BC Environment

1998 TOBOGGAN CREEK STEELHEAD ASSESSMENT

by

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Skeena Fisheries Report SK-118

March 1999

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ABSTRACT

The fish counting fence on Toboggan Creek near Smithers, B.C. was in operation from April 7 to June 23, 1998 for steelhead enumeration; this is the sixth consecutive year of operation. Stream discharge and water temperature, fish length, sex, and age data were collected and fish tagged as part of a mark-recapture program. A population estimate of 377 adult steelhead above the fence was calculated based on the tagging program. Female fish were found to be significantly larger than males in this year, and a trend of decreasing size over time is suggested by the historic and present data. The sex ratio indicates that, for the first time since sampling began, females outnumber males. The 1998 data are compared with the previous five years and recommendations regarding future sampling are presented.

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1. INTRODUCTION

1.1 Background

Toboggan Creek is a small system draining into the Bulkley River west of Smithers, B.C. and is one of three systems in the mid- and upper Skeena watershed with a fish counting fence utilized for steelhead assessment located on it (the others being the Sustut and Babine rivers). Prior to 1993, assessment of the steelhead trout (*Oncorhynchus mykiss*) population in Toboggan Creek watershed was limited (see O'Neill 1995, 1996; Gibson 1997). The Toboggan Creek counting fence was first operated for steelhead in 1978 (D. Atagi, pers. comm., Jan. 1999) though it has been in operation for coho salmon (*Oncorhynchus kisutch*) since 1989 (SKR Consultants 1996). Since 1993 steelhead population estimates based on fence counts have ranged from 120 - 505 with most of the estimates being in the range of 200-400 individuals.

1998 was the sixth consecutive year of adult steelhead enumeration via fence counts on Toboggan Creek. This document details the findings of 1998, and also summarizes the previous five years in order to determine trends and place this years results in context. Funding and support for this project was provided by the Habitat Conservation Trust Fund.

1.2 Objectives

The objectives of this project were to:

1) Estimate the size of the adult steelhead population utilizing Toboggan Creek above the fish counting fence by a mark-recapture procedure.
2) Document run timing of steelhead to Toboggan Creek in 1998.
3) Collect information on size, sex ratio, age and life histories (via scales).

2. STUDY AREA

Toboggan Creek is 17 km long, draining north into the Bulkley River 23 km north-northwest of Smithers, B.C. (Gibson 1997). There are numerous tributaries contributing to the mainstem, draining an area of approximately 110 km^2 (Tredger 1979). The stream originates from twin glaciers on Hudson Bay Mountain and is located within two Biogeoclimatic zones; the Englemann Spruce-Subalpine Fir, wet-very cold (ESSFwv) at higher elevations and the Interior Cedar Hemlock moist-cold (ICHmc) lower down (Gibson 1997). The stream flows largely through agricultural land and pasture leases in the reaches below Toboggan Lake. The creek is also paralleled on the west side by the Canadian National (CN) rail tracks.

Toboggan Creek supports rainbow/steelhead trout (*Oncorhynchus mykiss*), cutthroat trout (*O. clarki clarki*), coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), kokanee (*O. nerka*), Dolly Varden char (*Salvelinus malma*), Mountain whitefish (*Prosopium williamsoni*), lamprey (*Lampetra* sp.) and sculpins (*Cottus* sp.) (SKR Consultants 1996; Gibson 1997). There is an estimated 17 km of available fish habitat in the system distributed between the mainstem and tributaries (Tredger 1979).

The fish counting fence on Toboggan Creek is located approximately 2.5 km upstream of the confluence with the Bulkley River (SKR Consultants 1996); the property surrounding this location of the stream is owned by Mr. K. Landrock.

3. METHODS

3.1 Physical

Stream flow

Stream height (m) was recorded daily by use of a staff gauge adjacent to the Toboggan Creek Fish Hatchery. This was converted to discharge (Litres per minute [L/min.]) using the function:

$$\text{Discharge (L/min)} = H_{staff} * (700 \text{ L} * \text{min}^{-1} \text{ per cm})$$

Where H_{staff} = height on staff gauge (cm)

$L*min^{-1}$ per cm= discharge (Litres/minute) per cm on staff gauge

Temperature

Daily morning and afternoon temperatures were recorded (°C) in Toboggan Creek using an alcohol thermometer at a station adjacent to the Toboggan Creek Fish Hatchery. For purpose of this analysis, mean daily temperature was determined by averaging these morning and afternoon temperatures for each day.

3.2 Biological

Operation of the counting fence began on April 7, 1998 and continued until June 23, 1998. There were four interruptions in which the fence was laid down due to high stream flows (Figure 1); these were April 30-May 1 (16 hours), May 2 - May 3 (12

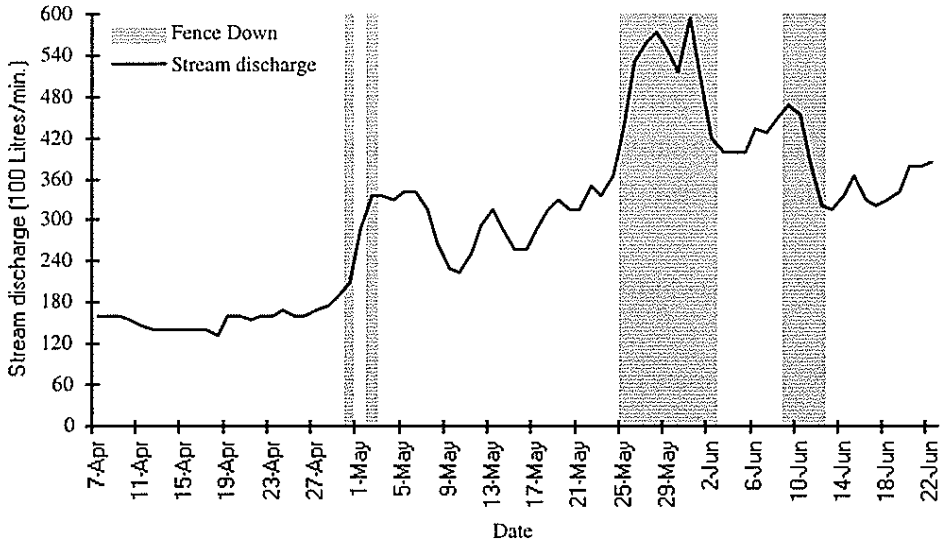

Figure 1. Periods of fence being laid down compared with stream disharge, Toboggan Creek, April 7 - June 22, 1998. See also Figure 2 for stream discharge.

hours), May 25-June 3 (9 days), and June 9 - June 11 (44 hours). Reported fish numbers in this report appearing to fall near or within these dates were from sampling immediately prior to laying the fence down. While the fence was operational, fish travelling upstream were captured in the box at the fence and tagged by insertion of a Floy anchor tag in the right dorsal muscle and secondarily marked by punching a small disc out of the right operculum. Tag number, fish sex (female vs male), origin (hatchery vs wild) and fork length (mm) were recorded, previous tags noted, and unusual scarring (i.e. gill net marks, seal bites, etc.) visually noted and recorded. Scale samples were taken for aging from the first 100 fish then approximately every third one after that, and the operculum punch retained from selected fishes for DNA analysis.

Downstream migrating kelts were beach seined above the fence (May 11 - June 23). Previously marked fish (those marked on the upstream migration) were recorded and released below the fence. Unmarked fish were anchor tagged, measured, and origin and unusual scarring noted. All fish were examined for tag loss and secondary marks (i.e., operculum punch).

3.3 Population Estimation Procedure

The Seber (1982) estimator of the Petersen method was used to estimate population size, and large sample binomial 95% Confidence Intervals were calculated. The Seber Estimator is (from Krebs 1989):

$$N' = [((M+1)(C+1))/(R+1)]-1$$

Where N' = Estimate of population size at time of marking
M = Number of individuals marked in first sample
C = Total number of individuals captured in second sample
R = Number of individuals in second sample that are marked

The large sample binomial 95% Confidence Intervals are calculated as (from Krebs 1989):

$$CI = R/C \pm Z_{\alpha/2} [((R/C)(1-R/C))/(C-1)]^{0.5}$$

Where CI = Confidence Interval
R, C = as above
$Z_{\alpha/2}$ = Standard normal deviate for (1-α) level of confidence;
(1.96 at $\alpha = 0.05$)

Absolute confidence interval values are calculated for lower and upper values as:

$$N'' = (1/CI)*M$$

Where N'' = Lower (upper) 95% Confidence Interval of population estimate
R, C, M = as above

3.4 Other Statistical Procedures

Steelhead fork length for 1998 was assessed for probability that it comes from a normal distribution using histograms and normal probability plots using SYSTAT 5.0. It was determined that these measurements were not sufficiently normally distributed for parametric analysis to be used, and so the Wilcoxon Signed Rank test was used to test for differences in fork length between male and female fish for 1998. The Wilcoxon test is never very much less efficient that the parametric *t*-test and may be much more efficient if the underlying distribution is far from normal (DeVore 1987).

