

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

was then filled nearly half full of water and in it were placed 22 carp, from 2 to 3 inches long. This was at 4 p. m. on the 15th of November; they remained in this water until 9 a. m., 16th. The water was then poured entirely off, and the bucket filled about half full of fresh water. The fish remained without further change of water or attention until 4 p. m., when an entire change was made, and the bucket of fish shipped by express to Eugene Blackford, Fulton Market. A card of instructions attached was as follows:

"Professor Baird wishes to ascertain if these carp will go to New York and return to Washington without change of water, or other attention than to keep as cool as practicable. Will Mr. Blackford examine the fish immediately upon arrival and verify their condition, and return them by first express to Washington, D. C. Don't make any change of water before reshipping, unless the condition of the fish seems to be bad."

The fish arrived safely in New York at 9 a. m. on the 17th. Mr. Blackford telegraphed:

"Fish arrived in good order. Kettle one-quarter full of water; will return by evening train."

At the same time he wrote:

"Kettle of carp arrived at 9 a. m. Fish all alive and looking well. Kettle only one-quarter full of water; either leaked out or slopped over from careless handling. I have sent them back on the Express that leaves to-night. I have not added, or changed the water; in fact, done nothing but attach a tag to the kettle and send it back. I have no doubt they will reach you all right in the morning."

The fish returned to the Smithsonian, at 11 a. m. on the 18th, all looking strong and well, and but little more than a pint of water in the bucket. In this they remained, without change, until 9 a. m. the 20th, when they were all alive but apparently weak. A change to fresh water immediately revived them, and they were soon as strong and vigorous as ever.

These fish had now been in less than 4 pounds of water for 89 hours, and had gone to New York and returned to Washington, subject to the rough handling which express packages usually encounter, no precautions having been taken to secure unusual care or attention in transmission.

The result of the experiment was so encouraging that it was determined to try a shipment of 750 fish in buckets. The details of this experiment were intrusted to W. F. Page, a messenger of intelligence, judgment, and long experience. The result of the experiment he thus reports:

"The carp were put up in twelve 6-quart pails, 50 carp to each pail, and the pails packed in a crate measuring 20"  $\times$  30"  $\times$  18". I also had an extra 4-quart pail, which I will here state received the same attention (that is, no attention) as the 6-quart pails and gave the same re-

sult. The fish were put up about 4 p. m. on the 25th instant, but at 4 a. m. the 26th, the night having been unusually cold, many fish were either dead or torpid from freezing; these were emptied out and replaced with fresh fish before starting for the 6.30 a. m. train. In the dark and hurry, as I afterwards discovered, quite a number of fish larger than are usually sent out in cylinder cans had been given me. Reached Richmond at 11.30 a. m., and laid over until 11.25 p. m. Had the fish carted up to the Saint James Hotel, for the double purpose of placing the experiment under all the conditions likely to arise on an ordinary trip, and that they might be seen.

"Leaving Richmond at 11.25 on the 26th, reached Danville at 7.30 a. m. on 27th. At Danville had the last bucket weighed at Coon's drug store. This bucket was an especial experiment, made at the instance of Professor Baird. It had from the start just as little water as would cover the fish; in fact, several had their backs above water. The weight of bucket, water, and fish was 4 pounds 7 ounces (65 ounces); of the bucket and water, 2 pounds 13 ounces (45 ounces), leaving the weight of fish 20 ounces. The weight of water by measure was 20 ounces, from which I conclude that one pint of water will carry one pound of fish (carp) without attention for at least 30 hours. Whether this relation will hold true with larger fish remains to be determined.

"In conclusion I would state that the water was so low in the buckets as to occasion no slop in the car. In fact, on the route from Richmond to Danville, the crate was at the top of a high pile of baggage, and the baggage was dry and in good order the following morning."

It seems hardly credible that a number of carp could live for any length of time in hardly more than their own weight of water. Experiment has, however, demonstrated the fact, and the explanation is probably this:

What the fish require is not water but air, water being the necessary medium through which they appropriate air. The air in a small quantity of water would be very quickly exhausted, and if there was no adequate provision for renewal of supply the fish would quickly die.

In the case of the fish in the small pails the free air surface of the water is very large in proportion to volume. It is kept in continual agitation by the jostling of the cars, or when at rest, by the movements of the fish. Consequently, although the oxygen in the water is rapidly and continuously exhausted, it is, also, rapidly and continuously renewed, and the fish remain in good healthy condition. It follows from these experiments that 25 or 50 carp in a half gallon of water in a shallow pail are really under better conditions for healthy existence than the same number of fish in the ordinary 8-gallon shipping can. The limits of distance and temperature within which this method of shipment may be resorted to can only be settled by further experiments.

WASHINGTON, *November 29, 1881.*

Since the conclusion of the experiments detailed above, the feasibility of shipping carp in crates and pails has been pretty thoroughly tested in the operations of the United States Fish Commission, with the following results: Single shipments in pails have been made from Washington into New York and Pennsylvania, and to Ohio, North Carolina, and Tennessee. Some losses have been reported, but comparatively few, the usual report being that the fish are received in good condition. In the case of a shipment to Reedville, N. C., the fish were eight days *en route* and were received in good condition.

Crates containing 16 buckets and 320 fish have been sent by express from Washington to Chattanooga and Grand Junction, Tenn., and Jackson and Meridian, Miss., and distributed from these points by Express to parties within a radius of 100 or 150 miles, without more than the casualties incident to transportation by the methods heretofore pursued. In conclusion, we may safely say that where the point of destination is not distant from the point of departure more than 24 hours, 25 or 30 carp may be safely shipped in an ordinary covered 4-quart tin pail.

Where the temperature is kept below 60° Fah., and freezing is avoided, it is probable that the fish may be 6 or 7 days *en route* without loss or injury. Some modification of the pail to prevent loss of water by slopping over is desirable, and it is to be presumed that the ingenuity of our fish-culturists will quickly supply the want.

WASHINGTON, December 25, 1881.

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#### INTRODUCTION OF THE ALAND OR ORFE INTO ENGLAND.

[From The Field, March 28, 1875, 299.]

One of the few fresh-water fishes which have a wide range over the continent of Europe, but are not found in the British Islands, is the "aland" or "nerfling" of the Germans, the "id" of the Swedes, named *Leuciscus idus* or *melanotus* by ichthyologists. It may be shortly characterized as a chub with smaller scales; for whilst the chub has, at the most, forty-six scales along the lateral line, the aland has never less than fifty-six, and sometimes as many as sixty; in its habits also it much resembles the chub, but prefers large to small streams, and inhabits lakes as well as rivers. Its usual size is about twelve inches, but it is known to have attained to a length of eighteen and twenty inches, and a weight of six pounds.

Normally this fish has the same coloration as the chub, being somewhat darker on the back; and, consequently, the two species have been constantly confounded with each other, and described under the same names, even to within a very recent period. However, for more than two centuries a singular variety, with bright colors like those of a gold-fish, has been cultivated in lakes and ponds of Bavaria, especially near