do. |
| Do | May 19 | do | May 19 | 160,000 | 160,000 | Virginia | Petersburg | Appomattox | James River | S. M. Rixey. |
| Thursday | May 20 | Thursday | May 20 | 400,000 | 400,000 | Maryland | Washington, D.C. | Eastern Br. Potomac | Potomac | Sauerhoff & Hamlen. |
| Do | May 20 | do | May 20 | 285,000 | 285,000 | do | Havre de Grace | Susquehanna | Chesapeake Bay | John S. Saunders. |
| Do | May 20 | do | May 20 | 200,000 | 200,000 | do | do | do | do | Do. |
| Do | May 20 | do | May 20 | 200,000 | 200,000 | do | Swan Creek | do | do | Do. |
| Friday | May 21 | Friday | May 21 | 350,000 | 350,000 | do | Havre de Grace | do | do | Do. |
| Do | May 21 | do | May 21 | 50,000 | 50,000 | do | do | do | do | Do. |
| Do | May 21 | do | May 21 | 25,000 | 25,000 | do | Spesutie Narrows | do | do | Do. |
| Do | May 21 | do | May 21 | 200,000 | 200,000 | do | Washington, D.C. | Eastern Br. Potomac | do | Sauerhoff & Hamlen. |
| Do | May 21 | do | May 21 | 600,000 | 600,000 | do | Savage | Patuxent | Chesapeake Bay | J. F. Ellis. |
| Do | May 21 | do | May 21 | 250,000 | 250,000 | Pennsylvania | Harrisburg | Susquehanna | do | J. P. Creveling. |
| Saturday | May 22 | Saturday | May 22 | 460,000 | 460,000 | Maryland | Havre de Grace | do | do | John S. Saunders. |
| Do | May 22 | do | May 22 | 600,000 | 600,000 | do | Washington, D.C. | Eastern Br. Potomac | Potomac | C. W. Schuermann. |
| Do | May 22 | do | May 22 | 200,000 | 200,000 | do | Near Fort Washington. | Potomac | Chesapeake Bay | Sauerhoff & Hamlen. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sunday | May 23 | Sunday | May 23 | 25,000 | 25,000 | ....do | ....do | ....do | ....do | Sauerhoff & Hamlen |
| Do. | May 23 | Monday | May 24 | 2,000,000 | 375,000 | South Carolina | Gaffney's Station | Broad River | Congaree | C. J. Huske. |
| | | ....do | May 24 | | 375,000 | ....do | Seneca Station | Seneca River | Savannah River | Do. |
| | | ....do | May 24 | | 60,000 | ....do | Near Rock Hill | Catawba | Wateree | J. F. Ellis. |
| | | ....do | May 24 | | 140,000 | ....do | | | | J. F. Ellis.[1] |
| | | ....do | May 24 | | 40,000 | ....do | Railroad Crossing | Wateree | Santee | S. M. Rixey. |
| | | ....do | May 24 | | 40,000 | ....do | ....do | Lynch's Creek | Great Pedee | Do. |
| | | ....do | May 24 | | 40,000 | ....do | ....do | Big Pedee | Winyaw Bay | Do. |
| | | ....do | May 24 | | 40,000 | ....do | Near Nicholls Station. | Little Pedee | Great Pedee | Do. |
| | | Tuesday | May 25 | | 296,000 | Georgia | Railroad Crossing | Oconee | Altamaha | J. F. Ellis. |
| | | ....do | May 25 | | 296,000 | ....do | Near Covington | Yellow | Ocmulgee | Do. |
| | | ....do | May 25 | | 296,000 | ....do | Near Boltonville | Chattahoochee | Apalachicola | Do. |
| Monday | May 24 | Monday | May 24 | 800,000 | 800,000 | Maryland | Washington, D. C. | Eastern Br. Potomac | Potomac | Clark & Schuermann. |
| Do. | May 24 | ....do | May 24 | 240,000 | 240,000 | ....do | Spesutie Narrows | Susquehanna | Chesapeake Bay | John S. Saunders. |
| Tuesday | May 25 | Tuesday | May 25 | 400,000 | 400,000 | ....do | Washington, D. C. | Eastern Br. Potomac | Potomac | F. N. Clark. |
| Do. | May 25 | ....do | May 25 | 500,000 | 500,000 | ....do | Moxley's Point | Potomac | Chesapeake Bay | Sauerhoff & Hamlen. |
| Do. | May 25 | ....do | May 25 | 500,000 | 500,000 | ....do | Savage | Patuxent | ....do | C. W. Schuermann. |