Despite the violation of Normality, 95% Confidence Intervals for fork length were still calculated via the parametric approach, that is (from DeVore 1987):

$$\text{mean value} \pm z_{\alpha/2} * s / n^{0.5}$$

Where: $Z_{\alpha/2}$ = Standard normal deviate for $(1-\alpha)$ level of confidence;
1.96 at $\alpha = 0.05$)
s = sample standard deviation
n = sample size

The use of the parametric approach was for ease of use, provision of comparability with other studies, and use of complex non-parametric approach is thought to not greatly affect estimated final values.

4. RESULTS AND DISCUSSION

4.1 Stream Flow and Water Temperature

Stream flow

Discharge in Toboggan Creek over the time of sampling ranged from 13,300 L/min. to 59,500 L/min (Figure 2, Appendix A). Discharge was low prior to April 30th, rose relatively steadily between April 30 and May 31, then declined, with occasional spikes, for the remainder of the sampling period. These high flows, and the rate at which the stream flow increased, created periods of hydraulic risk to the fence, and so it was lowered during these periods (Figure 1).

Stream temperature

Toboggan Creek stream temperature ranged from 2.5 to 12.5 °C and displayed a general increasing trend over the period of sampling (Figure 2, Appendix A). The mean stream temperature on the day of initiation of the upstream migration was 5.25 °C.

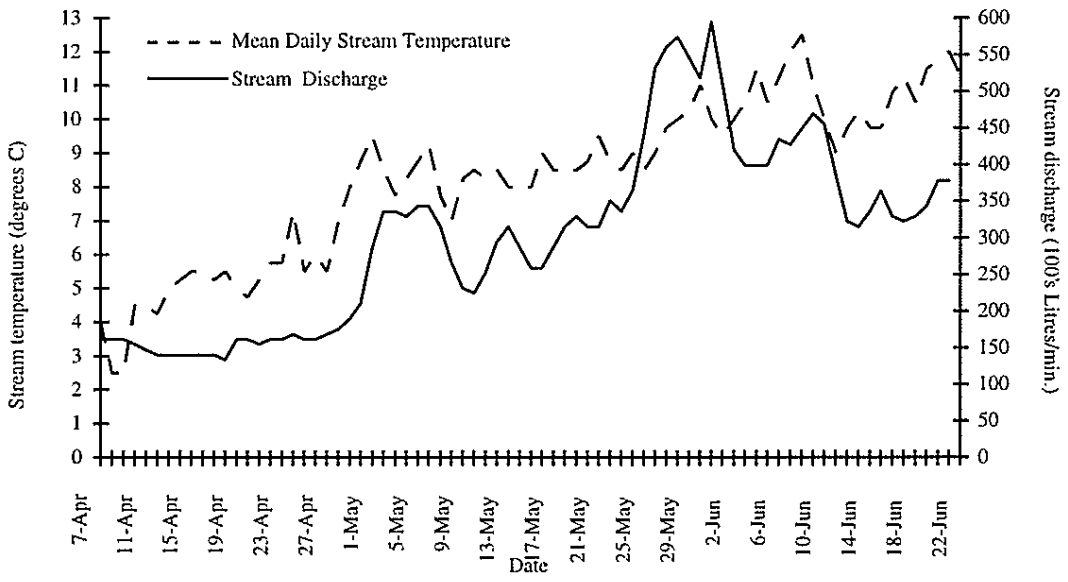

Figure 2. Stream temperature and estimated discharge of Toboggan Creek, April 7 - June 22, 1998.

4.2 Run Timing

The first steelhead to pass upstream through the fence were sampled on April 21, 1998 (2 males, 2 females) and the last date of fish passing upstream was May 25 (4 males, 5 females). Thus, the fish were passing upstream over a period of 35 days. There was an early peak in number of fish passing between April 21 and April 25 (17 fish passed) with the majority (90%) of the estimated run having passed through by May 17 (Table 1, Figures 3 and 4, Appendix B). The upstream run of steelhead appears to have been complete by the time of spring high flows (Figures 4 and 5). However, the fence

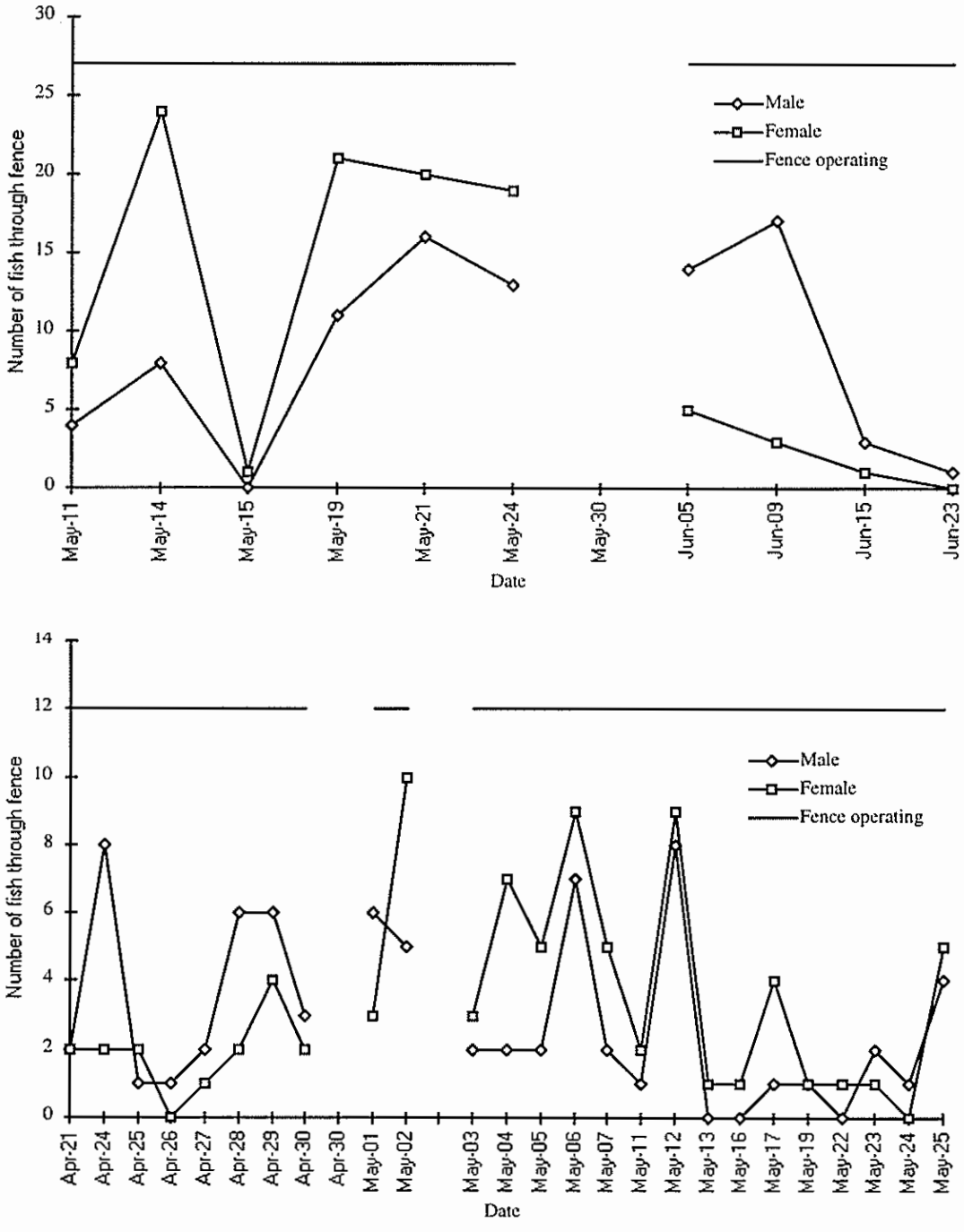

Figure 3. Number of steelhead passing upstream (upper) and downstream (lower) through fence by date.

