

Clowhom Project Water Use Plan

Fish Productivity Monitoring

Implementation Year 3

Reference: COMMON-2

Fish Productivity Monitoring Year 3 Data Summary 2009

Study Period: September 24, 2009

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Executive Summary

The shíshálh Nation and BC Hydro are currently working on data collection for a 20-year monitoring program that documents fish productivity in the Clowhom Lake reservoir. The monitoring program dictates the sampling of Clowhom Lake every 2 years using various collection methods with the next “regular” sample in 2010.

In the fall of 2009, an additional day of data collection was completed to supplement data from 2006 and 2008 and address the removal of the creel survey from the original monitoring plan and determine if CPUE efficiency could increase by setting gill nets in the early evening. In addition plans to collect juvenile use data on the upper Clowhom River were planned for 2009.

Efforts in the fall of 2009 resulted in the addition of limited fish data and confirmed that CPUE was adequate using daytime sampling and current methodology. It is proposed that if additional data is required it would be better achieved by increasing sample efficiency in the designated sample year of period. The next scheduled “regular” sample period is 2010.

Planned sampling of the lower reach of Clowhom River was deferred to 2010 with plans to review the sampling method and purpose. Difficulty in sampling the Clowhom River due to channel size raised the question of purpose and methods. In 2010 it is proposed that the river be sampled with nets along edge habitats to determine young-of-the-year use and multiday snorkel surveys in late summer to identify species use of key river habitats and attempt to identify spawning habitats for Kokanee salmon.

Conclusions following the 2009 season and cursory review of 2006 and 2008 data suggests the information collected to date will provide early answers and directions to questions originally presented in the Terms of Reference. Recommendations including continued sampling with possible increase in sample frequency and changes to river use survey methods are provided.

Table of Contents

	Page
Table of Contents	3
List of Tables	3
2.0 Study Area	5
3.0 Methods.....	5
3.1 Fish Collection	5
3.2 Fish Biometrics	7
3.5 Clowhom River Juvenile Salmonid Use	7
4.0 Results.....	7
4.1 Fish Capture	7
4.2 Fish Biometrics.	8
5.0 Discussion.....	10
5.1 Evening Gill Net Sets.....	10
5.2 Juvenile Use Assessment	11
6.0 Future Recommendations	12
7.0 References.....	13

List of Figures

Figure 1: Sample locations A and B (circle) selected for the 2009 gill net set within Clowhom Lake. Locations have been identified previously along the shoreline using with flagging tape.	6
Figure 2: Length weight relationships for Rainbow Trout and Kokanee salmon captured in Clowhom lake in 2006, 2008 and 2009.	9

List of Tables

Table I: Type and set times for the sampling gear used to collect fish samples in the Clowhom Lake Reservoir.	7
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Table II: Summary of the catch at sample Site A and B for years 2006, 2008 and 2009. The catch was translated to catch per unit effort or catch per hour of soak time. The CPUE is reported to compare the evening gill net sets in 2009 to previous data collection success..... 8

Table III: Summary of length-at-age data for the salmonids caught in Clowhom Lake On September 24, 2009. 8

Table IV: Summary of wet weight data for the salmonids caught in Clowhom Lake on September 24, 2009. 10

1.0 Introduction

The shísháhlh Nation and BC Hydro are currently working on data collection for a 20-year monitoring program that documents fish productivity in the Clowhom Lake reservoir. The monitoring program dictates the sampling of Clowhom Lake every 2 years using various collection methods with the next “regular” sample in 2010.

In 2009, additional sampling was conducted in an attempt to address two issues cited following the 2008 sample season. These were:

- The collection of additional data on species and salmonid size increasing the sample size offsetting loss of data collection opportunities from the creel survey originally proposed. The creel survey was removed in 2008 because of closure of a lodge catering to recreational fishermen.
- Would altering the time of day for setting gill nets improve the catch-per-unit-effort (CPUE) of survey crew(s)?

The purpose of this report is to present the data collected in 2009 and addresses the two issues above. The report also provides recommendations for the 2010 sample season and continuation of the 20-year study.

