

Deena Coho Indicator Stock Equipment Upgrade 2008

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Table of Contents

Executive Summary	1
Introduction.....	2
Methods.....	3
Equipment Upgrade	3
Site Location	4
Smolt Population Estimate.....	5
Results.....	6
Summary	7
Appendix 1.....	8
Project Expenditure Report.....	8

Executive Summary

During the spring of 2008, the HFP used \$13,500 CAD from the Northern Fund to purchase a T4 CWT Tunnel Detector from Northwest Marine Technologies and other related equipment. This detector was used at Deena Creek to detect, sort, and enumerate AFC/CWT marked fish recaptured by a 5'RST. The T4 detector significantly improved the ability of HFP technicians to sort AFC/CWT marked fish and allowed larger mark groups to be released. The release of larger mark groups has proven successful for improving the estimate of emigrating population of coho smolts from Deena Creek.

Introduction

Deena Creek Coho are used as a stock indicator for northern B.C. coho populations. The Haida Fisheries Program (HFP) has been enumerating and applying adipose fin clips (AFC) and coded wire tags (CWT) to emigrating coho smolts, and enumerating adult escapement since 1994. This data along with CWT recoveries from marine fisheries has been used to monitor marine survival and exploitation of Deena Coho in Alaskan and Canadian fisheries.

Deena coho smolts are captured using 2 rotary screw traps as they emigrate from Deena Creek to the ocean. An upstream trap is used to capture smolts for application of CWTs, while a downstream trap is used to enumerate the total migrating smolt population using mark recapture methodology. In previous years, HFP technicians were required to manually sort marked and unmarked fish. This was labour and time intensive and therefore limited the number of marked fish released upstream of the trap to approximately 10% of all CWT marked fish. During the 2007 season, HFP successfully tested a T4 CWT detector, developed by Northwest Marine Technologies, to detect and sort CWT marked smolts from unmarked smolts at Deena Creek. This resulted in a significant increase in sorting efficiency and mark detection and therefore all CWT marked fish were released upstream of the mark recapture trap. Larger mark groups and improved CWT detection therefore improved the Peterson estimate of the migrating coho smolt population.

The objectives of this project were to:

1. Purchase and receive a T4 CWT detector from Northwest Marine Technologies prior to May 2008;
2. Release all CWT marked fish upstream of the mark recapture trap location and use the T4 to sort and enumerate marked and unmarked coho smolts during May and June of 2008;
3. Estimate the migrating coho smolt population from Deena Creek using mark recapture data collected by the T4 CWT detector.

Methods

Equipment Upgrade

Haida Fisheries contacted Northwest Marine Technologies (Washington, USA) and ordered a T4 CWT Tunnel Detector during March of 2008. This unit was received by Haida Fisheries during late April and tested at the office prior to deployment in the field.



Figure 1 Haida Fisheries technician testing T4 CWT Tunnel Detector prior to deployment at Deena Creek field site.

Site Location

Deena Creek (watershed code # 950-974300) drains northern Moresby Island into Skidegate Inlet (See Figure 1). It has a watershed area of 65 km² and approximately 15.5 km of mainstem accessible by anadromous fishes. In addition to coho, the river also supports pink salmon (*O. gorbuscha*), chum salmon (*O. keta*), rainbow trout (*O. mykiss*), cutthroat trout (*O. clarki*), and Dolly Varden char (*Salvelinus malma*).

