

"The invention, about to be patented, is the construction of a car for the transportation of fresh salt-water fish, by employing a tank, by introducing into this tank fresh air, which is absolutely necessary to the well-being of fish, the air having previously been cooled, and the superfluous air having been shut off from the ice-box, with a view of keeping the air in the tank at a slight tension, so as to prevent any violent motion of the water.

"This car is to serve for the wholesale transportation of salt-water fish from the coast to some central point in the interior."

If this invention fulfills all it promises to do—and it is to be supposed that the capitalists who have made it possible to carry out its theory in practice have thoroughly convinced themselves of its usefulness—Mr. Pachaly deserves the gratitude of all fish-dealers. A beginning has been made, and circumstances will finally compel the disobliging railroad companies to be far more accommodating in the matter of transporting fish than they have hitherto been accustomed or willing to be.

MEMORANDUM OF SOME RESULTS OF THE ARTIFICIAL PROPAGATION AND PLANTING OF FISH, DUE MAINLY TO THE EFFORTS OF THE UNITED STATES FISH COMMISSION.

The following chronological sketch shows some of the work accomplished within the last decade by the United States Fish Commission, either directly by its own efforts or indirectly by its co-operation with State commissions. It is, however, very far from complete, and the object of publishing it is only to place on record some scattering items preliminary to a more elaborate and complete article on the subject. The United States National Museum now has many specimens illustrating successful introduction of important species, and these are recorded in this article. The fishes from which returns have been received are as follows:

1. German whitefish (*Coregonus lavaretus*).
2. Maine salmon (*Salmo salar*).
3. Quinnet salmon (*Oncorhynchus chowicha*).
4. Rainbow trout (*Salmo irideus*).
5. Shad (*Alosa sapidissima*).
6. Carp (*Cyprinus carpio*).
7. Catfish (*Amiurus catus*).

GERMAN WHITEFISH (*Coregonus lavaretus* L. *vide* Günther, which equals *C. marana* Nilsson).

April 28, 1877.—Geo. H. Jerome, superintendent, writes:

"My overseer, Mr. Chase, informs me that but 409 of the 1,700 German whitefish lived to be planted in Michigan waters. The number which survived were very active and healthy, and were placed, on the 14th of April, in Gardner Lake, Otsego County, a small deep lake, where no whitefish had ever been planted, and free from all predaceous fish. The eggs were a little larger than our whitefish eggs. The fish had a larger sac and carried it longer than our whitefish."

2.—MAINE SALMON (*Salmo salar* L.).

1873.

May 9, 1873.—The Germantown Telegraph of this date announces the capture of young salmon in the Delaware River at Easton, Pa.

July 31, 1873.—The Germantown Telegraph of this date announces the fact that young salmon from 2 to 4 inches long are being caught daily in the Delaware in bait nets, and are returned to the river. One party, in one day, caught over fifty.

1874.

May 23, 1874.—Hartford Times, Conn., states that a fine salmon weighing six and a half pounds was caught in a cove, two miles below this city, by Francis Smith. The salmon was bought by a Mr. Cook and divided among three of his customers at 75 cents a pound.

September 18, 1874.—Mr. J. P. Creveling forwarded a salar or Maine salmon 5 inches long (catalogue number, 13068), which was caught in the Susquehanna River at Marietta, Pa.

1877.

November 20, 1877.—Hon. H. J. Reeder, a fish commissioner of the State of Pennsylvania, forwarded an adult female salar salmon which was caught in the Delaware River in November, 1877. (Catalogue number of specimen, 20763.)

1878.

January 14, 1878.—Dr. C. C. Abbot reports the capture, in the Delaware River at Trenton, of a salmon 16 inches long.

April 25, 1878.—E. J. Anderson reports the capture at Salem, N. J., on the Delaware, fifty miles from Philadelphia, of two fresh run salmon weighing 22 and 18 pounds.

May 2, 1878.—Benjamin & West, New York, received a salmon from Saybrook, Conn., weighing 11 pounds.

May 10, 1878.—S. B. Miller, Fulton Market, New York, reports the capture of a salmon in a pound in the sound, near the east end of Long Island, and of six or eight more taken in the Connecticut, two of them eight miles from the mouth of the river.

June —, 1878.—Captain Potter caught between Narragansett Ferry and Hickford a salmon weighing 11 pounds.

July 3, 1878.—Chas. G. Atkins writes:

“We have found two more tags of our salmon, and obtained the record of the fish from which they were taken: No. 768, handled at our pond November 1, 1875, weighing 20 pounds 7 ounces, yielded us 5 pounds 7 ounces of eggs, dismissed weighing 15 pounds; caught at Lincolnville, June 14, 1877, weighing 26 pounds. No. 1010, handled at our pond November 9, 1875, weighing 18 pounds 2 ounces, yielded 4 pounds 10 ounces of eggs, and was dismissed weighing 13½ pounds. Caught again June 13, 1877, at Lincolnville, weighing 30½ pounds.”

