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JOHN T. HEIMER, W. M. FRAZIER, AND J. S. GRIFFITH

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Post-Stocking Performance of Catchable-Size Hatchery Rainbow Trout With and Without Pectoral Fins

JOHN T. HEIMER
Idaho Department of Fish and Game
5205 S. 5th Avenue
Pocatello, Idaho 83204

W. M. FRAZIER' AND J. S. GRIFFITH
Department of Biology
Idaho State University
Pocatello, Idaho 83209

ABSTRACT

We compared returns to the creel, survival, movements, and growth of several groups of hatchery rainbow trout *(Salmo gairdneri),* half with fully developed pectoral fins and half without pectoral fins. We stocked the fish at two locations on two different dates in Idaho's Portneuf River during 1979, and used angler interviews and electrofishing to assess their characteristics. There was no significant difference in total numbers of angler-caught trout with and without pectoral fins (632 vs. 630) or trout with and without pectoral fins (163 vs. 179) caught by electrofishing. There also was no significant difference in growth for 15 groups of trout measured at eight 2-week intervals throughout the summer after stocking. There was no significant difference in the movement of the two different groups of fish. Most (66% of total recovered) were recaptured within a few hundred meters of the stocking site. Only 17 trout (of 8,000 stocked in 1979) were reported caught in 1980, indicating poor over-winter survival and/or extensive movement from the study areas.

Catchable-size hatchery trout often are characterized by the partial or total loss of certain fins (especially the pectorals) from nipping and abrasion. Although studies are somewhat contradictory, there is evidence that the sudden removal of any fin by clipping increases fish mortality (Nicola and Cordone 1973); however, to our knowledge no studies have evaluated the possible consequences of the gradual fin loss that typifies hatchery trout. These consequences would be expected to be less drastic than those resulting from fin-clipping because of the gradual nature of the loss and the opportunity for the fish to adapt to it in the benign hatchery environment.

Many hatchery-reared, catchable-size rainbow trout *(Salmo gairdneri)* have part of one or both pectoral fins missing. The percentage of fish which exhibit this characteristic may be quite high; however, it depends on a number of hatchery conditions such as pond densities and feeding regimes. Routinely, fishery biologists identify catchable-size hatchery rainbow trout by the appearance of their pectoral or dorsal fins at the time of capture.

Pectoral fins are used mainly by trout to regulate their body pitch and brake their forward motion (Alexander 1974). If these fins are missing, it should be more difficult for them to make the delicate movements required to capture food items, especially from the stream drift. With the large-scale hatchery production that currently exists (for example, more than 2 million "catchables" stocked annually in Idaho), the potential effects of this fin loss become important. If returns to the creel were deleteriously affected by this fin loss, the fishery manager may need to make stocking adjustments to accomodate for it, or call for changes in hatchery techniques that would reduce fin loss.

The objectives of this study were to determine what effect the gradual loss of pectoral fins on rainbow trout in a hatchery environment had on their performance in the wild. The null hypothesis was that the gradual loss of these fins in a hatchery by rainbow trout has no effect on their performance in the wild. To test this hypothesis, we planted several groups of hatchery rainbow

' Present address: Pennsylvania Fish Commission, 450 Robinson Lane, Bellefonte, Pennsylvania 16823.

trout in Idaho's Portneuf River. Half of the fish in these groups had fully developed pectoral fins and half were without pectoral fins. Performance was evaluated by monitoring anglers' catches, survival, growth, and movement.

METHODS

We stocked the fish at two sites in the upper Portneuf River (elevation 1,615 m) in Caribou County, Idaho, a tributary of the Snake River. The Portneuf River is a low-gradient (approximately 2.5% in the study area) stream characterized by abundant growth of submerged vegetation, especially *Potamogeton* and *Rorippa,* with summer flows of approximately 3 m^3/second. Wild rainbow trout were abundant and some wild cutthroat trout *(Salmo clarki bouvieri)* also were present in the study area. The two locations, referred to as Pebble Bridge and Utah Bridge, are 5 km apart and typically receive hatchery rainbow trout in approximately the same numbers as in our study.

To determine what constitutes a full-finned fish, we captured several hundred wild rainbow trout from the Portneuf River and measured the total length and pectoral fin length of each in millimeters. A linear regression of these data (r^2 = 0.92) gave the equation:

$$P = 0.1301L — 0.3972$$

where P = pectoral fin length and L = total fish length. We then established the criterion that lengths of both pectoral fins of a hatchery fish must be at least 80% of the mean for wild fish of that body length in order for that hatchery fish to be considered as "finned."

We obtained hatchery trout from the Idaho Department of Fish and Game's American Falls Hatchery. During both May and July of 1979, we selected 2,000 trout meeting the finned criterion and simultaneously selected 2,000 fish that were totally missing both pectoral fins. We did not consider the condition of the other fins. It was necessary to hand-sort a large number of trout to find those that were suitable; most trout were either 40 to 60% fully-finned or else were totally missing only one pectoral fin.

