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FISH DIVISION

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Report No. 1469

INVESTIGATIONS DURING 1955 ON BROWN TROUT IN A PART OF BALDWIN RIVER,
LAKE COUNTY¹

By Edward E. Schultz²

Introduction

During 1953 and 1954 an experiment was conducted on survival of sub-legal hatchery brown trout in the Baldwin River, Lake County (Schultz, 1954). On October 14, 1953, 1,481 hatchery-reared trout were released in the river. These fish were marked by amputation of the right pelvic and adipose fins. The following summer two collections were made with a direct-current electric shocker to see how many of the clipped fish could be recovered as compared to wild fish of the same age group. The numbers of marked fish in the different collections were too variable to permit reasonable conclusions. Therefore plans were made to repeat the experiment during 1955 with techniques that promised to yield more conclusive information.

¹ Part of the field work, analysis of data, and preparation of the report were undertaken with Federal Aid to Fish Restoration funds under Dingell-Johnson Project Number F-2-R.

² The field crew in June consisted of Fisheries Technicians Donald C. McNaught and Eugene B. Welch, and the author. These men together with District Fisheries Supervisor Edward H. Andersen and Fish Area Biologist Donald R. Peterson did the collecting in September.

Field procedures in 1955

In preparation for the 1955 studies, a trout population estimate (by the mark and recapture, or Petersen, method) was made during the fall of 1954 on a study section of the river near the Chesapeake and Ohio Railroad bridge. Also, during the fall of 1954, 1,073 sub-legal wild brown trout and 1,075 sub-legal hatchery-reared brown trout were jaw tagged and released at the bridge. Details of this work done during the fall of 1954 are given in Institute for Fisheries Research Report No. 1407.

Before the opening of the trout season on April 30, 1955, District Fisheries Supervisor E. H. Andersen placed 50 printed posters at access points along six miles of the Baldwin River to inform anglers of the presence of tagged trout. The posters told the location of the tag on the fish, what information was wanted if a tagged fish was caught, and to whom the information should be sent. To date there have been 60 tag returns from anglers.

From June 17 through June 25, 1955, a three-man crew collected trout with a D. C. shocker in Baldwin River from the confluence of this stream with the Pere Marquette River (T. 17 N., R. 13 W., Sec. 16) to a point about five miles upstream, near the M-37 highway bridge (T. 17 N., R. 13 W., Sec. 10). All captured brown trout between 4 and 10 inches in length were examined for jaw tags. When a tagged fish was found, the tag number, total length, date and location of capture were recorded. All fish were released within a few feet of the point of capture. An aerial photo was used as a record of ^{the} locations on the stream. Fifty-seven tagged fish were recorded, and scale samples and lengths were taken from 89 untagged wild brown trout.

On September 12 and 13, 1955, a second population estimate was made in the study section at the Chesapeake and Ohio Railroad bridge. Pro-

cedures used in shocking, fin-clipping, releasing and recording of recaptures duplicated those followed in 1954 (I.F.R. Report No. 1407). Sixty-eight tagged fish were recorded while making the population estimate; also 38 additional trout that had apparently lost their jaw tags were captured.

Population estimates

Using the formula of LaPlace ($N = \frac{nT}{t}$, in which N equals the unknown population; n, the number of fish captured in the second collection; T, the number of fish captured and fin-clipped in the first collection; and t, the number of fin-clipped fish captured in the second collection), population estimates were calculated for brown and rainbow trout in the study section. Although the rainbow trout is not involved in the present survival study, this species is included in the tables because it occupies living space in the stream and thereby presumably competes with the brown trout.

Population estimates were made on a second section of the stream at the public fishing site in both 1954 and 1955. The numbers of trout captured and recaptured in this section of stream have been too small to give reliable estimates and therefore have not been used in this report. However, the figures have been included in the tables as a matter of record.

The trout recorded in the tables have been divided into three size groups to show the abundance of each group. Further division would not leave a sufficient number of fish in each group for population calculations.

It will be seen that the totals for population estimates in Table 1 are not simple additions of the three size groups. The total population numbers, for all sizes combined, were recalculated using LaPlace's formula and the actual numbers of fish shocked. That is, population estimates were

calculated by using the figures for the fish actually captured. Table 1 shows the results of the population estimates made in 1955. Three sets of population figures are given, namely, one for the study area, another on the basis of stream surface area, and a third on a stream mileage basis.

The population estimates of 1955 are compared with those of 1954 in Table 2. These figures show an apparent increase in the population of brown trout from 548 per acre in 1954 to 743 in 1955. The increase involved the two size groups of fish under 10 inches in length. The release of 1,073 sub-legal wild brown trout and 1,075 sub-legal hatchery brown trout near the railroad bridge in the fall of 1954 probably accounts for part of the increase.

