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COMPARATIVE RETURNS FROM FALL AND SPRING RELEASES OF LEGAL BROWN TROUT AND RAINBOW TROUT IN THE AU SABLE DRAINAGE DURING THE 1953 AND 1954 TROUT SEASONS.

By

David S. Shetter

This study was conducted at the instigation of the Conservation Commission as the result of continued requests for autumn releases of legal trout in the Au Sable drainage in the vicinity of Grayling. Also it was felt that additional information on the movements of planted fish of both species might aid in planning of stocking programs for these waters. Verification or negation of earlier findings on this general subject also would result.

Methods

Brown trout and rainbow trout, almost all longer than 7 inches, were drawn from the ponds of the state fish hatchery at Grayling. The experimental fish, at the time of planting ranged in total length as follows:

Fall release - brown trout - 6.1 - 10.1 inches;
rainbow trout - 6.8 - 9.3 inches; planted October 29, 30, 1952

Spring release - brown trout - 7.2 - 10.3 inches;
rainbow trout - 7.0 - 9.9 inches; planted April 13, 14, 1953

All experimental fish were tagged with serially numbered jaw tags for individual indentification on recapture as to the season and site of release. The fish were not measured individually. Average sizes of the various lots were determined from a 10 to 12% sample dipped at random from the holding crates after

tagging. The average total lengths of the several groups released are given in Table 1. The tagging and measuring of the experimental fish was carried out by H. J. Vondett and O. M. Corbett under the direction of the author.

Plantings in the fall of 1952 were made at the "Pullover" (T. 26 N., R. 3 W., Sec. 10) on the Main Au Sable River, and at the junction of the Main Au Sable River and the East Branch of the Au Sable River (T. 26 N., R. 3 W., Sec. 8).

Spring releases also were made at the "Pullover," and just below the hatchery grounds on the East Branch of the Au Sable River.

Equal numbers (625) of each species were released at each site at each season. Thus 1,250 brown trout and 1,250 rainbow trout were freed at each season of planting.

Recoveries of tagged fish were obtained during the 1953 and 1954 trout season by:

(1) Partial creel census during weekends, up to Decoration Day;

(2) Reports turned in to the Grayling hatchery personnel;

(3) Voluntary reports by mail from interested anglers.

It is assumed that the numbers of fish reported by the anglers is in proportion to the numbers surviving from the various releases, and that the angling pressure was relatively constant in all parts of the Au Sable drainage. There is no reason to believe that anglers would be more inclined to report fish tagged at one season than another, in view of the fact that the tag numbers used were known only to a few Department employees. There is no way in which the angling pressure on various parts of the stream can be determined under present operating budgets.

Results

To date (April 18, 1955) a total of 502 tagged fish from the plantings described above have been reported, a recovery percentage of just over 10 percent. Divided by season of planting, 196 fall-planted trout of 2,500 were recaptured, or 7.8%; 306 spring-planted fish from a like number were retaken, or 12.2 percent (Table 2). All but 2 fish from each season of planting were captured in 1953; the

latter four fish were caught in 1954. This difference in percentage of fish retaken from equal numbers released in the fall of 1952 and the spring of 1953 is highly significant (chi-square equals 26, P = 99.9+ percent).

Considered now by species, a total of 171 spring-planted rainbow trout were reported as compared with 89 recaptures from the fall release of rainbow trout (13.7% as compared with 7.2%). For rainbow trout, spring planting yielded almost twice as many returns as did fall planting. Again the difference is highly significant (chi-square = 28, P = 99.9+ percent).

For brown trout, 135 spring-planted fish were retaken while 107 fall-planted fish were reported, or 10.8% and 8.6% respectively. The difference, while not particularly great at first glance, approaches statistical significance (chi-square = 3.34, P = 93.1%).

About as many fall-planted brown trout (107) were recovered as were fall-planted rainbow trout (89). The chi-square test yielded a value of 1.60 with a corresponding P value of 80%. On the other hand spring-planted rainbow trout (171) were found among anglers's catches in significantly higher numbers than were spring-planted brown trout (135) (chi-square = 4.56, P = 96.6%).

