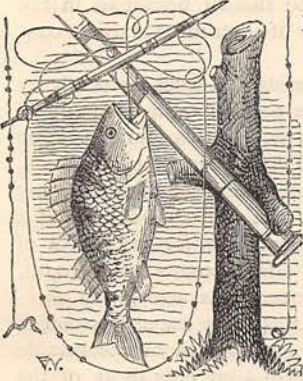


## FISH-CULTURE IN GREAT BRITAIN.

BY GREVILLE FENNELL.



IN the second and third volumes of the "Technical Educator" appeared a series of papers upon this subject, which, however, was principally confined to the then approved and recognised mode of the artificial breeding of fish, with copious illustrations of the mechanical appliances necessary for hatching the eggs and

protecting and sustaining the fry after fecundation. How far a strict adherence to this mode of procedure has been successful, can only be judged by the increased produce of our public and private waters, and here it is urged that, with one or two exceptions, so far as Great Britain is concerned the benefit—in other words, the return for capital and labour expended—has not been remunerative. There have been literally millions of the fry of salmon and trout poured into the Thames, and many thousands into the river Lea, yet up to the present moment even the most sanguine and zealous pisciculturists will but admit that such vast numbers have not as yet made any appreciable mark or apparently added a single "take" to the returns of the angler. What then, is asked, has become of such legions of young fry? The reply of close observers is humiliating—they have gone to feed the larger fish. Indeed fresh-water fish without an exception have been provided with an expensive dish of tiny salmonidæ; for every fish preys upon its fellow, provided its victim is sufficiently small to swallow, and will even, if the opportunity offer, make a meal of its own offspring; and, contrary to the opinion of epicures with regard to the flesh of pike and perch fed upon salmonidæ, the flavour of the Thames fish does not appear to have been in the slightest degree improved by this lavish and costly diet. Nature, however, has to some extent provided against this wholesale cannibalism, by giving to the young an instinctive dread of fish bigger than themselves, combined with the power of greater facilities of escape: hiding themselves under boulders, amid the roots of submerged trees, and other havens of refuge into which their pursuers, by reason of their greater bulk, cannot intrude. And it has been, with some degree of truth, suggested that, although fish in infancy bred in their native element may acquire from the first this dread of their enemies, on the contrary those brought up by artificial means lack that discretion which would enable them to avoid becoming little Red Riding-Hoods to the water-wolves: the obvious remedy for which is to turn in only such trout as are of a sufficient size to hold their own against their persecutors.

Albeit, whatever the causes may have been which have in our isles retarded the progress of fish-culture, and left us so manifestly in the rear of Holland, Norway, Sweden, Japan, China, and not least the United States, the International Fishery Exhibition of Berlin has, however mortifying to our pride, fully explained and manifested by wholesome contrast for our future guidance the reasons of our short-comings.

The United States appear to be fully impressed that they will take the lead in this competition, which most essentially involves one of the great food-problems of the age. If the United States do not distance all other nations, it will be no fault of the high controlling powers, as the effort to multiply fish has now for years past become a State work. Compare this with the little assistance and encouragement given to pisciculture in England, and it may be we place our finger upon one cause of our failure. The only "public exhibitions" we have, and have had, are the experiments of Mr. F. Buckland in the South Kensington Museum, to which as yet we believe no money Government grant has been extended; the ponds at Stormondfield, the pioneer examples of Mr. Francis Francis and others at Hampton, Mr. Forbes at Chertsey, and Mr. Frederick Pigou at Dartford.

On the other hand, Professor S. F. Baird, secretary of the Smithsonian Institution, and Commissioner of Fish and Fisheries, tells us that "the first experiments in fish-culture in the United States were privately conducted by Dr. Garlick, and the more public efforts were commenced in the New England States—Massachusetts, Vermont, and Connecticut. Then New York followed, and now nearly every State in the Union has its Fishery Commission; in fact," says Professor Baird, "I do not call to mind any State in the Union that has not an officer designated by authority of the Legislature to take charge of this interest; and in nearly all the States they have establishments for fish-culture and propagation."

