

a case which will hardly ever occur in the open sea. It might be recommended to make an experiment with bow-nets made of galvanized-iron wire, painted brown, like the color of the bow-nets usually employed. The shape of these bow-nets should be that of the common bow-nets used for catching cod, but the entrances to the different chambers should be so arranged as to make it easy for the seals to slip in. Live fish—especially cod, of which the seals are very fond—might, if necessary, be put in these bow-nets when they are set; but there would probably be no lack of bait to attract the seals, as even in wire bow-nets plenty of fish are caught. Such an experiment, which should be made in places frequented by seals, would not involve any great expense, and would certainly be a step toward solving the question as to the best way of protecting the fishermen against the seals.

The chief cause why the seals infest our fishing-grounds in such large numbers must, however, be sought in the circumstance that in many places they enjoy full protection, so that sportsmen and visitors to watering-places may have a chance to follow the sport of seal-hunting. Near the Island of Rügen certain districts are rented out to seal-hunters, and the persons owning these districts take good care that the game shall not decrease, but rather increase, in number.

KIEL, GERMANY, *April*, 1886.

### 30.—REPORT ON THE SHAD WORK OF THE STEAMER FISH HAWK DURING THE SEASON OF 1887.

By Mate JAMES A. SMITH, U. S. N.

[Abstract.]

The shad work prosecuted by the steamer Fish Hawk during the season of 1887 covered the period from May 2 to 26, inclusive.

On May 2 the ship took a position on the east side of Chesapeake Bay and near the mouth of North East River, adjacent to the fishing shores and gilliers in that vicinity, and began the work of hatching.

On May 3 arrangements were made with the proprietors of the fishing shores and the gilliers to pay them for all impregnated shad eggs, and the spawn-takers began by tending Carpenter's Point, Red Bank, and Roche's fishing shores. As many gilliers as could be conveniently be visited by the crew of the vessel.

On May 4 the ship was visited and inspected by the Assistant Commissioner, who gave instructions for the vessel to remain on this station until further orders, and the work of collecting, hatching, depositing, and transferring was carried on until the end of the season.

On May 6, all of the cones and hatching jars being full, 1,130,000 eggs were transferred to Battery Station. The next day, spawn being plentiful, 3,157,000 impregnated shad eggs were deposited.

On May 8, spawn still being collected in great numbers, the outside hatching cylinders were put in operation and 220,000 eggs were placed

in each of the six cylinders; but, owing to the eggs having stood in buckets for some hours while the apparatus was being arranged, the number hatched out was very small, about 25 per cent.

On May 11 a shipment of 1,250,000 shad fry was made by the steamer Halcyon, to be deposited in the SassafRAS River.

On May 14 2,000,000 good impregnated shad eggs were sent to Dr. E. G. Shortlidge, Wilmington, for the Delaware fish commission.

On May 15 a second trial was made with the cylinders, which resulted very satisfactorily. On the previous trial a great many young fish had broken their sacs by trying to get through the wire gauze. In this instance a layer of cheese-cloth was placed over the wire, thereby protecting the eggs and young fish. It being fine weather and the water smooth a percentage was hatched out equal to that secured by the cones.

On May 19 a second shipment of 1,054,000 shad fry was made by the steamer Halcyon, designed for the Chester River; but, owing to an accident to her machinery, the fish were deposited in Elk River and Bohemia Creek.

On May 23 it was found that the percentage of fish hatched from eggs received within the few preceding days had been very small owing to so many dead eggs being found in the jars and cones. Eggs which, when brought on board, seemed in prime condition and properly impregnated, died rapidly after being in the apparatus for thirty-six hours.

The work continued until May 26, when, in accordance with instructions, hatching operations were discontinued for the season, and all fish and eggs on hand were transferred to Battery Station.