Distribution of the recovered fish during 1953 and 1954

The recovery data are summarized by monthly periods in Table 3. About one-sixth of the recoveries were made in the first five days of fishing in April 1953; almost half (47.4%) were captured in May, 1953; slightly more than one-quarter (28.5%) were returned in June. The remainder were taken mainly in July and August, only one fish was reported in September of 1953.

Four recoveries from this experiment were reported recaptured in 1954. They were as follows:

one fall-planted brown trout(April 29, 1954)

one fall-planted rainbow (May 28, 1954)

2 spring-planted brown trout (July 9, 1954, prior to July 22, 1954).

The pattern of the recoveries in time varied somewhat with the species and season of release. However, the data suggests that well over 50% of legal-size rainbow trout and brown trout surviving from mid-April plantings will have been recovered by the end of May, and that between 85 and 90 percent of the recoveries are taken by the end of June.

Distribution of the recoveries in space

Because of the difference noted in the recovery pattern from fish released at the various sites, the recoveries were tabulated by season and planting site in the upper half of Table 4. In the lower half, all fall-planted fish are combined by species for comparison with all spring-planted fish.

Generally speaking, fish released at the mouth of the East Branch or in the East Branch just below the hatchery, tended to migrate only in a downstream direction. This pattern is probably influenced by the closeness of dams on the Main Stream and East Branch a relatively short distance above these planting sites. On the other hand, fish released at the Pullover tended to move both upstream and downstream.

A greater proportion of fall-planted fish were recovered at some distance from the planting site than was noted among fish released in the spring. Among brown trout, about 33% of the fall-planted recoveries migrated little or not at all, while 67% were recovered between 1 and 50 miles away. Three-fourths of the spring-planted brown trout recoveries were made at or near the planting site, the remainder at points further distant. The fall-planted rainbow trout differed slightly from the brown trout in that they were more evenly distributed along the stream--about 25% upstream, 41% at the planting site, and 34% downstream. Recoveries on the spring-planted rainbow trout suggest that fewer spring-planted fish moved upstream, that more were taken at the point of release, and that a greater fraction tended to move downstream than was noted for the fall planting.

Of some interest are the longer movements of certain fish. The longest movement noted was approximately 150 miles by a 1952 fall-planted rainbow released at the mouth of the East Branch and reported from below Alcona Dam. Another fish from this same planting was recovered below the Mio Dam, about 80 miles downstream. The longest migration for brown trout was a fall-planted fish, released at the East Branch mouth, recovered near Stephans Bridge, 19 miles downstream,

Discussion

Benson(1953, IFR Report No. 1360) reported that from 2,000 spring-planted tagged rainbow trout released in April 1952 in the East Branch of the Au Sable River at a temperature of 38° F., 209 or 10.4% were later tallied. The 1953 spring rainbow trout released in the East Branch yielded a reported return of 93 recoveries (14.1%) from 625 tagged fish put out on April 13 at a water temperature of 43° F. In the earlier study, 58.1% of the recoveries were taken at or near the planting site; in the 1953 study 76.3% were taken at the planting site. Upstream migration was very minor in both experiments. Downstream migration was noticeably less in the 1953 experiment.

The differences noted in these two releases suggest that temperature of the water at time of planting may be an influence of the subsequent distribution of the fish as reported earlier by Cooper (1953). However, two other variables which also may have influenced the 1953 observations are:

(1) differences in number of days between planting and opening of the fishing season;

(2) differences in angling pressure between 1952 and 1953.

Conclusions

It can be shown that there were equal numbers of brown trout and rainbow trout planted at the two seasons and that the fall and spring releases were of approximately equal size among each species. Assuming that the anglers were not fishing specifically for one species or one planting more than for another,

and that angling pressure was reasonably constant throughout the Au Sable drainage, then the only factor causing the differences noted among recovery percentages is the season of release.

