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INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

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Report No. 1266

Returns on Trout Plantings in Michigan

By

Gerald P. Cooper

Abstract

This report was part of a symposium on the general subject of returns from plantings of hatchery trout, on the program of the annual meetings of The American Society of Ichthyologists and Herpetologists, Salt Lake City, Utah, June 20, 1950. The report is purely a compilation of information from publications by other staff members of the Institute--a list of references is given at the end. It is not intended for publication.

Michigan is planting about a million legal-size trout for its million anglers about one-sixth of whom fish for trout. These trout cost about 50 cents apiece to plant. A long series of test plantings (since 1937) combined with intensive creel census have shown the following to be generally true: Intensive plantings of legal trout will contribute around 25 percent (sometimes up to 50 or 60 percent) to the total anglers creel--75 percent comes from wild stock. Fall plants of legals in streams give very poor returns, as compared to spring plants from which one-quarter of the brooks and rainbows and one-eighth of the browns are recovered, on the average. Planted legals are present in the stream only for the first few weeks; they disappear rapidly. No great advantage has yet been demonstrated for scatter planting over spot planting. At 50 cents to raise, and with returns

of one-quarter to one-eighth of the fish planted, each hatchery fish in the anglers creel costs $2 to $4. There is much need for clear thinking on relative values, and no doubt there are great possibilities for improvement of hatchery fish.

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The importance of this subject in Michigan is readily appreciated by reference to a few statistics. In 1949, as an example of recent years, the State sold a total of 1,101,872 general fishing licenses (resident plus non-resident), and of these persons, 182,058 paid an extra $1 for a trout stamp for the privilege of fishing for trout in inland waters. During the same calendar year the state hatcheries propagated and planted the following numbers of trout (brooks, browns, rainbows, and lake trout combined): 813,700 fingerlings, 170,250 sub-legals, and 1,067,999 of legal size. At this point, we are most interested in the million legal-size fish, since they are of major significance in the stocking program, both from the standpoint of cost in production and of returns to anglers. A rather close estimate of the cost of these million legal-size fish planted in the stream is 50 cents apiece. In other words, something in the neighborhood of one-half million dollars a year of sportsmen's fishing license money is being spent on trout propagation.

Historically, the figures of 1949 may be somewhat misleading. During the recent two decades there has been a great increase in the sale of fishing licenses, and a corresponding considerable increase in the trout cultural effort, although the increase in cultural effort has not kept pace with that of environmental improvement, research, and fishing site

acquisition and maintenance. The recent increase in trout cultural activity is reflected, not so much in the numbers of trout produced, but in the great change in emphasis from fingerling fish to fish of legal size (over 7 inches)--cf., 232,000 legal trout planted in 1937 increased to over one million in 1949.

The change in emphasis from trout fingerlings to legals has been dictated by the results of numerous test plantings. At the start, members of the Conservation Commission were influential in pointing out the need for research on the returns which were being obtained from trout plantings of various sizes, species, and at different seasons. The entire staff of the Fish Division, including fish culturists, administrative personnel, and research staff, have cooperated in good harmony in making such studies over a period now of about 14 years--1937 to date. These test plantings of trout have been planned, the evaluations by creel census have been supervised, and the results summarized in a series of papers, principally by A. S. Hazzard and D. S. Shetter, with a summary also given in the article "For Better Fishing" by F. A. Westerman and A. S. Hazzard. A series of test plantings, in a newly established trout research station on the Pigeon River in Otsego County, is being supervised principally by E. L. Cooper, and results for the first season are summarized in a report as yet unpublished. These numerous test plantings of trout, conducted since about 1937, have compared the returns to anglers of hatchery plantings: of fingerling trout versus legal-size trout (of 7 inches), of fall versus spring versus open-season (generally the last Saturday in April to Labor Day) plantings, spot versus scatter plantings, etc., for brook, brown, and rainbow trout. These studies have been made on certain test waters, and at the Hunt Creek Trout Experiment Station in Montmorency County since 1939, the Rifle River Area in Ogemaw County since 1946,

and the Pigeon River since 1949; included were many of the best trout waters in the state, especially in the northern half of the Lower Peninsula. The typical experiment has involved the planting of several hundred to a few thousand legal-sized trout, or up to many thousands of fingerlings, from hatcheries, where the fish were marked partly by numbered tags and partly by distinctive fin clipping. Then an organized creel census of the fishing was conducted, either as a partial census involving a large random sample of the fishing, or as a complete census during which practically all fishermen on a given stretch of water were contacted. Most of these censuses were carried out in the first few years by the C.C.C., later by Fish Division personnel. These censuses gave either estimates of the total returns to anglers from given plantings, or they gave close estimates of the relative returns to anglers of wild fish versus fish of hatchery origin, or relative returns from plantings made at different seasons or by different methods.