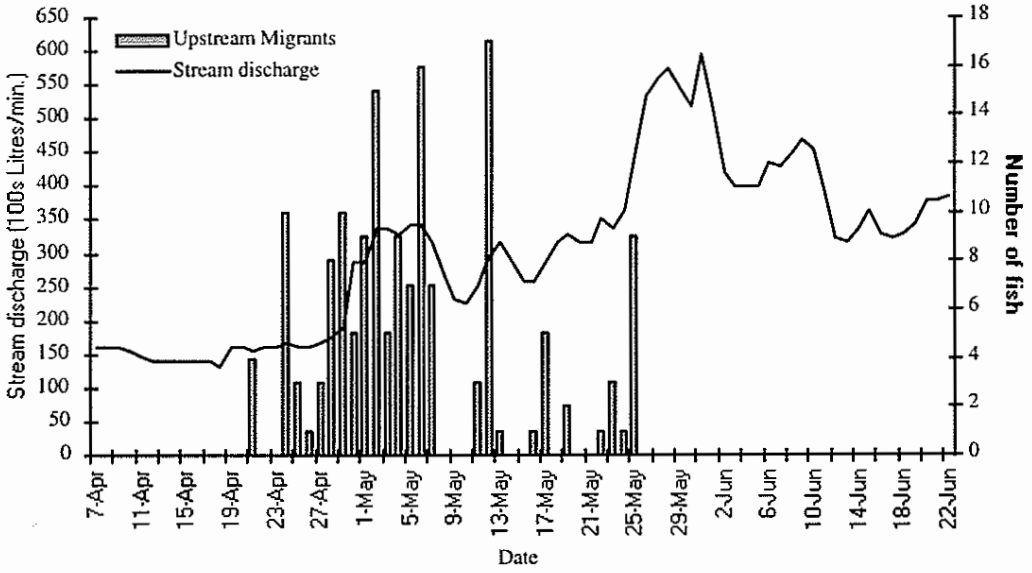

Figure 4. Stream discharge and steelhead passage upstream (scaled to match discharge) Toboggan Creek, April 7 - June 22, 1998.

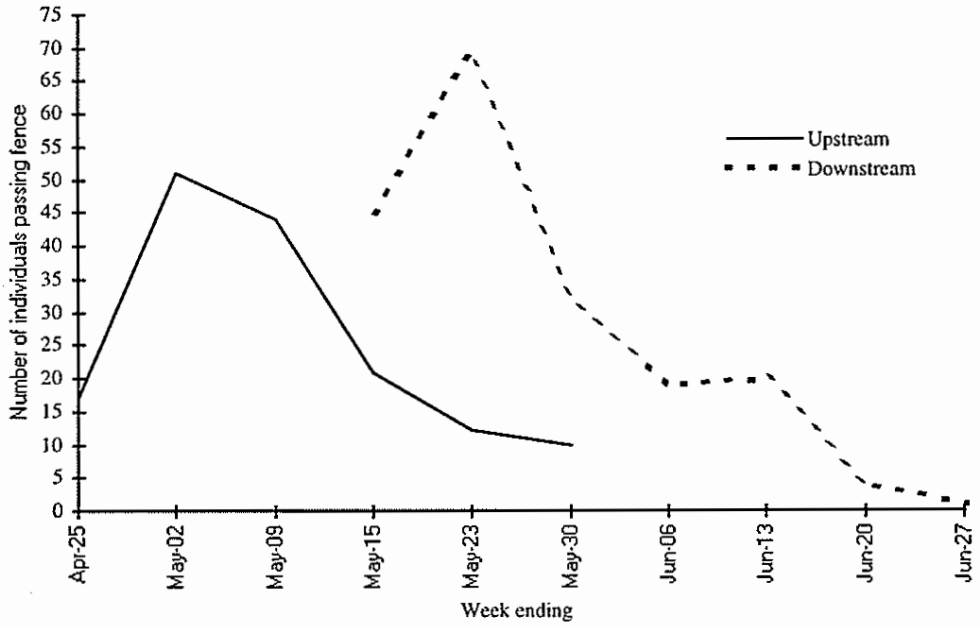

Figure 5. Run timing of steelhead upstream and downstream past Toboggan Creek counting fence, for weeks ending April 25-June 27, 1998

was laid down for nine days at this point so determination of how many fish moved upstream during the high flow period is not possible, though it appears that the run was declining by this point. Six days of fence operation after the peak flows indicated no further upstream migration (Figures 1 and 5).

Returning downstream, the first fish were placed over the fence on May 11 (4 males, 8 females) and the last fish was June 23 (1 male). The duration of downstream passage was 44 days. The primary peak in numbers of fish returning downstream occurred between the weeks ending May 16 - May 30 (i.e., May 16 - May 24), with a secondary peak during the week ending June 13 (Table 1, Figures 3 and 5, Appendix C). The majority of the run (90%) downstream had passed by June 5 - 9.

Male steelhead in Toboggan Creek move upstream prior to females and return downstream later than females. The majority (90%) of the males were upstream by May 15, females by May 23. Returning downstream, 90% of the males were passed by June 13 while 90% of the females had passed by May 30. This indicates the males may spend as much as 3 weeks longer than the females on the spawning grounds.

Table 1. Weekly steelhead movement upstream and downstream in Toboggan Creek April 7 - June 27, 1998. (Percentage of run in brackets).

	UPSTREAM			DOWNSTREAM		
Week ending	Male	Female	Total	Male	Female	Total
April 25	11 (15.0)	6 (7.3)	17 (11.0)			
May 2	29 (39.7)	22 (26.8)	51 (32.9)			
May 9	15 (20.5)	29 (35.3)	44 (28.4)			
May 15	9 (12.3)	12 (14.6)	21 (13.5)	12 (13.6)	33 (32.3)	45 (23.7)
May 23	4 (5.5)	8 (9.7)	12 (7.7)	28 (31.8)	41 (40.2)	69 (36.3)
May 30	5 (6.8)	5 (6.1)	10 (6.4)	13 (14.8)	19 (18.6)	32 (16.8)
June 6				14 (15.9)	5 (4.9)	19 (10)
June 13				17 (19.3)	3 (2.9)	20 (10.5)
June 20				3 (3.4)	1 (1.0)	4 (2.1)
June 27				1 (1.1)	0	1 (0.5)
Total	73	82	155	88	102	190

4.3 Population Estimate and Confidence Interval

The 1998 steelhead population estimate for Toboggan Creek above the fish counting fence is 377 fish, with the 95% confidence intervals bracketing the range of 323-456 individuals (Table 2). There were 155 individuals marked migrating upstream (M), and of 190 passing downstream (C), 78 were tagged (R) including three that lost their tags (evident by the operculum punch). The sex ratio of the population is estimated at 1.19:1, female:male (i.e. 1.19 females/male). Figures 6 and 7 and Table 2 illustrate the current population estimate and female to male ratio together with historic estimates since 1993 (historic data from O'Neill 1994, 1995, 1996; O'Neill unpublished data 1993, 1997).

Table 2. Population estimates, with 95 % Confidence Intervals, and female to male ratio for Toboggan Creek, 1993-1998.

Year	Population estimate (95% confidence intervals)	Female:Male ratio
1993	435 [a]	0.775
1994	237 (201 - 288)	0.977
1995	330 (296 - 370)	0.538
1996	120 (103 - 147)	0.818
1997	543 (363 - 1482) [b]	0.724
1998	377(323 - 456)	1.19

[a] 1993 did not involve a recapture phase, estimate is based on visual observation of tagged to untagged above fence.

[b] 1997 estimate based on small sample size of marked (M = 43, R = 10) relative to unmarked (C = 135), thus inflating the 95% confidence intervals

Toboggan Creek has supported up to 550 steelhead spawners upstream of the counting fence during the 1990's. Spawning below the fence is known to occur but has not been quantified as yet.

The sex ratio of the fish has ranged from 0.54 females to males to 1.19. Interestingly, 1998 is the first year that females numbers have exceeded males though in 1994 they were equal (Figure 7). This demonstrates a great degree of variability in female:male ratios. Over the six years of record, the mean ratio is 0.842 females to males.

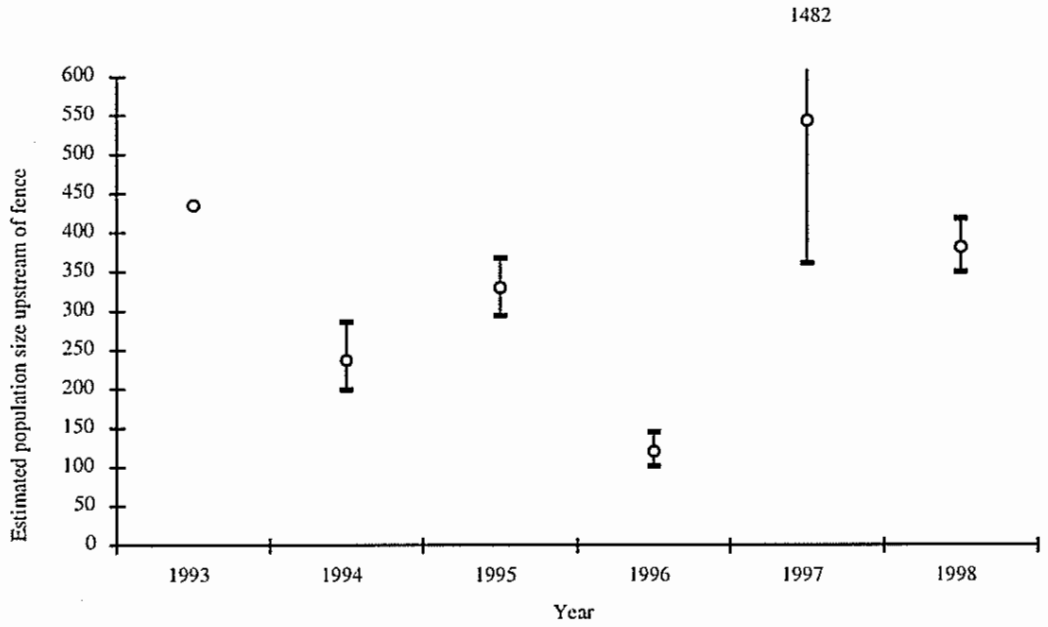

Figure 6. Steelhead population estimates with 95% confidence intervals (CI) for toboggan Creek, 1993-1998 (1993 not mark-recapture so no CI; 1997 upper CI (1448) not shown for clarity of remaining points.

