

# MIGRATORY TENDENCIES OF THE MANCHESTER (IA.) STRAIN OF RAINBOW TROUT

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Cooperating with the U. S. Fish and Wildlife Service, North Carolina conducted studies on the migratory tendencies of the Manchester (Ia.) strain of rainbow trout during the 1952 fishing season. The rainbow trout propagated at the Manchester Station are a pure strain, and the purpose of the study was to determine whether or not this strain might be less migratory than the rainbow trout generally being used in eastern United States for stocking purposes.

The study was conducted by comparing the migratory tendencies of the Manchester (Ia.) strain with rainbow trout developed from eggs obtained from the U. S. Fish & Wildlife Service stations at Wytheville, Virginia, and at Walhalla, South Carolina. No attempt has been made to maintain the stock as a pure strain at these latter stations, and it was believed that they might fairly represent the average trout used for restocking in the eastern states. By marking equal numbers of both groups of fish, and by stocking proportionately, a comparison of the actual migrations was possible. The studies were made on the streams of the Cooperative Wildlife Management Areas in western North Carolina, where all fishermen are required to obtain a permit upon entering, and to have their creels checked upon leaving the areas.

## METHODS

Three streams in three different management areas were selected as test sites. In each case, a ten mile section of the stream was designated as a test area. Beginning at the downstream end of each, numbered signs were posted along the stream banks at one-fourth mile intervals. The signs, numbered from one to forty on each area, were so posted as to be visible either from upstream or downstream. The distance between the signs was measured by a pedometer. The streams selected are considered better than average rainbow trout streams, and annually they support a moderately heavy fishing pressure.

The test fish were tagged with monel metal strap type fish tags, size number 1, as supplied by the National Band and Tag Company, Newport, Kentucky. Serially numbered tags were used in order that each individual fish might be identified. Each fish was tagged on the operculum. After tagging, all test fish were held in hatchery pools at least twenty-four hours to make sure there was no immediate tagging loss. The fish were stocked during the latter half of March, 1952, in preparation for the opening of the fishing season on April 15th. Consequently, a minimum period of two weeks was permitted for migratory tendencies to become evident.

Creel checkers at the entrance stations on the three test areas were instructed to inform the fishermen of the studies being conducted, and to request their cooperation. In addition, each fisherman was given a prepared statement of the

aim of the study to emphasize its importance. The statement provided is reproduced below:

Mr. Fisherman:

Your cooperation is requested in finding out more about the migratory habits of trout. Tagged trout have been stocked in this area. Each tag carries a number. Points along the main stream are posted with numbered signs. When you catch a tagged trout, please write the tag number and nearest sign number in the proper place on the back of the permit issued you. Should you catch a tagged trout in a tributary of the main stream, please indicate the number of the tag, and the tributary and the approximate distance from the main stream.

Many thanks,  
North Carolina Wildlife Resources Commission

Upon entering a management area, a fisherman leaves his fishing license at the checking station in order to insure his return through that station. He is supplied with a permit for the area, upon which the checker records his catch at the time of this departure. In this study, all permits were stamped on the reverse side so that the fishermen might be able to show the tag number and the nearest sign number of each test fish caught. The stamp used is reproduced below:

TAGGED FISH CAUGHT

Metal Tag Number	Nearest Sign Number
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

On Fires Creek and on Big Santeetlah Creek, the test fish were stocked in four equal parts at various places in the test area. On Nantahala River, the test fish were all stocked at one location. The purpose in the two types of stocking was to obtain some indication of whether or not rainbow trout might be expected to disperse themselves through a stretch of water from one stocking point, or whether the customary procedure of numerous smaller stockings is necessary in order to insure an adequate distribution of fish throughout the length of the stream.

On all three of the test streams, additional untagged trout were stocked above and below the stocking points of test fish in order that there would be no forced migration which might result from unbalanced pressures on the existing food supply.

## RESULTS

### Area 1 — Fires Creek

Only rainbow trout are found in Fires Creek. There are no barriers to migration in the main stream, and only one tributary is accessible to fish in the test area.