2.0 Study Area

The Clowhom Lake reservoir, located at the head of Salmon Inlet northeast of Sechelt BC is a 745-ha reservoir created in 1956. The study area for this project includes the lower lake at sites A and B, which corresponds to sites, selected by *Bruce* (2004) and *Bates* (2006; 2009). These sites have not changed from previous studies (*Bates*, 2006; 2009) and are shown on **Figure 1** as sites A and B.

3.0 Methods

3.1 Fish Collection

At the completion of the 2008-sampling season (*Bates*, 2009) it was proposed that additional sampling outside the regular 2-year study window be implemented. This additional sampling was to target the diurnal behaviors of Kokanee salmon by specifically targeting daytime and nighttime gill net sets. This proposed additional sampling was amended following the release of the 2008 data report (*Bates*, 2009) to include a one-day evening gill net set.

On September 24, 2009 a two-person fisheries crew set 2 drift gill nets at predetermined sample locations (Sites A and B) between 08:30 and 11:30-pm (**Table I**). Nets were set perpendicular to the shoreline and allowed to soak for a minimum of three hours. The soak time is consistent with the original terms of reference and Year 1 and 2 of the fish

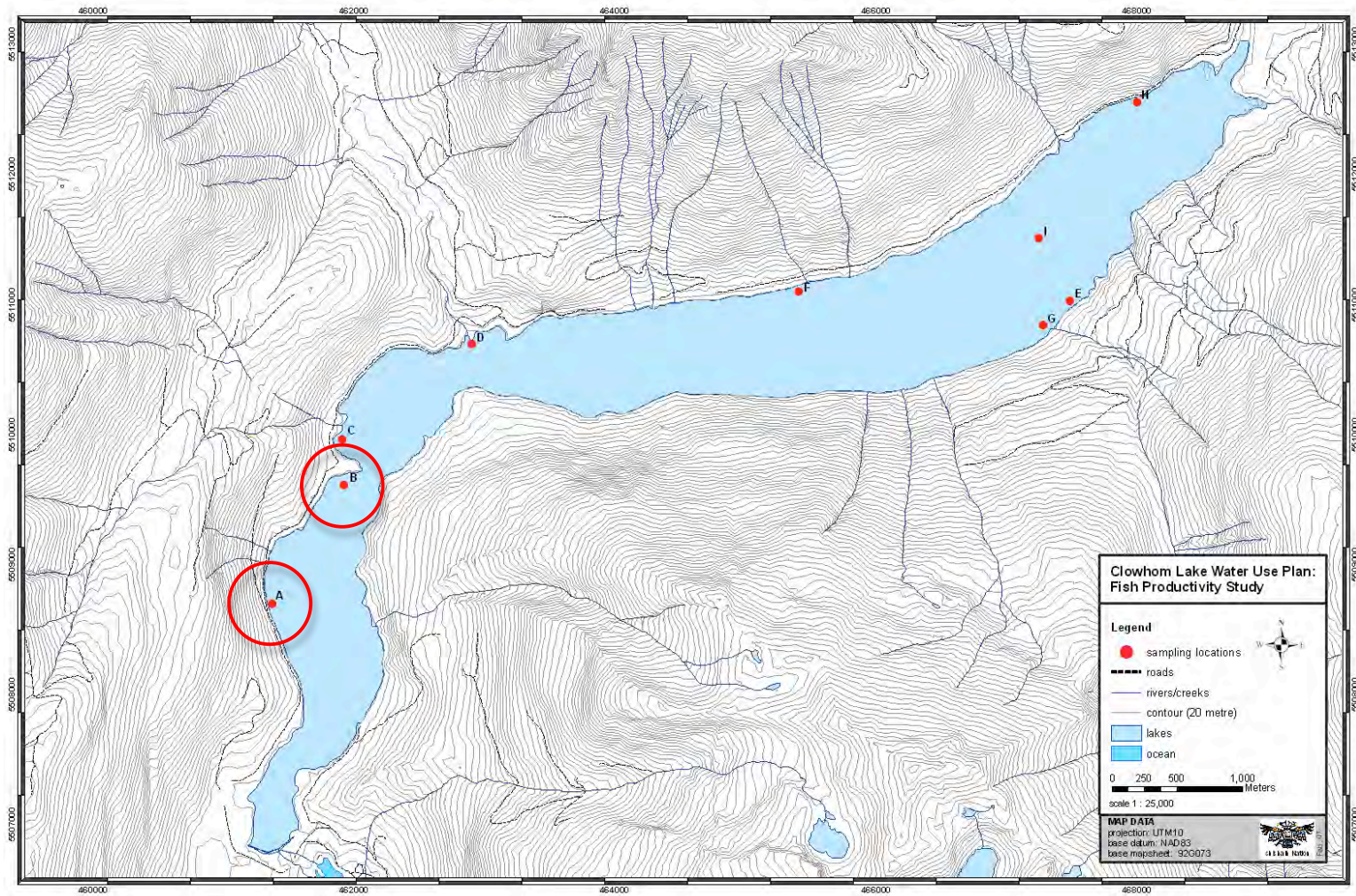


Figure 1: Sample locations A and B (circle) selected for the 2009 gill net set within Clowhom Lake. Locations have been identified previously along the shoreline using with flagging tape.

productivity monitoring (Bates, 2006; 2009). Gill net configuration also remained the same as previous sample years using the mesh sizes discussed in Bates (2009).

The net sample period was restricted to 3-hours to minimize impacts salmonid mortality. All captured salmonids were retained and species, length and weights recorded then compared to previous sample year using catch-per-unit-effort (CPUE). The effort in the CPUE is defined as an hour time. Therefore CPUE is catch per hour of soak.

Table I: Type and set times for the sampling gear used to collect fish samples in the Clowhom Lake Reservoir.

Date	Site ID	UTM		Gear	Set Time			Duration (hr.)
		Northing	Easting		Type	Deployed	Retrieved	
Sept 24	A	5508579	461286	Drift GN	Night	2030	2330	3:00
	B	5509613	461887	Drift GN	Night	2030	2330	3:00

3.2 Fish Biometrics