1881.

September 10, 1881.—Hon. S. G. Worth sent to the United States National Museum two young salar salmon, of the Sebago type, measuring $7\frac{1}{2}$ inches. These were collected at Henry's, North Carolina, on the above date. (Catalogue number of specimens, 29088.)

November 24, 1881.—The same commissioner expressed a specimen of of the land-locked form of salar salmon, measuring $7\frac{1}{2}$ inches in length; this was caught on a hook in Mill Creek, two miles above Henry Station, in McDowell County, North Carolina. The letter of transmittal contains the following information: "3,000 fry were planted in Mill Creek, in the spring of 1880, and 5,000 in the spring of 1881. * * * It may be well to mention the planting of 1,000 California trout in Mill Creek, March, 1880, with the land-locked salmon. These fish must be the original plant of 1880, there being dams below and these the only ones planted above." (Catalogue number of salmon, 29112.)

3. QUINNAT OR CALIFORNIA SALMON (*Oncorhynchus chowicha* [Walb.] Jordan & Gilbert).

1877.

December 14, 1877.—J. B. Thompson forwarded from his hatching ponds at New Hope, Bucks County, Pennsylvania, three quinnat or California salmon, measuring 13 to 14 inches, which had been reared in confinement from eggs hatched in 1874. (Catalogue numbers, 20894, 20895, and 20896.) He also sent two measuring $5\frac{1}{2}$ to 6 inches, which were similarly raised from eggs of 1876. (Catalogue numbers, 20897 and 20898.)

1878.

July 15, 1878.—John S. Robson, New Castle, Ontario, caught a specimen of quinnat salmon weighing 14 pounds, in Lake Ontario.

1879.

June, 1879.—Mr. A. Booth, of Chicago, Ill., sent a quinnat salmon, over 20 inches long, which was caught in Lake Michigan. (Catalogue number, 23203.)

November 3, 1879.—Mr. R. J. Sawyer presented to the National Museum a quinnat salmon, 10 inches long, which was caught at Green Bay, Michigan. (Catalogue number, 23373.)

4. RAINBOW TROUT (*Salmo irideus* Gibbons).

1879.

September 23, 1879.—Mr. Livingston Stone, in a letter from the United States fishery, Shasta, Cal., reporting results of experiments with the California trout (*Salmo irideus*), concludes: "In pure and swift running water the *Salmo irideus* will, in my opinion, easily survive a temperature

of 75° to 80°. My experiments were tried in a tub of water, where, of course, the conditions were unfavorable to the fish."

1881.

May 16, 1881.—A rainbow trout, 14 inches long (catalogue number 27844), bred to this size from the eggs at Northville, Mich., by Mr. Frank N. Clark, was received from the United States carp ponds, Washington, D. C., where Mr. Clark had sent it.

November 24, 1881.—Hon. S. G. Worth, commissioner of agriculture of the State of North Carolina, forwarded, in alcohol, a specimen of rainbow trout, 8 inches in length, which was caught on a hook in the month of August in Mill Creek, a tributary of Catawba River. (Catalogue number, 29113.) The commissioner wrote as follows concerning the fish: "It may be well to mention the planting of 1,000 California trout in Mill Creek, March, 1880, with the land-locked salmon. These fish must be the original plant of 1880, there being dams below and these the only ones planted above."

5. SHAD [*Alosa sapidissima* (Wilson) Storer].

1871.

———, 1871.—The New Bedford Evening Standard, of this date, announces a large increase in the catch of shad in the Connecticut and Hudson Rivers, which is undoubtedly owing to the work of artificial propagation. It further adds:

"Seth Green, in a letter to R. G. Pike, fish commissioner of Connecticut, in answer to his inquiry as to whether there had been an increase in the number of shad caught in the Hudson River, says:

"There has been an increase in the catch in the Hudson River * *

* I am not surprised at the increase; it is what I predicted. There is no increase in any river that shad frequent except the Connecticut and Hudson.

"I have just come from the South and find their catch is light everywhere."

1872.

———. —In the report of the Connecticut fish commissioners for 1872, we find that schools of shad in immense numbers were seen in the spring in Long Island Sound, making their way up to the Connecticut River, and on the 23d of May over twenty-eight hundred were taken from a pound near Saybrooke; at another, thirty-five hundred and sixty were taken, and elsewhere they were caught in numbers varying with the locality.

The largest haul previously on record was in 1811, when twenty-two hundred and eighty were taken, though there was a haul said to have been made in 1862 at Haddam Pier of twenty-three hundred.