The creek is clear, turbulent, and contains many excellent pools. Numbered signs were located along the creek, beginning at the downstream boundary of the management area, and continuing upstream for ten miles. One hundred of each of the two strains of tagged trout were stocked at each of four separate locations. Starting from the downstream boundary, the first stocking was made just above the one mile point, the second stocking at four miles, the third stocking at six and one-fourth miles, and the fourth at seven and one-fourth miles. The exact stocking points were determined, to some extent, by accessibility for the hatchery truck.

Figure 1 indicates the stocking locations, and the recovery points for each of the test fish caught in Fires Creek. It will be observed that there was little differences in the upstream and downstream migration from the downstream stocking point. From the four mile stocking point, both upstream and downstream migrations were relatively balanced, although the downstream tendency was slightly greater. From the sixth and seventh mile stocking points, a very definite downstream migration tendency existed. A reasonable explanation for the difference in migration from the various stocking points might well be that the stream is of sufficiently smaller size in its upper reaches to encourage downstream migration. It is to be observed that there is no significant difference exhibited between the test fish of either of the two groups.

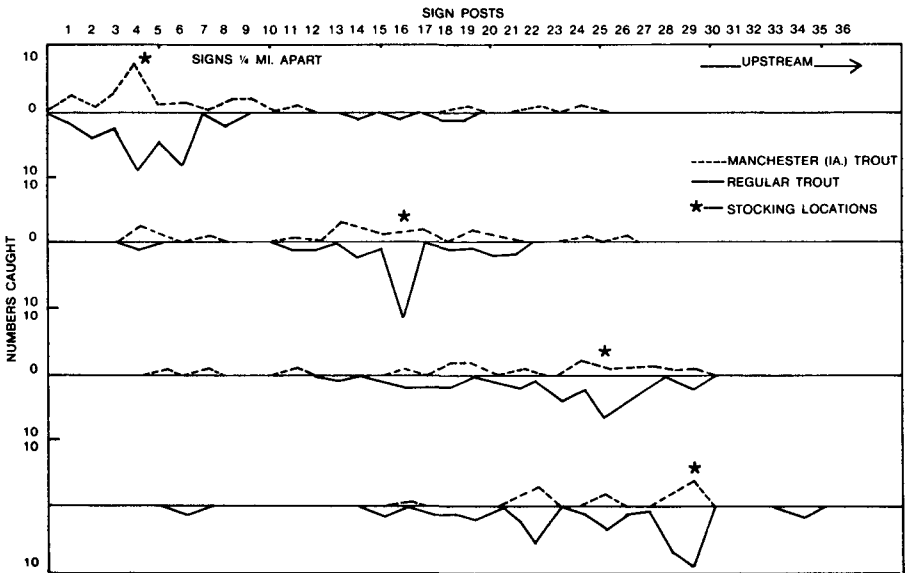


Fig. 1. Distance moved by fish stocked on Fires Creek.

During the 1952 trout fishing season, extending from April 15th to the end of August, Fires Creek Management Area was stocked with 2,800 rainbow trout, and 3,981 trout were caught. The stream was fished for a total of 914 man-days. The average catch was 4.4 fish, for a catch rate of 1.2 fish per man-hour.

Of the 800 tagged trout stocked in the area, 220 were recovered. Of these, 85 were of the Manchester (Ia.) strain, and 135 were the regular hatchery strain.

Table 1 shows the migration of the individual fish from the stocking points to the recovery points.

Table 1. Movement of stocked fish from stocking point to recovery point, Fires Creek.

Stocking locations & numbers stocked	Sign nos. ¼ mile	Tagged fish recovered — by stocking points								Total
		Sign 4½		Sign 16		Sign 25		Sign 29		
		Man.	Reg.	Man.	Reg.	Man.	Reg.	Man.	Reg.	
	1	3	2							5
	2	1	5							6
	3	3	3							6
100 Man. & 100 Reg.	4	7	9	3	1					20
	5	2	5	1		1				9
	6	2	8					1		11
	7	1		1		1				3
	8	2	2							4
	9	2								2
	10									
	11	1		1	1	1				4
	12				1					1
	13			4			1			5
	14		1	3	3					7
	15			1	1		1		1	4
100 Man. & 100 Reg.	16		1	2	11	1	2	1		18
	17			2			2		1	5
	18		1		1	2	2		1	7
	19	1	1	2	1	2			2	9
	20			1	2		1			4
	21				2	1	3	2	2	10
	22	1					1	4	5	11
	23						4			4
100 Man & 100 Reg.	24	1		1		3	3		1	9
	25					2	6	2	4	14
	26			1		2	4		1	8
	27					2	2			4
	28					1		2	8	11
100 Man. & 100 Reg.	29					1	2	4	10	17
	30									
	31									
	32									
	33									
	34								2	2
	35									
	36									
	37									
	38									
	39									
	40									
Man. Totals	400		27		23		20		15	85
Reg. Totals	400			38		24		34		135
Totals	800		65		47		54		54	220

