SITE C FISHERIES STUDIES
MERCURY LEVELS IN PEACE RIVER FISH TISSUE
DATA REPORT 2008

Prepared for

B.C. Hydro
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EXECUTIVE SUMMARY

B.C. Hydro is presently considering the Peace River Site C hydroelectric project (Site C) in northeastern British Columbia as one of several resource options being considered to help meet BC's future energy needs. Fisheries studies undertaken between 2005 and 2008 are being used to add to existing Peace River baseline information and to address baseline data gaps that have been identified. Current information that describes mercury concentrations in fish residing in the Peace River within the area potentially affected by Site C is considered limited. The purpose of the study was to characterize total mercury concentrations in mountain whitefish and bull trout residing in the Peace River between Peace Canyon Dam and Site C and make comparisons to historical data.

Fish were collected from three areas of the Peace River from just downstream of the Moberly River confluence upstream to Hudson's Hope in August/September 2009, as part of B.C. Hydro's Large Fish Indexing Program (Sections One, Three, and Five). Mountain whitefish collections were stratified into two areas to account for potential spatial differences in mercury concentration -- Section Three (upstream of the Site C dam location) and Section Five (downstream of the Site C dam location). Bull trout collections were not stratified because sufficient numbers of bull trout are typically not available for capture and the Peace River population is migratory and can potentially use the entire study area.

The study design and methods followed standard protocols. Fish were live-sampled by removing muscle tissue plugs, which were submitted to an accredited laboratory. Analytical results were presented as total mercury concentration (µg/g) based on wet weight.

Muscle tissue samples were collected from 25 bull trout, 30 mountain whitefish from Section Three, and 31 mountain whitefish from Section Five. Sampled fish in each group represented a wide range of sizes and ages, and they were representative of fish populations in the study area.

Mercury concentrations in fish muscle tissue increased with fish length in all three groups. Based on standard fork length, estimates of total mercury concentrations in muscle tissues (wet weight) were 0.07819 µg/g in bull trout, 0.03106 µg/g in Section Three mountain whitefish, and 0.03890 µg/g in Section Five mountain whitefish.

Further analyses of the 2008 data indicated spatial differences in mercury concentrations of mountain whitefish muscle tissue. Mountain whitefish in Section Three upstream of the proposed Site C location had, on average, a lower concentration of total mercury in muscle tissue, then mountain whitefish in Section Five located downstream of the proposed Site C location.

Data collected from Peace River fish in 1989 were available for comparison to data collected during the present study. The results (i.e., slope of the mercury – length relationship) indicated that total mercury concentrations in muscle tissues of bull trout and mountain whitefish may have been lower in 2008 compared to 1989.

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Client: B.C. Hydro Site C Project, Corporate Affairs

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1.0 INTRODUCTION

1.1 BACKGROUND

B.C. Hydro is presently considering the Peace River Site C hydroelectric project (Site C) in northeastern British Columbia as one of several resource options being considered to help meet BC's future energy needs. Fisheries studies undertaken between 2005 and 2008 are being used to add to existing Peace River baseline information and to address baseline data gaps that have been identified. Current information that describes mercury concentrations in fish residing in the Peace River within the area potentially affected by Site C is considered limited. Fish tissue samples were collected from the Peace River in 1989 and 1990 (Pattenden *et al.* 1990, 1991), which provide an initial baseline of mercury concentrations Peace River fish. Given that there were several fisheries studies being conducted in the Peace River in 2008, it was deemed opportunistic to collect fish tissue samples and analyze for mercury levels during the ongoing studies. This information was intended as a preliminary indictor of current mercury levels in the Peace River that could also be used in potential future mercury modeling efforts.

Mainstream Aquatics Ltd. (Mainstream) was contracted by B.C. Hydro to collect tissue samples from selected fish species in the Peace River in order to quantify total mercury concentration in fish tissue. This data report summarizes the results of that study.

1.2 PURPOSE AND OBJECTIVES

The purpose of the study was to characterize total mercury concentrations in mountain whitefish and bull trout residing in the Peace River between Peace Canyon Dam and Site C and make comparisons to data collected in 1989/1990.

The objectives of the study were as follows:

