arcs or rods which are not disposed radially, but concentrically to the base of the fin. These folds appear so far back on the embryo that their genetic relation to the gill arches appears improbable. The fin is displaced forwards with the growth of the young fish, and its base rotates through an angle of ninety degrees in acquiring the upright position.

PHILADELPHIA, *April* 20, 1881.

REARING OF CALIFORNIA MOUNTAIN TROUT (SALMO IRIDEUS).

By SETH GREEN.

(Extract from a letter to Prof. S. F. Baird, May 3, 1881.)

I have 220 six-year old California mountain trout, some of them weighing 3 pounds, and 10,000 three-year old that we are taking the spawn from now. One day last week we took 88,000 spawn. We shall have next year 30,000 more three years old. We have orders for all we shall take this year. But next year we shall have many millions. They are a hardy game fish. They spawn in the spring, and hatch in streams a much larger percentage than our trout. They will live in any streams that our trout will, and in many warmer streams that our trout will not live in. This is the fourth season that we have taken the spawn, and every year a good many have hatched in our spawning-races. We never saw one of our trout or salmon-trout hatched in the races. Seven years ago I got 300 of their eggs; we hatched and raised 275; when they were three years old we took 64,000 eggs and raised 10,000 for breeders. The next year we had 260 of the old stock, and took 90,000, and raised 30,000 for breeders and distributed the rest. Last year we had 220 of the old stock; we took 80,000 eggs and are raising 12,000.

SALMON CAUGHT IN GENESEE RIVER, NEW YORK.

By SETH GREEN.

NEW YORK STATE FISHERY COMMISSION,
OFFICE OF THE SUPERINTENDENT,
Rochester, N. Y., May 3, 1881.

* * *: Last week five salmon were caught in the Genesee River, weighing from 3 to 10 pounds. They were caught in small scoop-nets. The falls are seven miles from Lake Ontario. They are 87 feet in perpendicular height. Eighty rods above is another fall of 90 feet. Then the river, 90 miles to its head in the Allegheny Mountains, is a clear stream for 40 miles. Then it comes on large flats with clay banks, and becomes very roily during floods. The young salmon were put in the tributaries above the falls. They have gone over the falls and

come back to them again thinking they could get back to the streams to spawn where they spent their childhood days, but the leaps are too much for them. There never were any salmon caught in the Genesee before last year. I have fished the river for fifty years. I do not know whether they were California or Kennebec salmon; I did not see them. The fishermen think we do not want them caught, and have kept shy of me. I have spent some days on the river since to let them know that we did want them caught in the spring of the year, and to let me know if they catch any more.

NOTES ON THE DEVELOPMENT, SPINNING HABITS, AND STRUCTURE OF THE FOUR-SPINED STICKLEBACK, APELTES QUADRACUS.

BY JOHN A. RYDER.

Nests and ova of this species were recently brought to me for investigation by Mr. W. P. Seal, who obtained them in the ditches along the Delaware, below Philadelphia. More recently (April 27), the same gentleman had the kindness to bring me a pair of adults about to spawn, the male very industriously completing the nest under my observation in an aquarium extemporized for the purpose.

The early stages of development I did not witness, as the first lot of eggs had the blastoderm already formed, and inclosing the vitellus, and those laid by the pair in confinement were unluckily not impregnated. The egg-membrane is a true zona radiata, being perforated by numerous pore canals, and is covered by an adhesive material, which agglutinates the eggs together into a mass to the number of 15 to 20, the number laid at one time. The ova sink to the bottom, and must be taken charge of by the male, as the female after having ridden herself of them takes no farther interest in their welfare. They measure one-twelfth of an inch in diameter, and are of an amber color. I was not able to discover a micropyle, but believe that one exists, nevertheless; at one pole of the egg a large number of button-shaped appendages are attached to the surface of the egg-membrane by means of pedicels, and it is in the midst of these that the micropyle is found in the European species, *Gasterosteus leiurus*, according to Ransom.

Not having witnessed the early stages of development, I will only describe the structure of the ovum. There is no germinal disk developed when the egg first leaves the ovary, and the germinal layer is uniformly distributed as a thin uniform granular envelope, inclosing the clearer vitelline protoplasm, which itself incloses a number of very refringent oil spheres of very variable size. Later, it appears that a germinal disk is developed without the influence of impregnation.

The formation of the segmentation cavity I have not witnessed, but I have a belief that it is present, inasmuch as there is a space developed