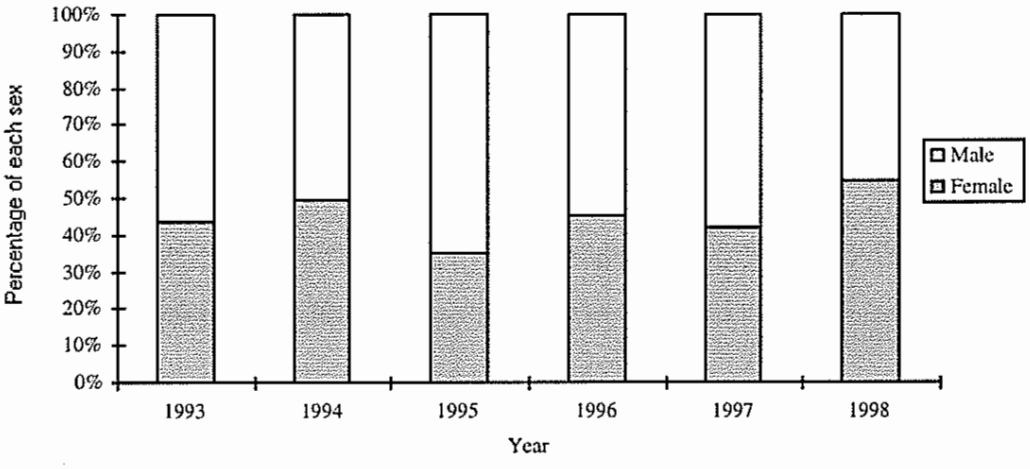

Figure 7. Proportion of each sex comprising steelhead population in Toboggan Creek, 1993-1998.

Rate of tag loss in this year of sampling was 7.3% (3 of 41) for females and 0% (0 of 37) for males. The combined sexes rate of 3.8 % compares favorably with 1994 and 1995 as indicated in Table 3, but female rate of tag loss is high, and male low, relative to previous years. The previously reported population estimate accounts for this tag loss.

Table 3. Rate of tag loss (expressed as % of tagged fish which lost tags) for the years 1994 to 1998.

	Females	Males	Combined
1994	3.4	4.2	3.8
1995	0	5.7	3.6
1996	0	27.3	* 18.8
1997	0	0	0
1998	7.3	0	3.8
Mean	2.1	7.4	6.0

* some tags were observed to be lost by kelts during seine recapture

4.4 Steelhead Age, Size and Recaptures

Age

Twenty seven scale books were prepared from scales taken from the returning Toboggan Creek steelhead, resulting in 134 scales read. The results are provided in Table 4. The range of ages of fish were from 3.1+ up to 5.1S1S1+ with 60% of the fish sampled comprising initial spawning ages of 3.2+ and 4.2+ (see Appendix D for data).

Table 4. Distribution of ages of a sample of Toboggan Creek steelhead passing though the fence in 1998 (n=134).

Age	Number	Percentage
R.1	7	5.2
R.2	10	7.5
R.3	1	0.8
3.1	7	5.2
3.2	39	29.1
3.3	2	1.5
4.1	10	7.5
4.2	42	31.3
4.3	2	1.5
5.1	5	3.7
5.2	7	5.2
5.3	2	1.5

DNA

128 DNA samples were collected from returning Toboggan Creek steelhead. DNA results were not available at the time of report preparation, thus are not reported here.

Size

The mean fork length of the female steelhead sampled in Toboggan Creek in 1998 was 705.6 mm (S.D. = 51.0 mm, n = 145) and the mean fork length of males was 689.7 mm (S.D. = 116.9 mm, n = 122). Fork length distributions of male and female steelhead are presented in Figure 8. The difference was found to be statistically significant (Wilcoxon test, $Z = 14.167$, $Z_{crit} = 2.575$, $P<0.0001$). There appears to be a decline in mean size of fish in Toboggan Creek over time for both males and females (Table 5, Figure 9), however, this may be a result of sample size bias. Ricker (1981) reports a decrease in size of fish caught between 1951 and 1975 for all five species of

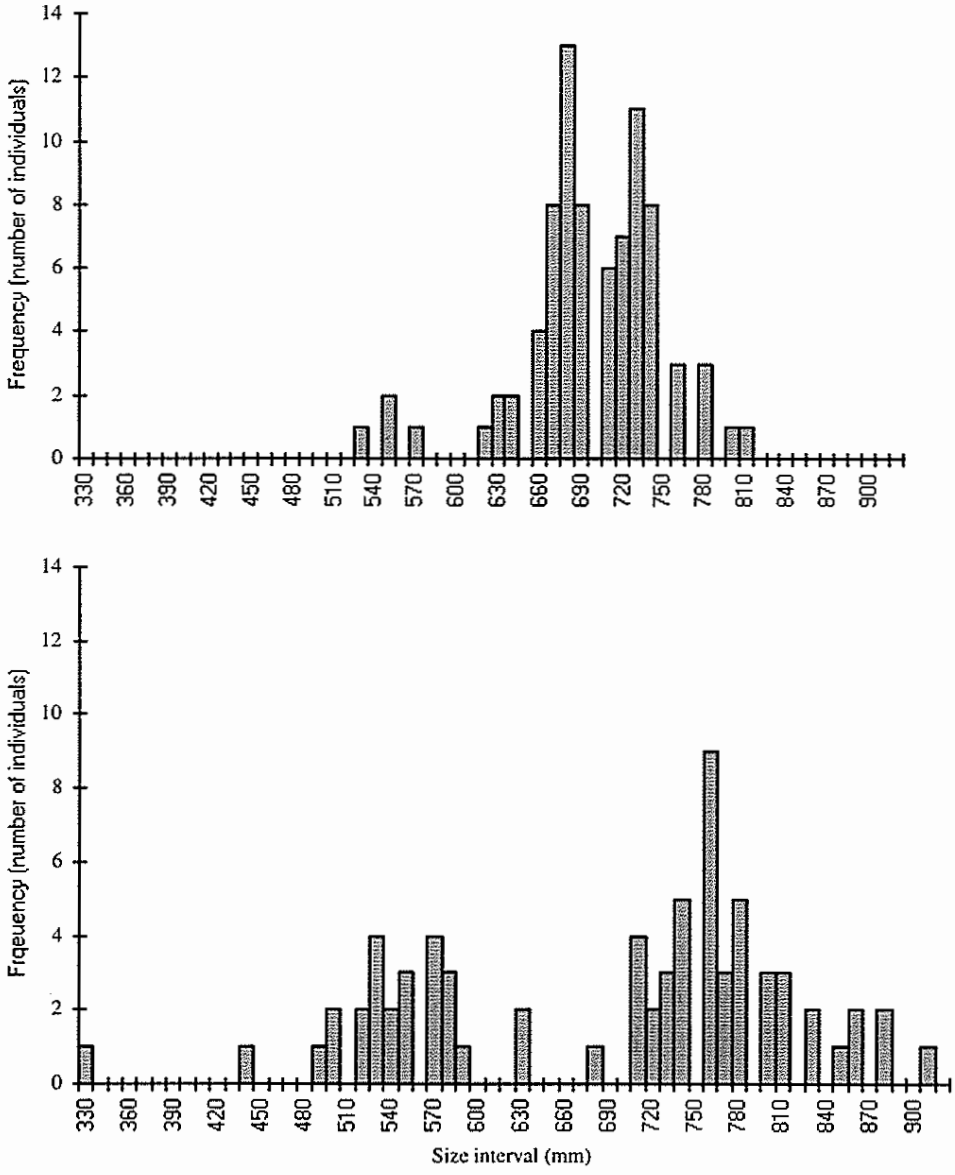

Figure 8. Fork length frequency histograms for female (upper) and male (lower) steelhead for Toboggan Creek sampling, 1998.