The following portion of a speech upon this subject by Mr. Morton, one of the representatives of New York city, would apply in its opening words equally to our own country:—"The production of fish is a source of national wealth, and in the early history of the world it was a preventive of famine and distress. Experience has shown that while it is a luxury for the rich, it is pre-eminently the poor man's food. This is understood thoroughly in the countries where food-production and cheap living are carried on to the greatest perfection." And still more closely the following remarks are in unison with what was, and still unfortunately is, our own position:—"Not many years ago the erection of mills, dams, and factories along the banks of the rivers of the United States threatened the extinction of many valuable species of fish. This calamity was prevented by the timely discovery of the art of propagating fish by artificial means. The Connecticut river, once one of the most fertile fish-streams



in the world, became almost depleted. A few years ago, at the expense of a few hundred dollars, Seth Green, of New York, one of the pioneers, replenished the river with artificially-hatched shad, and in three years' time these fish had become more abundant in the river than they were before the white man began to fish them out."

Here follows a record of practical wisdom:—Seth Green knew that the water of the Connecticut river was by nature peculiarly adapted to the shad, and that its absence from the waters was attributable to exceptional causes. He therefore, instead of attempting ambitiously to fill up the void with salmonidæ or any other capriciously-priced fish, set to work to give the waters back their own, and succeeded to the extent of the waters paying the States enormous interest upon so sensible and judicious an outlay.

Our own Thames was once famous for its shad, and they were caught by boat-loads and landed at Shadwell, Shad Thames, and elsewhere on its banks. If ever our magnificent river should be free from the wall of pollution at Barking and Crossness, and again sufficiently pure for the reception of a "gentlemanly fish," as the shad, with others, has been termed, let the hundreds of pounds (not dollars) now thrown away in the attempt to acclimatise salmon (for the Thames never was a salmon-stream in the proper signification of the term) be spent *à la* Seth Green, and a hatching apparatus here and there be established to restore the shad to its old quarters.

It is to be feared that vaulting ambition has greatly retarded the growth of fish-culture in this country, and done more for the retardation of fish-production than the fungoid disease and the net of the poacher. We are not satisfied with what we have got of that which can be readily increased, and that which is valuable in the aggregate; but we would have salmon-trout, grayling, and char take the place of pike, perch, and gudgeon, without the slightest consideration whether the waters are adapted to their requirements. Thus it is threatened with East Anglia. The natives first looked with apathy upon the gradual but certain ruin of their once prolific and splendid rivers and lakes, termed "broads," and when the fish indigenous to their natural element were depleted by the net and unsportsmanlike practices to almost *nil*, instead of throwing every protection over the stock which remained, talked of acclimatizing and introducing foreign fish perfectly unsuited to the waters—fish which, had nature intended their presence, would have been found therein without the interference of man. In the counties of Norfolk and Suffolk, at least, we may therefore shortly see, if proper judgment is not exercised, pike, perch, and eels fed by a liberal hand with the delicacy known as salmon-fry, far more expensive than whitebait, and particularly esteemed by these piscine gourmards, each of which it is known will almost follow its prey ashore rather than forego the luxury of so delicious a *bonne-bouche* as a juvenile salmon. It is somewhat strange that salmon-roe, one of the most irresistible fish-baits, and the

use of which is debarred by law to the angler, should after the matured salmon is robbed of it, and every attention has been devoted to its development, when considered of a sufficient size and all interest in the breeding is evaporated, be thrown broadcast in the waters to become the prey of their more stalwart congeners.

No one hears of increasing the stock of perch by artificial means. Yet the perch is a most desirable fish, and maintains a high price in our markets. The only course hitherto adopted is to import perch stock, small perch from one place over-crowded to another less inhabited. And it is true that this change of a surplus to other waters is generally for the benefit of the fish, particularly from ponds somewhat stagnant, in which the food is consequently not enough for all.

We should earnestly suggest that the experiment of increasing the volume of our indigenous marketable fish should be entered upon—not only those of the fresh waters, but those admitted to be scarce in and around our sea-board. We need not hesitate for an example, as we are now assured that the American method of artificially impregnating and hatching the eggs of sea-fishes has made it possible to hatch all the different kinds of fish found on the United States coast, except the blue-fish and manheden, which do not spawn at a time when they can be reached. Thus not only can the old fishing-grounds be made to furnish an increased product, but new stations can be established. The Fish Commission, in fact, to which we allude, believe that productive cod-fisheries can be developed as far south as the Chesapeake Bay, or even Cape Hatteras; and it is also considered possible to regulate in a great measure the fitful appearance and disappearance of mackerel on the American shores.