The abundance of shad in the river in 1871 was still greater than in

the previous year, so much so that in the time of greatest plenty they could hardly be disposed of at three dollars and a half per hundred.

At the present period the increase has been such that numerous fishing stations for a long time abandoned have resumed operations with very satisfactory results. A great increase in the numbers of the shad has also manifested itself in the Hudson and Merrimac Rivers, and with a reasonable continuance of effort there is every reason to expect that the pristine abundance of the fish will be restored, and possibly increased, if young shad are hatched out in sufficient numbers.

———, 1872.—The Germantown Telegraph says:

"In the year 1867 there were two million young shad hatched in the Connecticut River, and in 1869 four millions. The official report of the Connecticut and Massachusetts commission for 1871 stated that there were 60 per cent. more shad in the river that year than in 1802 and 1870, and 200 per cent. more than in 1862 alone. There had been a gradual decrease until 1870."

1873.

May 9, 1873.—A letter received by Seth Green from Frank B. Leach, editor of Vallejo Chronicle, California, says:

"The first shad ever caught in California waters was taken Monday, by Baltimore Harry, and is now on exhibition at stall 79 and 80, California Market, San Francisco. The Piscicultural Society had offered a standing reward of \$50 for the first of these fish caught in the waters of this coast. There is no doubt about this fish being a shad. It was caught in the net of Alex Boyd & Co., at the junction of the Casquinez and Vallejo Straits, opposite the navy-yard magazine. The stranger was about 16 or 17 inches in length.

"On April 30 announcement was made that a shad measuring 13 inches in length was caught in the nets of the same firm, and brought to the Chronicle Office. The Chronicle states that A. Boyd and Company have been catching the same kind of fish for some weeks past. Being unacquainted with the species of fish, they attached no importance to it, and have been eating them as fast as caught. Mr. Boyd says he noticed they were very good eating. They have caught some thirteen of them."—(From Rochester Union and Daily Advertiser.)

May 20, 1873.—Mr. Livingston Stone writes that a true shad was caught at San Francisco, in the mouth of the Sacramento River, on the 28th of April preceding.

May 24, 1873.—An item in the Rochester Union and Advertiser of this date states that "a Mr. Parkhurst, of Stapleton, N. Y., near the mouth of the Genesee River, caught a shad in his seine. The same item says, that last year persons caught a number of young shad in scoop-nets, and the event was duly noticed."

September 10, 1873.—The Rochester Union and Daily Advertiser of this date announces that a shad 15½ inches long, well developed, was

taken from the Alleghany River at Tidioute, Pa., sixty miles below Sulana, where shad were put in by Wm. Clift, in 1872, under direction of the United States Fish Commission.

1874.

April 8, 1874.—The Germantown Telegraph of this date, quoting from the New York Sun, says:

“During the shad season on the Hudson, lasting from the 1st of April till the middle of May, one million fish (shad) are usually taken, worth about \$300,000.

“Fishing is begun along Sandy Hook; and from there to Stapleton, Staten Island, drift-nets are used.

“From Stapleton to the Highlands stake-nets are employed. Poles are set at regular intervals across the river, leaving room for vessels to pass. To these poles gill-nets are fastened, and the fishes passing up the river are caught. Above the Highlands drift-nets are used. Very few shad are caught above Hudson and Kinderhook, although a few run to Troy. The nets have 5½-inch meshes. Higher up the river smaller meshes are used. The nets are lifted every high water, and thus the fish are caught going up the river with the tides.

“Three years ago in the Hudson the fish were so run down that many fishermen gave up fishing. The fishing has greatly improved since the expenditures in artificial breeding.”

May 16, 1874.—The Saint Paul Pioneer, of Minn., of this date, says:

Captain Johns has in his possession the first shad supposed to be of those placed in the Mississippi two or three years ago. It weighs 5 pounds 9 ounces, and is 18 inches long. Mr. Williams states that thousands of these fish are dancing around in the waters of the lake” (probably *Pomolobus mediocris* according to Milner).

May 18, 1874.—Providence Press, R. I., says: “The shad catch is the best this season that it has been for fifteen years. The results of shad culture are beginning to be seen.”

May 25, 1873 or 1874.—Mr. Benjamin Shurtleff, Shasta, Cal., writes, May 20, to Hon. B. B. Redding, State fish commissioner, that on the 14th instant Judge Hopping, Wm. Jackson, and Jos. Brown caught a fish in a net in the Sacramento River, at Jackson's Ferry, that was doubtless a shad. The fish was 12 inches in length, and weighed about a pound. These gentlemen seemed to have more interest in trying the flavor of their first shad from the Sacramento than of making the identity of the fish certain or of obtaining the \$50 reward which was offered by the State for the first shad taken. Judge Hopping is a native of Keyport, N. J., and familiar with the shad of the Raritan Bay and River; while Jos. Brown is a native of Fall River, Mass., and claims to know the shad thoroughly.—(Sacramento Daily Record.)