TABLE I.—*Meteorological record made on board steamer Fish Hawk, Susquehanna River, from May 3 to 26, 1887.*

Date.	Air.		Surface.		Bottom.		Jars.		Direction of wind.	Force of wind.	Weather.
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
1887.	o	o	o	o	o	o	o	o			
May 3.....	80	60	60	58	60	60	61	59	Variable.....	0-3	Clear.
4.....	81	60	67	60	61	56	63	61	SE. and NNE.....	1-2	Partly cloudy.
5.....	77	58	64	62	63	62	64	63	S. and E.....	1-5	Clear.
6.....	78	54	67	63	65	62	67	64	S. and E.....	0-4	Partly cloudy.
7.....	76	65	66	64	66	64	68	65	N. and E.....	2-4	Squally and raining.
8.....	68	58	65	65	65	65	66	66	S. and E.....	2-5	Cloudy.
9.....	68	60	65	65	66	61	66	66	S. and E.....	3-4	Do.
10.....	72	59	66	65	65	65	66	65	S. and E.....	0-4	Foggy.
11.....	75	62	68	65	69	65	69	66	S. and W.....	0-3	Partly cloudy.
12.....	77	62	70	67	69	67	70	68	S. and W.....	0-3	Clear.
13.....	77	56	73	68	71	68	71	69	Variable.....	0-3	Do.
14.....	78	50	72	68	68	67	70	68	Variable.....	1-4	Do.
15.....	76	52	69	68	69	67	70	68	S. and W., S. and E.....	0-2	Do.
16.....	88	53	73	68	70	68	73	69	S. and W., S. and E.....	0-2	Do.
17.....	78	58	72	69	70	68	72	69	Variable.....	0-3	Do.
18.....	82	50	72	68	71	69	72	70	Variable.....	0-2	Do.
19.....	80	61	74	69	73	68	71	69	Variable.....	0-3	Do.
20.....	79	64	74	61	73	70	75	71	N. and E., S. and W.....	0-4	Partly cloudy.
21.....	84	68	75	73	75	72	76	73	S. and W.....	0-4	Do.
22.....	88	63	75	72	75	71	75	73	S. and W.....	1-4	Do.
23.....	78	64	75	74	74	73	76	74	Variable.....	3-5	Clear.
24.....	81	67	75	74	75	74	76	74	S. and E.....	3-7	Cloudy.
25.....	80	62	76	74	75	74	77	74	Variable.....	0-8	Squally.
26.....	82	63	76	74	74	73	75	75	Variable.....	0-9	Cloudy and raining.

State of water, clear.

TABLE II.—Record of temperature observations made at Bull Mountain, on the steamer Fish Hawk, from May 3 to 26, 1887.

