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MORTALITY AND CATCH RATES OF JUVENILE STEELHEAD TROUT CAUGHT ON SINGLE VERSUS TREBLE BARBLESS HOOKS

Hayden Creek Research Station, 1979 –

by

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INTRODUCTION

Both the Clearwater and Salmon River drainages support large populations of naturally rearing steelhead trout juveniles. These fish inadvertently provide the major portion of a continually growing summer-time recreational "trout" fishery. Lindland (1978) found that 73% of the fish caught by anglers in the Lochsa River were juvenile steelhead. Special catch and release regulations are being increasingly employed in Idaho to reduce this loss of steelhead juveniles in anadromous fish rearing streams. Some of these special regulations include the requirement that only flies or lures with single barbless hooks be used in order to minimize injury to the released fish.

Fisheries agencies in other states require only that hooks be barbless and treble hooks are allowed.

In 1979 we initiated an experiment at the Hayden Creek Research Station to compare the effects of single and treble barbless hooks on the mortality of juvenile steelhead trout. An experiment comparing efficiency of the two types of hooks was also conducted.

TECHNIQUES USED

Fish

The steelhead trout used in these experiments were raised from eggs obtained from the Skamania Fish Hatchery on the Washougal River, Washington; a lower tributary of the Columbia. The steelhead were being reared in a .2-ha (.6-acre) dirt bottomed hatchery pond at the Hayden Creek Research Station located 48 km (30 mi) south of the town of Salmon, Idaho. The fish ranged between 150-220 mm (6-8.5 in) total length at the time of the experiments (20 January - 9 February 1979). Pond water temperature ranged from 9.4 C (49 F) to 12.2 C (54 F).

Equipment

We used standard spin fishing reels and spinning rods equipped with 4-6 lb test line. Terminal tackle was a red, size 0 "Mepps" spinner equipped with size 10 single or treble hooks made barbless by pinching the barb closed with pliers.

Methods

Casts were made into the pond and each time a steelhead was caught it was removed from the hook and placed in one of two 60-m (220-ft) concrete raceways according to the type of hook used. Only what we considered "normal care" was used in removing the hook and releasing the fish. Fish in the raceways were fed a normal diet and records on mortality were kept on a daily basis. Fish were kept in the raceway for 2 weeks after being caught and released to account for any delayed mortality.

We also kept records of time spent fishing, strikes, fish hooked and lost, fish landed, and lengths to enable us to draw conclusions on various aspects of

the experiment.

FINDINGS

Mortality Rates of Steelhead Juveniles on Barbless Single and Treble Hooks

During the study period we caught and released 700 steelhead smolts; 350 on a single barbless hook and 350 on a treble barbless hook. Two weeks after the last fish was caught we totaled the actual mortalities as recorded daily (Table 1).

Table 1. Mortalities of single barbless and treble barbless hooked steelhead.

	Single barbless	Treble barbless
Number fish caught:	350	350
Number fish died:	2	9
Percent mortality:	0.57%	2.57%

As with most hook and release experiments, mortalities were extremely low for both groups: 2 barbless single deaths (0.57%) versus 9 barbless treble deaths (2.57%). A chi-square test yields a value of .242 indicating no significant statistical difference can be demonstrated in mortality among the two groups. Most hook and release studies done have shown mortalities in the 5% range or less, and consequently do not readily lend themselves to statistical comparison. However, even at the low level of mortalities observed, losses from treble barbless hooks were 4.5 times that of losses from single barbless hooks. In an intensive catch-and-release fishery, this could be meaningful. Ball (Personal Communication, 1979) estimated that anglers hooked and released 75,000 cutthroat trout on the Middle Fork Salmon River in 1978. Applying the percent mortalities observed at Hayden Creek, single barbless hooks would account for 428 deaths versus 1,928 for treble barbless hooks, a difference of 1,500 trout; predominantly spawner size individuals. This is 83% of the estimated season trout harvest in that stream **in** 1969 (1,800) when it was catch and keep (Ortmann 1971).

Hooking Efficiency

During the course of the experiment we recorded the number of fish landed versus the number that struck the lure or were briefly hooked and escaped before being landed. This can be interpreted as **a** value of "hooking efficiency" of the two types of hooks (Table 2).

Table 2. Numbers and percent of fish landed and escaped on single barbless and treble barbless hooks.

	Single barbless	Treble barbless
Total fish striking:	1,923	2,651
Total fish landed:*	275	272
Percent landed (efficiency):	14.3%	10.3%

*Includes approximately 11% juvenile chinook salmon also present in the test pond.

The single barbless hook was more "efficient" in hooking fish than the treble barbless hook. It took 728 (27%) more strikes to land approximately the same number of fish on the treble hook than on the single hook. Fourteen percent of the fish striking the single hook were landed versus 10% of the fish hitting the lure with the treble hook.

DISCUSSION

Applied to a catch and release fishery, specifically involving juvenile steelhead trout, some basic assumptions are indicated.

The mortality rate of fish hooked and released on a single barbless hook will be less than for those hooked and released on a treble barbless hook. However, for a given amount of time spent fishing, more fish will be landed (handled) on the single hook than on the treble. In a hypothetical example let us assume juvenile steelhead populations of 1,500 fish are exposed to the two types of hooks in a sport fishery. Applying the established hooking efficiency and mortality rates over an identical period of time would theoretically result in the loss of approximately four times more fish to the treble hook than to the single hook (Table 3). Although fewer fish would be caught on the treble hook the higher mortality rate offsets the reduced number of fish handled.

Table 3. Hypothetical effects of single and treble barbless hooks on a juvenile steelhead population.

	Single hook	Treble hook
Pop. size:	1,500	1,500
Percent caught:	14.3	10.3
Number caught:	215	155
Percent mortality	0.57	2.57
Number killed:	1	4

These experiments indicate that where a catch-and-release fishery is established to protect juvenile steelhead population, a single barbless hook would be of the most benefit to the fish (less mortality) and to the angler (more fish caught over time) compared to a treble barbless hook.

There is some indication from observations made in the field and at fish hatcheries that survival rates of handled fish may be related to the temperature of the water. This should be a subject for future experiments.

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