

133.—EXTRACTS FROM A REPORT OF INVESTIGATIONS OF THE SHAD FISHERIES AND RIVERS SOUTH OF CHARLESTON, S. C., WITH A VIEW TO ESTABLISHING STATIONS FOR ARTIFICIAL PROPAGATION.

By T. B. FERGUSON.

I arrived in the Lookout at Savannah during the afternoon of March 20, 1883. The fishermen and fish-dealers in Savannah reported a great scarcity of shad during the season both in the Savannah and neighboring rivers from which the market derives its supply. Shad were selling readily at from \$1.50 to \$2 per pair.

In order not to lose time I decided to make the examination of the Saint Mary's River before proceeding to the Saint John's so ran up the river as far as the town of Saint Mary's, a place of about 1,000 inhabitants, where we arrived at 4 o'clock, March 21. Engaged a pilot to take the steamer up the river, and left Saint Mary's about an hour later with a strong flood-tide running, and reached Clark's Bluff, a distance of about 30 miles, at 7 o'clock.

At this point I interviewed Mr. Pierson, who keeps a store at the Bluff, and learned from him that the fish were very plentiful this season, but not so much so as a few years back. He takes an average of 100 shad a day in his gill-net, and in the immediate neighborhood there are a number of gill-nets fished. The hoop-net was in use at this point a few years ago and many shad were taken in this manner. This net is operated by dragging at the side of the boat. Its use has been almost entirely superseded by the introduction of the gill-net. The nets used at this point were of 5-inch mesh, about 14 feet deep, and 65 yards in length.

An admirable location for a haul seine is reported at Brick Landing, about a mile above Clark's Bluff. This reach of the river is a favorite place for the shad, and most of the fishermen of the neighborhood drift their nets in this locality. No doubt, at small cost, a haul might be cleared and large numbers of shad taken. Soon after our arrival a drift was made with the gill-net with which the steamer was supplied, and although it was not properly rigged for this special locality several shad nearly ripe were taken. The males were quite ripe. We overhauled, in addition, the catch of two other boats, and found males predominating; a few ripe females and spent fish were taken. The water of the river showed 65° F. at this date, indicating a good temperature for shad hatching. A large female sturgeon, measuring 7 feet 11 inches, with roe fully developed, was taken in our gill-net.

A few miles up the river is King's Ferry, which is 8 miles from the station of the Jacksonville division of the Savannah, Florida, and Western Railroad. We learned that a tramway runs from the station to this point. No doubt, this would be a good locality to establish a station either with the Lookout or Fish Hawk, unless, perhaps, it was

found advisable to select a railroad crossing, which is some twenty-five miles further up the river. We heard all the evening the shad "splashing" around the steamer. Had we been provided with hatching apparatus, no doubt a large number of eggs could have been procured at this time in the immediate vicinity.

Being satisfied from the interviews had with several of the residents of the neighborhood that good shad-hatching work could be done at this station or further up the river, I determined to proceed with the investigation of the Saint John's River, so got under way at 6.30 a. m., on the 22d, and reached Saint Mary's after one or two stops on the river, at 12 m. Reached the Saint John's sea-buoy at 3.30 p. m. Taking a pilot we crossed the bar at almost extreme low water, the steamer drawing a few inches over 5 feet.

Stopping at Mayport, which is situated on the right bank of the Saint John's River near its mouth, for the purpose of taking in wood, we secured some excellent oysters from the waters near by. Leaving Mayport, we ran up to Jacksonville, reaching that city at 7 p. m. Observed on the way up many gill-nets set for shad. The fishermen generally complain of the scarcity of fish. Saw several nets overhauled without capturing a single shad. The most important fisheries of the Saint John's River lie between Jacksonville and Mayport, and gill-nets are exclusively used. Yellow Bluff, a small settlement below Jacksonville, is the center of the shad fishing on the river. The fish taken at this point are shipped to Jacksonville, and there marketed or reshipped North. As the principal portion of shad taken in this river are captured in salt water, there is no opportunity afforded of securing eggs in large numbers, the spawn being in an immature condition.