All captured were enumerated and recorded. Captured salmonids were identified to species, and the fork length to the nearest millimeter (mm) and wet weight nearest 0.1-gms were measured (Bates, 2006).

3.5 Clowhom River Juvenile Salmonid Use

Clowhom Lake supports salmonid populations that require accessible stream habitats to spawn. The upper Clowhom River enters the lake at the north end of the lake and is characterized by a low gradient reach. In 2008, a habitat survey of the lowest reach of the upper Clowhom River was completed (Bates, 2009) and in 2009 the habitat data was to be supplemented with juvenile use data on the Clowhom River within the lowest reach of the upper river.

The proposed sample method for assessing salmonid use of the Clowhom River was multi-pass closed depletion electrofishing. Sampling would target predetermined representative macrohabitat features and be completed within a 2-day period consistent with the Terms of Reference (BC Hydro, 2005). Juvenile use would then be used to develop standing stock and distribution estimates. In order to successfully sample this stream reach water conditions and access points will have to facilitate the isolation of the discrete habitat units.

4.0 Results

4.1 Fish Capture

A total of 3 fish were caught during the three-hour sample in 2009. At Site A only one fish was caught and represents a 0.33 CPUE while at Site B two fish were caught

yielding a 0.67 CPUE. The sampling success in 2009 was compared to previous years and is summarized in **Table II**. Results using estimated CPUE for samples were only representative of captures at Sites A and B.

4.2 Fish Biometrics.

Nose to fork length and wet weight are reported for the appropriate age class based on size groupings reported in *Bates* (2009). The data collected from the fish captured in 2009 were added to a length versus weight plot with 2006 and 2008 data to allow comparison of fit for the new data (**Figure 2**). **Table III**, and **IV** provide a brief summary of the length-at-age and weight for the two species captured in 2009.

Table II: Summary of the catch at sample Site A and B for years 2006, 2008 and 2009. The catch was translated to catch per unit effort or catch per hour of soak time. The CPUE is reported to compare the evening gill net sets in 2009 to previous data collection success.

