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IMPORTANCE OF PREDATION BY ADULT TROUT ON MORTALITY RATES OF FINGERLING RAINBOW TROUT STOCKED IN EAST CANYON RESERVOIR, UTAH

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SUMMARY

Personnel from Utah State University, working in cooperation with the Utah Division of Wildlife Resources and the Utah Cooperative Fish and Wildlife Research Unit, are attempting to determine various sources of mortality of fingerling rainbow trout (Salmo gairdneri) stocked into mid-elevation reservoirs in the State. Returns of planted fish are often much below desired levels. Angler surveys indicate that in East Canyon Reservoir, fishermen harvest only about 30% of the fingerling trout stocked, and this is a much higher return than in many other waters.

Predation on planted juvenile rainbow trout by adult salmonids was investigated in East Canyon Reservoir in 1986. Intensive gill net sampling of the predatory fish was begun following planting of the juveniles in May, and continued throughout the summer. Diets of trout in East Canyon Reservoir were dominated by large Daphnia spp., an expected finding due to the abundant supply of this invertebrate in the lake.

Although invertebrate food was dominant, adult salmonids also preyed on juvenile trout, redside shiners (Richardsonius balteatus) and other cyprinids (Table 1). Adult rainbow and cutthroat trout (Salmo clarki) smaller than 300 mm standard length fed on fish less than 75 mm SL, while predators between 300-450 mm consumed trout up to 125 mm in length. Redside shiners were more common in the diet than were trout, reflecting their much higher density in the reservoir. Cyprinids represented 66% of the fish identified in trout stomachs.

Table 1. Abundance of fishes in the stomachs of trout in East Canyon Reservoir during spring and summer of 1986. Key: RBT-rainbow trout; RSS-redside shiners; FHM-fathead minnow (Pimephales promelas); DACE-speckled dace (Rhinichthys osculus); UNI CYP-unidentified cyprinid; UNI FISH-unidentified fish.

		PREY SPECIES						
PREDATOR	N	RBT	RSS	FHM	DACE	UNI CYP	UNI FISH	TOTAL
Cutthroat								
200-249 mm	32	0	0	0	0	0	0	0
250-299	57	0	11	0	0	1	1	13
300-450	42	12	69	1	0	10	13	105
Rainbow								
200-249	247	6	2	0	0	2	0	10
250-300	661	9	16	1	0	19	11	56
300-450	96	7	20	2	2	10	2	43
Brown								
360-465	4	54	4	0	0	0	0	58
TOTAL	1139	88	122	4	2	42	27	283

We examined the guts of 1139 adult fish and found a total of 88 juvenile trout, or 0.077 trout/stomach. However predation was not evenly distributed among the different predators nor through time. Brown trout (Salmo trutta) appear to be particularly piscivorous, but since they are rare in East Canyon Reservoir our sample size was very low (n=4). One large brown trout (462 mm standard length) contained 52 juvenile trout. Cutthroat trout accounted for only 11% of gill net catches in the reservoir, but they were more piscivorous than the rainbow trout. Predation on the juveniles was most intense in the week immediately following stocking, but continued for 60 days.

A rough estimate of the losses of fingerling trout to piscine predation was made using the following model:

$$\text{Total Mortality} = \text{Predator Abundance} \times \frac{\text{juvenile trout}}{\text{stomach}} \div \text{digestion interval (days)} \times \text{predation interval (days)}$$

A minimum estimate of the abundance of rainbow trout that were predators was made by assuming a population size equal to the number caught by anglers after the stocking date of the juvenile fish. Because very few rainbow trout live past 2 years in this intensively fished reservoir (W. Wurtsbaugh, unpublished data), this estimate should be approximately correct. Because cutthroat and brown trout are rarely caught by anglers in East Canyon Reservoir, their abundances were calculated from their relative proportions (with respect to rainbows) in gill net catches, multiplied times the "known" abundance of the adult rainbow trout. The digestion interval was taken from Molnar, Tamassy and Tolg (1967; In S.D. Gerking [ed.], The biological basis of freshwater fish production. Blackwell). Using these parameters in the model, we arrive at the following estimate of predation losses in East Canyon Reservoir:

Predator	Abundance	juvenile trout / stomach	digestion interval (days)	predation interval (days)	Mortality
Rainbow 1+	33,600	0.016	1.4	7	2,700
2+	600	0.072	1.4	60	1,800
Cutthroat	7,090	0.092	1.4	60	28,000
Brown	420	13.500	1.4	60	243,000

In East Canyon Reservoir 300,000 fingerling trout are stocked annually and anglers harvest approximately 100,000, leaving 200,000 fish unaccounted for. The model shown above suggests that all of these losses could be due to predation of adult trout on the juveniles. However, because of the small sample sizes of some predators (i.e. brown trout), and our crude method of determining the abundances of the piscivores, our estimate of predation losses is only approximate. Future work will involve more intensive sampling to refine our estimate of predation rates, and hydroacoustic assessments of the abundance of predators. Nevertheless, our results suggest that predation by adult salmonids is an important loss factor for juvenile rainbow trout stocked in East Canyon Reservoir.