

immediate consequence of this will be that those animals which live on fresh or decayed vegetable matter will disappear. In consequence of this the young fry, if any is raised, is insufficiently fed, and comparatively few fish reach sexual maturity. In this way the fish of our brooks and rivers are constantly decreasing, and, as we have seen, from natural causes, which can be misjudged only by persons who have never studied the needs of fish.

The degree to which the abundance of fish in large water areas is dependent on very small (partly microscopical) animals, which entirely escape the attention of the casual observer, may be observed in the large diluvial lakes in the north of Germany. Last summer I investigated the waters of Holstein, Mecklenburg, and Pomerania, and am able to state, as the general result of my investigations, that those lakes which, among the rural population, had the reputation of being particularly rich in fish were also particularly rich in crustaceans, worms, and infusoria. With a fine gauze net one can in a few minutes catch myriads of small crustaceans and rotifers, so as to cover the bottom of the net to the depth of over an inch with a thick mass consisting entirely of diminutive animals. A person who has not seen the great mass of these little animals brought up at a single haul has no idea of the enormous quantity of living beings contained in a lake with an area of several square miles. An inexhaustible wealth of life moves in the clear waters of such a basin; and in exact proportion to the quantity of small crustaceans and infusoria will be the product of fish.

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### 132.—CALIFORNIA TROUT FOR THE OZARK MOUNTAIN REGION.

By MARSHALL McDONALD.

This species (*Salmo irideus*), which inhabits a restricted geographical range on the west coast, has been largely introduced into the streams of the Eastern and Middle States through the agency of the U. S. Fish Commission. In the spring of 1880, 10,000 eggs of this species were allotted to the Missouri Fish Commission. These were hatched out at the State hatchery and the fry planted in the headwaters of the Gasconade, Osage, and other streams of Southwest Missouri, having their sources in the clear, cold, large flowing springs that abound in the Ozark Hills. Three thousand were planted in the headwaters of Spring River, a tributary of the Arkansas.

A careful inspection of the stream, made in the summer of 1885 by the commissioner of Missouri and others who were familiar with the appearance of the rainbow trout, showed the presence of at least three generations resulting from the original plant. The largest in size weighed between 4 and 5 pounds; those of the second size measured from 15 to 17 inches in length; while the sources of the stream swarmed with thousands of the young from 4 to 5 inches in length.

Accepting the indications of success thus afforded, the United States Commissioner of Fisheries determined to introduce the rainbow trout into the headwaters of all the streams of Missouri, Arkansas, and the Indian Territory, which have their sources in the Ozark Mountains. The area to be colonized is more extensive than the famed Adirondack region of New York. The streams are clear and cold, the temperature of the waters not rising above 58° in the heat of summer. They have every characteristic of good trout streams, and experiment has shown their eminent adaptation to this purpose. It is a wonder that nature has neglected so inviting a field, yet we are informed by the State commissioners of Missouri that no native species of trout is found in any of the streams that rise in the Ozark range. The explanation will probably be found when the history of the development of the surface features of the interior of the continent are known. Be this as it may, it has devolved upon the Commission to utilize nature's neglected opportunities. In August, 1886, fish 4 to 6 inches long were planted:

In tributary of—	Place.	No.
Maramec River.....	Saint James, Phelps County, Missouri.....	925
Gasconade River.....	Newburg, Mo.....	950
Oaage River.....	Lebanon, Laclede County, Missouri.....	950
Neosho River.....	Verona, Lawrence County, Missouri.....	925
White River.....	Mammoth Spring, Arkansas.....	1,110
Total.....	.....	4,860

Referring to this subject, Dr. I. G. W. Steedman wrote from Saint Louis, Mo., April 6, 1886, concerning specimens of *Salmo irideus* from Verona, Lawrence County, Missouri:

"The eggs from which these trout were hatched came from Baird, Cal., through the U. S. Fish Commission. These eggs were hatched by the Missouri Fish Commission at our Saint Joseph Hatchery, and distributed by our agent to Mr. Montgomery, the owner of the spring at Verona, Mo. There are no trout of any species in the waters of Missouri, naturally, so there can be no question of the authenticity of these trout. This great spring at Verona is a tributary of the Neosho River (a branch of the Arkansas), yet geographically it matters very little, as the White and Arkansas are parallel, and running through the same scope of country, except that the Arkansas has its sources in the Rocky Mountains, and this branch at Verona in the Ozarks of Missouri. I fished with fly in the McCloud River at Baird in 1875. I caught four different varieties of *Salmo*, namely, *irideus*, *spectabilis* ('Dolly Varden,' so called), *quinnat* (California salmon), and a small speckled trout which I cannot name. It was the most numerous and common trout of the McCloud and Sacramento Rivers, and rarely exceeded one pound in weight. In collecting eggs at this station several varieties may have been inadvertently shipped to the East, viz, *irideus*, *spectabilis* ('Dolly Varden'), *Salmo quinnat* (California salmon), or the small speckled trout which I have referred to above."