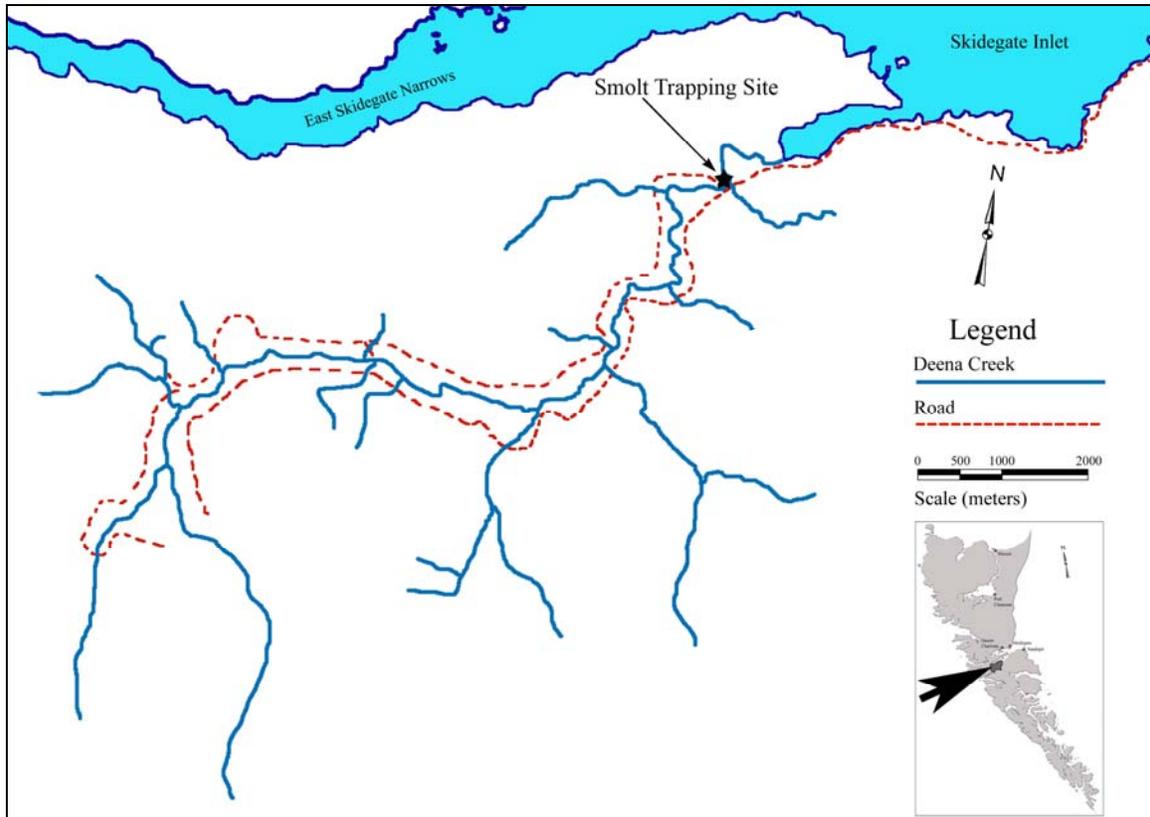


Figure 2 Map showing location of Deena Coho smolt trapping site on Haida Gwaii.

Smolt Population Estimate

Two RSTs were used to capture coho smolts emigrating from Deena Creek between April 24 and July 3, 2008. An 8' RST was used to capture coho smolts approximately 200 m upstream of a second 5' RST. Marks (caudal clips or AFC / CWT) were applied to coho smolts captured by the upstream trap and released to enumerate the total migrating smolt population using mark recapture methodology at the downstream trap.

Coho smolts captured by the downstream 5' RST were collected by HFP technicians daily. The T4 detector was used to sort and enumerate AFC/CWT marked smolts. The remainder of smolts were manually inspected and sorted for caudal clip marks and enumerated.

The emigrating coho smolt population was estimated using a temporally stratified Peterson estimator to estimate the run during distinct periods associated with specific released mark groups. The total population estimate was then the sum of the estimates for each of the periods. The following approximately unbiased estimate of the stratum population size using a stratified Petersen estimator with a Chapman modification was used to estimate the total population size:

$$N_i = \frac{(M_i + 1)(C_i + 1)}{(R_i + 1)} \quad (1)$$

$$\text{Total Population Size} = N = \sum N_i \quad (2)$$

Where:

- N_i = The population estimate for stratum i.
- M_i = # of fish marked and released at the Upstream Capture Site for stratum i.
- C_i = total # of fish caught at the Downstream Capture Site during stratum i.
- R_i = # of marked fish from stratum i recaptured at the Downstream Capture Site.