On the 23d we visited the market at Jacksonville and had an interview with Mr. Sullivan, the principal fish-dealer of the town, and learned from him that the fish were generally received about 9 o'clock from the points down the river; that none came to the market from up the river. On this day, Friday, March 23, 184 shad were received. On overhauling these we found that at least two-thirds were females, and the eggs apparently about a week or ten days from maturity. The fish were of good size. We were informed by Mr. Sullivan that the fish examined represented the catch of nine nets of 150 fathoms in length. These nets were of 5-inch mesh and 15 feet deep. It was his opinion that shad were getting more and more scarce every year. Up to that date last season he had shipped 35,000 shad; this year only 10,000.

He was of the opinion that by the last of the month the fish would be found ripe; but I would exceedingly doubt our ability to find eggs in a sufficiently advanced stage taken anywhere in the neighborhood of the mouth of the river where the water is very salt. The males were selling at about 80 cents per pair, and the roe shad at \$1. Mr. Sullivan attributes the falling off in the catch to the closing of the mouth of the river by the jetties recently constructed by the Engineer Department,

and also to the great numbers of sharks and porpoises which are frequently seen in the narrow channel of the river. The shad in their migration are met by great numbers of their enemies and are driven away.

We got under way at 11.15, from Jacksonville bound for Palatka, which point we reached at 4.15 in the afternoon. At this point I had an interview with S. J. Reynolds, of Lowell, Mass., who had been for years a mackerel fisher, sailing from the port of Gloucester. I learned from him that he had fished several years in the Saint John's. This year he operated eleven nets, 5-inch mesh, 50 meshes deep, and from 175 to 210 fathoms long. Two of these nets were now operated at Welaka several miles up the river. According to law, fishing commences on the Saint John's on December 1, and closes on April 1. He had not seen a ripe shad this season.

I learned that Mr. J. W. Merian, of New York City, operated seven nets of about 150 fathoms long at Palatka; that W. B. Cross, a native of the State, operated two nets of about 200 fathoms. These were all the nets fished in the neighborhood of this city. I caused the nets, five in all, that were being fished that night on the river, to be overhauled and only 8 shad were taken; they were all females, with eggs immature.

At Palatka we secured the services of James Garret, colored, as pilot for the upper river, and sailed for Lake Monroe on the 24th. At Georgetown I caused five nets to be overhauled and found that they were of 4-inch mesh, too small for shad. One channel bass and several mullet and black bass were taken during our stop at this point. The fishermen thought that shad could be taken in considerable numbers at this point, but there were no nets fished for them this year. Last year they reported that they were captured in some abundance in water no more than 2 feet deep.

Finding 5½ feet on Velusia Bar, we had no difficulty in reaching the upper river. Noticing the black bass jumping in the river just above Lake Barefoot, we stopped for two hours and took some nineteen with the fly. They were fat and in exceedingly fine condition. Proceeding up the river, we reached Sanford at 8 p. m., with wind blowing hard from the southeast. On going ashore I learned that there were only two fishermen operating in Lake Monroe. Mr. Alonzo Gitson fished two nets on the upper bar, one 50 and the other 25 fathoms; and Mr. John West fished the lower bar with two nets of 50 fathoms each. The average catch was from 30 to 40 shad a night, the maximum of the season being 60 shad. They reported that they had taken ripe shad some time previous. Those I caused to be examined were within three or four days of being ripe. The usual market price was 50 cents per pair.

Having learned that there was little prospect of establishing a hatchery station on Lake Monroe, we left Sanford at 6.55 on the morning of the 25th, and dropped down the river to Blue Spring, reaching there at 9.20. Found black bass exceedingly plentiful at this point. With two rods, fishing exclusively with the fly, 40 were taken in a short

time, the largest weighing 5 pounds. Seeing a large number of fish at the point where the water from the Blue Spring enters the Saint John's River, we set the seine around them. The bass, however, jumped over the cork line and none were taken.

Some 600 catfish, measuring from 12 to 25 inches, were taken in the net, and these were fish that could not readily be shaken out, as they had become entangled in the meshes, the men in hauling the net having endeavored to get rid of the same by shaking them out. The fish congregate around the entrance to this spring in immense numbers, possibly attracted by the sulphur of its waters. At many points on the river large numbers of shad might be taken, but the present plenty of gar and catfish in this river, judging from the experience obtained at those points where special examination was made, would render it almost impossible to fish for shad without having the nets destroyed by these fish.

