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SUCCESS OF PLANTINGS OF FINGERLING TROUT IN MICHIGAN WATERS AS DEMONSTRATED BY MARKING EXPERIMENTS AND CREEL CENSUSES

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Introduction

Since the fall of 1936 several marking experiments have been initiated to learn more concerning the survival of hatchery-reared trout fingerlings in natural waters. These experiments have continued through at least one open trout season in the various waters of the state. Certain of them have yielded sufficient information to permit the formulation of tentative conclusions. The experiments will be briefly discussed in the following paragraphs.

Discussion of Data

North Branch of the Au Sable River.-- A planting of 9,778 brook trout fingerlings averaging 3.5 inches (total length) was made in the North Branch of the Au Sable River in the region of the Twin Bridges on October 13, 1936. The fish were marked by entirely removing the dorsal and adipose fins with a pair of La Crosse manicure shears. One hundred and ninety fin-clipped fingerlings from the

same lot as that which was planted were retained at the Grayling Hatchery in the same pond with 105 normal brook trout fingerlings to serve as a control. The normal fish were from the same stock as those which were fin-clipped and were of the same average size. All control fish were measured at intervals (Table 1) and observed for regeneration of fins.

The survival of the marked brook trout fingerlings released in the North Branch of the Au Sable was studied in two ways. The first method was tabulating the number of marked and wild brook trout taken in seine hauls at six different intervals after the planting. Collections were made not only at the point of release but also for considerable distances upstream and downstream from that point. The data thus obtained reveal a considerable progressive decline in the number of marked brook trout taken per seine haul from November, 1936, to November, 1938, when no marked fish were taken (Table 2). The increase in the ratio of marked fish to the wild fish in November, 1937 over the same ratio for September, 1937, may have been caused by the concentration of sexually mature marked fish on the spawning beds where they were easily seined.

The second method of studying the survival of the marked brook trout fingerlings was by means of an intensive creel census operated during the 1937 and 1938 trout seasons. Creel census clerks stationed at strategic points above, at, and below localities where the marked fish had been released, approached anglers and examined their catches for marked brook trout while they secured the usual census data. Records of marked fish taken by fishermen in the legal catch were very few; three marked brook trout were reported in 1937, none in 1938.

TABLE 1. MORTALITY RECORDS AND LENGTHS (IN MILLIMETERS) OF NORMAL AND FIN-CLIPPED BROOK TROUT FINGERLINGS HELD AT THE GRAYLING HATCHERY

Date of examination	Fin-clipped trout			Normal trout			Progressive mortality (per cent)	
	Number	Standard length	Total length	Number	Standard length	Total length	Fin-clipped	Normal
October 18, 1936	190	...	89	105	...	89	0.0	0.0
July 6, 1937	162	135	160	105	132	155	14.8	0.0
March 26, 1938	121	203	235	79	198	229	36.4	24.5
October 21, 1938	123	250	293	77	242	285	35.3	26.7

TABLE 2. RATIO OF MARKED BROOK TROUT TO WILD BROOK TROUT IN THE NORTH BRANCH OF THE AU SABLE RIVER, NOVEMBER, 1936, TO NOVEMBER, 1938, AS DETERMINED FROM SEINE HAULS. (TOTAL LENGTHS ARE GIVEN IN MILLIMETERS; FIGURES IN PARENTHESES INDICATE NUMBER OF SPECIMENS USED TO OBTAIN AVERAGES.)

Collection dates Month	Year	Number of seine hauls	Wild brook trout Total number[1]	Wild brook trout Average size	Marked brook trout Total number	Marked brook trout Average size	Average number of wild brook trout per haul	Average number of marked brook trout per haul	Ratio of marked to wild individuals
November	1936	48	599	...	166	...	9.08	2.52	1:3.6
February	1937	124	229	...	51	...	1.85	0.41	1:4.4
July	1937	49	290	160 (216)	20	162 (18)	5.92	0.41	1:14.5
September	1937	35	477	165 (165)	5	148 (3)	13.63	0.14	1:95.4
November[2]	1937	79	825	184 (158)	27	184 (15)	10.44	0.34	1:30.6

[1] In November, 1936, and February, 1937, only fingerling fish were counted. In July, September, and November, 1937, all brook trout were counted except those obviously hatched in the spring of 1937.

[2] Seinings were also conducted October 26-31, 1938. No detailed records were kept on legal trout per haul, but in approximately 1,000 legal brook trout (178 mm. or over) no fin-clipped brook trout were found.

The fin-clipped brook trout held at the Grayling Hatchery suffered a mortality of 35.3 per cent from October 18, 1936, to October 21, 1938 (Table 1). During the same period the mortality of the normal (unclipped) brook trout in the control pond was 26.7 per cent. At all times the marked fish in the hatchery pond were readily distinguishable from the unmarked fish. Partial regeneration of dorsal fins occurred in a few individuals, but never became so extensive as to lead to confusion with unmarked specimens. All fin-clipped fish observed in the North Branch of the Au Sable River during the seining operations were easily separable from the normal (and presumably wild) brook trout. Measurements on the clipped and unclipped fish which were held at the hatchery indicated that the clipping operation had no influence on the growth (Table 1).