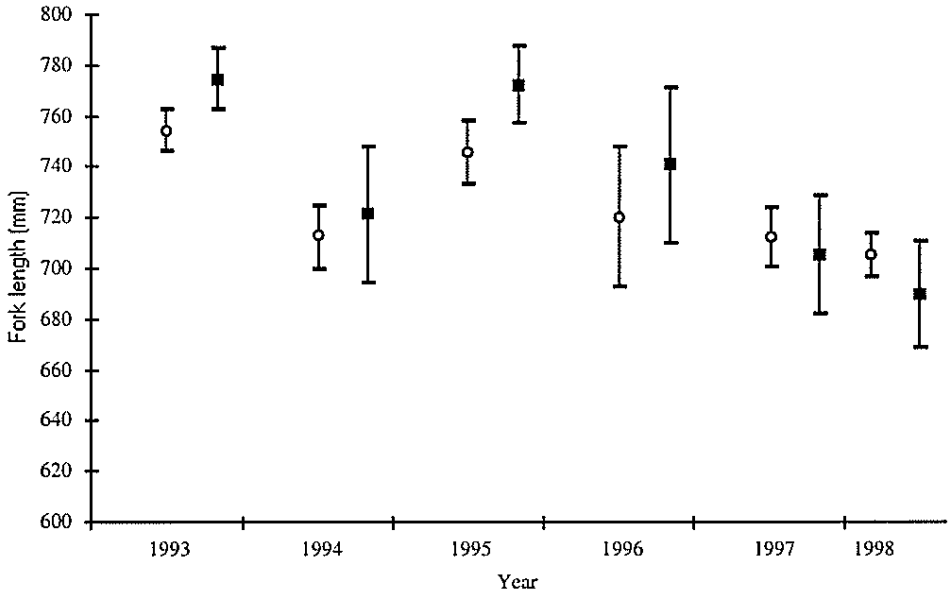

Figure 9. Mean fork length with 95% confidence intervals for female (open circles) and male (closed squares) steelhead for Toboggan Creek, 1993-1998.

salmon (*Oncorhynchus* spp.) and Wilkman and Stockerl (1981) found a modest correlation of 0.689 between length and fecundity for Skeena River steelhead between 1977 and 1979. Thus decreasing female size, if it is real, over time may result in reduced fecundity with implications for future population sizes. This should be intensively monitored in the future to determine if the trend is real or an artifact of the sample sizes.

Table 5. Minimum, mean, and maximum fork lengths (mm), and sample sizes, for steelhead in Toboggan Creek, 1993-1998.

	Female				Male			
	Min.	Mean	Max.	n	Min.	Mean	Max.	n
1993	635	754.5	901.7	76	609.7	774.7	939.8	98
1994	431.8	712.9	965.2	89	342.9	721.4	914.4	91
1995	558.8	745.8	873.6	112	444.5	772.4	965.2	135
1996	533.4	720.5	939.8	37	508	740.7	939.8	68
1997	560	712.4	814	67	330.5	705.4	967	101
1998	533.4	705.6	838.2	145	330.2	689.7	914.4	122

Recaptures

Of the 155 steelhead tagged passing upstream, 78 were recaptured moving downstream, for a recapture rate of 50.3%. A total of 10 adult steelhead (two female, eight males) were found dead near the fence (i.e., in the upstream pool or washed up against fence panels) for a minimum mortality rate of 2.6% of the estimated population. These dead fish were included in the population estimate as during the upstream migration they were active parts of the population, and they had successfully spawned prior to death. A total of 267 different steelhead were captured and sampled during the 1998 study.

A total of nine previously-tagged fish (i.e. tagged elsewhere or in previous years) were captured during the 1998 sampling. These are presented in Table 6. The five tagged fish from Moricetown come from a marked population of 709 tags (Anonymous, 1997) applied in August and September, 1997.

Table 6. Recaptures of previously tagged steelhead between April 7 and June 23, 1998.

Tag Number	Capture date	Origin of previous tag
MOE N04889	Apr. 25, 1998	Toboggan fence - May 29, 1996
MOE N07822	Apr. 28, 1998	Moricetown - Sept. 09, 1997
MOE N05081	May 07, 1998	Toboggan confl. - Sept. 11, 1997
Orange 00380	May 11, 1998	Moricetown - Aug. 21, 1997
MOE N04982	May 19, 1998	Toboggan fence - May 21, 1997
MOE N04835	May 19, 1998	Toboggan fence - May 14, 1996
Orange 00987	May 19, 1998	Moricetown - Aug. 22, 1997
MOE N07471	May 21, 1998	Moricetown - Aug. 26, 1997
MOE N07880	May 21, 1998	Moricetown - Sept. 11, 1997

4.5 Repeat Versus Maiden Spawning Migrations

Of 134 scale samples read seven fish were repeat spawners (5.2%) of which one was a twice-repeat spawner (5.1S1S1+). Five of the repeat spawners were male and two were female and three of the fish had been previously tagged at the fence (Table 7). Fish number N04835 was an adipose-clipped hatchery fish which had been previously tagged in Toboggan Creek in 1996 while N04982 had been previously tagged in Toboggan Creek in 1997, and was back for its second spawn in consecutive years (Appendix C).

Table 7. Age, sex and tag numbers of repeat spawning steelhead in Toboggan Creek sampled in 1998.

1998 Tag #	Previous Tag	Age	Sex
0S00580		1.1S1+	Female
0S00593	N04889 (MOE)	1.1S1+	Male
0S00863		5.1S1S1+	Male
0S00864		4.1S1+	Male
0S00860		4.1S1+	Male
N08329	N04835 (MOE)	4.2S1+	Female
Not Tagged	N04982 (MOE)	3.1S+	Male

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Sampling at the Toboggan Creek counting fence in 1998 provide an estimate of 377 adult steelhead utilizing Toboggan Creek upstream of the fence. The sex ratio of females to males indicates more females than males for the first time in six years, and the mean fork length of females is significantly longer than males in 1998. There also appears to be a decline in steelhead size over time between 1993 and 1998. Steelhead migration upstream occurred primarily between April 21 and May 25, 1998, and the downstream movement of kelts was between May 11 and June 23, 1998.

5.2 Recommendations

The following recommendations are for the future operation of the Toboggan Creek steelhead enumeration program.

Continued fence operation for monitoring of population size, fish length and sex ratio should be a high priority. This fence provides valuable information and now has a six year database for examining changes over time.

There has been some concern raised over the counting fence holding up spawner migration upstream and kelt movements downstream (M. O'Neill, pers. comm., July 1998). This may result in spawners utilizing downstream areas more due to difficulty accessing upstream sites, and postponement of downstream movements of kelts. Either of these activities will affect the population estimation. In order to more closely approximate free movement upstream and downstream for fish (i.e. allowing them to behave normally), it is suggested that a systematic sampling strategy be employed. Operation of the fence for 3.5 days then lowering it for 12 hours, followed by reinstating it for a further 3.5 days on a cycle will allow for a "normal fish movement" or at least reduce the barrier effect of the fence. In addition, this strategy will provide a distribution of fish movement prior to lowering and after raising the fence, which can then be used to interpolate probable fish movement during the time the fence is down. Thus, the use of a systematic sampling regime in which the fence is up for a specified period of time, then lowered to allow fish passage, would provide more accurate estimates by allowing natural behaviour of the fish moving upstream and downstream.

More consistent and detailed recording of location and magnitude of damage (i.e. seal bites, gill net marks, hook scars, etc.). These are indirect evidence of some of the predation and human pressures on these fish and may be useful in assessing the relative importance of various pressures.

Continue to monitor fork lengths and compare with other data sources and historical records to evaluate reality of trend of decreasing female size over time.

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7. ACKNOWLEDGEMENTS

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Appendix A. Daily stream discharge and temperature for Toboggan Creek, 1998, as measured at the Toboggan Creek fish hatchery.

		Daily Stream Temperature (C)				Stream Height (m)	Est. Stream Discharge (L/min)
		AM	PM	Mean			
April	7	3	5	4		0.23	16100.00
April	8	2	3	2.5		0.23	16100.00
April	9	2	3	2.5		0.23	16100.00
April	10	2	7	4.5		0.22	15400.00
April	11	2	7	4.5		0.21	14700.00
April	12	2	6.5	4.25		0.2	14000.00
April	13	3	7	5		0.2	14000.00
April	14	2.5	8	5.25		0.2	14000.00
April	15	3	8	5.5		0.2	14000.00
April	16	3	8	5.5		0.2	14000.00
April	17	3.5	7	5.25		0.2	14000.00
April	18	4	7	5.5		0.19	13300.00
April	19	3	7	5		0.23	16100.00
April	20	3.5	6	4.75		0.23	16100.00
April	21	3.5	7	5.25		0.22	15400.00
April	22	3.5	8	5.75		0.23	16100.00
April	23	3.5	8	5.75		0.23	16100.00
April	24	4.5	10	7.25		0.24	16800.00
April	25	5	6	5.5		0.23	16100.00
April	26	5	7	6		0.23	16100.00
April	27	3.5	7.5	5.5		0.24	16800.00
April	28	5	9	7		0.25	17500.00
April	29	5.5	10.5	8		0.27	18900.00
April	30	5	12.5	8.75		0.3	21000.00
May	1	6	13	9.5		0.41	28700.00
May	2	6	11	8.5		0.48	33600.00
May	3	5.5	10	7.75		0.48	33600.00
May	4	5	11.5	8.25		0.47	32900.00
May	5	6.5	11	8.75		0.49	34300.00
May	6	8	10.5	9.25		0.49	34300.00
May	7	6	9.5	7.75		0.45	31500.00
May	8	5	9	7		0.38	26600.00
May	9	6	10.5	8.25		0.33	23100.00
May	10	5.5	11.5	8.5		0.32	22400.00
May	11	7	9.5	8.25		0.36	25200.00
May	12	7	10	8.5		0.42	29400.00
May	13	6.5	9.5	8		0.45	31500.00
May	14	6	10	8		0.41	28700.00
May	15	5.5	10.5	8		0.37	25900.00