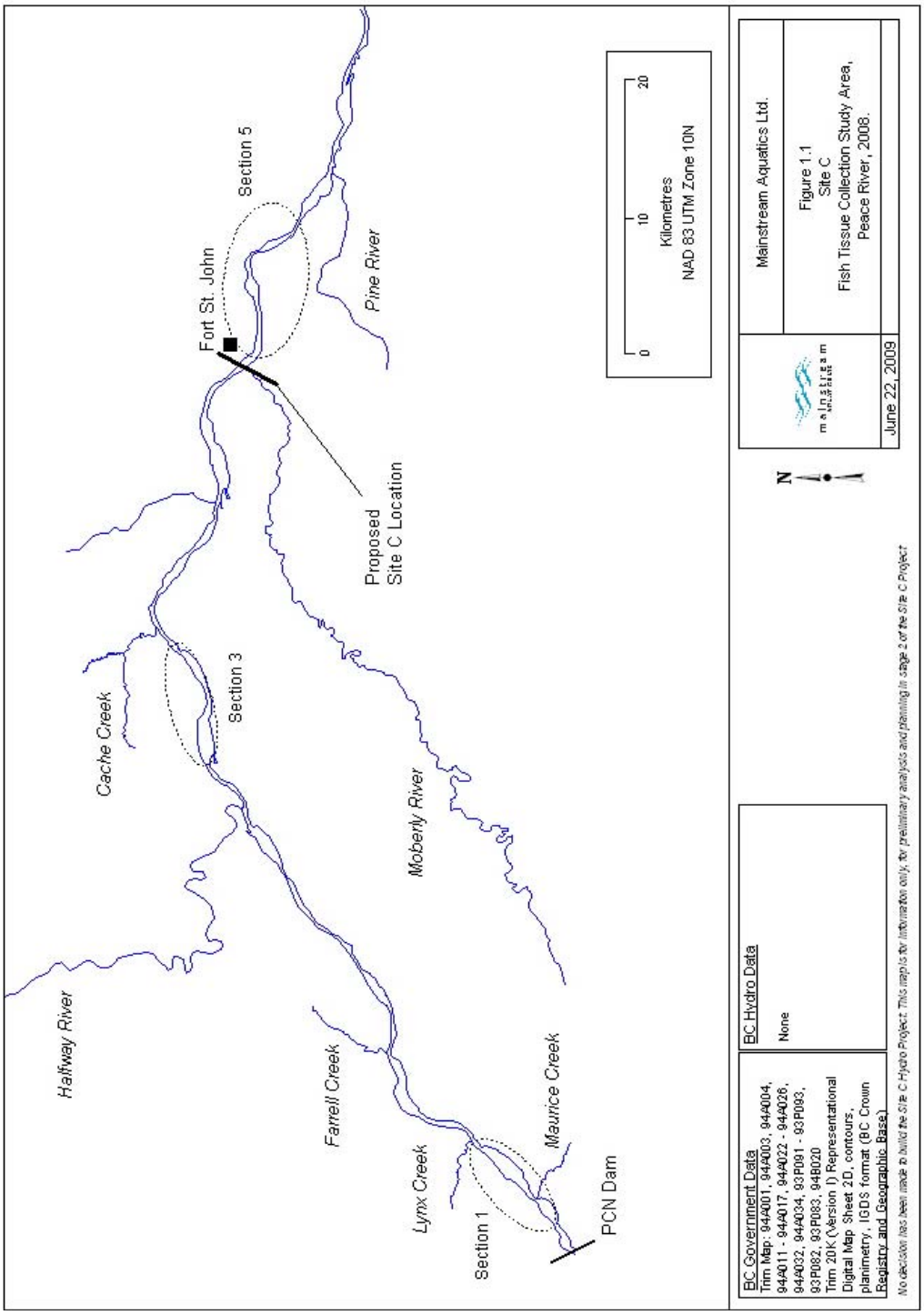
1. Collect muscle tissue samples from bull trout and mountain whitefish using nonlethal sampling techniques.
2. Analyze the tissue samples to quantify total mercury concentration.
3. Present the information in a concise data report.

1.3 STUDY PERIOD

Tissues were collected from fish during late summer between 20 August and 17 September, 2008.

1.4 STUDY AREA

The study area encompassed a 92 km stretch of the Peace River from just downstream of the Moberly River confluence upstream to Hudson's Hope (Figure 1.1). Samples were collected from three river sections as part of B.C. Hydro's Large Fish Indexing Program (Mainstream and Gazey 2008). These sections were Section One, Section Three, and Section Five.



2.0 METHODS

2.1 APPROACH

The study design and methods followed protocols described in Environment Canada (2005), Baker (2002), Baker *et. al* (2004). Tissues were collected from mountain whitefish (*Prosopium williamsoni*) and bull trout (*Salvelinus confluentus)*. Mountain whitefish are the numerically dominant species in the study area and are benthic insectivores. Bull trout are piscivores that represent the top predator in the system.

Mountain whitefish collections were stratified into two areas to account for potential spatial differences in mercury concentration. Mountain whitefish were collected from Section Three (upstream of the Site C dam location) and Section Five (downstream of the Site C dam location). This approach was used because mountain whitefish in the Peace River are thought to be largely sedentary (AMEC & LGL 2008, Mainstream and Gazey 2008). Bull trout tissues were not spatially stratified because:

1. Sufficient numbers of bull trout are typically not available for capture in each section (Mainstream and Gazey 2008); and,
2. The Peace River population is migratory and can potentially use the entire study area (Burrows *et al.* 2000).

Based on this sampling design three groups were targeted as follows:

1. Mountain whitefish in Section Three
2. Mountain whitefish in Section Five
3. Bull trout in Sections One, Three, and Five

As recommended by Baker (2002), a target sample size for each group of 25 to 30 fish was used for the study. Tissues were collected from a representative size range of fish based on size distribution information available from previous investigations (Mainstream and Gazey 2008). A range of fish sizes were sampled in order to derive a good statistical relationship between mercury concentration and fish size. Duplicate tissue samples were collected from 10% of fish from each group as part of quality assurance protocols.

