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SALMON AND TROUT

Natural and Artificial Propagation as Factors in
the Maintenance of Stocks

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Natural and Artificial Propagation as Factors in the Maintenance of Stocks

By

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The object of fishery regulations whether statutory or departmental is, in the ultimate, *conservation*. That is to say, it is sought by the imposition of certain restrictions to ensure such a run of fish for breeding purposes as will increase or at least maintain the stocks. Many citizens profess dissatisfaction with the existing stocks of fish in our rivers and lakes and persistently urge that they should be enhanced by all practical means. Generally the method which suggests itself to such persons is the setting up of a hatchery, to be operated either by stripping fish captured locally or by procuring supplies of ova (eggs) from outside sources. There seems to be a rather widespread belief that such a procedure even on a modest scale is bound to produce immediately beneficial results for the waters concerned. In other words, the operation of a hatchery is expected to offset completely the evils of over-fishing, as well as the damage resulting from illegal activities (whether within or outside the fishing season) and the reduction in stocks caused by predatory birds, fish and mammals added to the pollution of waters by the entrance of deleterious matter. Such a belief is, however, fallacious as it cannot be accepted in any degree without serious reservation. This idea as to the over-riding effect and efficiency of artificial propagation not improbably has its basis in the attitude adopted by some early writers on the subject who tended to stress the contention that in nature the process of fertilisation was very inefficient. Over a long period few were found to question the accuracy of such a viewpoint. More recently, however, a number of critics have challenged the validity of this theory, and one observer (Hobbs)* in New Zealand published the results of his investigations into the question and showed that natural spawning, at least in the circumstances prevailing in that country, was a remarkably efficient process. Many other well-known fishery scientists hold like opinions on natural spawning. Taking, however, the bulk of the investigations bearing on the subject, the indication seems to be that relatively heavy losses occur in nature from the alevin stage onwards. Generally, on the information available it seems possible that in natural spawning the process of fertilisation may approach in efficiency that which obtains in artificial propagation. It is, of course, to be borne in mind that if the produce of a hatchery be distributed as fry the losses sustained by the hatchery-bred fish are not likely to be less than those sustained by fish resulting from natural spawning. Where ova are

* Derisley F. Hobbs, 1937. "Natural reproduction of quinnat salmon, brown and rainbow trout." *Fisheries Bulletin No. 6, New Zealand Marine Department.*

stripped from parent fish obtained locally the *net gain to the fishery* is represented by the difference in efficiency between artificial propagation and natural spawning under conditions obtaining in the particular fishery. Even assuming a hatchery to be well run and provided with a satisfactory water supply, and that the fry are turned out with due precautions into a suitable area of river and lake, this net gain will be little or great according to the conditions prevailing in the particular fishery.

The introduction of eggs into the hatchery from sources outside the particular fishery with which we are here concerned can obviously be done only at the expense of some other fishery.

The statement that a hatchery will not necessarily remedy obvious defects in a system under which a particular species (either salmon or trout) has lived may now be examined in greater detail. If the problem is to be treated rationally a careful study of the water proposed to be re-stocked must be made with the object of determining whether there are evident reasons for the depletion of its stock, such as pollution, lack of spawning facilities, obstacles to migration, increasing numbers of predatory fish, birds, or mammals, over-fishing, or inadequate protection. If any of these be present it is essential to counter it before embarking on hatchery operations. Any one of such causes may well be responsible for a considerable loss of stock; and one concrete example will illustrate how necessary is the removal of impediments to the *natural* development of fish before attempting artificial propagation. Periodical reports reach the Fishery Authority that considerable numbers of salmon and trout are being taken by illegal methods in certain areas. For instance, it has been firmly alleged that in the main spawning stream for one of our small lakes up to 500 trout are being removed by local delinquents in each spawning season. Assuming that these trout would normally average about 1 lb. and further assuming one half of the total to be females, then the loss of eggs alone would amount to anything from 150,000 to 225,000 (each lb. of body weight of a female trout yields 600-900 eggs, depending on a number of factors which man cannot influence).† Despite such a heavy loss of trout eggs from the cause stated, the Anglers' Association in the district seriously believes that the operation of a hatchery capable of holding, say, 20,000 eggs, would go far towards counteracting the nefarious activities of the poachers. A hatchery capable of holding 200,000 eggs would be a large one costing upwards of £200 to construct and entailing annual expenditure of £100 at least to operate. Would it not be much better and cheaper for all concerned if, by enlightening public opinion, sympathy with the poacher's outlook were no longer to be tolerated, and our people led to understand the vital importance of permitting fish to reach their spawning beds in good numbers for natural reproduction?

Here is another thought bearing on the problem. Assuming that the stocks

† With salmon the number of eggs per lb. of body weight is somewhat less, 400-600, on account of the larger size of the egg.

of fish in a given locality comprise equal numbers of males and females, then for such stocks to remain constant each female must produce during her lifetime at least two offspring which reach maturity. It has been estimated for some fisheries in this country that each female produces four such offspring, and of course the surplus can safely be removed without reduction of the stock in such a case. Conversely if too many fish are removed it is obvious that the balance of nature will be upset and that the stock will diminish.

To sum up, how are we likely to help best in developing to the maximum our valuable fisheries? The answer is, that public opinion must be roused against those indulging or attempting to indulge in illegal practices (especially during the close season) which, if permitted to expand, must inevitably result in the reduction of our fish stocks to a point where replenishment will be extremely difficult, if not impossible. It is true, that poaching can be combatted in fair degree by the efforts of competent water keepers, but something more is required. Our citizens must develop a full appreciation of their duties and responsibilities in respect of a great national asset; and, while themselves refraining from contraventions of the fishery regulations, they must firmly oppose all attempted infractions of them by persons less conscientious.

In some respects man's intervention can produce beneficial results. The destruction or rigid control of fish-eating birds and mammals, the reduction in numbers of coarse fish, the improvement of facilities for the migration of sporting fish, the opening up of streams in which such fish can spawn free from interference or the risk of drought—all these afford a field of positive development suitable for members of angling associations and others genuinely interested. It is not feasible to set out, within the limits of a short article, details of the *modus operandi* for such activities; but technical advice will be supplied in respect of any specified programme or proposal so far as commitments on the time of the Department's technical staff may permit.

At all events, it may be taken as certain that time and money intelligently expended in the manner indicated above will yield on the whole better results than those likely to accrue from similar expenditure upon the outfitting and maintenance of a hatchery of the type generally visualised by enthusiasts. It is not, of course, suggested that hatcheries for the propagation of salmon and trout are useless. On the contrary, given suitable conditions and granted really expert management valuable results can be achieved by artificial propagation. What it is desired to stress is that far-reaching results of a really beneficial character cannot be expected from the operation of a fish hatchery unless and until all the factors tending to affect adversely, and in serious degree, the stock of the particular river or lake under consideration have been eradicated or, at least, minimised.