Original: Lansing
cc: J. McKenna
Inst. for Fish. Res.
Education-Game
C. T. Yoder
E. H. Andersen
H. A. Westveer
D. S. Shetter
E. E. Schultz

abc

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

ALBERT S. HAZZARD, PH.D.
DIRECTOR

ADDRESS
UNIVERSITY MUSEUMS ANNEX
ANN ARBOR, MICHIGAN

December 31, 1954

Report No. 1407

INVESTIGATIONS ON BROWN TROUT IN A PART OF BALDWIN RIVER, LAKE COUNTY[1]

By

Edward E. Schultz

Introduction

Many comparative studies have been made on the value of planting streams with hatchery trout of various sizes. Investigations in Michigan and other states have indicated that the release of legal-length trout just before, and during, the fishing season have yielded the highest returns for the angler. Consequently, planting of fingerlings in streams in the fall has been discontinued. However, various experiments in the planting of fingerling trout continue in Michigan. Baldwin River in Lake County is one of the streams where results from fall planting of fingerling brown trout are being studied although the lack of blocking screens and a complete creel census limit the value of the test.

1953 fall releases and recaptures

On October 14, 1953 a total of 1,481 brown trout fingerlings, average length of 4.5 inches, were released in Baldwin River (T17N, R13W, Sec. 15).

---

[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-3.

The right pelvic and adipose fins of these trout had been amputated[2] to permit future identification.

On June 15, 1954, a three-man crew[3], using a direct-current electric shocker, captured as many trout as possible from the section of Baldwin River where the fall planting had been made. Of 67 brown trout captured, 6 were fin-clipped. Unfavorable stream conditions made collecting with the shocker difficult. Heavy rains that resulted in lowered conductivity, high water levels, and poor clarity hampered operations considerably. Also, accumulated dirt on the commutator and brushes apparently reduced the electrical out-put of the generator. Table 1 gives the results of this collection.

It was decided that further study should be made, and the crew returned to Baldwin River on August 28, 1954, to shock the same section of stream. Conditions for shocking were greatly improved; 268 brown trout, including 23 that were fin-clipped (right pelvic and adipose), were captured. These results are included in Table 1.

The wide variation in the number of fin-clipped trout captured (Table 1) casts doubt on the results. During the second collection, more than two months after the first, considerably more fin-clipped fish were taken. One would naturally expect to take fewer because of mortalities from hooking and other causes. The ratio of fin-clipped fish to wild fish also increased which was contrary to expectation. In 1954, 300 unmarked hatchery brown trout were released in the study area and additional unmarked brown trout were planted above and below the area (Table 2), which also complicated interpretation of results. Because wild and hatchery trout could not be differentiated with

---

[2] Work done by Dr. D. S. Shetter and District Fisheries Supervisor Edward H. Andersen.

[3] The field crew consisted of Edward E. Schultz, Alfred M. Beeton, and James C. Wiese, with District Fisheries Supervisor Edward H. Andersen.

Table 1.--D. C. shocker captures of native and hatchery trout in Baldwin River near the Chesapeake and Ohio Railroad bridge, 1954
(Fish length intervals in inches)

Date	Length of stream shocked (feet)	Brown trout								Rainbow trout			
		Native				Fin-clipped hatchery[1]		Percent of recovery of hatchery fish	Ratio fin-clipped hatchery to wild				
		Young-of year	3.5 to 6.9	7.0 to 9.9	10.0+ over	3.5 to 6.9	7.0+ over			Young-of year	3.5 to 6.9	7.0 to 9.9	10.0+ over
June 15	2,500	39	2	10	10	5	1	0.4	0.27	10	6	0	0
Aug. 28	2,500	172	0	33	40	0	23	1.6	0.32	141	7	15	0
Oct. 27	1,206	57	0	2	8	0	5	0.3	0.50	53	0	1	1

[1] Right pelvic and adipose.