Ignoring species for the moment, 1 1/2 times as many spring-planted fish were reported as fall-planted fish. By species, almost twice as many spring-planted rainbow trout were retaken as fall-planted rainbow trout. Among brown trout, the advantage of spring planting amounted to slightly more than 1.2 over fall release.

Comparing the combined spring and fall returns from both species to date, approximately equal numbers (242 browns, 260 rainbows) have been reported. This result differs from observations recorded by Cooper (loc cit.) for Pigeon River brown trout releases, and also from unpublished recovery data on other Michigan streams, where significantly more rainbow trout have been recaptured from simultaneous releases of equal numbers of the two species.

Comparison of the relative returns from brown and rainbow trout released in the spring of 1953, however, indicates that a significantly larger number of rainbow trout were recaptured from plantings at that season.

To show the similarity in results between the 1953 experimentation and earlier work, Table 5 has been drafted. The earlier experiments were conducted in the same general stream section of the Main Au Sable River as that employed in 1953.

In all instances where spring and fall plantings of rainbow trout were involved, approximately twice as many spring-planted fish were reported as were fall-planted fish. Brown trout released in the spring also were returned in significantly larger numbers than fall-planted fish in two of the earlier experiments but in 1953 were not as numerous in the catch as in earlier years. Conclusions reached after earlier research as to the best season for release of

legal-size trout for "maintenance" stocking (Shetter, 1947) are not altered by the 1953 observations on the Au Sable drainage.

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Table 1

Average total length (in inches) at planting, fall- and spring-planted brown trout and rainbow trout, Au Sable River, 1953.

Season and year	Site planted	Brown Trout			Rainbow Trout		
		Number	Average T. L.	Standard Error	Number	Average T. L.	Standard Error
Fall, 1952	Pullover	75	8.27	0.070	75	8.01	0.065
	E. Br. mouth	75	8.35	0.066	75	7.89	0.070
	Totals	150	8.31	0.048	150	7.95	0.048
Spring, 1953	Pullover	65	8.35	0.082	65	7.96	0.080
	E. Br. below hatchery	65	8.10	0.063	65	7.95	0.057
	Totals	130	8.22	0.053	130	7.95	0.049
Totals, all plantings		280	8.27	0.036	280	7.95	0.034

Table 2

The percentage[1] of recovery of fall- and spring-planted brown trout and rainbow trout, Au Sable River, 1953 and 1954.

Season and year	Site planted	Brown Trout			Rainbow Trout			All Fish		
		Number planted	Number recovered	Percentage	Number planted	Number recovered	Percentage	Number planted	Number recovered	Percentage
Fall, 1952	Pullover	625	54	8.6	625	42	6.7	1,250	96	7.7
	E. Br. Mouth	625	52	8.5	625	46	7.4	1,250	98	7.9
	Totals	1,250	106	8.6	1,250	88	7.0	2,500	194	7.8
Spring, 1953	Pullover	625	55	8.8	625	78	12.5	1,250	133	10.6
	E. Br. Below Hatchery	625	78	12.5	625	93	14.9	1,250	171	13.7
	Totals	1,250	133	10.6	1,250	171	13.7	2,500	304	12.2
Total recovery, 1953, all plantings		2,500	239	9.6	2,500	259	10.4	5,000	498	10.0
Total recovery, 1954, all plantings		3			1			502		10.0+

[1] In the table, the four 1954 recoveries were not used in calculating percentage of recovery.

Table 3

Distribution in time of fall- and spring-planted brown trout and rainbow trout recoveries during the 1953 trout season.

