

**BC HYDRO
BRIDGE COASTAL
FISH AND WILDLIFE RESTORATION PROGRAM
PROJECT REPORT**

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**CHEAKAMUS RIVER
PINK SALMON RECOVERY PROGRAM
2001-2002**

**In Partnership;
Fisheries and Oceans Canada,
Tenderfoot Creek Salmon Hatchery and
Lower Fraser Resource Restoration Unit,
Seymour Salmonid Society,
North Vancouver Outdoor School**

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Executive Summary

Brood year 2001/2002 was the first year of an intensive short-term (three cycles) fish culture program designed to re-build pink salmon stocks in the Cheakamus River watershed. The Cheakamus Pink Salmon Recovery Plan is a joint project undertaken by Fisheries and Oceans Canada, BC Hydro Bridge Coastal Fish and Wildlife Restoration Program, Seymour Salmonid Society and the North Vancouver Outdoor School in Squamish.

Total pink salmon eggs taken in 2001 was an estimated 1.45 million. This included 1.2 million transplanted from the Indian River watershed. Total fry released in 2002 was an estimated 771 thousand.

1. Introduction

In the 1960's returns of pink salmon to the Cheakamus River exceeded 500,000 spawners. Returns collapsed after a major flood event in 1975 and have remained at negligible levels since that time. The causes of this collapse may involve several factors including hydro development of the watershed. Changes in river morphology attributed to the reduction in flow, sediment input and dyking have altered channel forming processes and reduced the number of secondary channels in the Cheakamus River. A review of changes to river hydrology and substrate over the last forty years and the strength of the chum salmon returns to mainstem river habitats strongly suggest that significant habitat for spawning pink salmon remains in the Cheakamus River. Given there has been some loss of habitat available to this species it is not unreasonable to assume sufficient habitat remains to support populations of pink salmon in excess of 100,000 spawners. Large numbers of returning pink salmon are known to provide an important nutrient source for both aquatic and terrestrial animals and plants.

Artificial propagation "provides support for re-introduction of fish and wildlife, and for artificially supplementing production where necessary" and is listed as the fifth restoration priority in the BCHRP Strategic Plan. Without direct fish culture support it is highly unlikely that pink salmon will naturally rebuild to habitat capacity due to compensatory mortality effects. Predation, redd competition with chum salmon, incidental fishing mortality and other mortality factors all disproportionately effect pink salmon at low populations levels. Pink salmon populations in the Oyster River on the East Coast of Vancouver Island, collapsed in the 1960's and showed no ability to naturally recover for over 30 years. In the 1990's, Quinsam Hatchery and the Oyster River Enhancement Society jointly cultured pink salmon and initiated a rapid rebuilding of this population to over 100,000 adults in 1995. This population is now naturally self-sustaining. DFO proposes to take a similar course of action for the Cheakamus.

The North Vancouver Outdoor School worked with Fisheries and Oceans in 1991 on a pilot pink salmon culture project for the Cheakamus watershed. Eggs and fry were incubated and released to a restored river fed side-channel on the school grounds known as Moody's Channel. The 1991 program confirmed that culture of pink salmon was both practical and feasible and the fry release resulted in adult pink salmon returns to Moody's Channel in 1993. Restored river fed side-channels on the NVOSS property were specifically designed to support pink salmon. Unfortunately returns of pink salmon spawners utilising these habitats have remained low during the last number of years due to limited stock recruitment.

Brood year 2001/2002 was the first year of an intensive, short-term (three cycles) fish culture program designed to rebuild the pink salmon population of the Cheakamus River to sustainable levels. DFO and BC Hydro, Bridge Coastal Fish and Wildlife Restoration Program jointly fund this program. Pink salmon eggs and sperm were collected from spawning populations in the Squamish and Indian River watersheds. The resultant pink salmon fry were released to Moody's Channel during the spring of 2002. Following is a summary of the first year of the program.

2. Study Area

The proposed pink salmon recovery area is between kilometre 4 and 8 on the Cheakamus River (downstream of Tenderfoot Creek Hatchery and adjacent to the North Vancouver Outdoor School). This includes a river fed side-channel on the grounds of the school known as Moody's Channel. Maps that include the site are Natural Resources Canada National Topographic System 92G/14 and GeoData British Columbia Terrain Resource Information Management 92G.085 near UTM co-ordinates of 5519500m N by 489250m E (1983 North American Datum, UTM Zone 10U).

3. Methods

3.1 Adult Capture

Adult pink salmon were captured by beach seine net in late September/early October, 2001 from both the Squamish watershed (Mamquam and Cheakamus Rivers) and from the Indian River watershed. A crew from Seymour River Hatchery performed the broodstock capture at Indian River and commuted by truck and boat. A crew from Tenderfoot Creek Hatchery was responsible for the adult capture in Squamish. Low water conditions allowed for most of the netting to be done by hand although a river jet boat was also used in Squamish for setting the net. Ripe fish on the spawning grounds were generally targeted. An attempt to transport green fish captured in the Mamquam River and hold them until ready for spawning, met with limited success.

