

the relative rapidity with which changes have come about it is evident that conditions are still in a state of flux. Some trout streams that were classed excellent twenty years ago are now only fair. Waters that once teemed with native fish like *Galaxias attenuatus*, of which whitebait is the young form, are now almost lacking in this species. The native grayling is on the verge of extermination. These well-known examples might be multiplied, but this is not the place for a discussion of details. It is clear that the activities of a few men who are expert in the art of hatching and catching fish is not going to provide all that is requisite for the well-being of our fresh-water fisheries. There is, it may be said, no lack of amateur advisers on problems connected with these fisheries—advisers whose confidence and assurance are in proportion to their ignorance of fundamentals. Some of these prescribe putting in more fry as the sole requirement for the improvement of fishing, regardless of the question as to whether there exists suitable and sufficient food-supplies for the proper nourishment of these fry and the fish into which they will grow. Others advocate the introduction of trout-food—shrimps from Samoa, snails from England, bullies from a neighbouring stream, unmindful of the problem as to whether these introduced species would be able to increase and multiply in their new environment.

Before a medical practitioner is allowed to treat patients he is obliged to study the structure of the organs of the human body and to obtain an understanding of their normal functioning. So in dealing with our fisheries: we must first understand the conditions as they are, and the fundamental facts which operate in bringing about those conditions. This understanding can only come from organized investigation. We must know the intimate habits and requirements of the fishes themselves at every stage of life, their rate of growth, the relative importance of the factors which make for their extinction, what propagation of young fish is necessary to provide the most satisfactory stock of catchable fish for particular waters. We must get a measure of the destructive effects of their natural enemies so as to be able to wage rational war against them. With regard to other aquatic organisms which provide food for the fishes, knowledge of their life-histories is equally important. It is especially essential in the case of organisms which are intended to be introduced into trout waters for the benefit of the trout's food requirements. Without this knowledge practical efforts at fish-culture are likely to be at least uncertain, and have in many instances proved futile. For instance, some who have given a limited amount of consideration, mainly theoretical, to the subject have advocated stocking streams with May-flies as a means of improving the trout. Professor Percival has shown that certain May-flies can only reproduce successfully in water which flows at a certain speed. Attempts to stock waters with this species without reference to this fact, which is not one that leaps to the eye, would be wasted effort. So would the attempt to acclimatize the fresh-water prawn from Samoa into water of a temperature which would prevent the maturation of its eggs. This latter has actually been attempted, and, whatever it cost, it is certain that neither trout nor anglers derived any benefit from it.

The only circumstance that stands in the way of a well-organized and effective scheme for fresh-water research is the question of expense. And when this aspect is being considered it is necessary to realize the very considerable waste of money which has taken place from time to time because attempts at stocking or acclimatizing have been undertaken in blind ignorance of the character of the organism introduced and of the environment into which it was thrust. And since even such enterprises as the acclimatization of various Salmonidæ were of the nature of a gamble, success may be said to have been due to careful hatchery-work, plus good luck, and failures to have been due to bad luck in spite of good hatchery-work. As a matter of fact, fish-acclimatization, like that of birds and four-footed game, has been a blind gamble, and will continue to be so until scientific enlightenment is sought and attained. It is not a matter for consulting an outside expert: we have to get on to the job of investigating and elucidating the conditions which hold in New Zealand.

Apart from the immediately practical problems connected with trout propagation and food there are further considerations of no small weight in favour of the establishment of an institution for fresh-water research. The native flora and fauna of our rivers and lakes are in many ways as unique and interesting to science as are the flora and fauna of the New Zealand bush; and similarly they have been affected detrimentally by human agency and the march of civilization. It is very desirable that the factors of change should be studied and their trend understood. Even the outstanding cases have received hardly more than momentary and superficial attention. Consider, for instance, the remarkable species *Galaxias attenuatus*, the young stages of which are commercially known as "white-bait." It is only in the last few months that its unique spawning habits have been made known. The facts revealed are of as considerable biological interest as they are of practical value in relation to the conservation of the species in view of its economic importance. Then there is the New Zealand grayling (*Prototroctes oxyrhynchus*). What do we know about it, except that it was formerly very abundant and is now on the verge of extinction? This is another unique native species which is, moreover, an excellent fish both for the angler and for the table. When it is as extinct as the moa—it is rapidly moving in that direction—those who were responsible for the control of New Zealand fisheries will certainly not escape a good deal of scornful criticism. Is it too late to save this species—to find for it a suitable sanctuary? In the first place, scientific study of its natural history and requirements and the cessation of chaotic and blindfold fishery-control afford the only chance.

The problems of maintaining and improving the fresh-water fisheries are many and complicated. They certainly cannot be solved by occasional and semi-amateur investigations. The only effective, and, in the long run, the only economical method is by an organization definitely staffed and equipped for fresh-water research. It is not so much a question whether we can afford it as whether we can afford not to provide it.

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