

13.—JOURNAL OF OPERATIONS ON THE GROUNDS OF THE EASTERN SHORE OYSTER COMPANY, ON CHINCOTEAGUE BAY, NEAR STOCKTON, MD., DURING THE SUMMER OF 1883.*

Compiled by JOHN A. RYDER.

[From records kept by J. A. Ryder, George V. Shepard, and H. H. Pierce.]

§ 1. (MOSTLY MR. SHEPARD'S RECORD.)

June 27.—Mr. Ryder arrived at Mr. Shepard's in company with Mr. Pierce.

June 28.—Went to Cedar Island oyster-beds; discovered no catch of spat on shells planted June, nor on those planted on more sandy bottoms about the 10th.

June 30.—Messrs. Pierce and Ryder left in the afternoon for Snow Hill, to settle upon some plans for experiment.

July 2.—Messrs. Pierce and Ryder returned to the Shepard House.

July 5 to 7.—Were employed in getting the pond excavated and prepared for our experiment.

July 7, 11.30 a. m.—Opened about two dozen oysters, about one-third male and two-thirds female. Placed the eggs and milt at once in a pail of water taken from the creek near the claire. Changed the water in this pail at 1.30 p. m. At 4 p. m. contents of the pail were poured into the claire. Eleven stakes, with shells strung on wire attached, placed in the pond.

July 8, 10.45 a. m.—Opened two dozen oysters, about two-fifths male and three-fifths female. These oysters seemed to be in better spawning condition than those of yesterday. Temperature of water in claire, 85° F.; in creek the same at 10 a. m. Temperature of air, 91° F. Specific gravity in creek at oyster house, 1.0175, United States Standard Coast Survey hydrometer scale, to 1.015; in claire or pond, 1.018; in Chincoteague Bay, 1.020; at head of creek, 1.010.

July 9, 11 a. m.—Opened two dozen spawning oysters, "natural growth." Poured this spawn into pond at 4 p. m. Temperature much lower than yesterday. Specific gravity in creek, 1.018; claire, 1.018. Tide very full. (Spring tide.) Mr. Ryder returned to Washington this a. m.

* This journal gives a daily record of the work at Stockton, the results of which have already been published in Bulletin U. S. Fish Commission, vol. III, pp. 281-294, in a paper by the editor of this journal, entitled, "Rearing oysters from artificially fertilized eggs, together with notes on pond-culture, &c." Messrs. Shepard and Pierce, I have elsewhere neglected to say, bore the expense of excavating the pond used in the experiment, and also had the gate or diaphragm made which was placed in the trench leading from the pond to the bay in order to confine the spawn poured into the inclosure. A letter from Mr. Pierce has also been incorporated, which will be interesting as affording further confirmation of the results claimed in my first paper, the title of which has been cited above.

July 10.—Put out five more stakes, with date marked on them, with shell collectors attached; 12 m. opened two dozen oysters (Potomac plants); 4 p. m. poured fry into the pond.

July 12.—Put out the spawn from one dozen oysters at 3 p. m. Temperature of air, 80° F. Put out four stakes with shells attached.

July 13, 12 m.—Opened two dozen oysters, natural growth, well filled with eggs and milt; 4.30 p. m. poured the contents of the pail into the pond. Temperature of water, 82° F.; of the air, 83° F. Before putting out fry a violent thunder and hail storm occurred.

July 15.—The most violent thunder storm of the summer at 9 p. m.

July 16, 1 p. m.—Opened two dozen oysters; most of those opened had but few eggs and milt; 3.30 p. m. poured the spawn into the pond. Temperature of water, 84° F.; of air, 85° F.

July 17, 12 m.—Opened two dozen oysters well filled with spawn. Poured spawn into pond at 4 p. m. Put out three stakes with collectors attached.

July 18, 3 p. m.—Opened one dozen oysters not well filled with ripe spawn; poured into pond at 9 p. m. Temperature of air, 69° F.; that of water not observed. Discovered spat on shells put out in Cedar Island Channel June 1; none on those put out later.

