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THE IMPORTANCE OF FISH FOOD INSECTS IN TROUT MANAGEMENT[1]

By

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The State of Michigan has been hatching, rearing, and stocking fish in public waters since about 1872.

As long as two decades ago, it had become painfully apparent, to both sportsmen and conservation officials, that stocking alone was not yielding the desired results. In an effort to learn more about the reasons for the decline in sport fisheries and for the obvious failure of then-current stocking practices to meet demands, early in 1930 a technical branch was set up in the Fish Division of the State Department of Conservation, under the name of Institute for Fisheries Research. It was planned to staff this technical branch with professional biologists, civil and hydraulic engineers, fish pathologists or "veterinarians" and the like, and assign to them the task of finding out what happened to fish in our lakes and streams. Hatchery practices had already reached a satisfactory level of efficiency in Michigan; fish could be hatched and reared with fair success. It seemed obvious that the trouble occurred afterward--after the fish were planted out--so the newly-recruited technicians from the first directed their efforts to the open waters--streams and lakes--to find out how the fish lived their

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[1] - Approximate text of talk delivered to the Rotary Club of Scottville, Michigan, October 6, 1947.

daily lives at all seasons, and what unfavorable factors they had to meet--enemies, adverse physical conditions, too much competition for available food, sudden, epidemic diseases--and to devise methods and practices which would eliminate or reduce the effect of these adverse factors.

This was rather a large order--there was only a negligible body of proved information on stream and lake life to start with, for few people had cared, in the past, to slosh around in the cold and wet during the fall, winter, and spring in order to find out how fish lived. So, the first technicians had to more or less write the book as they went along.

One of the first of the factors detrimental to fish to attract their attention was the physical change that had taken place in many of our streams since "the good old days". Not that this hadn't been thought of before, but no one had felt able to do anything about it except on a small and inconclusive scale.

Any old-timer in the trout country could talk of how the streams had changed--how loggers had cleared down-timber from streams to make open channels for the spring drives, how lumbering off the pine had resulted in appalling erosion, so that once deep, cold, gravel-bottomed streams had filled with shifting sand and become broad, shallow, and warm in summer; how springs feeding the streams had choked with sand or failed with a falling water-table. How these sand-laden streams, cleared of snags and dead-heads, looked more like drainage ditches than the excellent trout streams they once were. How it seemed that the streams now had few holes for big fish to lie in, little gravel for them to spawn in, and but scanty protection and cover against enemies such as fish-eating birds and other predators.

A few private clubs had attempted what was then called "re-snagging"--the fastening of stumps and snags in streams in an effort to re-create holes and "hides" for trout. But so little water was thus treated that sound conclusions could hardly be drawn.

About this time, creation of the Civilian Conservation Corps suddenly made available for conservation work large amounts of labor and materials. Although the technicians were just getting started, and would have preferred to have a larger back-log of facts, they felt that the opportunity to try "re-snagging", or stream improvement, on a large scale should not be passed up. Standardized plans for hole-digging deflectors, for bank-covers, and for erosion-checking booms were drawn up, and their implementation entrusted to the CCC in the hope that at least some benefit might accrue to the streams.

Although it was pretty much of a cart-before-the-horse proposition, good did come of the work. Much of it, inevitably, was not too successful or permanent, but much of it was. A lot depended on the individual crew foreman. If he was a fisherman himself, possibly a former guide, his work was generally excellent. If he knew nothing of trout streams and fishing, and was just putting in time, results were often unsatisfactory. But I could take you, today, to quite a few streams where structures installed twelve to fifteen years ago are still in place and doing excellent work,--with shifting sand piled up and stabilized in bars covered with vegetation, deep holes and swift runs created, and the structures themselves weathered to a natural, unobtrusive appearance.

The Fish Division's technical staff had never been too well satisfied with the emergency work, and kept up their investigations of stream conditions, fishing pressure, and trout requirements. Fish were marked, released, and recovered over several-year-long periods to study survival and growth of both wild and hatchery-reared fish; spawning was observed and reproductive rates calculated; efforts were made, by studying trout feeding habits and natural food available, to figure out the trout-supporting capacities of various streams.