Canada Creek.--On April 28, 1937, a planting of 500 advanced brook trout fingerlings was made in Canada Creek. These fish, whose average total length was 5.5 inches, were marked with the fingerling tag around the lower left jaw (Shetter, 1936). An intensive creel census was operated on Canada Creek during the 1937 and 1938 trout seasons. None of the jaw-tagged brook trout entered the catch of legal fish during the 1937 season, but 133 or 26.6 per cent of the total number planted were reported as captured and released at some time during that period. It is possible that some of these undersized tagged fish were caught more than once during 1937.

During the 1938 trout season five of the tagged fingerlings planted in 1937 were reported to the census clerks and three were reported by mail from stream areas not covered by the creel census. Thus, a total of eight fish, or 1.8 per cent of the original planting

came into the catch of legal fish. A control experiment on this particular planting could not be set up because of lack of pond space. Consequently it is impossible to predict the possible loss of tags from fish or the mortality caused by the tagging operation. It is probable that few, if any, of the spring planting of 1937 will be recognizable as hatchery trout during the 1939 season. Most of the survivors should have grown by that time to such a size that their jaws will be too large for the small tag (Shetter, 1936).

One thousand fingerling brook trout averaging 4.0 inches in total length were fin-clipped and placed in Canada Creek on October 26, 1937. None of these fish was recorded during the 1938 creel census, either as an undersized or as a legal fish, nor were any reported caught in a fish weir which was operated in this section of Canada Creek from January 1-December 31, 1937 (Shetter, 1938).

South Branch of the Pine River.--A planting of 496 jaw-tagged brook trout fingerlings averaging 5.5 inches in total length was distributed on October 6, 1936, in the South Branch of the Pine River and its tributaries. An intensive creel census on this stream during the 1937 trout season yielded records of three tagged fish of legal length, representing 0.6 per cent of the total planted. In addition, four tagged brook trout which were less than legal size were reported. Therefore, a total of seven fish, or 1.4 per cent of the original planting is known to have survived the winter of 1936-1937. None of the tagged brook trout released in the fall of 1936 in this stream was reported in the 1938 creel census on the South Branch of the Pine River.

On September 10, 1937, another planting of ninety-eight jaw-tagged brook trout averaging 4.6 inches in total length was made in the South Branch of the Pine River. None of the fish from this release were reported taken during the 1938 trout season.

Perry Creek.--One hundred ninety-seven jaw-tagged rainbow trout fingerlings were released on October 7, 1936, in Perry Creek, a tributary of the Main Au Sable River. The average total length of these fish was 5.9 inches.

One thousand fin-clipped brown trout fingerlings whose average total length was 3.5 inches were planted in Perry Creek on November 5, 1937. No reports of captures of either marked brown or rainbow trout from these plantings have been received to date. It was not possible to conduct a creel census on this stream.

Clancey Creek.--On November 10, 1937, the following planting of fin-clipped trout fingerlings was made in Clancey Creek, a tributary of the Little Manistee River: 468 rainbow trout (average total length 4.8 inches); ~~461~~ 541 brook trout (average total length 6.0 inches); and 506 brown trout (average total length 4.0 inches). The 1938 creel census on the Little Manistee River (which included the lower portion of Clancey Creek and the Little Manistee River for approximately a mile above and below the mouth of Clancey Creek) contained reports of the capture of five fin-clipped rainbow trout among the catch of legal rainbow. No fin-clipped brook or brown trout were recorded. These five rainbow trout represent a return of 1.07 per cent of the total planting of that species released in Clancey Creek.

Lake Charlevoix.--Five thousand fin-clipped rainbow trout fingerlings were planted in the South Arm of Lake Charlevoix on October 25, 1936. These fish averaged 3.9 inches total length at the time of release.

One recovery from the planting has been received to date, although no creel census has been conducted on this body of water because of the expense that would have been involved. Additional returns from this experiment may be expected for at least two more years.

Summary and Conclusions

The releases of marked fingerling trout have been summarized in tabular form (Table 3). It may be seen that returns have been received in five of the eleven experiments, but in no experiment have the returns (in the form of legal fish) been greater than the 1.6 per cent of the total number of fingerlings planted.

Although insufficient data are available to determine the most successful size of fish to release and season at which to plant, the spring planting of advanced brook trout fingerlings in Canada Creek resulted in the highest return in legal brook trout.

Returns were obtained from two of the three releases of marked rainbow trout fingerlings, all of which were planted in the fall of the year. The percentages of survival varied from 1.07 in the Little Manistee River to 0.02 in Lake Charlevoix.