Fish were captured during the Large Fish Indexing Program using a boat electrofisher. Methods are described in Mainstream and Gazey (2008).

2.2 TISSUE COLLECTION

Tissue was collected using a nonlethal method described in Baker *et al*. (2004). Approximately 80 mg of muscle tissue was extracted from the dorsal area posterior to the dorsal fin using a sterile dermal punch. Fish selected for tissue collection were first anesthetized using clove oil. The fish was then measured for fork length (mm) and weight (gm), and appropriate ageing structure collected (scale for mountain whitefish; fin ray for bull trout).

Muscle tissue was collected using a sterile 4 mm wide Miltex Biopsy Punch. The punch was inserted into the fish to a depth of 7 mm, twisted, and the 45 mg sample extracted and placed on a sterile glass microscope slide. This procedure was then repeated. The skin was removed from the two tissue plugs using a sterile scalpel, transferred to a sterile, labeled tissue vial, and then placed on ice in an insulated cooler. Samples were stored frozen until processing by the laboratory. The open wounds left by the dermal punch were sealed with a waterproof liquid bandage (Vetbond™) to close the wound and decrease the chance of infection. The fish were placed in a recovery tank and then released.

2.3 LABORATORY ANALYSES

Chemical analyses were completed by Alberta Research Council Laboratories, which is an accredited laboratory in Vegreville, Alberta. Samples were analyzed for Total Mercury (wet weight) using cold vapor atomic absorption spectrometry (CVAA) and percent moisture.

During the analytical process, approximately 1g of tissue (non-homogenized) is microwave digested using 5 mL nitric acid, then diluted to 100 mL with double distilled water and preserved with bromine monochloride. The mercury is then analyzed using CVAA on a flow injection mercury system. For lower sample weights, the reagent and final volume are scaled down proportionally. The measurable detection limit was 0.003 (µg/g).

For quality control, various fish mercury Standard Reference Materials (SRM) were digested along with the samples to ensure accuracy, and other SRMs were run after calibration to confirm instrument performance.

2.4 AGEING

Ageing procedures followed those described in Mackay *et al.* (1990). Scales were immersed in water and cleaned if dirty, and then placed on a microscope slide for viewing using a dissecting microscope.

Mounting procedures for bull trout fin rays followed Koch and Quist (2007). Fin rays were fixed in epoxy, sectioned with a jeweler's saw, and mounted on a slide for viewing under a dissecting microscope. Two experienced Mainstream employees independently aged each structure. If a discrepancy occurred between the two readers a third reader examined the structure until a consensus was reached regarding the age.

2.5 DATA ANALYSES

Data were entered and checked for errors prior to analyses. Raw data were then plotted against fish length and age to identify outliers. Total mercury wet weight was converted to total mercury dry weight using the percent moisture content in each sample. This was undertaken in order to reduce potential variation caused by differences in tissue moisture content.

To address accumulation of mercury in fish tissue with age, mercury concentration (µg/g) was regressed against fish age and fish length to quantify mercury concentration. Data were logtransformed as necessary to reduce heteroscedasticity.

Pearson correlation coefficient was used to identify which relationship best described mercury concentration in fish tissue. The relationship that demonstrated the highest correlation was used for subsequent analyses. Parameters used for comparisons were as follows:

- Total mercury (dry weight)
- Total mercury (wet weight)
- Age
- Fork length
- Log_{10}(Total mercury [dry weight])
- Log_{10}(Total mercury [wet weight])
- Log_{10}(Age)
- Log_{10}(fork length)

Linear regression was used to describe the relationship between total mercury and fish size/age in each group. Analysis of covariance (ANCOVA) was used to determine whether standardized mercury concentrations among the two mountain whitefish groups differed significantly from one another. Equality of slopes among the groups was examined prior to completing the ANCOVA.

Statistical significance was accepted at $p < 0.05$. All statistical analyses followed descriptions by Sokal and Rohlf (1981). Statistical analyses were completed using SPSS 8 (SPSS Science, Chicago).

3.0 RESULTS

3.1 FISH CHARACTERISTICS

In total, 25 bull trout, 30 mountain whitefish from Section Three, and 31 mountain whitefish from Section Five were collected (Table 3.1, Appendix A1). Sampled fish in each group represented a wide range of sizes and ages and they were representative of fish populations in the study area (Mainstream and Gazey 2008). The characteristics of the two mountain whitefish groups differed slightly. The average age of the Section 3 sample was lower compared to Section 5 (5.8 versus 6.0 years), as was average fork length (339.9 versus 354.4 mm). Differences were not statistically significant for age ($p = 0.706$, Mann-Whitney U Test) or fork length ($p = 0.478$, Mann-Whitney U Test).

Table 3.1 Summary characteristics of Peace River fish sampled for muscle tissue mercury concentration, Site C investigations 2008.