## Area 2 — Big Santeetlah Creek

The same general procedure for stocking trout was carried out on Big Santeetlah Creek as on Fires Creek. The signs at one-fourth mile intervals were begun at the downstream area boundary, and continued upstream for ten miles. A suspected barrier to trout migration, in the form of a falls, is located six and three-fourths miles above the downstream boundary on the main stream. There are several small tributaries in the test area. The dominant species of the whole area is rainbow trout, but small populations of brook and brown trout are present.

Again, in this area, a total of 800 tagged fish were stocked. One hundred of each strain were stocked at each of four locations. The first stocking was at sign 11, two and three-fourths miles above the downstream boundary. The second stocking was at three and three-fourths miles, the third at five and one-fourth miles, and the fourth at six and one-fourth miles, just below the barrier. Again, additional trout were stocked in the stream to equalize the pressure on the food supply.

There was little migration in either direction by either group of test fish from the downstream stocking. There was a general migration both upstream and downstream from the second stocking station. Tagged fish moved both upstream and downstream from the third station, but generally moved downstream from the fourth. It is significant that only one fish was reported as having moved upstream past the falls. This actually may have been the case, or it may have been an erroneous report. Figure 2 shows the stocking points and the recovery points of the tagged fish.

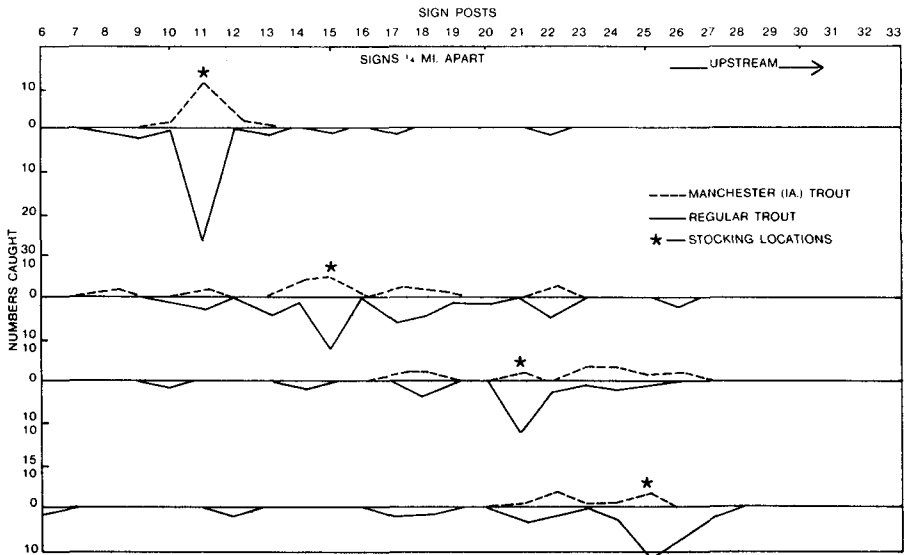


Fig. 2. Distances moved by fish stocked on Big Santeetlah Creek.

Prior to and during the 1952 fishing season, the test area was stocked with 2,250 rainbow trout, 900 brook trout, and 925 brown trout, for a total stocking of 4,075 fish. The catch consisted of 3,902 rainbow trout, 1,367 brook trout, and 408 brown trout, for a total catch of 5,677 fish. Fishing pressure consisted of 1,180 man-days, for an average catch of 4.8 fish, at the rate of 1.2 fish per man-hour.

Of the 800 tagged fish stocked, 172 were recovered by fishermen. These were made up of 43 fish of the Manchester (Ia.) strain, and 129 fish of the regular hatchery trout. Table 2 shows the stocking points, and the recovery points of the tagged fish from this test area.