		Daily Stream Temperature (C)				Stream Height (m)	Est. Stream Discharge (L/min)
		AM	PM	Mean			
May	16	7	11	9		0.37	25900.00
May	17	7	10	8.5		0.41	28700.00
May	18	7	10	8.5		0.45	31500.00
May	19	5.5	11.5	8.5		0.47	32900.00
May	20	6	11.5	8.75		0.45	31500.00
May	21	7	12	9.5		0.45	31500.00
May	22	8	9.5	8.75		0.5	35000.00
May	23	8	9	8.5		0.48	33600.00
May	24	8	10	9		0.52	36400.00
May	25	7.5	9.5	8.5		0.63	44100.00
May	26	8	10	9		0.76	53200.00
May	27	7.5	12	9.75		0.8	56000.00
May	28	8.5	11.5	10		0.82	57400.00
May	29	8.5	12	10.25		0.78	54600.00
May	30	9	13	11		0.74	51800.00
May	31	9	11	10		0.85	59500.00
June	1	8	11	9.5		0.73	51100.00
June	2	8	12	10		0.6	42000.00
June	3	8.5	12.5	10.5		0.57	39900.00
June	4	10	13	11.5		0.57	39900.00
June	5	8	13	10.5		0.57	39900.00
June	6	9	13.5	11.25		0.62	43400.00
June	7	10	14	12		0.61	42700.00
June	8	11	14	12.5		0.64	44800.00
June	9	10.5	11.5	11		0.67	46900.00
June	10	9.5	10.5	10		0.65	45500.00
June	11	8	10	9		0.55	38500.00
June	12	8	11.5	9.75		0.46	32200.00
June	13	8.5	12	10.25		0.45	31500.00
June	14	9	10.5	9.75		0.48	33600.00
June	15	9	10.5	9.75		0.52	36400.00
June	16	9.6	12	10.8		0.47	32900.00
June	17	10.5	12	11.25		0.46	32200.00
June	18	10	11	10.5		0.47	32900.00
June	19	9	14	11.5		0.49	34300.00
June	20	9.5	14	11.75		0.54	37800.00
June	21	10	14	12		0.54	37800.00
June	22	10.5	12	11.25		0.55	38500.00

Appendix B. Upstream migrating steelhead spawners put through the Toboggan Creek counting fence, April 21 - May 25, 1998.

Date 1998	Sex	Length (mm)	Tag Number	Scale Number	Previous Tags/Comments
Apr-21	M	749.3	S00578	40507-R1	
	F	723.9	S00579	40507-R2	
	F	787.4	S00580	40507-R3	
	M	787.4	S00581	40507-R4	
Apr-24	M	762	S00582	40507-R5	
	F	660.4	S00583	40508-R1	
	M	711.2	S00584	40508-R2	
	M	762	S00585	40508-R3	
	M	800.1	S00586	40508-R4	
	F	736.6	S00587	40508-R5	
	M	723.9	S00588	40509-R1	
	M	711.2	S00589	40509-R2	
	M	736.6	S00590	40509-R3	
	M	546.1	S00591	40509-R4	
Apr-25	F	685.8	S00592	40509-R5	
	M	749.3	S00593	40510-R1	N04889 (MOE) ***(1996)
	F	749.3	S00595	40510-R2	
Apr-26	M	889	S00596	40510-R3	
Apr-27	M	609.6	S00597	40510-R4	
	M	774.7	S00598	40510-R5	
	F	749.3	S00599	40511-R1	Head scar, damaged tail
Apr-28	M	558.8	S00600	40511-R2	
	M	762	S00873	40511-R3	
	M	736.6	S00872	40511-R4	N07822 (MOE) *
	M	762	S00871	40511-R5	
	F	787.4	S00870	40512-R1	
	F	685.8	S00869	40512-R2	
	M	863.6	S00868	40512-R3	
	M	584.2	S00867	40512-R4	
Apr-29	F	673.1	S00866	40512-R5	Damaged dorsal fin
	F	723.9	S00865	40513-R1	
	M	685.8	S00864	40513-R2	
	M	800.1	S00863	40513-R3	
	F	736.6	S00862	40513-R4	
	F	673.1	S00861	40513-R5	
	M	635	S00860	40514-R1	
	M	812.8	S00859	40514-R2	
	M	800.1	S00858	40514-R3	

Date 1998	Sex	Length (mm)	Tag Number	Scale Number	Previous Tags/Comments
Apr-29	M	508	S00857	40514-R4	
Apr-30	M	863.6	S00856	40514-R5	
	M	495.3	S00855	40515-R1	
	F	698.5	S00854	40515-R2	
	M	762	S00853	40515-R3	
	F	736.6	S00852	40515-R4	
May-01	M	330.2	NO3851	40515-R5	
	M	749.3	NO3852	40516-R1	
	M	723.9	NO3853	40516-R2	
	M	762	NO3854	40516-R3	
	F	723.9	NO3855	40516-R4	
	M	571.5	NO3856	40516-R5	
	F	558.8	NO3857	40517-R1	Blind in right eye
	F	685.8	NO3858	40517-R2	
	M	711.2	NO3859	40517-R3	
May-02	F	762	NO3860	40517-R4	
	F	685.8	NO3861	40517-R5	
	F	647.7	NO3862	40518-R1	
	F	787.4	NO3863	40518-R2	
	F	685.8	NO3864	40518-R3	
	M	914.4	NO3865	40518-R4	
	F	749.3	NO3866	40518-R5	
	F	749.3	NO3867	40519-R1	
	M	635	NO3869	40519-R3	
	M	508	NO3870	40519-R4	
	F	711.2	NO3868	40519-R2	
	F	647.7	NO3871	40519-R5	
	M	787.4	NO3872	40520-R1	
	F	711.2	NO3873	40520-R2	
	M	596.9	NO3874	40520-R3	
May-03	F	698.5	N03875	40520-R4	
	M	889	N03876	40520-R5	
	F	723.9	N03877	40521-R1	
	M	558.8	N03878	40521-R2	
	F	736.6	N03879	40521-R3	
May-04	F	762	N03880	40521-R4	Ripe, predator bit tail
	F	723.9	N03881	40521-R5	Predator bit tail
	M	762	N03882	40522-R1	
	M	711.2	N03883	40522-R2	
	F	685.8	N03884	40522-R3	
	F	711.2	N03885	40522-R4	Predator bit tail

Date 1998	Sex	Length (mm)	Tag Number	Scale Number	Previous Tags/Comments
May-04	F	673.1	N03886	40522-R5	
	F	673.1	N03887	40523-R1	
	F	711.2	N03888	40523-R2	Damaged tail
May-05	F	736.6	N03889	40523-R3	
	F	635	N03890	40523-R4	
	F	736.6	N03891	40523-R5	Ripe
	F	736.6	N03892	40524-R1	
	M	749.3	N03893	40524-R2	
	M	838.2	N03894	40524-R3	
	F	685.8	N03895	40524-R4	
May-06	M	838.2	N03896	40524-R5	Tail bit
	F	749.3	N03898	40525-R1	
	M	762	N03899	40525-R2	
	M	850.9	N03900	40525-R3	
	F	749.3	N05101	40525-R4	
	F	558.8	N05102	40525-R5	
	M	533.4	N05103	40526-R1	
	M	520.7	N05104	40526-R2	
	F	533.4	N05105	40526-R3	
	F	685.8	N05106	40526-R4	Predator damaged, blind in right eye
	M	812.8	N05107	40526-R5	
	F	685.8	N05108	No Scales	
	F	711.2	N05109	No Scales	
	M	762	N05110	No Scales	
	F	698.5	N05111	No Scales	
	F	673.1	N05112	No Scales	
May-07	M	787.4	N05113	40527-R1	
	F	698.5	N05114	40527-R2	N05081 (MOE) **
	M	812.8	N05115	40527-R3	
	F	673.1	N05116 & N05117	40527-R4	
	F	635	N05118	40527-R5	
	F	698.5	N05119	40528-R1	
	F	736.6	N05120	40528-R2	
May-11	M	736.6	N05121	No Scales	Partly spawned
	F	685.8	N05122	40528-R3	00380(Orange)
	F	622.3	N05123	No Scales	Predator bit tail - dorsal lobe
May-12	F	698.5	N05132	40528-R4	
	F	673.1	N05133	No Scales	
	F	698.5	N05134	No Scales	
	M	444.5	N05135	No Scales	
	M	558.8	N05136	No Scales	Predator bite - dorsal fin

