

To do this will probably cause the rapid death of organisms of so delicate a nature as young fish.

There is an aerating apparatus consisting of a simple syringe furnished with a perforated mouth-piece. To renew the air, one breathes by means of the syringe into the water of the apparatus, and then places the mouth-piece at a short distance from the surface of the water, and makes the piston go down, not losing sight of the circumstance that little fish of a very delicate nature are concerned. The air should, therefore, not be blown into the water too violently.

Renewing the water.—When the distance to be traveled is very great, it will be well, whenever a favorable opportunity offers, to renew the water in the apparatus. To do this, one should have clear and drinkable water. In no case should muddy water, containing impurities, be employed. To renew the water in the apparatus, one inclines the tube C, so as to make the water flow off slowly; then he adds slowly, through the ice-box, new water, so as gradually to change the temperature of the element in which the young fish are kept. Too sudden a change of temperature would endanger the life of the young fish.

81.—NOTES ON HATCHING AND PLANTING YOUNG FISH IN ITALIAN WATERS.*

By Prof. PIETRO PAVESI.

In an address on fish-culture, delivered February 27, 1885, I stated that lavarets (*Coregonus wartmanni*) from the Lake of Constance had been placed in Italian waters at Lario at two different times (on February 27 and March 5), when the young fish had almost lost their umbilical sacs, and measured about 11 millimeters [nearly one-half inch] in length. Doubts were expressed as to the success of this experiment, but the eggs hatched. After the young fish appeared, however, the usual mold was observed. There are two suppositions to account for this mold: one, that it is caused by the quality of the water used in the hatching apparatus, in which case filters of the Waplitz model will have to be employed; the other, that some of the shells of the eggs broke in transportation and thus favored the development of mold.

I have now to report that my experiments resulted successfully. During October, November, and December, 1885, a number of little fish were caught near Bellano, which were about 4½ inches long, and in shape and color bore a strong resemblance to the fry I had planted. The fishermen cooked and ate some and found their flavor excellent, while some specimens that were sent to me here leave no doubt as to their being the same fish (*Coregoni*) planted by me. By planting more

* These notes are taken from an open letter to Prof. B. Benecke, of Königsberg, Germany, which is extracted from the report of the Italian Society of Natural Science, Milan, 1886. Translated from the Italian by HERMAN JACOBSON.

of these fish we shall eventually make Lake Como the Lake of Constance of Italy.

As regards the cultivation of Rhine salmon (*Salmo salar*), 100,000 eggs received from Mr. Carl Schuster, of Freiburg, Germany, were placed in hatching boxes of the Green system on January 14, and after they had been hatched the young fish were set at liberty on February 9 in the river Ticino. The day we placed the eggs in the boxes the water of the river was somewhat turbid, but soon became fresh and limpid again, having a temperature of 6° C. [about 43° F.], thus presenting the necessary conditions for the young fish, although the yelk sacs were not yet entirely absorbed. There was an alarming mortality, due to the sediment which formed at the bottom of the boxes, although this bottom was composed of a metallic net-work, and was separated from the bottom of the river by a considerable amount of flowing water, the Ticino having a rapid current. It must be said, however, that the boxes of the Green system, which hitherto had been used only for the cultivation of the shad (*Alosa præstabilis*) in America, and which I desire to see employed on a large scale in our lakes, have proved themselves well adapted even to eggs which, like those of the salmon, take a longer time to hatch. Another hatching experiment was made with eggs of the grayling (*Thymallus vulgaris*), which were placed in the upper Oglio. Eighty thousand eggs were received from Mr. Schuster (50,000 of them being in very poor condition), from which number we succeeded in hatching about 15,000 beautiful and healthy young fish, which, on May 27, 1885, were placed in the river not far from Darfo.

It was not thought advisable to hatch the 100,000 embryonated eggs of the *Salmo fario* and of the *Salmo salvelinus*, but those eggs which were very near being hatched were placed directly in lakes and rivers. Many fish-culturists, like Haack, Schuster, and Benecke, are opposed to this method; but when there are difficulties in the way of hatching, as was the case here, it seemed the best way of restocking the waters. The chief objection seems to be that natural causes will destroy the eggs, more especially that they will become a prey to their voracious enemies, such as the *Lota vulgaris*, the *Leuciscus cephalus*, and the *Chondrostoma soëtta*. But these fish do not approach the shores of the lakes in winter, when the eggs of trout and similar fish are placed in the water. In placing embryonated eggs in the water, everything will depend on the selection of a suitable place, and on having careful regard to the physical and biological conditions of the water. Care should also be taken not to crowd the eggs into too limited a space, but to scatter them somewhat. Even if only ten out of every thousand reach the state of maturity, there will be that many reproducers of fish in the public waters.

Hardly had the 100,000 trout eggs been received from the establishment of Torbole, on January 8, 1885, when one-half was planted at the mouths of the rivers Plesna and Rivalaccio, near Pella; while the other

half was planted near the falls of the Qualba, a very suitable locality, owing to the sandy bottom and the nearness of a rich aquatic vegetation. All the eggs planted in the two locations referred to were exceptionally fine and healthy. Quite a number of young fish have been observed here, which goes to show, first, that the eggs from the Torbole establishment had been hatched, although some people maintained that this would not be the case, as they had not been fecundated according to the Russian system; and in the second place, that large fish had not come near the shores and devoured them.

Another 100,000 embryonated trout eggs, received from Torbole in an excellent state of preservation, and destined for the Venetian waters, were sent to Count Ninni, who selected the locations where they were to be planted, namely, one-half in Lake Lapisino and the other half in the waters near Trevigiano. These were planted on January 6 and 8 at different spots, where there was a suitable bottom and pure water. Some specimens of the eggs were taken to Venice and there hatched in a small apparatus on January 16, with such success that 130 healthy young fish were placed in open waters, thus proving the excellent quality of the eggs.

Fifty thousand eggs of the *Salmo salvelinus* were received from Freiburg, Germany, and on January 18 were planted in Lake Idro, at a depth of about 10 feet, on a sandy and rocky bottom. Some specimens of these eggs were sent to Pavia, and were very successfully hatched between January 30 and February 1.

Finally, 800,000 young eels, taken near the mouth of the river Arno, were planted in Lake Trasimeno, where they could find ample food in the innumerable *Leuciscus aula*. In former years this lake was very rich in eels, and it is to be hoped that it will regain its ancient fame in this respect, as some of the young eels which were planted have already been caught in an advanced state of development.

PAVIA, ITALY, December 15, 1885.

82.—THE SEA FISHERIES OF NORWAY.*

By Dr. FRIEDRICH HEINCKE.

In no country do the sea fisheries play such an important part in public affairs as in Norway, nowhere is such a general interest taken in them, and in no country are better and more exhaustive fishery statistics taken. For centuries the Government has taken account of the results of the fisheries, and for more than twenty years regular and extensive statistics have been obtained. A uniform plan, however, has been followed only since 1876; and the annual reports published since

*"Die Seefischereien Norwegens." From *Mittheilungen der Section für Küsten- und Hochsee-Fischerei*, Berlin, July and August, 1886. Translated from the German by HERMAN JACOBSON.