Group	Parameter	Sample Size	Mean	Range
Bull trout	Fork Length (mm)	25	460.1	211 - 741
	Weight (g)	25	1513.7	100 - 5450
	Age	24	4.8	2 - 9
Mountain whitefish (Section Three)	Fork Length (mm)	30	339.9	209 - 466
	Weight (g)	30	482.6	94 - 1180
	Age	30	5.8	2 - 11
Mountain whitefish (Section Five)	Fork Length (mm)	31	354.5	202 - 512
	Weight (g)	31	570.1	74 - 1526
	Age	28	6.0	2 - 11

3.2 QUALITY ASSURANCE

Outliers

Total mercury (wet weight) was plotted against length and age and visually assessed to identify potential outliers (Figure 3.1). One mercury value in the bull trout sample (0.1196 µg/g) was at least 68% higher than values of fish having similar fork lengths. One mercury value (0.0944 µg/g) from a mountain whitefish in Section Three (380 mm fork length) was 51% higher than the next highest value recorded in the sample (collected from a 460 mm fish). Log transformation of the data or use of dry weight mercury concentration did not substantively reduce the difference between the two outliers and their respective samples (Appendix B1). As such, the two outliers were omitted from subsequent analyses.

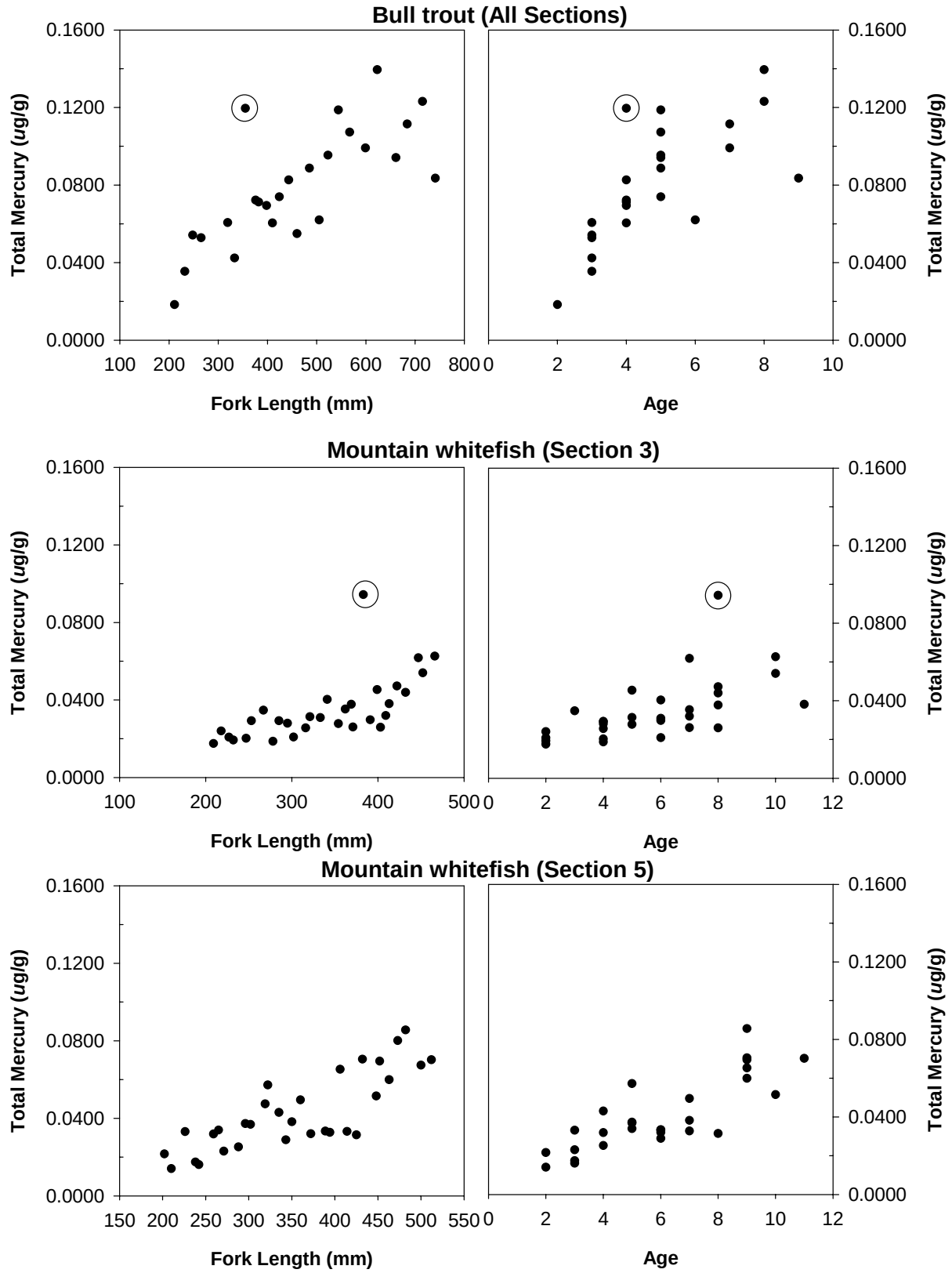


Figure 3.1 Plots of total mercury (wet weight) in muscle tissue versus fork length and age for bull trout and mountain whitefish, Site C investigations 2008 (circle represents outlier).