| Do. | May 25 | ....do | May 25 | 1,500,000 | 129,630 | Delaware | Wilmington | Christiania Creek | Delaware River | N. Simmons. |
| | | ....do | May 25 | | 180,000 | ....do | Dover | Jones Creek | ....do | Do. |
| | | ....do | May 25 | | 1,050,000 | ....do | Seaford | Nanticoke | Chesapeake Bay | Do. |
| Wednesday | May 26 | Wednesday | May 26 | 500,000 | 500,000 | Maryland | Moxley's Point | Potomac River | ....do | Sauerhoff & Hamlen. |
| Do. | May 26 | ....do | May 26 | 1,500,000 | 1,500,000 | ....do | Laurel | Patuxent | ....do | C. J. Huske. |
| Do. | May 26 | ....do | May 26 | 400,000 | 400,000 | ....do | Washington, D. C. | Eastern Br. Potomac | Potomac | C. W. Schuermann. |
| Thursday | May 27 | Thursday | May 27 | 450,000 | 450,000 | ....do | ....do | ....do | ....do | F. N. Clark. |
| Do. | May 27 | ....do | May 27 | 1,070,000 | 1,070,000 | ....do | Spesutie Narrows | Susquehanna | Chesapeake Bay | John S. Saunders. |
| Friday | May 28 | Friday | May 28 | 75,000 | 75,000 | ....do | ....do | ....do | ....do | Do. |
| Do. | May 28 | ....do | May 28 | 150,000 | 150,000 | ....do | Washington, D. C. | Eastern Br. Potomac | Potomac | F. N. Clark. |
| Do. | May 28 | ....do | May 28 | 200,000 | 200,000 | South Carolina | | | | C. J. Huske. |
| Saturday | May 29 | Saturday | May 29 | 150,000 | 150,000 | Maryland | Near Perrymansville. | Bush River | Chesapeake Bay | Newton Simmons. |
| Do. | May 29 | ....do | May 29 | 50,000 | 50,000 | ....do | Deer Park | Little Youghiogheny | Youghiogheny | S. M. Rixey. |
| Do. | May 29 | ....do | May 29 | 200,000 | 200,000 | ....do | Washington, D. C | Eastern Br. Potomac | Potomac | F. N. Clark. |
| Tuesday | June 1 | Tuesday | June 1 | 30,000 | 30,000 | ....do | ....do | ....do | ....do | Do. |
| Do. | June 1 | Friday | June 4 | 200,000 | 40,000 | Missouri | Shell City | Osage River | Missouri | G. G. Davenport. |
| | | ....do | June 4 | | 20,000 | ....do | Railroad Crossing | Salt River | Mississippi | J. F. Ellis. |
| | | ....do | June 4 | | 20,000 | ....do | ....do | Chariton | Missouri | Do. |
| | | ....do | June 4 | | 40,000 | ....do | Near Jerome | Gasconade | ....do | S. M. Rixey. |
| | | ....do | June 4 | | 20,000 | ....do | Railroad Crossing | Grand River | ....do | J. F. Ellis. |
| | | Saturday | June 5 | | 20,000 | ....do | ....do | Platte River | ....do | Do. |
| | | ....do | June 5 | | 20,000 | ....do | ....do | 202 River | | Do. |
| | | ....do | June 5 | | 20,000 | ....do | ....do | Nodaway | Missouri | Do. |
| Wednesday | June 2 | Wednesday | June 2 | 50,000 | 50,000 | Maryland | Off Watson's Isl'd | Susquehanna | Chesapeake Bay | John S. Saunders. |
| Do. | June 2 | ....do | June 2 | 275,000 | 275,000 | ....do | Moxley's Point | Potomac | ....do | W. P. Sauerhoff. |
| Thursday | June 3 | Thursday | June 3 | 285,000 | 285,000 | ....do | Near Perrymansville. | Bush River | ....do | M. Gleason. |
| Friday | June 4 | Friday | June 4 | 485,000 | 485,000 | ....do | Off Watson's Isl'd | Susquehanna | ....do | John S. Saunders. |
| Do. | June 4 | ....do | June 4 | 500,000 | 500,000 | ....do | Little Falls | Potomac | ....do | Frank N. Clark. |
| Do. | June 4 | ....do | June 4 | 175,000 | 175,000 | ....do | Washington, D. C. | Eastern Br. Potomac | Potomac | Do. |
| Saturday | June 5 | Saturday | June 5 | 600,000 | 600,000 | ....do | Little Falls | Potomac | Chesapeake Bay | Wm. H. Jenkins, jr. |