In 1939, a field experiment station was built on Hunt Creek, in Montmorency County, to facilitate observations and experiments at all seasons of the year. It was a place to find out facts, and to test new methods on a small scale to determine if they were worth applying all over the state. To start with, the experimental section of Hunt Creek, over five miles of stream including tributaries, was worked intensively until we had a very accurate idea of the standing population of fish, the total amount of insect life, and the annual catch by anglers. After three years spent in determining the normal, natural conditions of the streams, improvement devices were installed. After another three-year period had elapsed, we were able to demonstrate that the legal-size trout population of the improved section had increased in numbers by 130 per cent, despite an ever-increasing fishing pressure. No fish were planted from other sources throughout the six-year period.

Part of this increase, we believe, was due not so much to creation of better pools and "hides" as to increased production of natural food. Fish need food, shelter, a chance to reproduce their kind, and protection from enemies. The food supply is more frequently the limiting factor in our waters than any other. We have unmistakable evidence, acquired over many years and from a wide variety of lakes and streams, that an inadequate food supply is the most common cause of poor fishing quality, in lakes and streams alike. At the experiment station, we tried to design structures which would improve conditions, not only for the fish, but for the insects on which they primarily subsist.

The war caused serious disruption of our work, as it did that of everyone. Practically all of us on the technical staff were in uniform, from three to five years. Now that men and materials are again becoming available, the division has set up a separate branch to do nothing but install stream improvement structures, embodying the results of our still-incomplete knowledge.

Our engineers can now design structures that are very effective in combatting erosion, in creating holes and shelter, and in withstanding the effects of ice-action and floods. Our greatest lack of knowledge is regarding the insects,--the food organisms,--on which the trout depend almost entirely for nourishment.

It must be obvious that a stream can support only as many fish as it has food for. A cattle-feeder knows within a matter of pounds how many bushels of feed will be required to bring a steer to the finishing-out point; the rancher can estimate with great accuracy how many head of cattle his pasture will support. But in our case, we know so little, actually, about the stream insects, we hardly know whether we're feeding corn or rag-weed seed,--whether we are pasturing our trout on good grass or Canadian thistles.

Some things we know, of course, in a general way,--we know not all insects are equally nutritious, ounce for ounce; some insects appear to be definitely unpalatable, and others are so securely hidden away among the stream bottom materials that feeding trout rarely find them; still other insects are most abundant in the streams at seasons when the fish are feeding little if at all.

When we know which insects are most desirable, and what their own requirements are, we can then make our stream improvement devices serve an additional, and very fundamental function,--that of greatly increasing food production, and thereby increase still further the number of trout a given stretch of water can support.

My own work this summer on the Pere Marquette has been exclusively with these stream insects,--trying to find out what kinds there are, where they live in the stream, at what seasons they are available to the fish, both as aquatic nymphs and larvae, and as adults on the wing.

It is not an easy task. Since the middle of May I have had a temporary laboratory set up in a cottage on the river just south of Baldwin. In the gravel riffle in front of this cottage I have so far found 30 different kinds of stoneflies; 46 kinds of mayflies; and 68 kinds of caddisflies. In addition, there are over two dozen varieties of midges, as well as several species each of deerflies, craneflies, blackflies, hellgrammites, and dragonflies. All told, there are probably 200 distinct and separate species of insects in the Pere Marquette system. Some of them occur abundantly in trout stomachs, others scarcely at all. Some are desirable plant-and-muck feeders, others are carnivorous, and so compete for food with the trout. Some are so inaccessible trout rarely find them. Some "hatch" all at once, others "hatch" off and on all summer long. Some, strangely enough, "hatch" in the middle of winter.

My work is to find out (1) what kind of insects we have; (2) determine by stomach examinations what ones appeal most to fish; (3) learn the life-cycle and requirements of the desirable ones, so improvement devices can be designed to favor them.

So far, I've spoken only of the bearing our insect surveys have on stream improvement and the goal of increasing the numbers of trout by increasing their food supply. There are other practical applications: most of our insects have been described, and named, only from the adult, winged stage; but when we are determining fish food supplies we work almost wholly with the immature, aquatic stages, which we can recognize only in a general way. I am rearing out these immatures and associating unknown nymph or larva with known adult (many, we find, have never been described at all). I am finding out when they "hatch". It is planned to publish a sort of handbook, with many illustrations, which will enable fishery workers and sportsmen alike to recognize the various fish food insects, and to learn where they live, when the adults "hatch", and how useful they are to fish.

It is my firm belief that such information will prove of much utility to professional fishery workers as well as to sportsmen, by enabling the latter to more or less foretell when given types will "hatch", and by giving fly-tiers pictures of naturals to imitate,--and by making it possible for our divisional staff to increase fish food production and so make stream improvement even more beneficial than it is now.

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