Stocking Success of Brown Trout and 2 Strains of Rainbow Trout in Jocassee Reservoir, South Carolina

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Abstract: The relative success of the Walhalla strain of brown trout (*Salmo trutta*) and the Wytheville and Winthrop strains of rainbow trout (*S. gairdneri*) was evaluated for 2 years in a put-grow-and-take stocking program in Jocassee Reservoir. Gillnet catches of brown trout increased during the 2-year study, while catches of rainbow trout of both strains declined rapidly after stocking and no rainbow trout were netted during the second year of the study. A total of 11.4% of the stocked brown trout and 1.6% of the rainbow trout were harvested by fishermen during the study. Poor survival of rainbow trout in Jocassee Reservoir may be related more to the size of fish stocked than to different strain-specific characteristics.

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Jocassee Reservoir, 1 of 2 impoundments created during the development of Duke Power Company's Keowee-Toxaway Project, is located in northwestern South Carolina with small portions extending into North Carolina. This 3,063-ha reservoir serves as the upper pool for the Jocassee Pumped Storage Station (610 MW) while Keowee Reservoir (7,435 ha) serves as the lower pool. Jocassee Reservoir is a deep (maximum depth of 107 m, mean depth of 40 m), oligotrophic reservoir that contains hypolimnetic water suitable for trout (*Salmo* spp.) survival (Oliver et al. 1977). Thus, Jocassee Reservoir is managed as a put-grow-and-take trout fishery.

South Carolina Wildlife and Marine Resources Department has stocked (from 1972 to 1979) a total of 50,000 brown trout and 200,000 rainbow trout in order to establish and maintain this trout fishery. Despite being stocked in larger numbers, rainbow trout provided fewer fish to fishermen than did brown trout (Geddings 1979). This low return of rainbow trout was originally believed to be due in part to

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excessive mortality resulting from thermal and handling stress at stocking and injuries and stress associated with catch-and-release fishing by shoreline anglers. These factors, however, were ruled out as sources of high mortality by Barwick (1985). He concluded that the poor returns may have resulted from high natural mortality that was perhaps related to characteristics inherent in the principal strain of rainbow trout planted (Wytheville). Predation was also not a major factor in rainbow trout mortality, based on a 13-month food study of large brown trout (Vaughan 1983) and cursory examination of largemouth bass (*Micropterus salmoides*) stomachs by the authors.

Previous studies of post-stocking success of trout have demonstrated that certain strains have specific characteristics that make them more productive than others for a given type of stocking program (Rawstron 1977, Brauhn and Kincaid 1982, Moring 1982). Inasmuch as strains of rainbow trout other than the Wytheville may have greater potential for creating a successful "put-grow-and-take" fishery in Jocassee Reservoir, we selected for evaluation a strain of rainbow trout (Winthrop) that was readily available from a nearby hatchery. In this paper, we discuss the post-stocking success of the Wytheville and Winthrop strains of rainbow trout in Jocassee Reservoir and compare their performance with that of the Walhalla brown trout which is currently being successfully stocked in this reservoir.

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Methods

An evaluation of the post-stocking performances of Walhalla brown trout and the Wytheville and Winthrop strains of rainbow trout in Jocassee Reservoir was conducted during 1981–1982. All fish representing each strain were produced in the Walhalla (South Carolina) National Fish Hatchery, marked with a distinctive fin clip, and stocked in the reservoir during the winter of 1980–1981 (Table 1).

Data for the evaluations were collected with gill nets and a creel survey. Multifilament nylon gill nets, 45.5 × 1.8 m, containing 3 3-m panels each of 5 mesh sizes (25, 38, 51, 63 and 75 mm, bar measure) were set horizontally on the bottom at depths of 2 to 20 m. Two overnight sets were made each month at 15 stations during

Table 1. Stockings of one strain of brown trout and two of rainbow trout in Jocassee Reservoir, South Carolina.

Species and strain	Date stocked	Number stocked	Identifying fin clip	Total length (mm)		Weight (g)	
				Range	Mean	Range	Mean
Brown trout							
Walhalla	2 Feb 1981	25,000	Adipose	157–243	197	46–163	94
Rainbow trout							
Wytheville	15 Dec 1980	23,200	Right pelvic	157–247	212	60–230	125
Winthrop	12 Feb 1981	21,800	Left pelvic	157–233	201	43–148	96

January, March, May, July, and November in 1981 and 1982; all fin-clipped fish caught were measured (total length in mm) and weighed (g).

The numbers of fish of each strain caught annually by fishermen were estimated indirectly from an existing roving creel survey similar to that described by Malvestuto et al. (1978). Since no significant nighttime fishery exists on this reservoir, the survey was conducted only during daylight hours. Because this survey had been conducted unchanged on this reservoir since 1973, we decided not to alter the design to incorporate direct estimates of the number of trout of the various strains caught. The number of fish of each strain caught by fishermen was approximated by determining the percentages of fish of each strain in the total catches of brown trout and rainbow trout examined by creel clerks and multiplying this percentage by the estimated total harvest of brown trout and rainbow trout (obtained from the creel survey). The percentages of fin-clipped fish occurring in the catch were based on a total of 254 days of observations by creel clerks from January 1981 through December 1982.