Following are a resume of the various experiments and a statement of general conclusions, reasonized mostly from the writings of A. S. Hazzard and D. S. Shetter, plus some unpublished conclusions by E. L. Cooper.

Some 15,000 finglering (3 1/2 inches - 6 inches) brooks, browns, and rainbows, marked by fin clipping and planted during 1936 and 1937 in five good trout streams, gave up to 1.6 percent returns to anglers, mostly within a year. Most of the several lots of fish which were involved gave less than 1 percent. Creel census and seining showed that there was practically no survival of these hatchery fingerlings beyond 2 years after planting. Likewise, other subsequent fingerling plantings, in streams which have abundant natural reproduction of trout, have given very low returns.

The Pine River, Lake County, was the location of the first series of test plantings, in 1937, of legal size trout--brooks and rainbows: 11,500 were

distributed among 4 monthly plantings during the open-season. A partial creel census showed that anglers recovered at least 19.8 percent of the 7,500 brooks and 17.5 percent of the 4,000 rainbows. Furthermore, planted fish constituted 46 percent of the total catch of brook trout and 21 percent of the catch of rainbows. On the 12 miles of test stream, 8,500 angler hours of fishing were recorded, and the weekly average catches per hour varied between 0.32 and 1.35 fish per hour. (For comparison, the State average catch per hour of trout from trout waters is about 0.7). These open-season plants of legal (8 to 10 inches) fish made a significant contribution to the catch. But there were some unfavorable aspects of the results: Planted fish contributed to the catch for only about 2 or 3 weeks. Thus higher fishing quality was not continously maintained by the monthly plants. Practically none survived to the following season. Scatter planting did not give noticeably better returns than spot planting.

An unusual result which seemed to be borne out by the data was that each planting of hatchery fish stimulated a decided rise in catch rate of wild fish, presumably because the presence of the hatchery fish caused the wild fish to be more active and more susceptible to capture. This is an intriguing idea, worthy of further intensive investigations, because very important implications could be involved. A close scrutiny of the data in Hazzard and Shetter (1939, Figures 2 and 3) still leaves some doubt in the matter. Stocking in the Pine during 1937 was at a heavy rate, and the question at this point is what stocking rate might be employed without having an undue effect (if any) on the catch of native fish.

Test plantings of legal-sized brooks, browns and rainbows were continued during 1938 and 1939 on the Pine plus four other streams. About 15,000 marked fish, in periodic plantings during fall, spring, and open-season, gave highly

variable returns. Fall plants of fish to be caught the following year gave very poor returns of only 1 to 4 percent. Spring and open season plants gave 4 to 8 times as good returns, averaging about 25 percent for brooks and rainbows and 13 percent for browns. Planting rate in the Pine River (an average width of 50 feet) was reduced from about 250 fish per mile in 1937 to about 100 per mile in 1939. In the latter year the hatchery plants did not appear to stimulate increase in catchability of native fish. Also, stocking at the less intensive rate gave a higher rate of return, although the fact that the 1939 census by Department employees probably was more complete could account for some of the difference. Stocked fish in the test streams of 1938 and 1939 made up about 25 to 30 percent of total creels, on the average. There was no clear-cut benefit from scatter plants over spot plants. The plants benefited only one-eighth of the fishermen (only these caught hatchery fish). Most returns came in the first two weeks for brooks and within the first 4 weeks for rainbows and browns.

A series of test plants during 1941 and 1942 on six newly selected trout streams, testing fall versus spring plants of 17,000 brooks, browns, and rainbows gave quite consistently twice as good returns from spring plants (15 percent) as compared to fall plants (7 percent). There were almost no carryovers into the second season after planting. Browns have given the best carryover of the three species. No consistent benefit was evident from the scatter plants versus spot plants.

Monthly plants totaling 4,500 legal trout (300 to 400 per acre) in 2 miles of the Pigeon River in 1949 gave returns of 40 percent for brooks, 45 percent for rainbows, and 26 percent for browns. These fish, at an estimate average cost of about $1.25 per creeled fish, made up 60 percent of the total

catch of trout for the season by 2,233 angler trips representing 283 angling hours per acre (Cooper, 1950).

Test plantings of 14,000 legal rainbows in 5 small, good trout lakes during 1935 to 1939 gave recoveries of 14 to 66 percent, average about 40 percent. Numerous other plants of 7- to 9-inch rainbows in lakes have given equally good returns. Legal-size brook trout planted in suitable lakes gave high recoveries, ranging in 6 tests from 14 to 88 percent, average about 60 percent, and somewhat better recoveries from spring plants than fall plants.

