

## X.—THE BEST FOOD FOR YOUNG SALMONIDS AND FOR LARGER SALMONIDS IN PONDS.

[From circular No. 4 of the German Fishery Association, Berlin, May 28, 1877.]\*

At the meeting of German pisciculturists held at Berlin, May 1 and 2, 1877, discussion on the above question was opened by Mr. Schuster, of Freiburg. He said that this question was one of great importance in more than one respect, and that he was desirous of obtaining information from competent persons. As regards the very young fish, some might say that it would be best not to feed them at all, but put them in ponds before they seek their food, and while they still have a small remnant of the umbilical bag. But this is not always advisable, for if the snow melts very suddenly the young fish are easily destroyed by the high water. Mr. Schuster, in conclusion, remarked that a Swiss had offered him a recipe for procuring a never-failing supply of suitable food, but he demanded no less than \$4,000 for divulging the secret.

Mr. Haack, of Hünningen, made a long speech on this question, which he considered the most important question in pisciculture. He recommended the following food for young salmonoids: The larvæ of gnats, the small larvæ *Daphnia*, *Cyclops*, &c., which are skimmed off stagnant water (ditches, pools, &c.) with a fine muslin skimmer. Two children do this early in the morning and in the afternoon, and he says he in this way gets enough food every day to feed 20,000–30,000, and even 50,000 young fish. This is the most natural food for them, but not the cheapest. Mr. Haack said he did not like to feed the fish inside the building for any length of time, for even if the fish grow till they lose their umbilical bag they are easily affected by the *Achlya prolifera* or fungus. The larger fish are fed on the larvæ of the "Kriebelmücke," a sort of gnat which are found even in the coldest trout-brooks. The females of this species of gnat generally deposit their eggs on floating grass.

Ground meat ("Fleischmehl," meat-flour) and ground Norwegian fish ("Fischmehl," fish-flour) seem to deserve special attention. According to information received from Mr. Kuffer, three to four parts ground meat are mixed with one part common flour. The ground meat is boiled a little in hot water and then the flour is stirred in. He had not yet tried

\* Which is the best food: (a) for young salmonoids and (b) for larger salmonoids in ponds where no food-fish can be obtained?

Welches Futter ist das beste: (a) für Salmonidenbrut, und (b) für grössere Salmoniden in Teichen, wenn keine Futterfische zu erhalten sind? Aus circular No. 4 des Deutschen Fischerei-Vereins, Berlin, den 28 Mai, 1877. Translated by H. Jacobson.

this food for small trout, and for small troughs it could not be recommended. Some method would have to be found by which this food could be put up in a shape that would be more acceptable to the fish. Further experiments should at any rate be made with it, especially with a view of feeding trout in ponds.

During the first years Mr. Haack had frequently fed the larger fish with horse flesh, and this kind of food deserves some attention. But unfortunately a good deal is required, and one is too much dependent on the dealer, so that frequently, when too much meat is on hand, it becomes necessary to salt it down. The price of this meat was at that time one and a half cents a pound; the fish often preferred the salt meat to the fresh. For the one year old fish it was chopped in a meat-cutter, and for the larger fish it was according to their age cut in small and large cubes. The meat never putrefied in the water, for if the fish are properly fed not a single piece will fall to the bottom. The fish remembered the persons who fed them and came near the shore as soon as they noticed them. On some holiday, however, when many people came to Hünigen to visit the fish-breeding establishment, the attendants during his absence fed the fish too much (for the sake of the gratuity which they received from the visitors), a great quantity of meat remained lying at the bottom, and by its putrefying, a good many fish were lost. Otherwise the results at that time were very favorable, and a thirty months old trout had simply by artificial feeding reached a weight of three pounds. But one day the trout in all the ponds got sick very suddenly, so that three to four thousand pounds were lost, and this phenomenon cannot be explained in any other way but by supposing that the fish had been fed on diseased meat. The greatest care must therefore be exercised, and nothing but sound meat should be used.

Mr. von dem Borne asked whether Mr. Haack had ever fed the fish with maggots. He had heard it recommended to lay meat in boxes placed over the water, and having a perforated bottom so that the maggots could fall into the water. Other people again advised to gather the spawn of frogs, and raise young frogs for food.

