

## XXIII.—WHAT DOES A FISH COST?\*

BY CHRISTIAN WAGNER.

After the tiny, jelly-like fish has left its egg it receives nourishment for several days from the adhering yolk-bag, mostly resting on its side upon a blade of grass as near as possible to the surface. Thence forward, however, it preys on living aquatic animalculæ, and though enjoying a life scarcely perceptible by means of a microscope it soon begins to hunt for the mite-like water-fleas, the larvæ of gnats, &c. For some time I have been in the habit of keeping, and not only during the breeding season, small cups and larger dishes for raising different insects, which facilitate the observations.

The goldfish, carp, tench, &c., are quite voracious when only eight days old. They consume in three days about as many of these animalculæ as their own weight. Higher or lower temperatures are at this time of the greatest influence. The warmer the weather the greater is the vitality of the fish and the more rapid its growth, if properly fed.

By continued natural feeding the little fish doubles its size in about eight days, and then, fourteen days old, is looking for larger food, which now mostly consists of larvæ of gnats. The consumption of food equal to one-third of its own weight per day is still continued; but the growth does not progress at the same rate, it only increasing about 100 per cent. in the next fourteen days. A fish of four weeks, with sufficient food, will, perhaps, in four weeks double its size; then in eight weeks, and so forth, at the same ratio, if the winter or other circumstances do not interfere.

Although our predaceous fish, the so-called winter-fish, as pikes (pike-perch), trout, &c., down to the little stickleback, sometimes take food in rather cold weather, the so-called summer-fishes (carp, tench, bream) eat almost nothing in winter time. The colder it is the slower they breathe, and though on warm sunny days they occasionally appear near the surface, they rarely take adequate food. They are always satisfied with the little nourishment contained in the water, which, by breathing, is conducted into the stomach—it is true at the expense of their own bodies, for in spring-time all these fishes appear more or less emaciated. Suppose such a fish, one year old, be it summer or winter fish, to have attained a length of about six centimeters, and to represent, according to its weight, a food value of one pfenning [equal to nearly one-

\* Translated by H. Diebitsch from *Deutsche Fischerzeitung*, No. 46, Stettin, November 12, 1878.

fourth of a cent.—TRANSL.] (fifty of such fishes equal one kilogram), it has in the coming summer one hundred more warm days for growth. It may be taken for granted that the fish in these one hundred days, as in the first year of its existence, will consume every three days as much food as its own weight, which in the second summer amounts to  $33\frac{1}{3}$  times its own weight of feeding matter, worth  $33\frac{1}{3}$  pfenninge.

The predaceous fish, as is known, lives on other fishes, even of his own species, if not fed with blood, scraps, &c., and consumes food matter as valuable or nearly as valuable as itself. In fact, up to the second summer the fish represents only 10 per cent. of the value of its feeding expenses, having only attained the weight of 120 grams, and in the third year, consuming at the same ratio, it costs already 10 mark (1 mark nearly 24 cents), and so forth.

Proceeding on this undoubtedly correct basis, calculation would finally arrive to an enormous amount. I shall afterwards give a striking example. If the so-called summer-fish in its third year does perhaps not use up quite  $33\frac{1}{3}$  times as much food as its own weight, the winter-fish, on the contrary, as it keeps on eating throughout the whole year, consumes a great deal more.

According to my observations, a three-pound pike prefers a one-pound pike to a one-fourth pound one, and a pike one-fourth pound in weight rather takes another one one year old than a smaller fish or an angle-worm, &c. As a special dainty, the frog may be mentioned. In the following I shall state facts, and shall prove by figures how dear a fish can become, though apparently an inexpensive inhabitant of the water.

I had rented a (Grand Ducal) fish-breeding establishment at Varel, and a friend of mine, Mr. Krommelbein, placed in one of the ponds, which had proved especially adapted, 2,000 so-called *Streck*-carp, about as long as a hand; these are fit for propagation in the fourth year.

In order to destroy the too great quantity of fry, it is customary to introduce small pikes; in this case about 20 were added. As formerly done, this pond after three years was to be fished in its turn. When informed by Mr. K., I prepared for the 1,800 carp to be received (10 per cent. of loss), which, after former experience, ought to have attained the weight of  $1\frac{1}{2}$  pounds each. You will be surprised to hear the result of the entire proceeding, viz: Two eatable fishes—pike—of 30 pounds\* each, a number of two-year-old carp-fry, † one-year-old pikes without value, equally small perches, ‡ and many sticklebacks! The above two pikes had made such astonishing growth in consequence of the abundant food.

The summer, like the winter, fish of the same age often differ in size

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\* The pikes introduced with the *Streck*-carp must have been too large, since they actually eat up the carp.—[EDITOR.]

† The *Streck*-carp must have deposited eggs. Have none of the originally introduced carp been caught, from which those two year old must have been bred?—[EDITOR.]

‡ Had these also been introduced?—[EDITOR.]

in the ratio of 1 to 4, according to their feeding. A pike of six years weighs on an average about 5 pounds; but if its nutriment is abundant, as was the case in the carp pond mentioned, a triple weight has been obtained. What was the expense for these two pikes? From former results we know that the same pond had yielded 3,000 pounds of eatable fish when stocked with 2,000 carps (without larger pikes), and taking 1 mark as the value of 1 pound, then either of the two pikes costs 100 mark per pound!

How, during three years, so many enemies to the fry could originate is the question still to be answered, and the answer is quite simple. Just as weeds in the field without direct seeding grow in greatest luxuriance, so the hosts of unwelcome destroyers originate in the water-basins. If we, for instance, observe ducks swimming among the deposits of eggs (either on plants as with summer-fish or on the bare shore with others), we will see how they carry on their wings the contents of the water when suddenly frightened, the eggs easily adhering to their feet and feathers. Reaching other, perhaps more quiet, water they dive and get rid of their adhesions, &c. Many kinds of water-fowl, also rats, frogs, and other animals, thus distribute useful seed, as well as that of weeds, if this expression be allowed.

Whoever, therefore, wants to breed a certain species of fish, must know how to calculate and must thoroughly cultivate the water. The water is like the field; where there is no cultivation there is no result in either. My experiences serve me as proofs for the statements made in 1863 (in *Zoolog. Garten zu Frankfurt-am-Main*). The area of my property, if used for agriculture, would scarcely support a laborer and family, while by pisciculture it gives employment to fifteen men, three horses, and a steam-engine. The profit to myself is much greater than any farmer or gardener could make of it, for the water is much richer than the field, if pools are cultivated like land. The field is my school, the water my field!

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