Survival of tagged brown trout

The 2,148 tagged brown trout were released within a 16-day period during the fall of 1954 at a single point in Baldwin River. During 1955, 209 tagged fish were recovered and 14 of these were seen twice. That is, they were captured with the shocker, recorded and released, and later in the summer 2 were caught by anglers and 12 were captured a second time with the shocker.

Table 3 gives the number of tagged fish captured by the two methods. Anglers recovered 3.0 percent of the hatchery trout and 2.6 percent of the tagged wild trout. Recoveries by both angling and shocking amounted to 6.4 percent of the hatchery trout and 14.4 percent of the wild. Collecting results indicate that more wild brown trout survived than hatchery-reared brown trout, but anglers caught slightly more hatchery than wild fish.

The ratio of wild to hatchery trout increased in the two checks made in 1955. Although nearly equal numbers of both kinds of trout were released

Table 1. Fall population estimates of trout at two sites on Baldwin River, 1955

(Site No. 2, Chesapeake & Ohio Railroad bridge, 0.91 acres, 1,206 feet)

Species	Size group	Number of trout captured			Population estimates		
		First shocking	Second shocking	Recaptures	Study area	Fish per acre	Fish per mile
Brown trout	2.0 - 6.9	186	185	75	459	504	2,010
	7.0 - 9.9	89	113	51	197	216	862
	10.0 - 23.0	15	12	7	26	29	114
Total		290	310	133	676	743	2,960
Rainbow trout	2.0 - 6.9	344	346	121	984	1,081	4,308
	7.0 - 9.9	8	8	4	16	18	70
Total		352	354	125	997	1,096	4,365
All species total		642	664	258	1,652	1,815	7,233

(Site No. 1, public fishing site, 1.06 acres, 1,316 feet)

Brown trout	2.0 - 6.9	31	29	7	128	121	514
	7.0 - 9.9	29	25	12	60	57	241
	10.0 - 20.0	17	13	8	28	26	112
Total		77	67	27	191	180	766
Rainbow trout	2.0 - 6.9	22	20	6	73	69	293
	7.0 - 9.9	2	3	2	3	3	12
Total		24	23	8	69	65	277
All species total		101	90	35	260	245	1,043

Table 2

Comparison of population estimates made in 1954 and 1955

at two sites on Baldwin River

(Site No. 2, Chesapeake & Ohio Railroad bridge)

Species	Size group	Fish per acre		Fish per mile	
		1954	1955	1954	1955
Brown trout	2.0 - 6.9	348	504	1,524	2,010
	7.0 - 9.9	42	216	184	862
	10.0 & over	158	29	692	114
Total		548	743	2,400	2,960
Rainbow trout	2.0 - 6.9	226	1,081	902	4,308
	7.0 - 9.9	2	18	9	70
	10.0 & over	1	0	4	0
Total		229	1,096	915	4,365
All species total		777	1,815	3,315	7,233

(Site No. 1, public fishing site)

Brown trout	2.0 - 6.9	197	121	838	514
	7.0 - 9.9	11	57	48	241
	10.0 - over	9	26	40	112
Total		217	180	926	766
Rainbow trout	2.0 - 6.9	10	69	44	293
	7.0 - 9.9	5	3	20	12
Total		15	65	64	277
All species total		232	260	990	1,043

in the fall of 1954, eight months later there were 2.2 wild trout for each hatchery trout (Table 3). By the end of summer, 11 months after release, there were 4.7 wild trout for every hatchery trout. Further collecting is planned for 1956 to determine whether or not this trend will continue.

Growth rates of tagged trout

When first captured, the length, place of capture and tag number were recorded for all tagged brown trout. When tagged fish were recaptured, the tag number, length of fish, and place of capture were again recorded. Comparison of the increase in length of these fish with growth of a series of untagged wild brown trout, given in Table 4, shows the effect of the tags on growth. Because all tagged fish were of age group I, only wild trout of that group were used for comparison. Tagged fish, whether wild or hatchery-reared, increased 2.0 inches in length in the 8 months from October, 1954, to June, 1955. During this same period the untagged wild fish increased 2.7 inches in length.

Homing tendency

From the recorded information on tagged fish, it was possible to determine if the wild brown trout were returning to the point where they had been originally captured. Table 5 summarizes the homing records.

Brown trout captured downstream from the Chesapeake and Ohio Railroad bridge apparently tended to remain at the bridge where they had been released. The majority of those that moved returned to the place of original capture. Of the trout that were both originally captured and released at the bridge, slightly more went upstream than stayed at the bridge. None of these fish were found downstream from the bridge.

Table 3. Ratio of hatchery to wild brown trout captured by shocker and angling during 1955 from 1,075 hatchery trout and 1,073 wild trout tagged and released in October and November of 1954

Method of recapture	Date of recapture	Hatchery trout	Wild trout
D. C. shocker	June, 1955	18	39
Angling	May-Sept., 1955	32	28
D. C. shocker	Sept., 1955	12	56
Total recovered	1955	69	154

Table 4. Comparison of growth of tagged to untagged brown trout in Baldwin River, 1954 to 1955.