Table 2. Distance moved by stocked fish on Big Santeetlah Creek.

Stocking locations & numbers stocked	Sign nos. ¼ mile	Tagged fish recovered — by stocking points								Total
		Sign 4½		Sign 16		Sign 25		Sign 29		
		Man.	Reg.	Man.	Reg.	Man.	Reg.	Man.	Reg.	
	1									
	2									
	3									
	4									
	5									
	6							1		1
	7									
	8		1	1						2
	9		2							2
	10	1	1		1		1			4
100 Reg. - 100 Man.	11	10	28	1	2					41
	12	2						1		3
	13		1		4					5
	14			2	1		2			5
100 Reg. - 100 Man.	15		1	3	13		1			18
	16									
	17		1	2	6	1			1	11
	18			1	5	1	3		1	11
	19				1					1
	20				1					1
100 Reg. - 100 Man.	21					1	12	1	3	17
	22		1	2	3		3	3	1	13
	23					2	1	1		4
	24					2	2	1	2	7
100 Reg. - 100 Man.	25					1	1	3	11	16
	26				1				6	8
(Barrier)	27								1	1
	28		1							1
	29									
	30									
	31									
	32									
	33									
	34									
	35									
	36									
	37									
	38									
	39									
	40									
Man. Totals	400		13		12		9		9	43
Reg. Totals	400			37		38		26		129
Totals	800		50		50		35		37	172

Area 3 — Nantahala River

Nantahala River, in the Standing Indian Management Area, is predominantly a rainbow trout stream, although there are some few brook trout in the upper reaches and a few brown trout in the lower section. There are numerous small tributaries to the main stream, and a five foot falls exists one mile above the downstream management area boundary. As on the other areas, numbered signs were placed along the main stream, beginning at the downstream boundary and extending upstream for ten miles.

On the area a total of 600 tagged trout were stocked, consisting of 300 each of the two strains being studied. All of the tagged fish were stocked at sign 16, four miles above the boundary of the area. Additional unmarked trout were stocked to equalize the pressure on the food supply. Figure 3 indicates the stocking location and the extent of migration. It will be observed that the general migration trend was downstream, although the major recovery was in the vicinity of the stocking point. Migration tendencies between the two strains showed no significant difference.

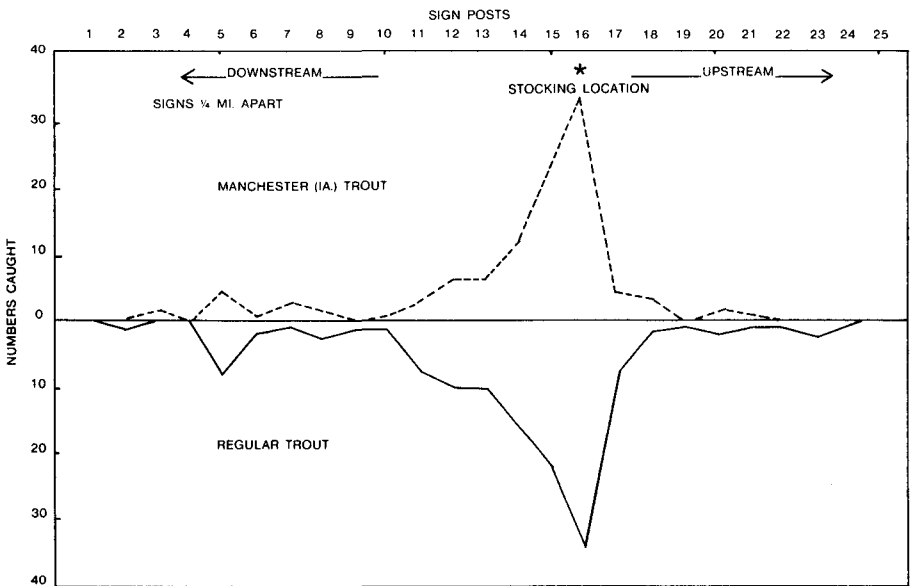


Fig. 3. Distances moved by fish stocked at Nantahala River.