Date.	Temperature of air.			Temperature of surface water.			Temperature of bottom.			Direction of wind.			Intensity of wind.			Condition of sky.			Condition of water.*	State of tide.		
	8 a. m.	12 m.	4 p. m.	8 a. m.	12 m.	4 p. m.	8 a. m.	12 m.	4 p. m.	8 a. m.	12 m.	4 p. m.	8 a. m.	12 m.	4 p. m.	8 a. m.	12 m.	4 p. m.		8 a. m.	12 m.	4 p. m.
1887.	o	o	o	o	o	o	o	o	o													
May 3 <sup>1</sup> .....	65	60	62	58	60	60	58	59	59	NNE.	NNE.	NW.	3	2	1	Clear	Clear	Clear	Clear	Ebb	Flood	Flood.
4.....	67	71	83	64	62	64	60	61	61	Calm.	Calm.	Calm.	0	0	0	Cloudy	Partly cloudy	Cloudy	do	do	Ebb	Do.
5.....	71	58	70	62	63	69	62	63	63	NE.	NE.	ESE.	5	3	3	do	do	do	do	do	do	Do.
6.....	55	62	77	63	64	67	63	63	65	E.	ENE.	SE.	2	4	3	Foggy	do	do	do	do	do	Do.
7.....	62	64	69	61	63	66	64	65	66	E.	ESE.	E. by N.	3	4	2	Cloudy	Cloudy	do	do	Flood	do	Do.
8.....	58	64	67	65	65	65	65	65	65	E.	E.	E.	4	3	4	Foggy	do	do	do	do	do	Ebb.
9.....	59	60	70	65	65	65	65	65	65	ENE.	SE.	SE.	2	3	3	do	do	do	do	do	do	SE.
10 <sup>2</sup> .....	60	59	69	65	66	66	65	65	61	E.	SSE.	NW.	3	1	1	do	Clear	Partly cloudy.	Muddy	do	Flood	Do.
11 <sup>3</sup> .....	70	70	80	65	68	69	65	67	69	Calm.	Calm.	SW.	0	0	3	do	do	Clear.	do	do	do	Do.
12 <sup>3</sup> .....	66	68	76	67	69	69	67	68	69	Calm.	NE.	SW.	0	3	3	Mist	do	do	Slightly muddy and clearing.	do	do	Do.
13.....	66	56	76	68	69	72	68	69	69	NE.	ENE.	S.	2	1	1	Clear	do	do	do	Ebb	do	Do.
14.....	66	54	67	69	63	70	68	68	68	ENE.	SE.	W.	2	3	1	do	do	do	Clear	do	do	Do.
15.....	73	52	68	68	68	68	68	68	68	Calm.	ESE.	SW.	0	1	1	do	do	do	do	do	do	Do.
16.....	64	52	62	68	68	68	68	68	68	SE	E.	SW.	1	1	1	do	do	do	do	do	do	Do.
17.....	64	61	77	69	70	72	68	69	71	NNW.	S.	SW.	2	1	1	do	do	do	do	do	Ebb	Flood.
18.....	61	64	78	70	69	72	69	69	71	ENE.	Calm.	Calm.	2	0	0	Cloudy	do	do	do	do	do	Do.
19.....	70	66	82	70	71	71	70	70	70	NE.	Calm.	SSW.	3	0	2	Clear	do	do	do	do	do	Do.
20.....	68	70	76	71	72	73	72	72	73	Calm.	SSW.	SW.	0	3	4	do	do	do	do	do	do	Do.
21.....	68	71	80	73	73	75	73	73	74	SSW.	S.	S.	3	4	4	Cloudy	do	do	do	do	do	Do.
22.....	68	67	88	72	75	75	74	74	74	SW.	SE.	WNW.	2	4	2	do	do	do	do	do	do	Do.
23.....	73	70	78	74	75	74	74	74	74	SSE.	SSE.	SW.	3	4	5	Clear	Cloudy	do	do	Flood	do	Do.
24.....	72	68	76	74	74	75	74	75	75	SSE.	S.	S.	4	5	5	Cloudy	do	Cloudy	Muddy	do	do	Ebb.
25.....	70	64	84	74	74	76	74	74	75	NW.	S.	SW.	2	2	1	do	Clear	do	Clear	do	Flood	Do.
26.....	66	.....	.....	74	.....	.....	74	.....	.....	WSW.	.....	.....	2	.....	.....	do	.....	.....	Muddy	do	.....	.....

\* Depth of water at station 15 feet.

<sup>1</sup> Filled cones; temperature in same 63°, at bottom 59°.

<sup>2</sup> Rise in river above, water became muddy.

<sup>3</sup> Continuation of above, clearing slightly.

TABLE III.—Record of shad-hatching operations conducted by the steamer Fish Hawk near the mouth of North East River, Maryland, from May 1 to 26, 1887.