Table 2.--Stocking record of brown trout (unmarked) released adjacent to and in the study areas of Baldwin River, 1954

Location	Township section	Number released	Average length, inches	Age, years	Date of release Month	Day
Study area	15	250	10.3	2	4	14
Study area	15	50	15.4	3	5	4
Upstream	10	550	10.3	2	4	14
Upstream	10	50	15.4	3	5	4
Upstream	10	750	7.8	1-1/2	8	2
Downstream	16	500	10.3	2	4	14
Total		2,150				

certainty, any trout captured with all fins intact was regarded as a native fish. During the shocking, several marked trout were taken that had not been clipped by Conservation Department personnel, e.g., both pectoral fins clipped, upper part of the caudal fin clipped, etc. These were not included in the tabulations of hatchery fin-clipped trout.

1954 fall studies

Lack of confidence in the results of the 1953 planting prompted further investigation. Therefore, a new experiment, starting in the fall of 1954 was planned.

On October 26 and 27, 1954, two study areas were chosen. The first was located at the public fishing site (T17N, R13W, Sec. 10). The second area was downstream from the first at the Chesapeake and Ohio (formerly Pere Marquette) Railroad bridge (T17N, R13W, Sec. 15). A plane-table map was made of each area in the field by a four-man crew.[4] The table was aligned by back-sighting, and distances were measured with a 100-foot steel tape. Boundaries were marked by a 90-penny spike driven into a tree or, as in one case, into a current deflector in the stream.

The area of each section was measured by circumscribing the map ten times with a polar planimeter and getting the average. Section length was measured ten times with a map measurer and the result averaged. On October 27, 28 and 29, a population estimate was made on these two sections of stream.[5] The procedure used was as follows: as many trout as possible were shocked, captured, and recorded by one-inch classes. A small piece was then clipped from the top of the caudal fin and the fish returned to the stream near the point of capture. By this method the five-man crew could check an

---

[4] Robert C. Barber in charge, assisted by Walter R. Crowe, Robert N. Schafer and Edward E. Schultz.

[5] This crew consisted of Walter R. Crowe, Robert C. Barber, Robert N. Schafer, Edward H. Andersen and Edward E. Schultz.

entire study section without stopping. The following day the area was shocked in the same manner and a record was kept of the number of clipped and unclipped trout captured. All fish captured the second day were marked by clipping the bottom of the caudal fin. With this mark it was possible to identify any recaptures of fish handled the second day.

Population estimates were calculated by the formula of LaPlace as given by Schaefer, 1951. Briefly, the formula is:

$$N = \frac{nT}{t}$$

N = The unknown population of fish

n = The number of fish captured during the second shocking

T = The number of fish captured and clipped during the first shocking

t = The number of clipped fish captured during the second shocking

In the several instances where no recaptures of fish were made, the actual number of fish captured in that section of stream was entered in the table. That is, the population estimate given is the sum of the fish captured the first time plus the fish captured the second time.

Calculations for the number of fish per acre and number per mile were by direct proportion.

When the shocking was completed on both study sections, as many wild brown trout fingerlings as possible were collected. The collection consisted of 1,075 fingerlings taken from several miles of Baldwin River with the D. C. shocker. These trout were marked with No. 1 (fingerling) jaw-tags picked at random from 2,200 tags. These tagged wild fish were released between October 27 and November 5, 1954, in the lower study section at the Chesapeake and Ohio Railroad bridge. On November 7, 8 and 12, 1954, District Fisheries Supervisor E. H. Andersen had 1,075 hatchery brown trout fingerlings

tagged and released in the same study section. The tags used were the remainder of the 2,200.[6]

This work completed the 1954 part of the program.

Results at the public fishing site

The first area for study was at the public fishing site. Measurements from the plane-table map gave an area of 1.06 acres and a length of 1,316 feet. The first trip through the section with the D. C. shocker resulted in the capture of 32 brown trout, while the second trip the next day gave only 20 brown trout. Included among the 20 fish was one recapture. Such a small sample made it impossible to obtain a population estimate.

The small number of fish captured can be partly attributed to difficulty in shocking caused by extensive areas of deep water. The results are given in Table 3. Although the study did not involve rainbow trout, a record was kept of this species also, and the results are included in Table 3.