July 20, 10.45 a. m.—Opened two dozen oysters well filled with spawn. At 3 p. m. poured contents of pail into the pond. Put out six more stakes with shells attached.

§ 2. (MR. PIERCE'S RECORD.)

July 23.—At 10.30 a. m. the spawn of twelve female oysters was mixed with the milt of three males; added water three times, and after occasional agitation, carefully poured the same into the pond at 1.30 p. m. Put out six new collectors marked with the date.

July 25.—Opened about thirty oysters and took spawn from eighteen, and emptied into the claire at 3.30 p. m., after standing in pail about four hours. Put out six new collectors. Last evening a very severe thunder storm; wind, almost a hurricane, passed over the claire. Trees nearly blown down.

July 28.—Opened about three dozen oysters taken yesterday from Cedar Island Channel, and found spawn in about two dozen abundant, and a good proportion of males. Put out five collectors and poured the spawn into the pond at 2.45 p. m., after having stood in the pail two and a half to three hours. Temperature of water in clair, 81° F.; temperature of air in claire, 77° F.; temperature of water in pail, 76° F.; in bay, 79° F.; in creek, 79° F. Day cloudy, and a strong southerly wind. Heavy rain, with some thunder and lightning in the early evening.

July 30.—Put spawn from about two dozen oysters into the pond after it had stood about three hours. The adults from which this spawn was taken were fresh from the off-shore beds (Cedar Island Channel), and seemed to be in fine condition.

August 1.—Took spawn from eighteen oysters taken from the float at oyster house and brought from Cedar Island Channel three days ago. Spawn seemed poor, coming from very watery oysters. Spawn stood in the pail about three and a half hours and was put into the claire at 3.30 p. m. Temperature of water in claire at 3.30 p. m., 84° F.; temperature of air in sun, strong south breeze, 88° F.; in shade, 80° F.; temperature of water in pail emptied into pond, 76° F.

August 3.—No spawn to be got from inshore oysters.

August 4.—No spawn to be got from oysters taken from Cedar Island Channel.

August 5.—Found plenty of spawning oysters on the float (at oyster house), and put that taken from about one and a half dozen into claire at 6.30 p. m. Temperature of air in the sun at the pond, 83° F.; temperature of water in the pond, 81° F.; in the creek, 83° F.

August 6.—Took spawn from about two dozen oysters taken from the float. These oysters, two days ago, had apparently little or no spawn in them. Found a good proportion of males. Spawn emptied into claire about 10 o'clock. Put out five new collectors. Temperature of air in sun over claire, 92° F.; of water in claire, 79° F.; in bay, 80° F.

Wednesday, August 22.—Had Sharply, a laborer, examine pond. He reports the discovery of several young oysters of considerable size.

Thursday, August 23.—Went to the claire or pond in person and made a more thorough examination, and found quite a numerous set of spat on collectors put in place July 7 to 12; some as large as a 10-cent piece; could not discover any on collectors of a later date with the naked eye; sent several shells by mail to Mr. J. A. Ryder, at Wood's Holl, Mass.

August 31.—Examined pond and found a set of spat on collectors, put down as late as the 20th August, but could see none on collectors of a later date with the naked eye. The slimy deposit on the shells is great and is apparently increasing.

§ 3. (MEMORANDUM BY MR. RYDER.)

Summarizing the foregoing data, the following facts may be especially noticed. Seventeen lots of spawn were put into the pond from July 7 to August 6, inclusive. An average of 22 adult oysters were sacrificed each time a fresh lot of spawn was obtained. The entire number of adult oysters sacrificed was 378, of which probably not more than half actually yielded spawn.

Nine lots of shell collectors were placed in position altogether, from July 7 to August 6, inclusive. From eleven to as few as three were placed in position in one day in the pond. The whole number of collectors, consisting of stakes supporting garlands of oyster shells strung on galvanized wire, was 51.

§ 4. (EXTRACT FROM A LETTER FROM MR. PIERCE TO MR. RYDER,
WITH COMMENTS BY THE LATTER.)SNOW HILL, WORCESTER COUNTY, MARYLAND,
October 10, 1883.