Year	Site	Gear Type	Species	Number	CPUE
2006	A	Floating GN	-	0	0.00
	B	Sinking GN	Cutthroat Trout	2	0.67
2008	A	Floating GN	Rainbow Trout	1	0.33
			Rainbow Trout	3	1.00
	B	Sinking GN	Kokanee salmon	1	0.33
			Cutthroat Trout	3	1.00
2009	A	Floating GN	Kokanee salmon	1	0.33
	B	Sinking GN	Rainbow Trout	1	0.33
			Kokanee salmon	1	0.33

Table III: Summary of length-at-age data for the salmonids caught in Clowhom Lake On September 24, 2009.

Age	Species specific fork length (mm)					
	Rainbow Trout		Cutthroat Trout		Kokanee salmon	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
0+	0	-	0	-	0	-
1+	0	-	0	-	0	-
2+	1	168.3	0	-	2	195.5(13.4)
3+	0	-	0	-	0	-
4+	0	-	0	-	0	-
5+	0	-	0	-	0	-

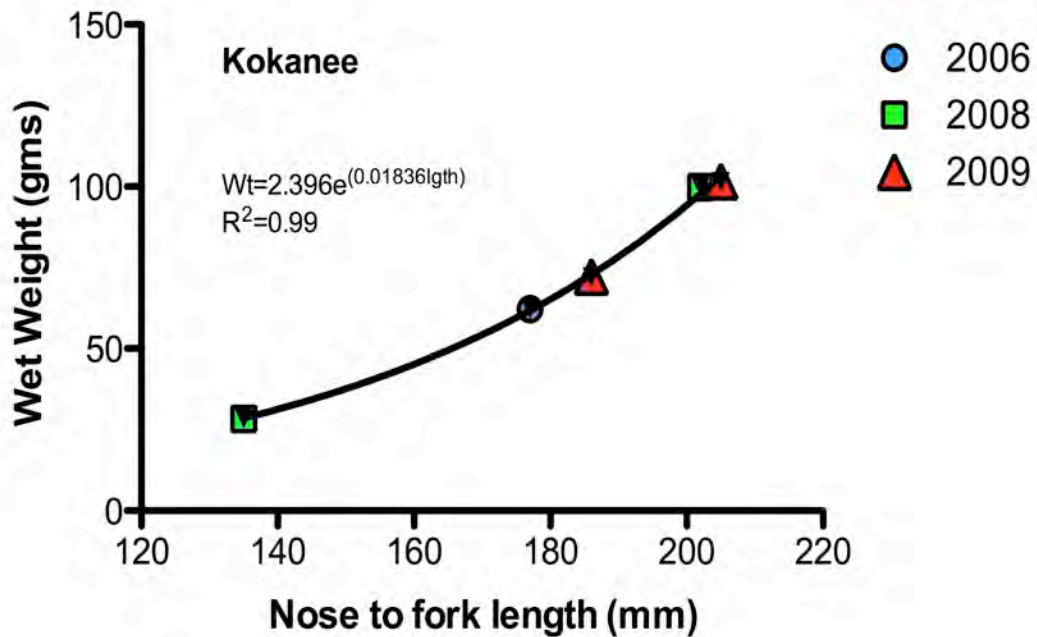
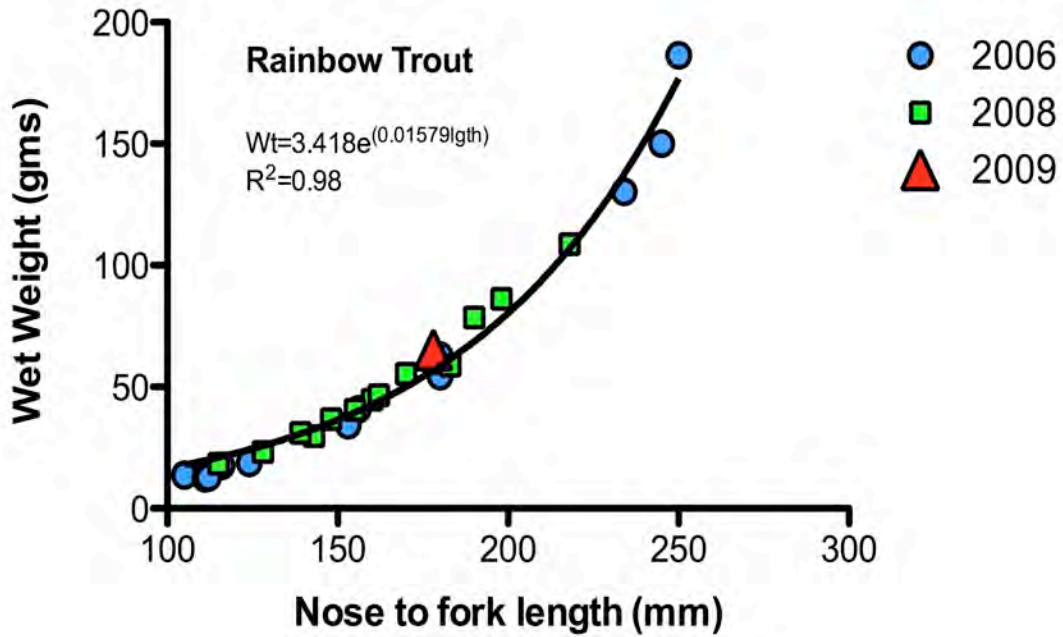