The foregoing may be summarized as follows: Fingerling trout planted in good trout streams, where there is abundant natural reproduction, contribute almost nothing to the catch of legal fish, apparently because such streams are constantly "seeded" to the maximum. Plants of legal trout, at 100 to 400 to the mile of stream, in good trout waters, will contribute around 25 percent of anglers' catches; and of the fish planted one-quarter of the brooks and rainbows and one-eighth of the browns are recovered. Plants contribute to the catch mostly for the first two weeks, practically not at all after the first season. Mortality after planting is so fast that legal fish planted in the fall are mostly gone before the fishing season opens the following spring. No great advantage of scatter planting over spot planting has been demonstrated. There are important species differences among brooks, rainbows, and browns. The brook trout, most easily caught, gives the greatest rate of returns and is gone in the shortest period of time. Browns give by far the lowest returns and more frequently carry-over for two or three years. At 50 cents to raise, and with returns at the rate of one-quarter or one-eighth, legal hatchery trout in the anglers creel cost $2 each for brooks and rainbows, and $4 each for browns--cf., the resident trout license costs $2.50. Only

about one trout fisherman out of nine catches any hatchery trout, and it can be calculated roughly that each trout fisherman who does catch any hatchery trout gets about $20 worth on the average.

Trout plants in certain suitable lakes give better returns than in streams, partly because of longer survival and a greater growth increment in the lake, especially where there is no opportunity for natural propagation.

One can not do this subject justice without considering the matter of values, the interests of fishermen, and the whole economics of the "trout country." In fact, it seems to me, the philosophical and economic aspects of the question are as important as the biological, if not more so. Whether we, as fishery biologists, should pose as authorities on the entire subject, or call upon outstanding economists and philosophers for assistance, is a significant question.

In a democratic approach to this question, the fisherman is "king," and fishery biologists are his "public servants." How base his desires, or how crude and selfish his methods, are no especial concern to Department employees, except that our conservation officers are elected to keep everybody toeing the same line so that no one has any special advantage. But the fisherman ought to know what he wants, and presumably he must enjoy what he wants when he gets it. Our job is to try to give him what he wants (whether pigs on the end of a rope, or a scrappy little brightly colored fellow on a fly rod, or perhaps a pig on a fly rod), or is it? I don't profess to know the answer. But the correct answer is the basis to the whole question of trout planting. And it seems to me that most fishery biologists who have written on this subject during the past 20 years have become idealists whose analysis

of the subject is considerably influenced by personal feelings and whose philosophy may not be in agreement with that of the majority of anglers. Is it one of our responsibilities to convert the hoi polloi to a finer appreciation of values, or should we merely work at satisfying their professed desires? The answer, which perhaps should be left up to the fisherman, is again of great significance.

Pursuing a little further the interests of the angler: Those trout fishermen (perhaps the majority) who spend from $25 to $100 on gear, clothes, transportation, meals and lodging for a few days of fishing, the obvious climax of which is having a trout or two on the line, are, I believe, not at all impressed by the fact that a given trout costs the State $3, especially when it costs him $50. That fish is worth a lot more than $3 to him, especially to his ego. His philosophy perhaps would be for a more equal division of the costs of fishing (between himself and the State). But on the other hand, costs are not a major issue to the trout fisherman, provided that he has a sporting chance to catch one of the trout. There would be no point in telling fishermen that half of them can't catch trout because they don't know how to fish, albeit a fact; for human ego will not tolerate that kind of treatment. Rare, I'm sure, is the trout fisherman who thinks, or who could be convinced that he doesn't have a chance to catch a planted trout.

Another important aspect of the problem is the possibility of greatly improving the hatchery product. Granted that hatchery trout are poor resemblances of their wild brothers, perhaps this need not be so. Take the fact that legal-sized trout, especially brooks, survive in natural waters less than a year after planting, while in the same stream many wild brook trout will live to be much older. There is something wrong with these hatchery fish, either burnt out

physiologically by forced growth, or they don't know how to find food, or some other shortcoming, any one of which probably could be corrected. There must be untold possibilities of improving the condition of hatchery trout through the approach of nutrition. Yet in the Michigan Fish Division, where half a million a year is spent on fish culture, there is only one man who is technically trained as a fish nutritionist and his work is now mostly administrative. The situation is not much different in other states.

Although the general picture of returns from trout culture does not appear very favorable at present, it seems to me that a positive program is called for rather than a negative one. With an increasing number of fishermen, more time to fish, and more money to throw around, there will always be a demand for trout plants, or for some application of cultural methods to natural waters. There is tremendous opportunity for improvements in techniques, and there are prospects of fish culture making a significant contribution. When extensive plantings of legal trout in good trout streams contribute 25 percent to the total catch, the 75 percent natural production is the obvious significant fact, but we should not overlook the implications to be drawn from the 25 percent. If this much of a contribution can be made to trout angling on an extensive scale by the fish produced in an insignificant acreage of hatchery water, the still undeveloped possibilities seem great.

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