Analytical Precision

Duplicate samples from the same fish submitted to laboratory for analyses showed variable results (Table 3.2). The percent difference of moisture content varied from 0.6 % to 12.7 %, which indicated good analytical precision. The difference of total mercury concentrations among duplicates were within acceptable limits; values ranged from 3.7 % to 28.0 %. The average difference was 20.4 % for bull trout, and 13.9 % (Section 3) and 12.6 % (Section 5) for mountain whitefish.

Table 3.2 Summary metrics of analytical precision for duplicate samples, Site C investigations 2008.

Group	Sample	Moisture Content (%)		Wet Weight Total Mercury (µg/g)	
		Value	Percent Difference	Value	Percent Difference
Bull trout	1	78.5	1.5	0.094	17.4
	Duplicate	79.6		0.078	
	2	65.5	12.7	0.140	28.0
	Duplicate	73.8		0.100	
	3	74.4	9.4	0.099	16.6
	Duplicate	67.4		0.116	
	Average		**7.9**		**20.4**
Mountain whitefish (Section Three)	1	80.8	5.3	0.052	3.7
	Duplicate	76.5		0.053	
	2	84.4	9.5	0.060	24.3
	Duplicate	76.4		0.075	
	3	71.3	1.4	0.065	13.8
	Duplicate	70.3		0.074	
	Average		**5.4**		**13.9**
Mountain whitefish (Section Five)	1	76.0	0.6	0.032	16.4
	Duplicate	76.5		0.037	
	2	79.7	1.0	0.035	7.1
	Duplicate	80.5		0.033	
	3	82.3	0.9	0.045	14.3
	Duplicate	83.0		0.052	
	Average		**0.9**		**12.6**

Covariates and Data Transformation

As expected, mercury concentration was significantly correlated with both fork length and age in each of the three groups (Table 3.3). Wet weight rather than dry weight mercury concentration exhibited a higher correlation to fork length and age (i.e., higher coefficient value), although the difference was not large. This indicated that, for this study, moisture content in tissue samples did cause undue variability in the analytical results. In general, mercury concentration (wet weight and dry weight) was more highly correlated with fork length than with age. This was particularly true for bull trout. Finally, the log transformed wet weight mercury concentration and log transformed fork length generally provided the best correlation.

Based on this evaluation the following were used to assess total mercury concentration in fish tissue:

- wet weight mercury concentration
- fork length
- logarithmic (base 10) transformed data

Table 3.3 Correlations between total mercury concentration in fish muscle tissue and fork length and age, Site C investigations 2008.

Species	Total Mercury Concentration (µg/g)	Metric	Fork Length (mm)	Log (length)	Age	Log (age)
Bull trout	Wet Weight	Pearson Correlation	0.831	0.844	0.770	0.826
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	24	24	23	23
	Log_{10} (Wet Weight)	Pearson Correlation	0.810	0.855	0.735	0.830
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	24	24	23	23
	Dry Weight	Pearson Correlation	0.826	0.844	0.768	0.826
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	24	24	23	23
	Log_{10} (Dry Weight)	Pearson Correlation	0.799	0.847	0.728	0.824
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	24	24	23	23
Mountain whitefish (Section Three)	Wet Weight	Pearson Correlation	0.798	0.767	0.684	0.655
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	29	29	29	29
	Log_{10} (Wet Weight)	Pearson Correlation	0.818	0.800	0.707	0.698
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	29	29	29	29
	Dry Weight	Pearson Correlation	0.797	0.767	0.691	0.660
		Significance	0.000	0.000	0.000	0.000
		Sample Size	29	29	29	29
	Log_{10} (Dry Weight)	Pearson Correlation	0.814	0.796	0.707	0.696
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	29	29	29	29
Mountain whitefish (Section Five)	Wet Weight	Pearson Correlation	0.806	0.786	0.814	0.780
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	31	31	28	28
	Log_{10} (Wet Weight)	Pearson Correlation	0.810	0.811	0.828	0.831
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	31	31	28	28
	Dry Weight	Pearson Correlation	0.811	0.791	0.817	0.781
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	31	31	28	28
	Log_{10} (Dry Weight)	Pearson Correlation	0.815	0.816	0.831	0.834
		Significance (2 tailed)	0.000	0.000	0.000	0.000
		Sample Size	31	31	28	28

3.3 MERCURY CONCENTRATIONS IN FISH TISSUE

Total mercury in muscle tissue of sampled bull trout and mountain whitefish in the Site C study area ranged from 0.014 µg/g to 0.140 µg/g (Table 3.4, Appendix A1). The highest value (0.140 µg/g) was recorded from a bull trout that was Age 8 and 623 mm in fork length. The highest value is below Health Canada's guideline of 0.5 µg/g mercury concentration in freshwater fish used for human consumption (http://www.hc-sc.gc.ca/fn-an/securit/chem-chim/contaminants-guidelines-directives-eng.php#guidelines; 1 June 2009). Total mercury concentrations were lower in mountain whitefish compared to bull trout. Mean values were 0.033 µg/g (Section Three) and 0.043 µg/g (Section Five) for mountain whitefish compared to 0.078 µg/g for bull trout.

Table 3.4 Summary of wet weight total mercury concentration (µg/g) in fish muscle tissue, Site C investigations 2008.