[1] Turned over to Colonel Butler.

TABLE 5.—*Chronological record of distribution of shad made from May 7, 1880, to June 27, 1880, &c.*—Continued.

| Date of leaving station. | | Date fish placed in the stream stocked. | | Number of fish. | | State. | Place. | Stream. | Tributary of— | Transfer in charge of— |
|---|---|---|---|---|---|---|---|---|---|---|
| Day of week. | Day of month. | Day of week. | Day of month. | Originally taken. | Actually planted. | | | | | |
| Saturday | June 5 | Saturday | June 5 | 300,000 | 300,000 | Maryland | Washington, D. C. | Eastern Br. Potomac | Potomac | F. N. Clark. |
| Sunday | June 6 | Sunday | June 6 | 460,000 | 460,000 | do | Off Watson's Island. | Susquehanna | Chesapeake Bay. | John S. Saunders. |
| Do | June 6 | do | June 6 | 300,000 | 300,000 | do | Washington, D. C. | Eastern Br. Potomac | Potomac River | F. N. Clark. |
| Do | June 6 | Monday | June 7 | 700,000 | 700,000 | Kentucky | Shepherdsville | Salt River | Ohio River | Commis'ner Griffith. |
| Monday | June 7 | do | June 7 | 55,000 | 55,000 | Maryland | Off Watson's Island. | Susquehanna | Chesapeake Bay. | John S. Saunders. |
| Do | June 7 | do | June 7 | 375,000 | 375,000 | do | Savage | Patuxent | do | S. M. Rixey. |
| Tuesday | June 8 | Tuesday | June 8 | 650,000 | 650,000 | do | Off Watson's Island. | Susquehanna | do | John S. Saunders. |
| Do | June 8 | do | June 8 | 400,000 | 400,000 | do | Little Falls | Potomac | do | S. M. Rixey. |
| Wednesday | June 9 | Wednesday | June 9 | 140,000 | 140,000 | do | Off Watson's Island. | Susquehanna | do | John S. Saunders. |
| Do | June 9 | do | June 9 | 100,000 | 100,000 | do | Fort Washington. | Potomac | do | William P. Sauerhoff. |
| Friday | June 11 | | | 300,000 | 150,000 | Georgia | Milledgeville | Oconee River | Altamaha | C. W. Schnermann. |
| | | | | | 150,000 | do | Albany | Flint | Apalachicola | Do. |
| Saturday | June 12 | Saturday | June 12 | 400,000 | 400,000 | Maryland | Off Watson's Island. | Susquehanna | Chesapeake Bay. | John S. Saunders. |
| Do | June 12 | do | June 12 | 100,000 | 100,000 | do | Off Watson's Island. | do | do | Do. |
| Do | June 12 | do | June 12 | 75,000 | 75,000 | do | Washington, D. C. | Eastern Br. Potomac | Potomac | F. N. Clark. |
| Do | June 12 | do | June 12 | 500,000 | 500,000 | do | Little Falls | Potomac | Chesapeake Bay. | William H. Jenkins. |
| Do | June 12 | Friday | June 18 | 240,000 | 215,000 | California | Tehama | Sacramento | San Francisco Bay. | Ellis & Davenport. |
| Sunday | June 13 | Sunday | June 13 | 175,000 | *175,000 | Maryland | | | | F. N. Clark. |
| Do | June 13 | do | June 13 | 300,000 | 300,000 | do | Washington, D. C. | Eastern Br. Potomac | Potomac | Do. |
| Do | June 13 | Tuesday | June 15 | 675,000 | 337,500 | Maine | Waterville | Kennebec | Atlantic Ocean | H. E. Quinn. |
| | | do | June 15 | | 337,500 | do | Mattawamkeag | Mattawamkeag | Penobscot | Do. |
| Monday | June 14 | Monday | June 14 | 85,000 | *85,000 | Maryland | | | | F. N. Clark. |
| Friday | June 18 | Friday | June 18 | 50,000 | *50,000 | do | | | | Do. |
| Do | June 18 | | | 200,000 | 200,000 | Ohio | Fremont | Sandusky | Lake Erie | C. W. Schnermann. |
| Do | June 18 | Sunday | June 20 | 200,000 | 200,000 | Indiana | La Fayette | Wabash | Ohio River | H. E. Quinn. |
| Saturday | June 19 | Saturday | June 19 | 100,000 | *100,000 | Maryland | | | | F. N. Clark. |
| Tuesday | June 22 | Tuesday | June 22 | 160,000 | *160,000 | do | | | | Do. |
| Sunday | June 27 | Sunday | June 27 | 100,000 | †100,000 | do | | | | Do. |
| | | | | 23,473,000 | 22,296,000 | | | | | |