	Average length Oct.-Nov., '54	Average increment winter & spring	Average length June, 1955	Average increment during summer	Average length Sept, 1955	Total increment
Tagged hatchery fish	4.4	2.0	6.4	0.9	7.3	2.9
Number of fish	(30)		(18)		(12)	
Tagged wild fish	4.9	1.9	6.8	0.8	7.6	2.7
Number of fish	(95)		(56)		(39)	
Untagged wild fish	4.8	2.7	7.5	...	...
Number of fish	(1,073)		(45)			

Table 5. Homing tendency of tagged, sub-legal, wild brown trout in Baldwin River, Lake County, between the fall of 1954 and summer of 1955

Location of original capture of fish	Points of recapture						
	← Movement downstream			R.R. bridge, (Point of release)	Movement upstream →		
	Below home site	At home site	Above home site		Below home site	At home site	Above home site
Downstream of R.R. bridge	1	5	1	13	...	...	1
Captured at R.R. bridge	0	...	...	4	...	...	5
Upstream of R.R. bridge	7	...	...	13	7	10	0
Fish of hatchery origin	7 [✓]	24	...	...	16 [✓]

✓ Home site has no meaning for the fish of hatchery origin, so only the direction of travel from the release point is indicated.

Trout which were originally captured upstream from the bridge were inclined to move back upstream, although a large number remained at the bridge. Most of the fish that went upstream returned to the place where they had originally been captured, and none of them were found above that point. A few went downstream.

Most of the hatchery-reared brown trout remained near their point of release. Of those that did move, twice as many went upstream as downstream.

The number of trout involved in determining the homing tendency is quite small and therefore the results are inconclusive. From the limited data, it would appear that brown trout have a slight homing tendency but an appreciable number stay in the general area to which they are transferred. Trout released downstream from their point of capture seem to have the strongest tendency, of the groups mentioned, to return to the place in the stream from which they were removed. However, as shown by the hatchery trout and those captured at the bridge, if transferred brown trout move at all, the general inclination appears to be for them to go upstream rather than downstream.

INSTITUTE FOR FISHERIES RESEARCH

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MICHIGAN DEPARTMENT OF CONSERVATION

Summary of (Institute for Fisheries Research Report No. 1469)

INVESTIGATIONS DURING 1955 ON BROWN TROUT IN A PART OF BALDWIN RIVER,

LAKE COUNTY^{1/}

By Edward E. Schultz

March 22, 1956

Upon completion of studies on brown trout in Baldwin River during 1953 and through the summer of 1954, it was decided that further study was necessary with different techniques. A section of the river at the Chesapeake and Ohio railroad bridge was chosen for study. In the fall of 1954, a population estimate was made on this section. Then 1,073 sub-legal, wild brown trout, captured from the Baldwin River mostly outside the study area, were jaw-tagged and released at the bridge. Also released here were 1,075 jaw-tagged, hatchery-reared brown trout of comparable size and age.

During the summer of 1955, a crew^{2/} with a direct-current electric shocker captured 57 tagged fish. Anglers turned in 60 tags. Shocking during the course of the 1955 fall population study yielded 68 more tagged trout, making a total of 185 tag recoveries. Of this number 14 were recovered twice. In addition, 38 brown trout that had lost tags were captured.

The two population estimates for the study section indicated an increase of 195 brown trout per acre--548 per acre in 1954 to 743 per acre in 1955. This

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^{2/} The field crew in June consisted of Fisheries Technicians Donald C. McNaught and Eugene B. Welch, and the author. These men together with District Fisheries Supervisor Edward H. Andersen and Fish Area Biologist Donald R. Peterson did the collecting in September.

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increase was partly due to the 1954 planting. Rainbow trout increased from 229 per acre to 1,096 per acre during this same period. Most of this increase was in the size group of fish less than seven inches in length.

Recoveries reported by anglers during 1955 consisted of 3.0 percent of the hatchery trout and 2.6 percent of the tagged wild fish. The total recoveries, including those made with the shocker, comprised 6.4 percent of the hatchery trout and 14.4 percent of the wild trout. The ratio of wild fish to hatchery fish captured with the shocker was 2.2:1 eight months after the release, and 4.7:1 eleven months after release.

The presence of a jaw-tag apparently affected the growth rate of the brown trout. During eight months after tagging, both the wild and hatchery fish averaged 2.0 inches of growth, whereas untagged wild brown trout averaged 2.7 inches.

Tagged wild trout showed a slight tendency to return to the part of the stream where they had been originally captured, but nearly an equal number remained near the point of release. The tendency to return to the home territory was stronger in trout that had been captured upstream of the release point. Most of the hatchery trout that were recovered had remained where they were released. Of those that moved, twice as many went upstream as downstream.

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