May 26, 1874.—The Hartford Post, Conn., says:

“The fact is, however, that shad are now more abundant and the

catch is larger than it has been for some time past. The fishermen think the reason is all attributable to the method of propagation now in vogue."

—, 1874.—The Appleton Post, Wis., announces that shad 3 or 4 inches long have been seen in Fox River, near Appleton, in large quantities.

December 12, 1874.—Oswego Times, N. Y., of this date states that on the day previous a gentleman fishing with a fly from the pier of that harbor captured a shad measuring 9 inches and weighing one-quarter of a pound.

December 18, 1874.—The Albany Advertiser of this date says: The efforts to stock interior lakes and rivers with shad have proved remarkably successful. Large numbers have been taken at Port Dalhousie, and one was recently caught at Cape Vincent weighing $4\frac{3}{4}$ pounds.

The fact that shad can be successfully introduced into Lake Ontario has been fully established.

1875.

April 3, 1875.—Albany Argus, N. Y., announces larger hauls (of shad) in the Hudson than in any year for a long time, the total catch being 1,000,000. This led to a sharp decline in the price of shad all along the river.

Unknown, 1875.—The productiveness of the different shores on the Delaware this season is a matter of daily comment.

At the Gloucester shore, on Monday, upwards of 2,200 shad were taken at one tide. A few days ago the fishery at Carpenter's Point, in Salem County, caught 2,500 shad in one haul.

Gill-nets have multiplied threefold the present season, and all have been successful. The shad run larger and have been better flavored than for many years past.

1877.

May, 1877.—Pack Thomas, esq., sent from Louisville, Ky., an adult shad, the first return from the introduction into the Ohio River. (Museum catalogue number, 19612.)

December 1, 1877.—Received a shad from Sacramento River, caught two years ago. It is apparently a spent adult male. (Museum catalogue number, 20845; sent by William S. Bassett, Sacramento.)

March 20, 1878.—T. B. Doron, Montgomery, Ala., sends a four-pound shad, caught at Wetumpka, on Coosa River.

April 18, 1878.—Dr. R. J. Hampton, Rome, Ga., reports that shad planted by the United States Fish Commission some years ago are now caught in large numbers.

(July 11, 1876.—90,000 placed in Alabama River, at Montgomery.)

May —, 1878.—Mr. Griffiths forwarded to National Museum two adult female shad (catalogue numbers, 21345 and 21346) from the Ohio River, at Louisville, Ky.

May 3, 1878.—George Spangler, Madison, Ind., announces the capture of about a dozen shad this season; sold for a high price. Two were caught last year 20 miles below Madison.

May 21, 1878.—George F. Akers, Nashville, Tenn., says: "During present month quite a number of shad were taken near Nashville and sold in market."

May, 1874.—Col. Marshall McDonald, fish commissioner of Virginia (report of 1878), speaks of marked increase of shad in the Rappahannock River, and says it is the general belief of the people that this is due to the planting of young fish by the United States Fish Commission in 1875.

April 15, 1879.—Rev. T. M. Thorpe sent to the National Museum an adult female shad, which was caught near Hot Springs, Ark., in the Washita River.

6. CARP (*Cyprinus carpio*, Linn.).

1880.

December 10, 1880.—Mr. J. B. Rogers, of Duval, Travis County, Texas, sent to the United States National Museum, through one of the messengers of the United States Fish Commission, Mr. J. F. Ellis, a fresh carp reared from a lot introduced by the Commission eleven months previous to the above date. In this short time, under the favorable conditions found in its new home, this carp (from about 4 inches) reached the astonishing length of 20½ inches, and weighed 4 pounds and 11 ounces. The fish was brought by Mr. Ellis in a fresh state; a cast of it (No. 963) is preserved, and the specimen may now be seen in the Museum. (Catalogue number, 26629.)

7. CAT-FISH (*Amiurus catus* [L.] Gill).

———, 1877.—Received a cat-fish from Sacramento River, caught two years ago. (Museum catalogue number, 20846, entered December 1, 1877.) It came with a shad from Sacramento River.

EXPERIMENTS IN THE TRANSPORTATION OF THE GERMAN CARP IN A LIMITED SUPPLY OF WATER.

By MARSHALL McDONALD.

The extreme hardihood of the German carp, and the great tenacity of life exhibited under adverse circumstances, led to the institution of experiments to determine whether we could not with safety greatly decrease the amount of water employed in their transportation and thus reduce the cost of their distribution.

A common covered tin bucket, capacity 6 quarts, was procured, and several holes made in the cover to allow free access of air. The bucket