Date 1998	Sex	Length (mm)	Tag Number	Scale Number	Previous Tags/Comments
May-12	M	749.3	N05137	No Scales	
	F	723.9	N05138	40528-R5	
	F	660.4	N05139	No Scales	
	F	723.9	N05140	40529-R1	
	M	774.7	N05141	No Scales	Predator bite - tail & dorsal fin
	M	774.7	N05142	No Scales	Predator bite - dorsal fin
	F	749.3	N05143	40529-R2	
	M	787.4	N05144	No Scales	Predator bit tail - dorsal lobe
	M	520.7	N05145	No Scales	
	M	787.4	N05146	40529-R3	Dorsal fin damage
	F	800.1	N05147	No Scales	
	F	698.5	N05148	40529-R4	
May-13	F	736.6	N05149	No Scales	
May-16	F	812.8	N05169	No Scales	
May-17	F	685.8	N05170	No Scales	
	F	749.3	N05171	No Scales	
	F	762	N05172	40529-R5	
	F	685.8	N05173	No Scales	
	M	584.2	N05174	No Scales	
May-19	M	546.1	N05175	No Scales	Hook damage - blind in left eye
	F	571.5	N08333	40530-R2	
May-22	F	685.8	N08296	No Scales	
May-23	M	533.4	N08297	No Scales	
	M	571.5	N08298	No Scales	
	F	660.4	N08299	No Scales	
May-24	M	533.4	N05176	No Scales	
May-25	M	571.5	N05197	No Scales	
	F	736.6	N05198	No Scales	
	F	736.6	N05199	No Scales	
	M	533.4	N05200	No Scales	
	M	584.2	(TCH) 01955	No Scales	
	M	571.5	(TCH) 01956	No Scales	
	F	673.1	(TCH) 01957	No Scales	
	F	711.2	(TCH) 01958	No Scales	
	F	660.4	(TCH) 01959	No Scales	

* = Previously tagged at Moricetown Canyon

** = Previously tagged at Toboggan Creek - Bulkley river confluence

***(19) = Previously tagged at Toboggan Creek fence (year of tagging in brackets)

Appendix C. Downstream migrating steelhead kelts put through the Toboggan Creek counting fence, May 11 - June 23, 1998.

Date 1998	Sex	Length (mm)	Tagged/ Punched	Tag Number	Scale Number	Comments
May-11	F	698.5	N/N	N05124	No Scale	
	F	723.9	N/N	N05125	No Scale	Hook scar - right maxilla
	M	825.5	N/N	N05126	No Scale	
	F	PS	Y/Y	S00579	PS	Predator bit tail
	F	762	N/N	N05127	No Scale	
	F	PS	Y/Y	S00587	PS	
	F	673.1	N/N	N05128	No Scale	
	F	673.1	N/N	N05129	No Scale	Predator bit tail - dorsal lobe
	F	774.7	N/N	N05130	No Scale	
	M	PS	Y/Y	N05113	PS	
	M	PS	Y/Y	S00598	PS	
	M	711.2	N/N	N05131	No Scale	
May-14	F	PS	Y/Y	N05106	PS	
	M	PS	Y/Y	N05137	No scale	
	M	PS	Y/Y	N05115	PS	
	M	838.2	N/N	N05150	No Scale	
	F	673.1	N/N	N05151	No Scale	Predator bite - right pectoral fin
	F	660.4	N/N	N05152	No Scale	
	F	711.2	N/N	N05153	No Scale	
	F	660.4	N/N	N05154	No Scale	Hook scar - left nostril
	F	PS	Y/Y	N03866	PS	
	M	PS	Y/Y	S00593	PS	P.T. = N04889 ***(1996)
	F	PS	Y/Y	N03875	PS	
	F	PS	Y/Y	N03898	PS	
	F	762	N/N	N05155	No Scale	Hook scar - right maxilla, and Predator bit tail - dorsal lobe
	F	673.1	N/N	N05156	No Scale	
	F	PS	Y/Y	N05101	PS	Hook scar - right maxilla
	F	660.4	N/N	N05157	No Scale	
	F	736.6	N/N	N05158	No Scale	
	M	711.2	N/N	N05159	No Scale	
	F	PS	Y/Y	N03862	PS	
	M	762	N/N	N05160	No Scale	
	F	711.2	N/N	N05161	No Scale	
	F	736.6	N/N	N05162	No Scale	
	F	812.8	N/N	N05163	No Scale	
	M	PS	Y/Y	N03896	PS	
	F	787.4	N/N	N05164	No Scale	Hook scar - left maxilla
	F		Y/Y	S00851		
	F	PS	Y/Y	N03884	PS	
	F	660.4	N/N	N05165	No Scale	Hook scar - left maxilla
	F	774.7	N/N	N05166	No Scale	
	F	711.2	N/N	N05167	No Scale	

Date 1998	Sex	Length (mm)	Tagged/ Punched	Tag Number	Scale Number	Comments
May-14	M	800.1	N/N	N05168	No Scale	Hook scar - right mandible
	F		Y/Y	N03860	PS	
May-15	F	PS	Y/Y	N03871	PS	Dead Pitch
May-19	M	533.4	N/N	N08326	No Scale	P.T. = 00987 (Moricetown, 1997)
	M	PS	Y/Y	N03882	PS	
	F	PS	Y/Y	N03861	PS	
	M	711.2	N/N	N03827	No Scale	
	F	PS	Y/Y	N05108	No Scale	
	F	736.6	N/N	N08328	No Scale	Predator bit tail - dorsal lobe
	F	PS	Y/Y	N03868	PS	
	F	838.2	N/N	N08329	40530-R1	P.T. = N04835***(1996); Adipose clipped
	M	PS	Y/Y	N05121	No Scale	
	F	698.5	N/N	N08330	No Scale	
	M	PS	Y/Y	S00578	PS	
	M	774.7	N/N	N08331	No Scale	
	F	698.5	N/N	N08332	No Scale	
	F	PS	Y/Y	S00869	PS	
	F	PS	Y/Y	N03880	PS	
	M	838.2	N/N	N05642	No Scale	
	F	660.4	N/N	N05643	No Scale	
	F	PS	Y/Y	N03885	PS	
	F	723.9	N/N	N05644	No Scale	
	F	711.2	N/N	N05645	No Scale	
	F	736.6	N/N	N05646	No Scale	
	F	685.8	N/N	N05647	No Scale	
	F	PS	Y/Y	N05147	No Scale	
	F	762	N/N	N05648	No Scale	
	F	PS	Y/Y	N05111	No Scale	
	F	685.8	N/N	N05649	No Scale	
	M	PS	Y/Y	S00589	PS	
	M	774.7	N/N	N05650	No Scale	
	F	685.8	N/N	N08280	No Scale	
	M	647.7	N/N	N04982	40530-R3	*** (1997)
	F	673.1	N/N	N08281	No Scale	
	M	749.3	N/N		No Scale	Dead Pitch
May-21	M	685.8	N/N	N08282	No Scale	
	M	PS	Y/Y	S00590	PS	
	M	PS	Y/Y	S00600	PS	
	F	PS	Y/Y	N05123	No Scale	
	F	787.4	N/N	N08283	No Scale	
	F	PS	Y/Y	S00599	PS	
	F	685.8	N/Y	N08284		Lost Original Tag
	F	PS	Y/Y	N05102	PS	
	M	PS	Y/Y	S00872	PS	P.T. = N07822*

