AN EVALUATION OF THE USE OF A ROTARY SCREW FISH TRAP FOR ASSESSING STEELHEAD SMOLT EMIGRATIONS IN THE LITTLE BULKLEY RIVER, 1993.

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INTRODUCTION

An eight foot (2.4 meter) diameter rotary screw trap (E.G. Solutions, INC., Corvallis, Oregon) was purchased by B.C. Environment Fisheries Branch with Habitat Conservation Fund monies. The little Bulkley River, near Houston, B.C. (Figure 1) was chosen as a location to utilize the trap. The objectives of this project were to:

1. **Determine whether we could effectively use the trap to capture emigrating juvenile salmonids in the little Bulkley River;**
2. **Enumerate all fish captured by species;**
3. **Determine whether or not a debris deflector would work effectively without significantly reducing the efficiency of the trap.**

Ultimately, we would like to use this trap to assess the strength and timing of the little Bulkley River summer steelhead (*Oncorhynchus mykiss*) smolt emigration. However, the trap was not obtained in time to begin to investigate these questions.

METHODS

A Hyab was obtained to place the trap in the little Bulkley River on May 20, 1993. The Canadian National Railway Bridge over the little Bulkley River was used to suspend 3/8" (9.5 mm) steel cable perpendicular to the flow of the river; the wetted width of the river

is approximately 25 meters at the trap site. The trap was attached to the cable using a pulley system such that the trap could be moved laterally to fish the most effective location or to pull the trap from the main current stream to remove large debris. A V-shaped debris deflector fabricated from aluminum was designed specifically for this project by the Engineering Department at the University of British Columbia. The deflector was suspended in a similar fashion from another cable immediately upstream of the trap. The trap and position of the deflector relative to it are shown in Figure 2.

The rotary screw trap captures fish when water enters the upstream end of the trapping cone. Water striking the angled surface of the internal screw rotates the perforated cone and screw assembly. As the assembly rotates, fish are trapped within the chambers formed by the screw and moved rearward into the livebox.

We began fishing on May 26, 1993. Fisheries Branch staff arrived at the trap each morning, excluding weekends, and dipnetted fish from the livebox into an approximately 50 litre tub of water. Fork length was measured on a subset of between 15% and 30% of the total catch. Alka Seltzer was used to anaesthetize these fish for ease of handling. All other fish captured were enumerated by species. On five dates when more than thirty steelhead smolt were captured we clipped a lobe of the caudal fin and released those fish approximately 100 meters upstream of the trap and used the incidence of recapture to calibrate the efficiency of the trap. The debris deflector was generally used on alternating days.

In addition to fish sampling, a max/min thermometer suspended from the trap was used to give a daily measure of water temperature. A staff gauge fixed to the bank of the river gave a daily relative measure of stream flows. The rotations per minute of the screw assembly and total fishing time between sampling were also recorded.

At the end of each sampling all debris was removed from the live box; the screw assembly was raised by a winch system to allow cleaning. A wire brush was used to remove fine organic debris from the perforations of the drum.

RESULTS

We successfully fished the screw trap for fifteen of eighteen sample days within the study period. Although data was obtained for all eighteen sample days, the trap had moved to an ineffective location and was no longer rotating for three consecutive days, June 15, 16 and 17. This occurred when large debris became entangled in support ropes that fixed the trap pontoons to the river bank. All data collected, with the exception of fish lengths, is presented in Appendix I.

During this investigation we captured 386 steelhead smolts, 687 steelhead parr, 1045 chinook smolts, 226 coho smolts, 176 coho fry, 256 Rocky Mountain whitefish, 1006 long nose dace and 618 lamprey ammocoetes. Also, one cutthroat trout, a single Dolly Varden char and 5 steelhead kelts were trapped. The number of steelhead smolts captured over the study period

is illustrated in Figure 3. Inspection of Figure 3 indicates that the peak of the steelhead smolt emigration most likely occurred on or near the middle of May.
Line graphs illustrating numbers of steelhead parr, coho smolts, coho fry, chinook smolts, Rocky Mountain whitefish and lamprey ammocoetes captured comprise Appendix II. The length frequency histogram for all rainbow trout juveniles sampled is displayed in Appendix III.

We captured 175 chinook smolts that had received an adipose left ventral clip by the Toboggan Creek Enhancement Society. These fish were originally part of a 51 840 fish release of 1+ year old chinook smolts. All of the 51 840 fish had been clipped and were released upstream of our trap at McQuarrie Creek, near Topley, on April 14th and 22nd, 1993.

The debris deflector was effective at reducing the amount of organic material caught in the trapping cone. The deflector appeared to fish best in relatively calm water conditions (Figure 2). However, when we fished the main current (the location consistent with the highest numbers of fish captured), as shown in Figure 4, the deflector partially submerged in the surface flow and created considerable turbulence. We could not find significant differences in numbers of fish captured with and without the deflector with our small sample size, but we suspect this turbulence would reduce catches of smolts and fry travelling in or near the surface flow.

We attempted to calibrate the efficiency of the trap by releasing marked fish upstream of the trap. Numbers of clipped steelhead smolts released and recaptured are shown in Appendix I. On only five dates were enough smolts captured to warrant a release of marked fish. Recapture incidence ranged from 5.3% to 16.1%. It is interesting to note that the both the highest and lowest recapture rates were realized on dates when the debris deflector was used.

There were some fish mortalities associated with trap operation. The exact number of morts could not be accurately assessed; the live box of the screw trap was equipped with a rotating drum designed to remove small debris which also removed morts. Fish mortalities are shown in brackets adjacent to numbers of fish captured in Appendix I.
Rocky Mountain whitefish suffered the highest mortality (10.5%); steelhead smolt mortality was 3.4%. The highest mortalities were noted on days when the debris deflector was not used, indicating that the deflector did indeed reduce fish mortality. This is most likely attributed to the fact that more debris was found in the trapping cone when the deflector was not used and fish may have been injured while passing through to the live box.

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APPENDIX I: Little Bulkley River rotary screw trap data set.

APPENDIX II: Line graphs illustrating numbers of steelhead parr, coho smolts, coho fry, chinook smolts, Rocky Mountain whitefish and lamprey ammocoetes captured. Arrows denote days when debris deflector was used.

APPENDIX III: Length frequency histogram for all rainbow trout juveniles sampled.