Mr. Morton, who is entitled to be listened to with respect, and who has hitherto shown himself far from Utopian or chimerical in his scientific forecasts with regard to fish-culture, expresses a hope ere long to transfer the general seat of the cod and the mackerel fisheries from the distant banks of the Gulf of St. Lawrence to the coast of the United States, thus settling some very serious international fishery questions, and making the American cod-fisheries especially similar to those of Norway, where 25,000 men are employed for four months in the year in fishing in open boats, going out in the morning and returning at night. Doubtless he would effect this by taking advantage of the now generally accepted fact that all fish are more prone to return to the place of their nativity than to stray and stay in other districts, provided the element was one in most, if not all, respects as congenial to their habits as elsewhere.

The objects, lectures, and papers of the Berlin Exhibition will throw much new light upon this grand phase of the extension of the food of man, and must be watched with corresponding interest and attention.

We had no intention, at the opening of this article, to recur to the mechanical operations of fish-culture, nor to make speculative guesses why in one portion of the world fish-hatching should, if not proved a



failure, at least have made but little progress; but we may be excused if we refer to one great departure from the general mode as practised in England, and found of great advantage in the United States.

The general practice of fish-hatching in this country has consisted in permitting the natural current of water, as that from a spring or hydrant, to pass through a series of wooden troughs, having at the bottom a layer of gravel, upon which the eggs were placed. This, with very slight variations of corrugated zinc, or a "gridiron" of close glass bars, represents to this day the inventive genius of Europe. Seth Green anchored his troughs in a running stream so as to get the natural flow of the water, instead of depending upon what may be termed a somewhat artificial source of supply, and thus his shad, particularly, were hatched upon a more extensive and economic scale than could be done under a shed and with the expensive and constant superintendence of watchers. But now advancing upon the method of having the eggs in actual layers and troughs, the United States devised the method of placing the eggs in trays one above another, and the series in vessels of a conical shape, and thus arranged, allowing the water to come in at the bottom and flow over at the top, by which means enormous numbers can be hatched on a given area. It is obvious that the flow thus admitted from under the egg gives it the full benefit of its influence, particularly on the under side, which, when the water only flows over it, is left without its due share of its effects. But the best recommendation of the innovation may be that such apparatus is now used to a considerable extent by the United States at its salmon, &c., hatching establishments in Maine and California; and that the result, with a very small force of operatives, has been as many as 15,000,000 eggs treated in a single season on the Sacramento river. This, indeed, is a product more than that of all the salmon-hatching establish-

ments, public and private, in Europe combined. We further learn that this funnel apparatus was next placed by the Commission on floating scows, so that the water used in developing the eggs could be drawn directly from the adjacent river where they were anchored. Nor does the inventive genius of the American fish-culturists end here, for the success of this apparatus has induced them to combine a form of buckets filled with eggs, which will be worked by a large steamer, and by which, when in use, it is anticipated the amount of production of previous seasons will be increased many-fold.

Amongst the fishes which have met with special success are the German carp, which are liberally distributed to applicants in proportion to the water to be inhabited: eight or ten pairs being sufficient for fifty acres of water. This we all know is a most domesticated fish, and bears the same relation to other fishes that ducks and barn-door fowls do to the birds of the woods and moors.

Our transatlantic cousins are practical foreseeing people, and it is noteworthy, with all their immense ocean fish-resources, they are now taking up inland fish-farming, a pursuit which we abandoned about a quarter of a century ago, the fish-farming in the innumerable ponds in the Weald of Sussex being the last, carried on by a Mr. Fenn, of London. Carp was the chief stock, but tench, perch, eels, and pike were raised. The carp were regularly fed upon peas, and grew to a great size, some showing two inches of fat on them.

We cannot better conclude this reference to the fast-growing industry of fish-culture in America than by another quotation from the Commissioners' Report in reference to fresh-water or migratory fish:—"Our principal object is to multiply our own fish, rather than seek the acclimatisation of others, because they must be better adapted to our own waters than any we can introduce."

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## NATURE'S SCHOOL.

### A SONNET.

**I**N puzzled doubt a little maiden sits,  
Where through the window westering sun-rays  
    peep,  
And kiss her face, and flash, and dart, and creep:  
There, flow'r and work in either hand, she knits  
Her little brows, as though in truth her wits  
Were concentrated on some problem deep,  
Until to sun-kissed lips the glad smiles leap,

And a bright flash across her sweet face flits.  
O happy maiden, who in early youth  
Hast thus been taught in Nature's perfect  
    school,  
Which tells that highest art is highest truth!  
Would that all men might learn the golden rule,  
And in their doubtings confidently rest,  
Knowing that what is truest *must* be best!

G. W.