Mean lengths of both May and July groups were not significantly different for finned vs. nonfinned trout (Table 1). The mean lengths for the May groups were approximately 200 mm, while those of the July groups were approximately 225 mm. We tagged all fish with serially numbered Monel jaw tags and held them for several days in the hatchery to assess mortality and tag loss, which was negligible.

Table 1. Total lengths (millimeters) of random samples of hatchery rainbow trout with and without pectoral fins prior to stocking in the Portneuf River, 1979. No differences were significant (P = 0.05; Student's *t* test).

Stocking location	Month	Length: With pectorals	Length: Without pectorals	df	*t* value
Pebble Bridge	May	206.0	203.0	386	0.98
Utah Bridge	May	205.2	198.9	422	2.32
Pebble Bridge	July	223.6	229.4	387	1.92
Utah Bridge	July	222.2	224.5	240	0.55

On 24 May 1979, 2 days before the opening of the general fishing season, we introduced the first group of tagged fish and split them between the two locations, with each site receiving 1,000 fish with full pectoral fins and 1,000 without pectoral fins. We distributed the second group of 4,000 fish on 23 July 1979.

We used a check station on a major access road to the area to assess returns of each group of fish. During each 2-week interval between 26 May and 28 September 1979, we operated the station on one Saturday, one Sunday and two weekdays chosen at random. Project personnel also circulated throughout the study area to interview anglers and they contacted approximately 40% of the fishermen through the end of September. Some tags were returned to other Department personnel during 1979 and 1980.

Electrofishing was done with an aluminum drift boat and a 2,500-watt DC generator 7 days after the May stocking and during the last few days of June, September, and October 1979, and in September of 1980 to monitor survival, growth, and movements of each group of trout. The area electrofished extended from 3 km above the upper stocking location (Utah Bridge) to 7 km below the lower stocking location (Pebble Bridge). The river upstream from the electrofishing area had been channelized several decades ago and does not provide suitable trout habitat.

Survival was assessed by a series of chi-square tests between groups of trout with and without pectoral fins. We compared growth in length for fish with and without pectoral fins by evaluating data from 680 trout captured by both angling

Table 2. Numbers of hatchery rainbow trout with and without pectoral fins stocked at two locations and taken by anglers and by electrofishing in the Portneuf River, 1979-1980. We stocked 1,000 of each group at each of the two locations on each stocking date.

			Pebble Bridge		Utah Bridge	
Stocking date, 1979	Collection technique	Dates	With pectorals	Without pectorals	With pectorals	Without pectorals
24 May	Angling	26 May–30 Nov 1979	249	257	217	213
		24 May–30 Nov 1980	0	0	3	1
	Electro-fishing	31 May–28 Oct 1979	38	41	65	83
		Totals	287	298	285	297
23 July	Angling	23 July–30 Nov 1979	70	53	83	103
		24 May–30 Nov 1980	7	3	3	0
	Electro-fishing	15 Sept–28 Oct 1979	29	18	31	37
		Totals	106	74	117	140
		Grand totals	393	372	402	437

and electrofishing during eight 2-week time intervals in the summer of 1979. For each interval, we calculated growth increments by subtracting mean length of that group at stocking from length of each fish at capture and then comparing increments with a Student's t test.

We assessed differences in movement between groups of fish with and without pectoral fins by recording capture locations for fish collected during electrofishing in 1979 and for those angler-caught fish whose location of capture could be determined precisely. The study area was divided into sections approximately 0.7 km long for this purpose. For analysis, each section was ranked, with number 1 being the section where stocking occurred. Sections upstream and downstream were given progressively larger ranks. We used a Mann-Whitney U test to compare the frequency-rank products between each group of fish with and without pectoral fins.

RESULTS AND DISCUSSION

Survival

Nearly identical numbers of rainbow trout with and without pectoral fins (795 with and 809 without) were recovered by anglers and electrofishing during the study (Table 2). For angler-caught rainbow trout, there was no significant difference in total number of fish with pectoral fins (632 fish) vs. without pectoral fins (630 fish) for all groups combined. There were no significant differences between groups in numbers of fish returned to the creel from either stocking date or location. Of the 8,000 fish stocked, 1,262 were reported to project personnel by anglers in 1979 and 1980, representing an overall extrapolated return to the creel of 40%. This return is slightly above the average of 34% for 11 rainbow trout studies summarized by Cresswell (1981).