Date.	Fishery.	Fish.		Eggs obtained.	Eggs put in jars or coues.	Date of hatching.	Number hatched.	Fish or eggs disposed of.		Where transferred to or deposited.
		Male.	Female.					Number.	Date.	
1887.										
May 1	Ship's gill-net.	1	1	60,000				60,000	May 2	Battery Station.
2	Ship's gill-net.	1	1	62,000				62,000	May 2	Do.
3	Red Bank.	5	5	241,000	2.30 a. m.	May 5	176,000	176,000	May 5	North East River.
3	Gilliers	2	2	30,000	2.30 a. m.	May 5	25,000	25,000	May 5	Do.
3	Carpenter's Point	1	1	14,000	1.00 p. m.	May 5	10,000	10,000	May 5	Do.
3	Red Bank	1	1	55,000	2.45 p. m.	May 5	46,000	46,000	May 5	Do.
3	do	5	5	210,000	6.15 p. m.	May 6	187,000	187,000	May 5	Do.
3	Carpenter's Point.	18	18	564,000	8.30 p. m.	May 6	490,000	490,000	May 5	Do.
3	Red Bank.	7	7	296,000	10 p. m.	May 6	250,000	250,000	May 5	Do.
4	Gilliers	3	3	102,000	3.45 a. m.	May 6	90,000	90,000	May 5	Do.
4	do	3	3	69,000	3.45 a. m.	May 6	50,000	50,000	May 9	Do.
4	do	6	6	291,000	3.30 a. m.	May 6	175,000	175,000	May 9	Do.
4	Gillier	2	2	58,000	7.30 a. m.	May 6	50,000	50,000	May 9	Do.
4	Gilliers	3	3	90,000	7.45 a. m.	May 6	60,000	60,000	May 9	Do.
4	Carpenter's Point	10	10	420,000	6.45 p. m.	May 6	375,000	375,000	May 9	Do.
4	Roche's Shore.	7	7	161,000	8.21 p. m.	May 7	125,000	125,000	May 10	Sassafras River.
4	Carpenter's Point	5	5	175,000	9 p. m.	May 7	160,000	160,000	May 10	Do.
4	Gilliers	7	7	252,000	9 p. m.	May 7	200,000	200,000	May 10	Do.
4	do	6	6	191,000	9 p. m.	May 7	130,000	130,000	May 10	Do.
4	Red Bank	8	8	310,000	11 p. m.	May 7	292,000	292,000	May 10	Do.
4	Gilliers	7	7	220,000	12 m.	May 7	138,000	138,000	May 10	Do.
5	do	3	3	108,000	3.15 a. m.		(*)			
5	do	15	15	442,000	10 p. m.	May 8	375,000	375,000	May 11	Do.
5	do	15	15	616,000	10 p. m.	May 8	553,000	553,000	May 11	Do.
5	do	11	11	462,000	10 p. m.	May 8	375,000	375,000	May 11	Do.
5	Carpenter's Point	22	22	672,000	10 p. m.	May 8	615,000	615,000	May 11	North East River.
5	Gilliers	1	1	56,000	10 p. m.	May 8	45,000	45,000	May 11	Sassafras River.
5	do	6	6	293,000	10 p. m.	May 6	203,000	203,000	May 6	Battery Station.
5	do	2	2	77,000	10 p. m.			77,000	May 6	Do.
6	Red Bank and gilliers	17	17	514,000	1.30 a. m.			514,000	May 6	Do.
6	Gilliers	15	15	336,000	1.30 a. m.			336,000	May 6	Do.
6	do	2	2	98,000	1.30 a. m.	May 8	65,000	65,000	May 11	North East River.
6	do	28	28	672,000	7 p. m.			672,000	May 7	Do.
6	Carpenter's Point and gilliers	19	19	868,000	9 p. m.			868,000	May 7	Do.
6	Gilliers	10	10	280,000	9.30 p. m.			280,000	May 7	Do.
6	Roche's and gilliers	11	11	476,000	10 p. m.			476,000	May 7	Do.
6	Gilliers	9	9	343,000	9.30 p. m.			343,000	May 7	Do.
6	do	9	9	420,000	10 p. m.			420,000	May 7	Do.
7	do	6	6	214,000	10 p. m.	May 10	54,000	54,000	May 11	Do.



TABLE III.—Record of shad-hatching operations conducted by the steamer Fish Hawk, &c.—Continued.