*Used for experimental purposes.

†Moved to Smithsonian Institution for experiments.

TABLE 6.—*Record of distribution of shad made from May 7, 1880, to June 27, 1880, by United States Fish Commission, under direction of T. B. Ferguson, arranged according to States.*

| Station. | Date of leaving station | | Date fish placed in the stream stocked. | | Number of fish. | | State. | Place. | Stream. | Tributary of— | Transfer in charge of— |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Day of week. | Day of month. | Day of week. | Day of month. | Originally taken. | Actually planted. | | | | | |
| Potomac station | Saturday | June 12 | Friday | June 18 | 240,000 | 215,000 | Cal. | Tehama | Sacramento | San Francisco Bay. | Ellis & Davenport. |
| Havre de Grace station. | Tuesday | May 25 | Tuesday | May 25 | 450,000 | 120,000 | Del. | Wilmington | Christiania Creek | Delaware River. | N. Simmons. |
| | | | do | May 25 | | 130,000 | Del. | Dover | Jones Creek | Delaware Bay | Do. |
| Potomac station | Sunday | May 23 | do | May 25 | 888,000 | 296,000 | Ga. | Railroad Crossing. | Oconee River | Altamaha | J. F. Ellis. |
| | | | do | May 25 | | 296,000 | do | Near Covington | Yellow River | Ocmulgee | Do. |
| | | | do | May 25 | | 296,000 | do | Near Boltonville | Chattahoochee | Apalachicola | Do. |
| Do | Friday | June 11 | | | 300,000 | 150,000 | do | Milledgeville | Oconee River | Altamaha | C. W. Schuermann. |
| | | | | | | 150,000 | do | Albany | Flint | Apalachicola | Do. |
| Do | do | June 18 | Sunday | June 20 | 200,000 | 200,000 | Ind. | La Fayette | Wabash | Ohio River | H. E. Quinn. |
| Do | Sunday | June 6 | Monday | June 7 | 700,000 | 700,000 | Ky. | Shepherdsville | Salt River | do | Commissioner Griffith. |
| Havre de Grace station. | do | June 13 | Tuesday | June 15 | 675,000 | 337,500 | Me. | Waterville | Kennebec | Atlantic Ocean | H. E. Quinn. |
| | | | do | June 15 | | 337,500 | do | Mattawamkeag | Mattawamkeag | Penobscot | Do. |
| Do | | | | May 7 to June 12 | 7,863,000 | 7,863,000 | Md. | Havre de Grace | Susquehanna | Chesapeake Bay. | John S. Saunders. |
| Potomac station | | | | May 7 to June 13 | 9,855,000 | 9,855,000 | do | Washington, D.C. | Potomac | do | F. N. Clark. |
| Do | | | | May 3 to June 7 | 2,775,000 | 2,775,000 | do | Laurel | Patuxent | do | Do. |
| Havre de Grace station. | | | | May 25 | 1,050,000 | 1,050,000 | Del. | Seaford | Nanticoke | do | Newton Simmons. |
| Do | | | | June — | 435,000 | 435,000 | Md. | Railroad Crossing. | Bush | do | Do. |
| Potomac station | | | | May 29 | 50,000 | 50,000 | do | Deer Park | Little Youghiogheny. | Youghiogheny | S. M. Rixey. |
| Do | | | | June 13 to June 27 | 670,000 | *670,000 | do | | | | F. N. Clark's Station. |
| Do | Tuesday | June 1 | Friday | June 4 | 200,000 | 40,000 | Mo. | Shell City | Osage River | Missouri | G. G. Davenport. |
| Do | | | do | June 4 | | 20,000 | do | Railroad Crossing. | Salt River | Mississippi | J. F. Ellis. |
| Do | | | do | June 4 | | 20,000 | do | do | Chariton | Missouri | Do. |
| Do | | | do | June 4 | | 40,000 | do | Near Jerome | Gasconade | do | S. M. Rixey. |
| Do | | | do | June 4 | | 20,000 | do | Railroad Crossing. | Grand River | do | J. F. Ellis. |
| Do | | | Saturday | June 5 | | 20,000 | do | do | Platte River | do | Do. |