Before and during the 1952 trout fishing season, the Nantahala River was stocked with a total of 2,800 rainbow trout, and 950 brown trout, for a total stocking of 3,750 fish. The catch on this area consisted of 4,490 rainbow trout, 617 brown trout, and 157 brook trout, for a total catch of 5,264 fish. This catch was made in 1,143 man-days of fishing, for an average catch of 4.6 fish, at the rate of 1.0 fish per man-hour.

Of the 600 tagged fish stocked, 245 were recovered. The recovery consisted of 111 trout of the Manchester (Ia.) strain, and 134 of the regular hatchery strain. Table 3 shows the migration of individual fish from the original stocking point to the points of recovery.

Table 3. Distance moved by fish stocked on Nantahala River.

Stocking locations & numbers stocked	Sign nos. ¼ mile	Tagged fish recovered - by stocking points		
		Sign 16		Total
		Man.	Reg.	
	1			
	2		1	1
	3	2		2
(Barrier)	4			
	5	4	7	11
	6	1	2	3
	7	3	1	4
	8	2	3	5
	9		2	2
	10	1	2	3
	11	3	7	10
	12	6	10	16
	13	6	10	16
	14	13	17	30
	15	23	24	47
300 Reg. - 300 Man.	16	34	32	66
	17	5	7	12
	18	4	2	6
	19		1	1
	20	2	2	4
	21	1	1	2
	22		1	1
	23		2	2
	24			
	25			
	26			
	27			
	28			
	29			
	30			
	31			
	32			
	33			
	34			
	35	1		1
	36			
	37			
	38			
	39			
	40			
Man. Totals	300	111		111
Reg. Totals	300		134	134
Totals	600			245



## OBSERVATIONS AND CONCLUSIONS

Considerable difficulty was experienced in the transportation and propagation of the Manchester (Ia.) trout. An allotment of 10,000 eggs from the Manchester Station was shipped to the U. S. Fish & Wildlife Service station at Leetown, West Virginia. There the eggs were hatched and reared to a size of approximately 2½ inches. At this size, 8,000 remained. Fish distribution units of the North Carolina Wildlife Resources Commission picked up the 8,000 trout and transported them to the Arrowood Glade Rearing Station near Franklin, North Carolina. Approximately 7,000 arrived alive.

During all of their subsequent rearing period, these fish demonstrated an unusual state of shock. It was necessary to cover the rearing pools to prevent losses occasioned by their wild gyrations when visitors approached. For a long period the pools could not be cleaned because of the resulting shock losses. Only 1,100 remained when they were stocked at a size of 7 inches. Throughout this study, the recovery of Manchester (Ia.) trout was consistently smaller than from the controls. From the history of the rearing of these fish, it seems reasonable to assume that a higher mortality rate may have continued to exist after the fish were introduced into the streams, and possibly as a result of handling during stocking.

Without a doubt, the recovery of tagged fish was greater than the totals indicated on the data sheets. Occasional illegible records provided by the fishermen were discarded. Also, it is known from the torn gill flaps that numerous tagged fish lost their tags prior to capture. The incidence of fish with torn gill flaps but without tags increased during the season, and no fish bearing tags were taken during July or August.

This had some effect on the total recovery percentages; but from the existing records, it is unlikely that it resulted in any disparity between the percentage recoveries of the two strains. Also, since the heaviest fishing pressure was during the first month of the season, it is likely that this loss of information on recovered fish was not as great as might first be assumed.

Although daily temperature records were not kept on the streams of the test areas, average water temperatures at the beginning of the fishing season, subsequent to stocking, were 43 degrees. From the occasional records available, it is believed that stream temperature reached 50 degrees about May 30th, and were approximately 66 degrees by the conclusion of the fishing season at the end of August.

From a consideration of the graphs of the three areas, it can be concluded that there was a slight general tendency of the test fish to move downstream. In the larger waters near the lower end of the test sections, there was little directional migration indicated. Most downstream migration resulted from stockings in the upper and smaller parts of the test area streams.

From the "one spot" stocking on the Nantahala River, it can be concluded that the dispersal of fish from such a stocking is not comparable to the results obtained by using several stocking locations. Within the few weeks available for migration, the fish failed to distribute themselves in desirable numbers throughout the available waters of the test area.

Finally, it can be concluded that there is no significant difference in the migratory tendency of the Manchester (Ia.) strain of rainbow trout as compared with the rainbow trout being used as controls.