Figure 2: Length weight relationships for Rainbow Trout and Kokanee salmon captured in Clowhom lake in 2006, 2008 and 2009.

Table IV: Summary of wet weight data for the salmonids caught in Clowhom Lake on September 24, 2009.

Age	Species specific wet weight (gms)					
	Rainbow Trout		Cutthroat Trout		Kokanee salmon	
	n	Mean (SD)	N	Mean (SD)	n	Mean (SD)
0+	0	-	0	-	0	-
1+	0	-	0	-	0	-
2+	1	65.3	0	-	2	86.8(20.7)
3+	0	-	0	-	0	-
4+	0	-	0	-	0	-
5+	0	-	0	-	0	-

5.0 Discussion

5.1 Evening Gill Net Sets

The 2009 sample season was not a “regular” sample as outlined under the original “study plan” detailed in Terms of Reference (*BC Hydro* 2005). The purpose of the sampling in 2009 was twofold; first it provided an opportunity to collect additional species and biometric data on rearing salmonids in Clowhom Lake; second it allowed crews to test whether altering the timing of gill net sets to late evening would provide better catch per unit effort results.

The opportunity to increase the number of individual fish reported from Clowhom Lake is in response to low capture rates from “regular” sampling but also in response to original plans for data collection through Creel surveys. In 2006 the monitoring plan included a creel survey component utilizing an area lodge and expected clients of the lodge. This portion of the original monitoring plan was altered after 2006 when it was found very little use of the lake by the lodge and lack of opportunities to collect biometric and use data from recreational fisherman. While there is still use of the reservoir by sport fishermen there is no means to capture data from this user group. In addition the lodge has closed and its entire infrastructure disbanded.

The second purpose of investigation of sample timing throughout the day recognizes diurnal variation of lake dwelling salmonid behaviors. This created the question as to whether variation in sample timing would result in more effective data collection opportunities.

Results reported from one nighttime gill net set yielded a CPUE of 0.33 (Site A) and 0.67 (Site B) at the 2 sites. This compared to species specific CPUE ranging from 0.00 to 1.00 in previous years (**Table II**) and suggests timing of net sets may not result in a significant increase in catch efficiency. As a result the current protocol with sampling occurring in the mid morning should remain unchanged for 2010. If additional data and improved

CPUE is warranted for future sampling it may be better achieved by either increasing the number of samples within each sample year (increase net frequency or number of nets) or increasing the length of time each gill net is permitted to soak from 3 hours to 6 hours. The concern with increasing both frequency and soak time would be the expected increase in the net mortality. The possibility of a change in protocol will be discussed for the 2010 season but does not diminish the value of the current data set and is not expected to reduce the ability to test hypotheses presented in the original Terms of Reference (Bates, 2006).