Results at the Chesapeake and Ohio Railroad bridge

The second study area was where the Chesapeake and Ohio Railroad bridge crosses the stream. This location is within the limits of the area shocked in June and August, 1954. The plane-table map of this section showed the area as 0.91 acre and the length as 1,206 feet. Shocking was done here in the same manner as at the public fishing site. The first shocking captured 72 brown trout. The next day 107 brown trout were captured, including 17 recaptures. These figures were used in the LaPlace formula (mentioned above) to calculate the population estimates given in Table 3. An attempt was made to obtain confidence intervals at the 95 percent level, but when the fish were divided into size groups the samples were too small. Compared to studies on other Michigan streams, the population estimate is believed to

---

[6] Fifty tags were damaged or for some other reason not used.

Table 3.--Fall population estimates of trout at two sites in Baldwin River, 1954
(Site No. 2, Chesapeake & Ohio Railroad bridge, 0.91 acres, 1,206 feet)

Species	Size group	Number of trout recaptured: First trip	Second trip	Recaptures	Percent of recovery	Population estimates: Study area	Fish per acre	Fish per mile
Brown trout	3.0-6.9	57	78	14	18.0	317	348	1,524
	7.0-9.9	7	11	2	18.3	38	42	184
	10-18	8	18	1	5.6	144	158	692
Total	3.0-18.0	72	107	17	15.9	499	548	2,400
Rainbow trout	3.0-6.9	53	66	17	25.8	206	226	902
	7.0-9.9	1	1	0	0.0	*2	2	9
	10-23	1	0	0	0.0	*1	1	4
Total	3.0-23.0	55	67	17	25.4	209	229	915
All species	3.0-23.0	127	174	34	19.5	708	777	3,315
(Site No. 1, public fishing site, 1.06 acres, 1,316 feet)								
Brown trout	3.0-6.9	19	11	1	9.1	209	197	838
	7.0-9.9	5	7	0	0.0	*12	11	48
	10-15	8	2	0	0.0	*10	9	40
Total	3.0-15.0	32	20	1	5.0	231	217	926
Rainbow trout	3.0-6.9	9	2	0	0.0	*11	10	44
	7.0-9.9	3	2	0	0.0	*5	5	20
Total	3.0-9.9	12	4	0	0.0	16	15	64
All species	3.0-15.0	44	24	1	4.2	247	232	990

*No recaptures were made, so this figure is the sum of the fish caught on the first trip plus those of the second trip.

be reasonable, although shocking later on in Baldwin River (for the wild brown trout fingerlings that were tagged) suggests that these population figures probably are lower than they should be.

In the collecting done on October 27, 1954, five brown trout with the adipose and pelvic fins clipped were taken. These fish have been included in Table 1.

Plans for 1955

Two phases of this study will be carried on in 1955 to give further information on results of planting of hatchery brown trout fingerlings. First, an attempt will be made to locate as many jaw-tagged trout as possible to compare growth, movement and survival of wild and hatchery fish that were tagged as fingerlings. District Fisheries Supervisor, Edward H. Andersen, has agreed to conduct a partial creel census that will afford an evaluation of the recovery of tagged fish by anglers. The stream will be posted with signs asking anglers to report the capture of any tagged trout. An Institute crew will search the river for tagged trout with a D. C. shocker from the mouth to the M-37 bridge. The creel census and collecting with the shocker will also serve to show what survival there has been of the fin-clipped fingerlings that were planted in 1953. Secondly, population studies will be repeated in the two sections of Baldwin River where 1954 estimates were made.

Literature cited

Schaefer, Milner B.

1951. Estimation of size of animal populations by marking experiments. Fishery Bulletin 69, from Fishery Bulletin of the Fish and Wildlife Service, Vol. 52, U.S.D.I., pp. 191-203.

INSTITUTE FOR FISHERIES RESEARCH

Edward E. Schultz

Approved by: A. S. Hazzard

Typed by: P. R. Darling