An approximately unbiased estimate of the variance for stratum i was estimated by:

$$\text{Variance of } N_i = V(N_i) = \frac{(M_i + 1)^2 (C_i + 1) (C_i - R_i)}{(R_i + 1)^2 (R_i + 2)} = \frac{N_i^2 (C_i - R_i)}{(C_i + 1) (R_i + 2)} \quad (3)$$

Variance of N_i was used to estimate an approximate 95% confidence interval (95% C.I.) of total population size by:

$$\text{Total standard error} = \text{Total S.E.} = \sqrt{\sum V(N_i)} \times 1.96 \quad (4)$$

$$95\% \text{ C.I.} = N + \text{Total S.E.} \quad (5)$$

Results

A total of four mark groups were used to estimate the total population of coho smolts emigrating from Deena Creek. Haida Fisheries Technicians applied to AFC / CWT marks to 11,062 coho smolts between May 9 and June 9. The majority of these marked fish (7,201) were released upstream of the 5'RST as the CWT mark group. Technicians used the T4 CWT Tunnel Detector to detect and sort 1,189 AFC / CWT marked coho from a total of 13,069 coho smolts captured between May 9 and June 9, 2008. The total stratified population estimate of coho smolts emigrating from Deena Creek during the spring of 2008 was 94,370.

Table 1. Mark groups released, total captured, and recaptured coho smolts with stratified population estimate of coho smolts emigrating from Deena Creek.

Date	Mark Group	Total Number of Co			Sample	Petersen	95 % C.I.		
		Marked	Recovered	Captured	Variance V(N)	Estimate (N)			
April 24 - May 8	UC	887	216	1479	143587	6056	5314	-	6799
May 9 - June 9	CWT	7201	1189	13069	4775211	79101	74818	-	83384
June 10 - June 19	LC	1469	384	1536	66873	5869	5362	-	6375
June 20 - July 3	UC2	882	206	783	39574	3344	2954	-	3734
	Total:	10439	1995	16867					
Total Population Estimate:						94370	89976	-	98764

Summary

During the spring of 2008, the HFP used \$13,500 CAD from the Northern Fund to purchase a T4 CWT Tunnel Detector from Northwest Marine Technologies and other related equipment. This detector was used at Deena Creek to detect, sort, and enumerate AFC/CWT marked fish recaptured by a 5'RST. The T4 detector significantly improved the ability of HFP technicians to sort AFC/CWT marked fish and allowed larger mark groups to be released. The release of larger mark groups has proven successful for improving the estimate of emigrating population of coho smolts from Deena Creek. The final estimate of coho emigration from Deena Creek was $94,370 \pm 4394$.

This project has met its 3 objectives. A T4 CWT Tunnel Detector was purchased from Northwest Marine Technologies prior to the Deena Creek coho smolt enumeration season in May of 2008. The T4 detector was used to sort and enumerate all AFC/CWT marked coho smolts captured in a 5'RST. Mark recapture rates generated by the T4 detector were used to estimate the total coho smolt population emigrating from Deena Creek.

Deena Creek Coho are one of the few remaining coho populations on the B.C. north coast that has a long term juvenile output and escapement data set and is presently being used as a coho indicator stock. Using a T4 CWT detector will increase the precision and accuracy of the emigrating coho smolt population and improve future stock assessment information. This data is used as a secondary method to estimate marine survival and validate estimates generated from CWT marked fish.

Appendix 1

Project Expenditure Report

Appendix 1. Deena Coho Indicator Stock Equipment Upgrade project expenditures.

Description of Expenditure	Costs Total	In-Kind	PSC Amount
HFP Biologist			
- set up, testing and training	\$2,000	\$2,000	
Office			
- mail and postage	\$10		\$10
Shipping			
- UPS Canada	\$115		\$115
Equipment Purchase			
Northwest Marine Technologies	\$13,620	\$428	\$13,193
- T4 Tunnel Detector			
- Protective Case			
- Detector Stand			
- Mechanical Gate			
- Mark IV remote trigger			
- Mark IV CWT cutter and needle			
House of Tools			
- Dewalt 18V rechargeable power packs			\$183
Project Totals:	\$15,745	\$2,428	\$13,500