TABLE 6.—*Record of distribution of shad made from May 7, 1880, to June 27, 1880, &c.*—Continued.

| Station. | Date of leaving station. | | Date fish placed in the stream stocked. | | Number of fish. | | State. | Place. | Stream. | Tributary of— | Transfer in charge of— |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Day of week. | Day of month. | Day of week. | Day of month. | Originally taken. | Actually planted. | | | | | |
| Potomac station | | | Saturday | June 5 | | 20,000 | Md | Railroad Crossing. | 202 River | | J. F. Ellis. |
| Do | | | do | June 5 | | 20,000 | do | do | Nodaway | Missouri | Do. |
| | Friday | June 18 | | | 200,000 | 200,000 | Ohio | Fremont | Sandusky | Lake Erie | C. W. Schuermann. |
| Havre de Grace station. | Monday | May 17 | Monday | May 17 | 200,000 | 200,000 | Pa | Georgetown | Susquehanna | Chesapeake Bay | J. P. Croveling. |
| Do | Friday | May 21 | Friday | May 21 | 250,000 | 250,000 | do | Harrisburg | do | do | Do. |
| Potomac station | Sunday | May 23 | Monday | May 24 | 1,112,000 | 375,000 | S. C | Gaffney's Station | Broad River | Congaree | C. J. Huske. |
| | | | do | May 24 | | 375,000 | do | Seneca Station | Seneca River | Savannah | Do. |
| | | | do | May 24 | | 60,000 | do | Near Rock Hill | Catawba | Waterce | J. F. Ellis. |
| | | | do | May 24 | | †140,000 | do | | | | Do. |
| | | | do | May 24 | | 40,000 | do | Railroad Crossing. | Waterce | Santee | S. M. Rixey. |
| | | | do | May 24 | | 40,000 | do | do | Lynch's Creek | Great Pedee | Do. |
| | | | do | May 24 | | 40,000 | do | do | Big Pedee | Winyaw Bay | Do. |
| | | | do | May 24 | | 40,000 | do | Near Nicholls Station. | Little Pedee | Great Pedee | Do. |
| Do | Friday | May 28 | | | 200,000 | 200,000 | do | | | | C. J. Huske. |
| Do | Wednesday | May 19 | Wednesday | May 19 | 160,000 | 160,000 | Va | Petersburg | Appomattox | James | S. M. Rixey. |
| | | | | | 29,473,000 | 29,296,000 | | | | | |

*Used for experimental purposes.

†Turned over to Colonel Butler.