Returns from the groups of trout stocked in July were considerably lower than from those stocked in May. Extrapolation from check station data indicated that an estimated 63% of fish stocked in May at the Pebble Bridge site and 55% of those stocked at the Utah Bridge site were taken by anglers during the 1979 census period. On the other hand, only 15% and 23% of those stocked in July at Pebble and Utah bridges, respectively, were caught. These differences reflect a substantial decline in angling effort throughout the season, with effort dropping off almost linearly with time. One-third of the effort occurred during the first 2 weeks of the season, including the Memorial Day weekend, and only 28% of all effort was recorded after the 23 July stocking. Catch per hour for all hatchery fish was 0.23 before 23 July 1979, then actually increased slightly to 0.28 in the latter part of the summer.

Returns from anglers in 1980 indicated that very few hatchery trout of any group remained in the study area following the 1979—1980 winter. A total of 17 fish of all groups stocked were reported as being caught in 1980. Of these, 13 had pectoral fins and 4 did not, suggesting (very inconclusively) a difference in long-term survival.

Electrofishing results from May to October

Table 3. Movement in the Portneuf River throughout 1979 of groups of hatchery rainbow trout with and without pectoral fins. Data from 342 fish taken by electrofishing and 390 fish captured by anglers are included. The "no movement" location included a section 0.7 km long encompassing the pool in which fish were stocked (Pebble Bridge and Utah Bridge data combined).

Capture method	Stocking date (1979)	Fish group	Minimum distance moved upstream (km)			No movement	Minimum distance moved downstream (km)		
			2.1	1.4	0.7		0.7	1.4	2.1
Angling	May	Finned	4	1	0	43	14	2	8
		No fins	2	0	0	52	18	1	8
	July	Finned	8	0	0	79	14	9	10
		No fins	5	0	0	86	10	5	11
Electro-fishing	May	Finned	1	1	1	62	31	4	3
		No fins	1	4	3	77	34	2	3
	July	Finned	0	3	2	42	3	2	8
		No fins	1	5	2	40	2	1	4
Totals		Finned	13	5	3	226	62	17	29
		No fins	9	9	5	255	64	9	26

1979 indicated the same trends in survival as the creel census. There were no significant differences between numbers of trout captured in 1979 with pectoral fins (163 fish) and without pectoral fins (179 fish), as shown in Table 2. Electrofishing in September 1980 failed to recover any hatchery trout from the 1979 stockings, indicating poor overwinter survival and/or extensive movement from the study areas. Similarly, Cooper (1952) found that only 0.8—2.3% of the hatchery rainbow trout were recovered after their first winter in Pigeon River, Michigan. Butler and Borgeson (1965) discussed some of California's catchable trout fisheries. They reported that 17 out of 20 test waters had harvests that exceeded 50% and that the average return from 13 streams was 73%. These are generally higher returns than in Idaho, probably because of heavier fishing pressure. They did not discuss overwinter survival, probably because the majority of trout were caught soon after being released.

Growth

There was no significant difference in growth throughout the summer between fish with and without pectoral fins for each of 15 groups of trout measured at 8 intervals after stocking. Growth data from the 680 individual fish recovered indicated that trout stocked in May showed no detectable increase in length until the latter part of July. These observations were similar to those of Cooper (1952) in the Pigeon River, Michigan where catchable-size rainbow trout grew less than 3 cm per year after their release in the stream.

Movement

There were no significant differences in movement between fish with and without pectoral fins, as indicated by a series of Mann-Whitney U tests for each paired group of trout. Results were similar for fish stocked at both Pebble and Utah bridges and we pooled the data for presentation in Table 3.

Most fish (66% of the total recovered) were recaptured throughout the summer within a few hundred meters of the location stocked. Very little upstream movement was detected, with only 6% of all recaptures being made upstream from the section of stocking. Despite similar stream habitat above and below each stocking site, very few fish moved upstream one section (0.7 km) while a substantial number moved downstream one section. Movement was greatest in the downstream direction and 28% of fish recovered showed some movement in that direction. These results are generally similar to those found elsewhere for hatchery rainbow trout (Cooper 1952; Newell 1957; Helfrich and Kendall 1982). However, Adams (1960) reported a considerable amount of upstream movement.

A few fish (not included in Table 3) were recovered by anglers in the fall of 1979 and the summer of 1980 long distances below the study area. Six fish were recovered from American Falls Reservoir on the Snake River, a minimum of

117 km below the point of stocking. Two other rainbow trout were caught from the Snake River below American Falls Reservoir indicating movement of at least 158 km.

In this study, the trout with pectoral fins missing were capable of maneuvering as well as their finned counterparts, as demonstrated by their growth and survival. This despite the fact that we evaluated fish whose pectorals were totally absent, while most of the fish that we processed in the hatchery had at least partial pectorals. On the other hand, it is important to note that the Portneuf River, with its low gradient and abundant food supply, does offer a relatively benign environment. Different results might be expected under more demanding physical conditions.

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