Date.	Fishery.	Fish.		Eggs obtained.	Eggs put in jars or cones.	Date of hatching.	Number hatched.	Fish or eggs disposed of.		Where transferred to or deposited.
		Male.	Female.					Number.	Date.	
1887.										
May 15	Gillers.....	9	9	250,000	12.50 a. m.	May 17	155,000	155,000	May 19	Chester River
16	do.....	6	6	230,000	1.30 a. m.	May 17	175,000	175,000	May 19	North East River.
16	do.....	7	7	225,000	1.30 a. m.	May 17	195,000	195,000	May 19	Do.
16	do.....	3	3	119,000	1.30 a. m.	May 18	105,000	105,000	May 21	Do.
16	do.....	18	18	466,000	1.30 a. m.	May 18	300,000	300,000	May 21	Do.
16	do.....	7	7	224,000	1.30 a. m.	May 18	180,000	180,000	May 21	Do.
16	do.....	2	2	89,000	10.30 p. m.	May 18	80,000	80,000	May 21	Do.
16	Carpenter's Point.....	2	2	68,000	10.30 p. m.	May 18	63,000	63,000	May 21	Do.
17	Gillers.....	1	1	35,000	1 a. m.	May 18	30,000	30,000	May 21	Do.
17	do.....	2	2	50,000	1 a. m.	May 20	45,000	45,000	May 21	Do.
17	do.....	1	1	18,000	1 a. m.	May 20	15,000	15,000	May 21	Do.
17	do.....	3	3	66,000	1.30 a. m.	May 20	60,000	60,000	May 21	Do.
17	do.....	13	13	320,000	2 a. m.	May 20	303,000	303,000	May 21	Do.
17	do.....	5	5	144,000	9.45 p. m.	May 20	134,000	134,000	May 22	Do.
17	do.....	18	18	438,000	11.45 p. m.	May 20	403,000	403,000	May 22	Do.
18	do.....	3	3	105,000	2.30 a. m.	May 20	75,000	75,000	May 23	Do.
18	do.....	1	1	29,000	2.30 a. m.	May 20	19,000	19,000	May 22	Do.
18	do.....	6	6	224,000	9.30 p. m.	May 20	175,000	145,000	May 22	Do.
18	do.....	1	1	35,000	9.30 p. m.	May 20	20,000	15,000	May 22	Do.
18	do.....	5	5	166,000	9.30 p. m.	May 20	126,000	105,000	May 22	Do.
18	do.....	3	3	123,000	9.30 p. m.	May 20	40,000	40,000	May 22	Do.
18	do.....	16	16	391,000	11.45 p. m.	May 21	285,000	285,000	May 23	Do.
19	do.....	1	1	14,000	3 a. m.	May 21	10,000	10,000	May 23	Do.
19	Giller.....	1	1	18,000	8 a. m.	May 21	15,000	15,000	May 23	Do.
19	do.....	1	1	52,000	10 p. m.	May 21	34,000	34,000	May 23	Do.
19	J. E. Ford.....	12	12	371,000	10 p. m.	May 21	175,000	175,000	May 23	Do.
19	Gillers.....	9	9	231,000	10 p. m.	May 21	120,000	120,000	May 23	Do.
19	do.....	9	9	266,000	10 p. m.	May 21	120,000	120,000	May 23	Do.
19	do.....	8	8	206,000	10 p. m.	May 21	109,000	100,000	May 23	Do.
20	do.....	14	14	470,000	12.50 a. m.	May 22	231,000	231,000	May 24	Do.
20	do.....	1	1	45,000	9.30 p. m.	May 22	30,000	30,000	May 24	Do.
20	do.....	6	6	200,000	9.30 p. m.	May 22	121,000	121,000	May 24	Do.
20	do.....	2	2	67,000	10 p. m.	May 22	50,000	50,000	May 24	Do.
20	do.....	5	5	178,000	10 p. m.	May 22	136,000	136,000	May 24	Do.
20	do.....	7	7	240,000	10 p. m.	May 23	200,000	200,000	May 24	Do.
20	do.....	1	1	35,000	10 p. m.	May 23	20,000	20,000	May 24	Do.
21	do.....	24	24	763,000	11.50 p. m.	May 23	408,000	408,000	May 24	Do.
21	do.....	3	3	95,000	10.30 p. m.	May 23	30,000	30,000	May 25	Do.
21	do.....	1	1	28,000	10.30 p. m.	May 23	10,000	10,000	May 25	Do.

21	do	5	5	124,000	10.30 p. m.	May 23	49,000	49,000	May 25	Do.
21	do	3	3	94,000	10.30 p. m.	May 23	30,000	30,000	May 25	Do.
21	do	5	5	112,000	10.30 p. m.	May 23	35,000	35,000	May 25	Do.
21	do	6	6	147,000	11.45 p. m.	May 23	57,000	57,000	May 25	Do.
21	Giller	1	1	35,000	11.45 p. m.	May 23	15,000	15,000	May 25	Do.
21	do	3	3	68,000	11.45 p. m.	May 23	25,000	25,000	May 25	Do.
21	Gillers	3	3	81,000	11.45 p. m.		(*)			
22	do	6	6	70,000	11.20 p. m.	May 24	45,000	45,000	May 25	North East River.
22	do	8	8	116,000	11.20 p. m.	May 24	70,000	70,000	May 25	Do.
22	do	3	3	114,000	11.20 p. m.	May 24	60,000	60,000	May 25	Do.
23	do	1	1	15,000	11 p. m.	May 25	15,000	15,000	May 26	Battery Station.
23	do	1	1	9,000	11 p. m.	May 25	9,000	9,000	May 26	Do.
25	do	3	3	54,000	10 p. m.			54,000	May 26	Do.
Total		909	909	29,334,000			15,801,000	22,264,000		

\* Died; improper impregnation.

U. S. FISH COMMISSION STEAMER FISH HAWK,  
*Baltimore, Md., July 9, 1887.*