MY DEAR MR. RYDER: * * * Before writing you I wanted to again visit the claire and the oyster beds, which I did yesterday. I was not able to discover that the "brood" (spat) in the claire had increased either in size or numbers. We placed some of the shells in the open bay and then took away the diaphragm, so that now the claire is open to the bay. It seems to me probable that the great amount of sediment [deposited] upon the shells [in the course of the experiment] prevented a large part of the catch which we ought to have had from fixing itself to the collectors. Perhaps you can suggest next season some way by which that difficulty can be overcome.

I found yesterday some very small oysters on the shells in the claire, and in the open bay; on the shells put out into the latter in June there is every indication that the catch there extends from soon after the shells were put out up to within a very few days. Some of the young oysters [taken from the bay, this season's spat] measured about 2 inches long, some were so small as to be not easily seen by the eye, except upon very close examination. * * *

Most sincerely, yours,

H. H. PIERCE.

P. S.—It may be interesting to you to know that yesterday Mr. Shepard, in opening some oysters out in the bay, found one with spawn enough in it to plainly show, in fact he took the spawn from it.

From Mr. Pierce's question as to the cessation of the growth of the spat in the claire, I am reminded that apparently but little growth of the shell, either of the adult or young oyster, occurs after cool weather sets in. There is, in fact, a marked cessation of growth about the end of October, as is shown by specimens of young oysters twenty-three months old now before me. In one specimen of that age the spat had grown during the first season to be $1\frac{1}{2}$ inches in diameter, after which there is a sharp offset where the growth had ceased in the autumn. This was the growth accomplished in about four months; during the next succeeding nineteen months a growth of only 2 inches had been made, so that the total length of the shell was now $3\frac{1}{2}$ inches measured from the beak to the free edges of the valves. In other specimens measuring $2\frac{1}{4}$ inches, but of the same age as the preceding, there is a similar sharp offset where the layers of calcic carbonate forming the spat shell cease, and where the first year's growth suffered temporary cessation.

The fact that the young oyster should stop growing appreciably during the autumn and winter is therefore not surprising, and this fact

may possibly be connected with another of some significance, namely, the great development or augmentation of the volume of the connective tissue of the animal during the winter months, when oysters are said to be fat or in good condition. This increase of the connective tissue mass in bulk and consistency may probably be regarded as a winter storage of reserve material, which upon the approach of warmer weather is gradually converted into germs. Such an opinion is supported by a large number of facts, derived from a study of the minute structure or the histology of the oyster.

Another fact of considerable importance is what Mr. Pierce notes regarding the late spawning of the oyster, which is in accord with my more exact observations made in 1880. I then found that spawning or spatting occurred during the period intervening from about July 1 to late in October, or that spat fell and fixed itself for a period extending over at least three and a half, if not for even as much as four months. This would indicate that in the case of the American species it is probably possible for the culturist to avail himself of the chance of collecting spat on collecting apparatus put out at intervals during the whole of this prolonged period of the reproductive activity of the animal.

WASHINGTON, D. C., *November 19, 1883.*

14.—NOTES ON THE MENHADEN FISHING OF 1883.

By OSCAR O. FRIEDLAENDER.

[From letters to Prof. S. F. Baird.]

The result as far as dollars and cents are concerned was very unsatisfactory this year on account of the poor yield of oil. We had a large catch from our own boats—about 50 per cent. more than last year—26,053,250 fish. There was a yield of 49,900½ gallons of oil. The average price was 39.6 cents. The above quantity included 2,614,800 fish purchased from outsiders.

Last year we had 23,996,650 fish, including 9,766,700 bought from outsiders. These yielded 121,553 gallons of oil. The average price was 39 cents.

This year's price would have been much higher had it not been for the very heavy import of Japanese fish oil—something entirely new here. The fish were much better in October and November, and, although the weather was very favorable, only small bodies of big sea menhaden were caught here. The catch on the east end of Long Island and Rhode Island was better than here, and the fish yielded about double the quantity of oil. The Church firm caught with four steamers over 60,000,000 fish. I sent some of the last caught fish to Mr. E. G. Black-