We left Blue Spring on the 26th, and after leaving pilot at Palatka proceeded down the river. Chief Boatswain's Mate Hamlen reports that in the morning before sailing he could see the catfish in immense numbers in the sulphur water just where the spring creek enters the Saint John's. During the day spent at Sulphur Spring, while playing two black bass that I had hooked on the rod at the mouth of Snake Creek, a small alligator, apparently about 4 feet long, took hold of one of the fish close alongside the boat, and before it could be frightened away left the marks of its teeth on the fish. At 8 p. m., it becoming very dark and blowing fresh from the northwest, we anchored for the night off Magnolia.

On the 27th we proceeded down the river, and after a short stop at Jacksonville reached its mouth in the afternoon. Having been informed that large numbers of sheepshead were being taken in the neighborhood of Saint Augustine in the Matanzas River, near Matanzas Inlet, we sailed on the 28th for Saint Augustine, which we reached at 2 p. m.

At Saint Augustine I learned from Mr. Alex. Iwauowski, an intelligent river pilot, that we were a little early to procure ripe sheepshead, and that it was doubtful whether the Lookout could be taken through the Matanzas River. I learned from him that sheepshead were taken a little later in the season in large quantities near the inlet, both north and south of it; that numbers of channel bass and drum could also be taken at this point. The water had been so abnormally cold this season that the fish were late in coming to the inlet. It was his opinion that spawning sheepshead could be readily procured in the Matanzas River a little later in the season.

The Lookout was ordered to return to Washington for service in the waters of the Chesapeake Bay, at which point she arrived on April 19, after having been detained by bad weather on the way.

As imperfect as the investigations of the shad fisheries of the southern coast were, they satisfied me that Saint Mary's River should be selected

as the basis of operations during the next season, and that operations may be carried on in this river on a sufficient scale to warrant its being occupied. No doubt in ordinary seasons ripe shad will be taken on this river early in March, and with a floating hatchery, such as the Fish Hawk or the Lookout, equipped with gill-nets such as are now used in the Saint Mary's River, and one or two haul seines, a large number of young fish can be produced before the season commences in the waters in the immediate vicinity of Washington.

The facilities for transporting the young fish to other rivers of the South are ample, as the station may be located on the river within reach of the crossing of the Jacksonville division of the Savannah, Florida, and Western Railroad, and by the roads intersecting with the Fernandina and Jacksonville Railroad.

An experimental station should be established on the Saint Mary's River during the coming season, and it should be ready for operations by the 1st of March. I would recommend, in addition, if Saint Mary's is selected as the river for our future operations at the South, that large numbers of young shad and herring be transported from the stations near Washington and deposited in the Saint Mary's, in order to more quickly increase the supply of shad in this river, and enable us to secure the adult fish in larger numbers in the future.

WASHINGTON, D. C., *June 15, 1883.*

134.—NOTE ON THE DESTRUCTION OF MACKEREL BY DOGFISH.

By Capt. J. W. COLLINS.

Capt. Joseph Smith, of Gloucester, Mass., tells me that while off Wood Island, Maine, in August, 1880, he observed what he supposed to be at first a moderate-sized school of mackerel at the surface of the water. On closer inspection, however, he found that only a small number were mackerel, probably not exceeding more than half or three-fourths of a barrel, and these were completely surrounded by an immense school of dog-fish. The body of dogfish was formed in such a manner as to inclose the mackerel on all sides and underneath, completely preventing their escape. Captain Smith had an opportunity of observing the mackerel closely, and says that many of them, he noticed, were bitten by the dogfish, some being deprived of their tails, and others having wounds on their sides. He is of the opinion that every one of the mackerel was ultimately eaten by the dogfish. It is probable, he thinks, that at first a much larger body of mackerel was surrounded. The school of dogfish he estimated to contain at least enough for one hundred barrels. Another school of dogfish surrounding a small body of mackerel was seen on the same day.

WASHINGTON, D. C., *July 7, 1884.*