Month recovered, 1953	Fall Rainbow		Fall Brown		Spring Rainbow		Spring Brown		Total recoveries	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
April	18	20.5	19	17.9	22	12.9	20	15.0	79	15.9
May	48	54.5	58	54.7	82	48.0	48	36.1	236	47.4
June	19	21.6	22	20.8	51	29.7	50	37.6	142	28.5
July	2	2.3	4	3.8	15	8.8	13	9.7	34	6.8
August	1	1.1	3	2.8	1	0.6	1	0.8	6	1.2
September	---	---	---	---	---	---	1	0.8	1	0.2
Totals, 1953	88	100.0	106	100.0	171	100.0	133	100.0	498	100.0
Totals, 1954	1	---	1	---	---	---	2	---	4	---
Grand Totals	89	---	107	---	171	---	135	---	502	---

Table 4

Distribution of fall- and spring-planted brown trout and rainbow trout recoveries in space during 1953. Percentages of total recoveries are given in parentheses.

Season and year	Species and site of release	Miles upstream		At or near planting site	Miles downstream				Location	Totals
		3-9.9	1-2.9	1 - 0 - 1	1-2.9	3-9.9	10-49.9	over 50	?	
Fall, 1952	Rainbow-E. Br. Mouth			28 (60.9)	3 (6.5)	10 (21.7)	4 (8.7)	1 (2.2)		46
	Pullover	20 (47.6)	2 (4.8)	8 (19.0)	2 (4.8)	6 (14.3)	4 (9.5)			42
	Brown-E. Br. Mouth			32 (61.6)	2 (3.8)	10 (19.2)	7 (13.4)		1 (1.9)	52
	Pullover	44 (81.4)		3 (5.6)	1 (1.9)	4 (7.4)	2 (3.7)			54
Spring, 1953	Rainbow-E. Br.		1 (1.1)	71 (76.3)	6 (6.5)	14 (15.0)	1 (1.1)			93
	Pullover	16 (20.5)	3 (3.8)	13 (16.7)	19 (24.4)	17 (21.8)	6 (7.7)		4 (5.1)	78
	Brown-E. Br.		2 (2.6)	70 (89.7)	1 (1.3)	3 (3.8)	1 (1.3)		1 (1.3)	78
	Pullover	12 (21.9)	4 (7.3)	29 (52.7)	8 (14.5)	2 (3.6)				55
All Fall Brown		44✓ (42.1)		35 (32.6)	3 (2.8)	14 (13.1)	9 (8.4)		1 (1.0)	106✓
All Fall Rainbow		20 (22.5)	2 (2.2)	36 (40.5)	5 (5.6)	16 (18.0)	8 (9.0)	1✓ (2.2)		88✓
All Spring Brown		12 (8.9)	6 (4.4)	99✓ (74.1)	9 (6.7)	5 (3.8)	1 (0.7)		1✓ (1.4)	133✓
All Spring Rainbow		16 (9.4)	4 (2.3)	84 (49.1)	25 (14.7)	31 (18.1)	7 (4.1)		4 (2.3)	171

NOTE: Number in carat (✓) indicates numbers of tag recoveries during 1954. These were included in calculation of percentages in this table.

Table 5

Comparison of the 1953-1954 recovery data with earlier work in the Au Sable River in the vicinity of Grayling. Recovery percentages are given in parentheses.

Species	Season first fished over	Number planted		Recovered first season		Recovered second season		Recovered third season	
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Rainbow trout	1941	499	471	98	51	3	1	---	---
				(19.6)	(10.8)	(0.6)	(0.2)	---	---
	1942	250	250	51	23	1	---	---	---
				(20.4)	(9.2)	(0.4)	---	---	---
	1952	2,000	---	209	---	11	---	---	---
				(10.4)	---	(0.6)	---	---	---
	1953	1,250	1,250	171	88	---	1	—	—
				(13.7)	(7.0)	---	(0.2)	—	—
Brown trout	1941	500	500	76	40	2	1	---	2
				(15.2)	(8.0)	(0.4)	(0.2)	---	(0.4)
	1942	250	250	32	18	1	2	1	---
				(12.8)	(7.2)	(0.4)	(0.8)	(0.4)	---
	1953	1,250	1,250	133	106	2	1	—	—
				(10.6)	(8.6)	(0.2)	(0.1)	—	—