3.2 Egg-takes

Eggs and sperm from adult returns to the Squamish watershed were the primary target for the fish culture program. Due to expected low returns to the Squamish, a transplant of 1.2 million eggs from the Indian River watershed was also approved. Delayed fertilisation was used for both the Squamish and Indian River egg-takes. Eggs were pooled in buckets and kept on ice for transport. Milt was taken in individual whirl bags and also kept on ice for transport. The Squamish area eggs and milt were transported to Tenderfoot Creek Hatchery for fertilisation and initial incubation and the Indian River eggs and milt were transported to Seymour River Hatchery. In addition, whenever possible extra milt was taken in Squamish for transportation to Seymour River Hatchery, to be used preferentially for crossing with Indian River eggs. It is theorised that the progeny of these crosses will be less likely to stray back to the Indian River. Total volume and sub-sample counts were used to estimate egg numbers.

3.3 Fertilisation, Incubation and Release

Upon arrival at either hatchery, the pooled eggs were divided in to small lots equivalent to the number of bags of milt. The eggs and milt were mixed in a one to one fashion thus maximising the number of crosses and genetic diversity of the resultant embryos. All fertilised eggs were initially incubated in bulk siphon boxes suspended in vacant rearing troughs. At the eyed stage the Indian River eggs were transported to Tenderfoot Hatchery then all were re-enumerated through an automatic egg picker/counter. After picking of dead eggs was complete, all the live, eyed eggs were moved to in-stream cassette incubators placed in Moody's Channel at the North

Vancouver Outdoor School. Here incubation was completed through hatch to the alevin stage and eventual release as un-fed fry.

4. Results

4.1 Adult Capture

The following table summarises the adults captured and used for broodstock. These numbers do not include the unripe or spawned-out fish also handled.

Table 1. Adult Broodstock

	Indian	Mamquam	Cheakamus
<u>Females</u>	849	158	10
<u>Males</u>	565	467	18

4.2 Egg-takes

The number of eggs taken from each stock in 2001, as estimated by the volume method prior to fertilisation, were as follows. Egg-takes commenced September 17th and were completed by October 2nd.

Table 2. Green Egg Estimate

Indian	Mamquam	Cheakamus
1,226,647	158,400	13,475

4.3 Fertilisation, Incubation and Release

After transport of gametes to either Tenderfoot or Seymour Hatcheries, fertilisation was effected, usually within two hours of completion of the egg-take. Through satellite phone communication and co-ordination of the two crew's efforts, it was possible to deliver 284 bags of sperm from Mamquam pinks to Seymour Hatchery in time for crossing with a portion of the Indian River eggs taken that day. Results after re-enumeration of all the eggs through the automatic egg picker/counter at Tenderfoot Hatchery were as follows.

Table 3. Eyed Egg Survival

	Indian	Mamquam	Cheakamus
<u>Total eggs</u>	1,241,503	168,989	14,689
<u>Dead eggs</u>	256,655	9,047	1,029
<u>Eyed eggs</u>	984,848	159,942	13,660
<u>Survival</u>	79%	95%	93%

After the eyed stage the eggs were all transferred to in-stream cassette incubators at Moody's channel. Significant mortality occurred at hatch in the most heavily loaded cassette incubator containing Indian River eggs. It is thought that insufficient flow was supplied to this incubator at the most critical time (hatch). Final fry release numbers were as follows. The fry release to Moody's Channel was completed by March 18, 2002.

Table 4. Fry Released

Indian	Mamquam	Cheakamus
604,852	153,694	12,970

5. Discussion

The first year of the Cheakamus River Pink Salmon Recovery Project met with varying degrees of success. The broodstock capture and egg collection phase of the program was extremely successful and the egg target was met. The in-stream incubation phase of the project was not nearly as successful as in previous similar projects.

6. Recommendations

Operational problems experienced during in-stream incubation need to be worked out. A new, river fed spawning channel built on the grounds of the North Vancouver Outdoor School in the summer of 2002 should be considered as an alternative site for the in-stream incubators. Lighter egg loadings in the cassette trays and increased flow through the incubators (particularly at hatch) may also be required. Otherwise the second year of the Cheakamus Pink Salmon Recovery Project should proceed as planned in the fall of 2003.

7. Acknowledgements

This project provides an excellent example of co-operation between government agencies (DFO's Enhancement Operations and Resource Restoration Divisions) and community partners (Seymour Salmonid Society and the North Vancouver Outdoor School). This would not be possible without the financial support of the BC Hydro Bridge Coastal Fish and Wildlife Restoration Program.

8. Figures



Figure 1. Indian River adult pink capture – sorting the catch



Figure 2. Indian River adult pink capture – prize catch of the day



Figure 3. Loading the cassette incubation trays



Figure 4. Loading the in-stream cassette incubator

Appendix A.

Financial Statement

Income & Expenses

	Income	Expensed	
Income			
BCRP	12,078		
DFO	13,000		
Total Income	25,078		
Expenses		BCRP	DFO
Project Personnel			
Wage		9,580	10,000
Consultant fees			
(List others as required)			
Equipment & Expenses			
Equipment rental			
Equipment purchase			
Materials purchased		700	1,500
Travel expenses		700	1,500
Permits			
(List others as required)			
Overhead		1,098 (10%)	
Office supplies			
Photo copies & printing			
Postage			
(list others as required)			
Subtotal		12,078	13,000
Total Expensed		12,078	13,000
Balance		*0	