Group	Sample Size	Mean	Standard Deviation	Range
Bull trout	24	0.078	0.030	0.018 – 0.140[a]
Mountain whitefish (Section Three)	29	0.033	0.012	0.018 – 0.063[b]
Mountain whitefish (Section Five)	31	0.043	0.020	0.014 – 0.086

[a] Outlier value excluded from the analysis = 0.1196 µg/g; 344 mm fork length
[b] Outlier value excluded from the analysis = 0.0944 µg/g; 380 mm fork length.

The relationship between mercury concentration and fork length is summarized in Table 3.5 and illustrated in Figure 3.2. As expected, mercury concentrations increased with fish length in all three groups. Based on standard fork length, estimates of total mercury concentrations in muscle tissues were 0.078 µg/g in bull trout, 0.031 µg/g in Section Three mountain whitefish, and 0.039 µg/g in Section Five mountain whitefish.

Table 3.5 Descriptions of the wet weight total mercury concentration (µg/g) and fork length (mm) relationships in Peace River bull trout and mountain whitefish muscle tissue, Site C investigations 2008.

Group	Relationship	Estimate of Total Mercury[a]	
		Standard Fork Length[b]	Concentration (µg/g)
Bull trout	Log_{10}(total mercury) = -3.943 + 1.060 * Log_{10}(fork length)	473.7	0.078
Mountain whitefish (Section Three)	Log_{10}(total mercury) = -4.441 + 1.165 * Log_{10}(fork length)	329.5	0.031
Mountain whitefish (Section Five)	Log_{10}(total mercury) = -5.045 + 1.434 * Log_{10}(fork length)	342.6	0.039

[a] Back-transformed values.
[b] Mean fork length of sample.

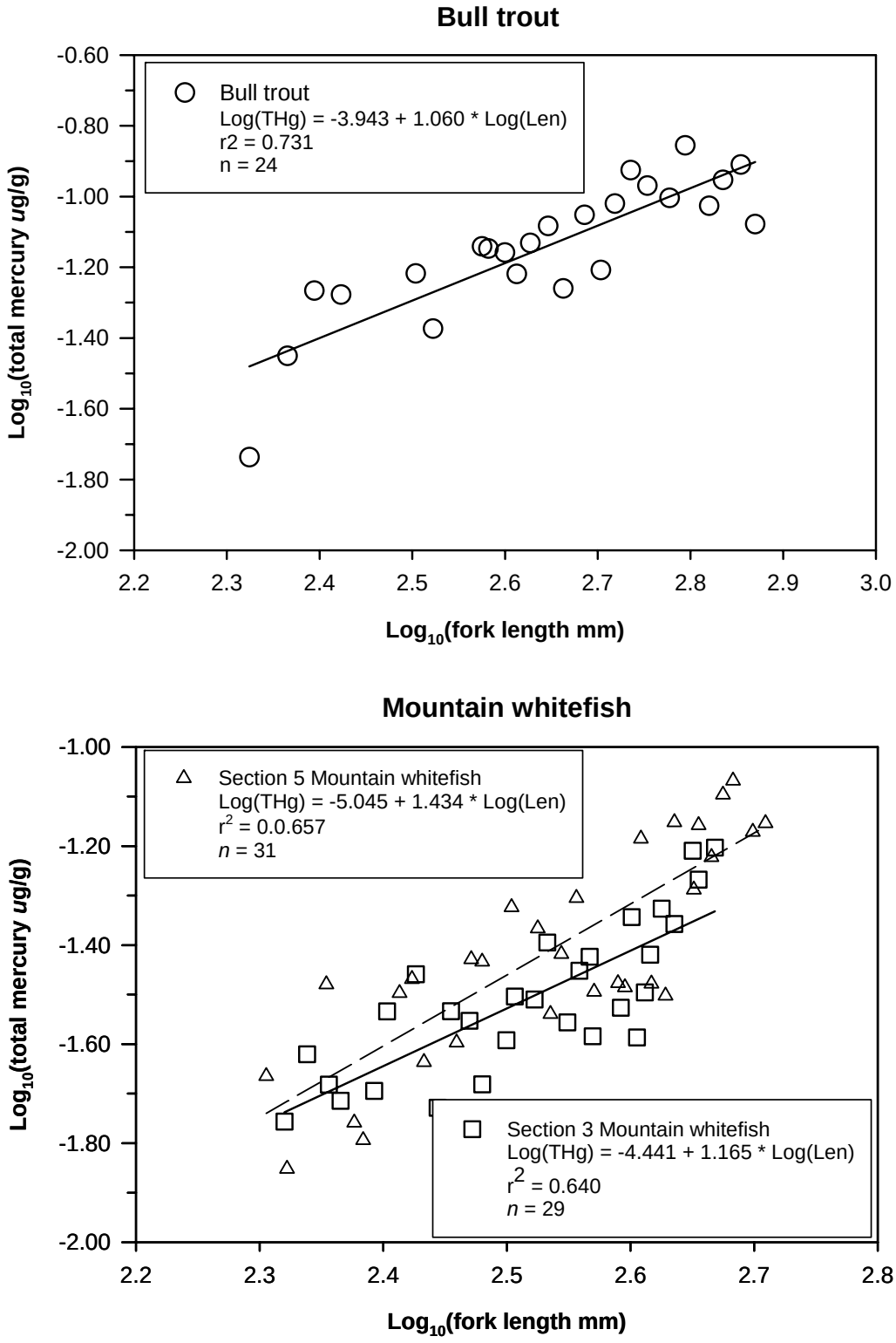


Figure 3.2 Relationship between total mercury (wet weight) and fork length in sampled Peace River bull trout and mountain whitefish, Site C investigations 2008.