5.2 *Juvenile Use Assessment*

In 2008, a habitat assessment was completed on the lower reach of the Upper Clowhom River, which is characterized by low gradient macrohabitat features suitable for spawning and limited rearing (Bates, 2009). Salmonid species currently residing and rearing in Clowhom lake all require habitats that can support successful spawning and perhaps to a lesser extent rearing. In 2009 it was proposed to sample the reach of the Clowhom River that had the habitat assessment completed on it with an attempt to relate salmonid use to available habitat.

Sampling was to be completed using electrofishing methods and closed depletion-sampling methodology. Crews visited the area in early fall 2009 and found isolation and sampling using electrofishing difficult due to the size and depth of the habitats that dominate this reach. As a result the plans to electrofish the area were stopped and the methodology revisited. The timing of the juvenile use sampling is important and varies depending on the desired outcome. The original ToR discusses the general use of the area. The habitat assessment shows large areas suitable for spawning which would be confirmed through early season assessments with edge habitats utilized by young-of-the-year sampled and surveys through the ideal spawning windows. In particular it would be important to try and target the spawning window for Kokanee salmon to document the use and distribution of this species.

With the results of the 2009 attempt to evaluate use directing future sampling it is proposed that a change in sampling strategy be implemented in 2010. The 2010 season should include an attempt to sample edge habitats along select lengths of the Clowhom River in late May and June as salmonids emerge. Sampling should also be completed under suitable low water in early October to document older age class use by species and potential areas used for spawning by Kokanee salmon.

In order to document these uses, it is proposed that the early summer sampling be completed using small beach seines and pole seines with success reported as CPUE. This sampling would then be supplemented with structured snorkel surveys in the late summer early fall.

Both planned sampling periods are contingent on seasonal flows and safety issues for crews working in the river. The logistical success of each sampling will be reported and

deviation from planned sampling discussed prior to any alterations in sampling methodology.

In conclusion, the 2009 sample season and previous years of more detailed sampling have and continue to provide valuable data on the biology of salmonid populations in the Clowhom Lake basin. The addition of salmonid use from the river and “regular” sample in 2010 will provide the first opportunity for seamless comparison and evaluation of these populations.

6.0 Future Recommendations

The continued success of this project has resulted in alterations in planned methods while continuing to address the final objectives highlighted in the original Terms of Reference. In order to assure continued success of this monitoring project the following recommendations are provided for consideration and discussion. It is expected that all modifications that occur in 2010 will be incorporated by minor adjustments in the current budget allocations and not result in changes to funding requirements. Recommendations for 2010 are:

1. Consider increasing the frequency of gill net sets in an attempt to increase the number of fish samples available for analysis providing more information on the biology of Clowhom Lake salmonids.
2. Implement a sample program that targets edge habitats along the lower reach of the upper Clowhom River targeting young-of-the-year (YOY) salmonids. This is intended to identify use of the river for spawning by documenting emergent juveniles.

Attempted sampling should be completed with seine and pole net methods. Edge sampling could also be accomplished using electrofishing methods recognizing only the edge habitats are sampled.

3. Conduct snorkel surveys of the lower reach of the upper Clowhom River from the 16-km bridge to the lake. Surveys should include daytime and evening surveys with the purpose of identifying important spawning habitats for lake dwelling salmonids, primarily Kokanee salmon. These surveys may be validated with other methods for swimmer and observational efficiency. Timing of swims should be considered as dusk and dawn surveys may yield different data than daytime surveys. Desired outcome will be discussed with BC Hydro to further clarify within the context and purpose of the current ToR.

7.0 References

Bates, D.J. 2009. Clowhom Lake water use plan. Fish productivity monitoring – Year 2. Shíshálh Nation and *FSCI* Biological Consultant.

Bates, D.J. 2006. Clowhom Lake water use plan. Fish productivity monitoring – Year 1. Shíshálh Nation and *FSCI* Biological Consultant.

BC Hydro. 2005. Clowhom Lake water use plan-Monitoring program Terms of Reference. BC Hydro, Burnaby, BC.

Bruce, J.2004. Results of fish studies – Clowhom Lake Water Use Plan. BC Hydro Technical Note Com-FTC-TN-001. Burnaby, BC.