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**5.—AMERICAN FISH CULTIVATED BY THE NATIONAL FISH CULTURE ASSOCIATION OF ENGLAND.**
**By W. OLDHAM CHAMBERS.**

[Abstracted from the Journal of the National Fish Culture Association, London, England, April, 1887, p. 137.]

The collection of fish eggs for the season of 1886-'87 began in October, 1886, at the establishment of the association at Delaford Park. The fish first operated upon were the *Salmo fontinalis*, hatched at South Kensington in 1885 from ova presented by Prof. Spencer F. Baird. Considering their age and weight, the latter being about half a pound, the circumstances attending their reproductive capacity are worthy of note. The date at which they spawned was unusually early, notwithstanding their being confined in ponds for about 18 months. The eggs produced were small, and of a lighter yellow color than those from which the parents were hatched. The time of incubation occupied about 65 days, during which period the death-rate showed a percentage of 15. The fry, on emerging from the eggs, were very dark in appearance, and have been remarkably strong and active throughout. A few at first were attacked with "blue swelling," but on being placed two or three times in earth mixed with water to the consistency of cream and carefully strained, they became temporarily relieved, but ultimately succumbed to congested liver. The fry have been placed in the nursery ponds, where they are feeding well and seem to be thriving.

On January 31, 1887, a consignment of eggs from America was received, consisting of 1,500,000 ova of the whitefish (*Coregonus albus*) and brook-trout ova (*Salmo fontinalis*). Nearly all the whitefish eggs were found dead on arrival, owing to undue pressure from the trays being too large (namely, 18 inches square). The brook-trout eggs, which were forwarded in smaller trays, arrived in good condition. On the failure of the first consignment being reported, the U. S. Fish Commission sent a further shipment of 1,000,000 whitefish eggs; but the second lot was received in almost as bad condition as the first, owing to the same cause, the temperature of the box being too high, and many thousands of the eggs hatching out while on the way.

With the eggs of the whitefish arrived also 9,000 rainbow-trout eggs (*Salmo irideus*) from America, 1,000 of which had died during transit. These eggs are now hatching,\* and the fry appear to be strong and vig-

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\*A note elsewhere in this journal states that on April 8, 1887, all the rainbow trout in the association's ponds at Delaford were maliciously poisoned, and it will be impossible to replace this loss for some time.

orous. The color of the eggs is of a yellowish tint, tinged with a purple brown, before hatching, thus producing an unhealthy appearance.

The association is also indebted to the U. S. Fish Commission for 25,000 eggs of the landlocked salmon (*Salmo sebago*), which reached the hatchery on March 20 in excellent condition. They were carefully packed on trays surrounded in muslin, with moss between each layer of eggs. Instead of sawdust, wet moss was closely packed around the nest of trays, to which fact I partly attribute the success of the shipment. The instance cited is probably unparalleled in the records of transmitting ova, there being only three dead eggs on arrival, and only 30 were found dead on the next morning.

The sight presented in the hatchery tanks is very interesting. The different colors of the gill-sacs of the various fish, especially of the different kinds of trout, is well seen in the struggling masses of tiny forms, which appear to be in a healthy condition. Their aptitude for congregating in corners of the hatching-trays shows not only their instinct to avoid danger, but also their physical condition. Fish that are sickly are usually found apart from the others, as not having the power to cope with them. It may be interesting to compare the habits of the whitefish on coming from the eggs with those of the trout and salmon, as the whitefish act very differently from these other fry. The whitefish is of a light gray color and about one-quarter inch long when hatched. Upon emerging from the egg it lies dormant for about two hours, after which time it is generally in a state of activity. Its infantile powers of locomotion are great, and its capacity for exercising them is unusual. Darting hither and thither continually, with their large bead-like eyes prominently displayed, they are an interesting sight. Trout and salmon, on the other hand, preserve a quieter attitude on entering upon their career, and are not in perpetual motion.

Much effort is being made to acclimatize and propagate the American whitefish in England, though considerable difficulty exists in securing suitable places for it. Evidences of its capacity for thriving in this country are not wanting. The Marquis of Exeter last year turned into a portion of his water at Burghley Park some fry of this species as an experiment, and now they are 7 inches long. A few weeks ago one was taken at Delaford 6 inches in length. The fish are now yearlings, and have consequently passed through the experiences and vicissitudes of all seasons, and may therefore be considered to have become accustomed to their present existence.

The most difficult problem in whitefish culture is how to feed them upon losing their sacs. After experimenting with multifarious diet, aries, I finally settled upon one which has hitherto proved efficacious. This consists of a finely-powdered meal, made by Mr. William Burgess, of Malvern Wells. This meal is mixed with the blood of animals and with water, in the following proportions:  $2\frac{1}{2}$  parts meal,  $\frac{1}{2}$  part blood,

and 6 parts water. This food is so fine that it can be absorbed or imbibed by the fish without any effort or unnatural exercise of their digestive functions. Moreover, the food is readily consumed by them, and it is not ejected, as is the case with liver and roe.

The results previously attained in the endeavor to acclimate certain varieties of American *Salmonidae* encourage the association to continue its efforts in this direction. The original list of transatlantic forms for introduction, which after all bear a striking resemblance to their cousins on this side of the Atlantic, has undergone considerable modification, and is limited to the really valuable food-producing forms whose presence in English waters cannot prove prejudicial to indigenous fish, but, on the contrary, may become an important acquisition in developing inland and populating barren waters. The following species would, it is believed, prove of undoubted value: Rainbow trout, *Salmo irideus*; landlocked salmon, *Salmo sebago*; and whitefish, *Coregonus albus*.

It is with reluctance that we omit from this list the American brook trout, *Salmo fontinalis*, which has had an excellent chance of asserting its qualifications for introduction into our group of *Salmonidae*, but has failed to do so, except in confined waters. Its first appearance in this country was heralded with jubilant anticipations; its capacities for rapid growth were hailed as a good omen, and its gorgeous dress and graceful form won golden opinions from all piscatorial classes, who willingly paid large sums of money for what was then considered the coming trout. Gradually, however, its true character appeared, and now it is universally regarded as a fish not to be depended upon. No authority rebuts the evidence forthcoming as to its suitability to British waters, if inclosed, nor as to its value as an addition to our fresh-water fish. The sole cause, and a very grave cause it is, for its denunciation is that it escapes from those places where it is turned in. Before finally discarding this unique char it behooves us to question more closely than we have yet done its habits, instincts, and the nature of its native home, in order to render it full justice. Probably the waters in which it has been placed have not been suitable, and this assumption certainly seems justified by the fact of the fish wandering as it does. The question naturally arises as to where it goes. Does it find suitable places in its wanderings? Does it descend to the sea, or does it pine and perish for lack of natural conditions? If death explains the mystery, which is hardly likely, we have at once a solution; but if not, it is difficult to say what has become of the thousands turned out into our English streams. In America the brook trout is regarded as a home-loving fish, therefore it seems somewhat likely that we have not yet provided the domestic comforts to which it is habituated. The suggestion, at least, is worth studying, and the association still has these fish under culture, not being convinced of their unsuitability for inclosed waters.

LONDON, ENGLAND, April, 1887.