Data presented in Table 3.5 and a visual assessment of data points presented in Figure 3.2 indicated that mercury concentrations may have been lower in mountain whitefish from Section Three compared to mountain whitefish from Section Five. The mercury - length relationship slope of each group was not significantly different ($p = 0.311$, ANCOVA Test for Slope Heterogeneity; Appendix C1), and therefore, slopes were assumed to be homogeneous. Analysis of covariance indicated statistically significant differences between the two groups ($p = 0.012$). This indicated that mountain whitefish from Section Three upstream of the proposed Site C location had, on average, a lower concentration of total mercury in muscle tissue, then mountain whitefish from Section Five located downstream of the proposed Site C location.

3.4 COMPARISONS TO OTHER DATA

In 1989, muscle tissue were collected from 8 bull trout and 24 mountain whitefish captured from the Peace River (Pattenden *et al.* 1990) (Appendix A2). All fish were collected upstream of the confluence of the Moberly River. Based on this information the 1989 data were collected in generally similar locations as the 2008 bull trout data and the 2008 Section 3 mountain whitefish data.

Table 3.6 Summary characteristics of Peace River fish sampled for muscle tissue mercury concentrations in 1989 (from Pattenden *et al.* 1990).

Species	Sample Size	Fork Length (mm)		Wet Weight Total Mercury Concentration (µg/g)		Correlation[a] (Mercury-Length)
		Mean	Range	Mean ± SD	Range	
Bull trout	8	499.5	330 – 814	0.21 ± 0.27	0.04 – 0.84	0.824*
Mountain whitefish	24	366.3	272 – 487	0.06 ± 0.03	0.02 – 0.12	0.766*

[a] * denotes significant Pearson Correlation at $p \leq 0.05$

Wet weight total mercury in fish collected in 1989 appeared to be higher than in fish collected in 2008. Average mercury concentrations in bull trout were 0.21 µg/g in 1989 compared to 0.08 µg/g in 2008. For mountain whitefish, average mercury concentrations were 0.06 µg/g in 1989 versus 0.03 µg/g in 2008.

The apparent yearly differences could have been caused by the size range of sampled fish. Smaller bull trout (<330 mm) and smaller mountain whitefish (<272 mm) sampled in 2008 were not sampled in 1989. The positive correlation between mercury concentration and fish length indicated that the 1989 sample, which contained larger fish, potentially could have had higher mercury concentrations. Statistical evaluations indicated that the slopes of the length-mercury relationships were not homogeneous between years ($p = 0.01$ for bull trout and $p = 0.002$ for mountain whitefish, ANCOVA Test for Slope Heterogeneity; Appendix C1); therefore, adjustments for fish size could not be used to address this issue.

However, a visual examination of the logtransformed data illustrated differences between 1989 and 2008 in terms of the rate of mercury accumulation over the size range of sampled fish. The rate of accumulation was higher in 1989 compared to 2008 for both bull trout and mountain whitefish (Figure 3.3). This suggested that total mercury concentrations in Peace River bull trout and mountain whitefish may have declined since 1989.

In 1990, additional muscle tissue samples were collected from 5 bull trout and 10 mountain whitefish captured from the Peace River (Pattenden *et al.* 1991) (Appendix A3). Summary information for the 1990 data is presented in Table 3.7. These data were not compared to the 2008 results due to small sample sizes available for analyses. These data were not combined with the 1989 information for comparison to the 2008 results because of apparent differences in the laboratory analytical procedures; 1989 results presented on a wet weight basis, while 1990 results presented on a dry weight basis (Pattenden *et al.* 1990, 1991).

Table 3.7 Summary characteristics of Peace River fish sampled for muscle tissue mercury concentrations in 1990 (from Pattenden *et al.* 1991).

Species	Sample Size	Fork Length (mm)		Wet Weight Total Mercury Concentration[a] (µg/g)		Correlation[b] (Mercury-Length)
		Mean	Range	Mean ± SD	Range	
Bull trout	5	431.4	342 – 530	0.16 ± 0.11	0.03 – 0.26	0.616
Mountain whitefish	10	377.6	300 – 463	0.04 ± 0.04	0.01 – 0.10	0.636*