Mr. Haack replied that it was unpleasant and not advisable to feed the fish on maggots, as some of the meat was thus lost to them. Frogs could not very well be raised artificially; it was better to gather them, but care should be taken not to transfer them from warm water into cold trout-ponds. He would recommend frogs as food for somewhat larger fish; the only drawback was that frogs could not be procured anywhere and at any season, particularly not in South Germany, where there was also a lack of larvæ, which are more frequent in North Germany where there are more stagnant waters.

Mr. Kuffer said that he had fed small trout, after they had lost their umbilical bag, with perch-spawn, which he could easily procure, as well as with ground liver.

Mr. Brüßow recommended sheep's liver ground through a fine sieve and mixed with water.

Mr. Schuster remarked that, with the exception of the ground meat, he had tried all the articles of food which had been mentioned, and many more besides such as dried ants' eggs ground fine, worms, &c.; but nothing seemed to give entire satisfaction. As a very suitable food he would recommend calf or sheep's brain ground through a fine-wire sieve. It swims on the water for a long time and looks as if it was alive. It was moreover particularly good for the fish on account of the great quantity of phosphoric acid which it contained. For large fish this kind of food, however, would be too expensive; these he fed with lungs, milt, salt meat, salt fish, &c., also occasionally with boiled meat. With regard to salting, Mr. Schuster has had the same experience as Mr. Haack. The fish like salt meat, as he found out accidentally when he received some fish for food which were almost spoiled so that they had to be salted. Afterward they were soaked in water, but did not lose their salty flavor entirely; the fish, however, ate them readily.

Mr. von dem Borne feeds lungs slightly boiled in salt water.

On motion of Mr. Eckardt, it was unanimously resolved to hold annual meetings of pisciculturists, since this present meeting had been accompanied by such satisfactory results, and the wish was expressed that these meetings should not always be held in Berlin.

Mr. Brüßow reported on his *artificial raising of crawfish*. He uses a basin having wooden walls 44 feet long, 20 feet broad, having a depth of water of 4 feet. At the bottom there is on all four sides a layer of bricks, laid flat, and on this there are 45 layers of drain-pipes cut in halves right across. One hole of these pipes is closed by the wall of the basin, but the other is open, so that the crawfish can crawl in. This seems to have been a very happy idea, for the pipes are all inhabited, and the crawfish only leave them to get their food or when the water of the basin is let off. The large crawfish were fed with fresh meat, fresh fish, and carrots, and the small ones with carrots cut in cubes.

He commenced his experiments last spring; 1,400 female crawfish with eggs were placed in the basin, and produced about 20,000 young ones. Generally each female produces 70-80 young ones, but these crawfish had suffered a little from the long journey, and were therefore not quite so prolific. In the beginning the young crawfish were about the size of a fly; in July they were placed in another basin, having a water depth of 4 feet and full of fagots and aquatic plants. At the end of October the crawfish were as large as a good-sized Italian bee, and resembled this insect somewhat by the manner in which the back part of the body was marked, only that they had black stripes on a gray background. The water does not flow into this basin very freely, so that it is only renewed every three days.

Last autumn Mr. Brüßow put 600 male crawfish to the females, and these must have copulated with them, as the females have now eggs

under their tails. The young crawfish which he had last year raised in his basin were in great demand, and fishermen paid \$5 a thousand. He was doubtful whether it would be profitable to raise crawfish in ponds till they had reached their full size, but he recommended to place the young ones in open lakes.

Mr. von dem Borne remarked that he kept crawfish in a basin whose walls were cemented. It is 12 feet long and 1 foot deep. He had observed the male crawfish copulate with the female, and had then seen the female lay eggs. Some females had, from some unknown cause, not laid any eggs.

The great crawfish establishment of Mr. Micha, in Berlin, was mentioned, and Mr. Kuffer remarked that he also kept crawfish all winter through. He buys them in September and October, and feeds them with the entrails of fish, which the crawfish like. In the beginning they ate a great deal and finally got quite fat.