No returns have been reported for any of the marked brown fingerlings. All were planted in the fall.

Two sources of possible error in these experiments are recognized. There may have been mass migrations of marked fingerlings away from the areas where they were released. Anglers and creel census clerks may have failed to recognize some of the marked fish, especially the fin-clipped trout. However, it seems unlikely that any large number of brook trout moved very far away from the localities of release. Such migrations would be contrary to what is known of the

TABLE 3. SUMMARY OF RESULTS OF MARKING EXPERIMENTS

INVOLVING FINGERLING TROUT IN MICHIGAN WATERS

River or lake	Date of release	Species of trout	Number released	Average total length (inches)	How marked	Caught[1] in 1937	Caught in 1938 (all legal)	Percentage of recovery
North Branch of the Au Sable	October, 1936	Brook	9,778	3.5	Fin-clip	3-0	0	0.03
Canada Creek	April, 1937	Brook	500	5.5	Tag	0-133	8	1.60
	October, 1937	Brook	1,000	4.0	Fin-clip	...	0	0.00
South Branch of the Pine	October, 1936	Brook	496	5.5	Tag	3-4	0	0.60
	September, 1937	Brook	98	4.6	Tag	...	0	0.00
Perry Creek[2]	October, 1936	Rainbow	197	5.9	Tag	0-0	0	0.00
	November, 1937	Brown	1,000	3.5	Fin-clip	...	0	0.00
Clancey Creek	November, 1937	Rainbow	468	4.8	Fin-clip	...	5	1.07
	November, 1937	Brook	541	6.0	Fin-clip	...	0	0.00
	November, 1937	Brown	506	4.0	Fin-clip	...	0	0.00
Lake Charlevoix[2]	October, 1936	Rainbow	5,000	3.9	Fin-clip	0-0	1	0.02

[1] First column shows number of legal trout, second column shows number of undersized trout.

[2] No creel census was conducted on these waters.

movements of wild brook trout in the North Branch of the Au Sable River. Earlier tagging studies (Shetter, 1937) have demonstrated that the brook trout population is relatively sedentary in this stream. Only two records of downstream movement out of the North Branch have been secured, and a very large percentage of the marked brook trout were recovered during summer and fall in the same stream localities in which they were seined and tagged. Furthermore, anglers and creel census clerks have been well instructed concerning the presence of marked trout in the public waters of the state. The marking experiments have been widely publicized through newspaper articles and through streamside posters displayed wherever marked fish were released. The nature of the experiments in progress was carefully explained to all creel census clerks before the opening of each trout season and the men were shown samples of tagged and fin-clipped trout. It is believed therefore that no significant number of marked fish caught were unreported. This conclusion is supported by many personal interviews conducted by the author during the past two summers on the experimental streams which have failed to yield a single additional return. Mr. Howard McCann, who fishes the North Branch of the Au Sable River regularly, stated that he did not take any fin-clipped brook trout during 1937 or 1938, nor did he hear of the capture of any fin-clipped brook trout other than those recorded. Because of his wide acquaintance with many of the anglers who fish the North Branch, Mr. McCann should have heard of any large catches of marked brook trout.

Other investigators who have attempted to determined the success of fingerling trout plantings have had results quite similar to those presented for Michigan trout waters. Surber (1937), working on

Big Spring Creek in West Virginia, recovered 6.0 and 1.5 per cent, respectively of 1,080 and 2,160 marked rainbow trout fingerlings (average total length 4.0 inches) planted during the falls of 1934 and 1935. This stream was privately owned and all fishing was controlled. Needham and Cliff (1938) reported that sixty-eight legal brook trout were captured from Fish Lake in the Umpqua National Forest, Oregon, during the 1937 creel census on that body of water. Stocking records for Fish Lake show that 20,000 brook trout fingerlings were planted in both 1935 and 1936. If these figures may be interpreted to mean that the entire catch of brook trout resulted from the 1935 stocking, the survival percentage is 0.34. If the sixty-eight legal brook trout are assumed to have been the result of the total number of fingerling brook trout planted, the survival percentage is only 0.17.

Although no data are yet available which demonstrates the best size of fingerling trout to plant, or the more advantageous season in which to plant them, all of the experimental evidence thus far presented points toward the inevitable conclusion that the planting of fingerling trout in the waters studied to date have resulted in a negligible return to the fishermen. Before the percentage of planted trout fingerlings surviving to the anglers' creel is accurately known, further intensive studies are needed on streams with varying amounts of natural reproduction. A more wide-spread use of the "test stream" such as established by Vermont (Lord, 1935), Pennsylvania (French, 1938) and West Virginia (Surber, loc. cit.) should provide excellent experimental conditions for such studies, and also for researches on closely allied problems. No matter where or how such experiments are conducted, the cooperation of the fishermen in reporting their

catches must be secured, since the number of legal fish which they hook or creel is the final measure of the success of any chosen plan of stocking.

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