[a] Based on conversion from dry weight basis using sample moisture content

[b] * denotes significant Pearson Correlation at $p \leq 0.05$

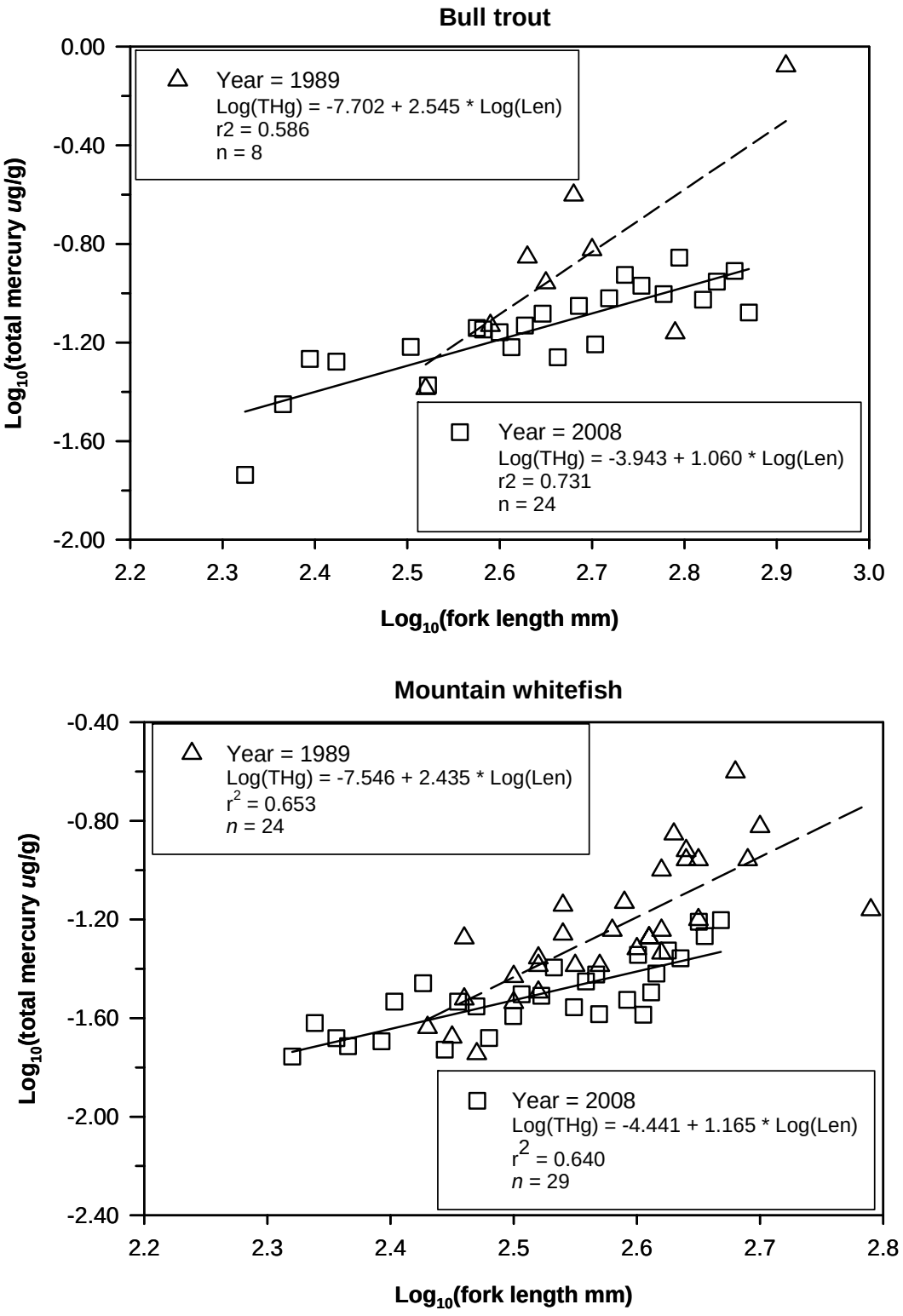


Figure 3.3 Relationship between total mercury (wet weight) and fork length of Peace River bull trout and mountain whitefish sampled in 1989 and 2008.

4.0 SUMMARY

Muscle tissue samples were collected from 25 bull trout, 30 mountain whitefish from Section Three, and 31 mountain whitefish from Section Five using nonlethal methods in order to quantify total mercury concentration. Sampled fish in each group represented a wide range of sizes and ages, and they were representative of fish populations in the study area. An evaluation of the raw data indicated that the best approach to quantify total mercury concentration in fish tissue was to use logarithmic transformed wet weight mercury concentration with logarithmic transformed fork length as the covariate.

Mercury concentrations in fish muscle tissue increased with fish length in all three groups. Based on standard fork length, estimates of total mercury concentrations in muscle tissues (wet weight) were 0.07819 µg/g in bull trout, 0.03106 µg/g in Section Three mountain whitefish, and 0.03890 µg/g in Section Five mountain whitefish.

Further analyses of the data indicated spatial differences in mercury concentrations of mountain whitefish muscle tissue. Mountain whitefish in Section Three upstream of the proposed Site C location had, on average, a lower concentration of total mercury in muscle tissue, then mountain whitefish in Section Five located downstream of the proposed Site C location.

Data collected from Peace River fish in 1989 were available for comparison to data collected during the present study. The results (i.e., slope of the mercury – length relationship) indicated that total mercury concentrations in muscle tissues of bull trout and mountain whitefish may have been lower in 2008 compared to 1989.

5.0 LITERATURE CITED

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