Results

Gill-net catches of brown trout were considerably higher than those of the two strains of rainbow trout (Table 2). A total of 44 brown trout were caught in March 1981 (1 month after stocking). Although only 18 were netted in May and 2 in July, 46 were taken in November. Catches in 1982 were somewhat higher than in 1981, ranging from 31 to 59 fish per sampling period (excluding July, when no fish were caught). Mean lengths of brown trout caught in November 1981 and November 1982 were 388 and 564 mm, respectively, and mean weights were 693 and 2,398 g.

Fisherman also caught more Walhalla brown trout than rainbow trout of either

Table 2. Numbers of fish representing one strain of brown trout and two of rainbow trout caught with gill nets in Jocassee Reservoir, South Carolina.

		Species and strain		
		Brown Trout	Rainbow Trout	
Date	Net sets	Walhalla	Wytheville	Winthrop
1981				
January	30		28	
March	30	44	4	4
May	29	18	1	3
July	30	2	0	1
November	30	46	0	0
1982				
January	30	49	0	0
March	30	39	0	0
May	30	31	0	0
July	30	0	0	0
November	30	59	0	0
Total	299	288	33	8

Table 3. Estimated numbers of fish representing one strain of brown trout and two of rainbow trout caught by fisherman in Jocassee Reservoir, South Carolina. (Percent of number stocked is shown in parentheses.)

Species and strain	1981	1982	Total
Brown trout			
Walhalla	1,769 (7.1)	1,076 (4.3)	2,845 (11.4)
Rainbow trout			
Wytheville	237 (1.0)	135 (0.6)	372 (1.6)
Winthrop	300 (1.4)	59 (0.3)	359 (1.6)

strain (Table 3). The estimated take was 1,769 brown trout in 1981 and 1,076 in 1982, or 11.4% of the total number stocked.

Gill-net catches of both strains of rainbow trout declined rapidly after stocking (Table 2). Catches of Wytheville fish declined from 28 in January (1 month after stocking) to 1 in May, and no fish were caught after May 1981. Initial catches of the Winthrop strain were even smaller: only 4 fish of this strain were caught in March (1 month after stocking) and only 1 in July. No Winthrop rainbow trout were netted after July 1981, and none of either strain were netted in 1982.

Catches of the 2 strains of rainbow trout by anglers were also small (Table 3). Fishermen caught 237 Wytheville and 300 Winthrop fish in 1981 and only 135 and 59 in 1982. Of the combined plantings of these 2 strains, only 1.6% were harvested by fishermen during the 2-year study.

Discussion

In this study, Walhalla brown trout survived better and provided better return to the creel than either strain of rainbow trout in the put-grow-and-take stocking program for Jocassee Reservoir. Both the gill-net catches and angling data indicated that first-year survival of brown trout was considerably higher than that of the rainbow trout. Post-stocking growth rates of the brown trout were excellent. Growth rates were faster than those reported for brown trout in a Tennessee stream (Little 1966) and in California reservoirs (Staley 1966), and similar to those for brown trout in Lake Lanier, Georgia (Kirkland and Bowling 1967).

Although no definitive explanation was readily apparent for the poor survival of the rainbow trout, there was some evidence to indicate that the poor survival of the 2 strains of rainbow trout evaluated may have been due to the lack of a suitable prey for the size of fish stocked (averaging 201–212 mm long). Cursory examination of the stomach contents of 12–15 fish of each strain of rainbow trout and brown trout (collected approximately 1 month after stocking) revealed that most rainbow trout stomachs contained no food or only a few insects, whereas most brown trout stomachs contained threadfin shad (*Dorosoma petenense*). Apparently, stocked rainbow trout were either not piscivorous or were too small to exploit the size of

threadfin shad available. Since no other acceptable food organisms are available in sufficient quantity, rainbow trout apparently were unable to survive. In contrast, brown trout (averaging 197 mm long) stocked at the same time and at the same locations, ate threadfin shad, survived, and contributed to the fishery.

In contrast to our results in Jocassee Reservoir, Weaver and England (1982) reported that Wytheville rainbow trout (averaging 229–254 mm long) stocked during December, January, and February in Lake Lanier, Georgia, survived well and contributed to the fishery. The concluded that their stockings of the Wytheville strain of rainbow trout were successful because their fish were large enough to immediately prey on small threadfin shad (about 38 mm long).

If survival of rainbow trout in Jocassee Reservoir is related to the lack of a suitable prey for the size of fish stocked, strain selection may not be as important in increasing survival as the size of fish stocked relative to the size of available threadfin shad. Thus, stocking of rainbow trout at least 230 mm long may enhance the survival of rainbow trout in Jocassee Reservoir. However, strain evaluations will continue in an attempt to find a strain suitable to the particular conditions encountered in this reservoir. Currently, the Tasmanian strain of rainbow trout is being stocked and evaluated.

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