Date 1998	Sex	Length (mm)	Tagged/ Punched	Tag Number	Scale Number	Comments
May-21	F	PS	Y/Y	N05114	PS	P.T. = N05081**
	M	PS	Y/Y	S00867	PS	
	F	698.5	N/N	N08285	No Scale	
	M	PS	Y/Y	S00582	PS	
	M	PS	Y/Y	N05142	No Scale	
	F	711.2	N/N	N07471	40530-R4	P.T. = Moricetown tag (1997)
	F	838.2	N/N	N08286	40530-R5	
	M	PS	Y/Y	S00858	PS	
	M	PS	Y/Y	N05104	PS	
	M	596.9	N/N	N08287	No Scale	
	F	PS	Y/Y	S00866	PS	
	F	PS	Y/Y	N05118	PS	
	M	PS	Y/Y	S00860	PS	
	M	PS	Y/Y	S00586	PS	
	F	PS	Y/Y	N05172	PS	
	M	609.6	N/N	N08288	No Scale	
	M	800.1	N/N	N08289	40531-R1	
	M	596.9	N/N	N08290	No Scale	
	F	PS	Y/Y	N03863	PS	
	F	723.9	N/N	N08291	No Scale	
	M	PS	Y/Y	N03900	PS	
	F	NS	N/N	N07880	No Scale	P.T. = Moricetown tag (1997)
	F	723.9	N/N	N08292	40531-R2	
	F	647.7	N/N	N08293	40531-R3	
	F	685.8	N/N	N08294	No Scale	Dorsal fin damage
	F	PS	Y/Y	N03898	PS	2nd time, 1st capture May 14
	F	749.3	N/N	N08295	No Scale	
	F	PS	Y/Y	N03888	PS	
May-22	M	PS	Y/Y	N03853	PS	Dead Pitch
May-24	F	PS	Y/Y	S00854	PS	
	F	PS	Y/Y	N05170	No Scale	
	F	PS	Y/Y	N03887	PS	
	M	774.7	N/N	N05177	No Scale	
	M	PS	Y/Y	N03865	PS	
	M	711.2	N/N	N05178	No Scale	
	F	PS	Y/Y	N05112	No Scale	
	F	685.8	N/N	N05179	No Scale	
	F	723.9	N/N	N05180	No Scale	
	M	762	N/N	N05181	No Scale	Hook scar
	F	673.1	N/N	N05182	No Scale	Hook scar
	M	749.3	N/N	N05183	No Scale	
	F	PS	Y/Y	N05133	No Scale	Hook scar
	M	749.3	N/N	N05184	No Scale	Hook scar
	F	685.8	N/N	N05185	No Scale	Snag mark - left side
	M	PS	Y/Y	S00871	PS	

Date 1998	Sex	Length (mm)	Tagged/ Punched	Tag Number	Scale Number	Comments
May-24	F	647.7	N/N	N05186	No Scale	
	F	736.6	N/N	N05187	No Scale	Predator bit tail
	F	PS	Y/Y	N05138	PS	
	F	774.7	N/N	N05188	No Scale	
	M	PS	Y/Y	S00857	PS	
	F	673.1	N/N	N05189	No Scale	Gill net marks - dorsal surface
	M	584.2	N/N	N05190	No Scale	
	F	698.5	N/Y	N05191	No Scale	Lost original tag
	F	PS	Y/Y	S00862	PS	
	F	749.3	N/N	N05192	No Scale	
	M	762	N/N	N05193	No Scale	Gill net marks -hook scar
	M	736.6	N/N	N05194	No Scale	Gill net marks
	M	723.9	N/N	N05195	No Scale	Gill net marks
	M	584.2	N/N	N05196	No Scale	
	F	PS	Y/Y	N03864	PS	Gill net marks
	F	PS	Y/Y	N05139	No Scale	
Jun-04	M	PS	Y/Y	N05159	No Scale	Dead Pitch (2nd time count moving downstream, 1st capture May 14)
Jun-05	F	571.5	N/N		No Scale	Dead Pitch
	M	774.7	N/N		No Scale	Dead Pitch
	M	PS	Y/Y	N05110	No Scale	Dead Pitch, hook scar
	M	736.6	N/N	C06715	40531-R4	Gill net marks
	M	749.3	N/N		No Scale	Dead, gill net marks
	M	PS	Y/Y	N05197	No Scale	
	M	584.2	N/N	C06716	No Scale	Gill net marks
	F	584.2	N/N	C06717	40531-R5	Hook scar
	M	PS	Y/Y	N03893	PS	
	M	584.2	N/N	C06718	40532-R1	Hook scar
	M	PS	Y/Y	N05200	40532-R2	
	F	723.9	N/N	C06719	40532-R3	
	M	482.6	N/N	C06720	No Scale	
	F	647.7	N/N	C06721	40532-R4	Gill net marks
	M	584.2	N/N	C06722	40532-R5	Gill net marks
	M	584.2	N/N	C06723	No Scale	Hook scar
	M	482.6	N/N	C06724	40533-R1	Predator scar - pectoral fin
	F	685.8	N/N	C06725	40533-R2	
	M	533.4	N/N	C06726	40533-R3	
Jun-09	M	762	N/N	C06727	No Scale	
	M	520.7	N/N	C06728	40533-R4	
	M	533.4	N/N	C06729	No Scale	
	M	762	N/N	C06730	No Scale	Gill net marks
	M	596.9	N/N	C06731	No Scale	
	M	749.3	N/N	C06732	No Scale	
	M	787.4	N/N	C06733	No Scale	

Date 1998	Sex	Length (mm)	Tagged/ Punched	Tag Number	Scale Number	Comments
Jun-09	M	558.8	N/N	C06734	No Scale	
	M	723.9	N/N	C06735	No Scale	
	M	558.8	N/N	C06736	No Scale	
	M	PS	Y/Y	N03894	PS	
	M	PS	Y/Y	S00597	PS	
	M	PS	Y/Y	N08297	No Scale	
	M	812.8	N/N	C06737	No Scale	Predator bite
	F	723.9	N/N	C06738	No Scale	Damaged gill
	F	673.1	N/Y	C06739	40533-R5	Lost original Tag
	M	PS	Y/Y	N05136	No Scale	
	F	711.2	N/N	C06740	No Scale	
	M	787.4	N/N		No Scale	Dead Pitch
	M	736.6	N/N		No Scale	Dead Pitch
Jun-15	M	PS	Y/Y	N03872	PS	
	F	723.9	N/N	C06741	No Scale	
	M	PS	Y/Y	(TCH) 01955	No Scale	
	M	PS	Y/Y	N03856	PS	
Jun-23	M	PS	Y/Y	N05175	No scale	

PS =Previously Sampled during upstream migration
NS = Not Sampled
** = Previously tagged at Toboggan Creek- Bulkley River confluence
***(19) = Previously tagged at Toboggan Creek fence (year of tagging in brackets)

Appendix D. Results of scale analysis from Birkenhead Scale Analyses.

Scale Book	Fish No.	Floy Tag	Date	Water Body	Sex	Wild/ Hatch	Fork Length (mm)	Spawned	Age	Comments
40507	1	OS00578	1998/04/21	Toboggan Creek	M	W	749	U	3.2+	
40507	1	OS00578	1998/04/21	Toboggan Creek	M	W	749	N	3.2+	
40507	2	OS00579	1998/04/21	Toboggan Creek	F	W	724	N	4.2+	
40507	3	OS00580	1998/04/21	Toboggan Creek	F	W	787	N	R.1S1+	
40507	4	OS00581	1998/04/21	Toboggan Creek	M	W	787	N	4.2+	
40507	5	OS00582	1998/04/24	Toboggan Creek	M	W	762	N	5.2+	
40508	1	OS00583	1998/04/24	Toboggan Creek	F	W	660	N	3.2+	
40508	2	OS00584	1998/04/24	Toboggan Creek	M	W	711	N	3.2+	
40508	3	OS00585	1998/04/24	Toboggan Creek	M	W	762	N	3.2+	
40508	4	OS00586	1998/04/24	Toboggan Creek	M	W	800	N	3.2+	
40508	5	OS00587	1998/04/24	Toboggan Creek	F	W	737	N	4.2+	
40509	1	OS00588	1998/04/24	Toboggan Creek	M	W	724	N	4.2+	
40509	2	OS00589	1998/04/24	Toboggan Creek	M	W	711	N	R.2+	
40509	3	OS00590	1998/04/24	Toboggan Creek	M	W	737	N	3.2+	
40509	4	OS00591	1998/04/24	Toboggan Creek	M	W	546	N	5.1+	
40509	5	OS00592	1998/04/25	Toboggan Creek	F	W	686	N	3.2+	
40510	1	OS00593	1998/04/25	Toboggan Creek	M	W	749	N	R.1S1+	
40510	2	OS00595	1998/04/25	Toboggan Creek	F	W	749	N	4.2+	
40510	3	OS00596	1998/04/26	Toboggan Creek	M	W	889	N	4.3+	
40510	4	OS00597	1998/04/27	Toboggan Creek	M	W	610	N	3.1+	
40510	5	OS00598	1998/04/27	Toboggan Creek	M	W	775	N	R.2+	
40511	1	OS00599	1998/04/27	Toboggan Creek	F	W	749	N	4.2+	
40511	2	OS00600	1998/04/28	Toboggan Creek	M	W	559	N	R.1+	
40511	3	OS00873	1998/04/28	Toboggan Creek	M	W	762	N	4.2+	
40511	4	OS00872	1998/04/28	Toboggan Creek	M	W	737	N	3.2+	
40511	5	OS00871	1998/04/28	Toboggan Creek	M	W	762	N	3.2+	
40512	1	OS00870	1998/04/28	Toboggan Creek	F	W	787	N	4.2+	
40512	2	OS00869	1998/04/28	Toboggan Creek	F	W	686	N		REGENERATED SCALE
40512	3	OS00868	1998/04/28	Toboggan Creek	M	W	864	N	4.3+	
40512	4	OS00867	1998/04/28	Toboggan Creek	M	W	584	N	R.1+	
40512	5	OS00866	1998/04/29	Toboggan Creek	F	W	673	N	R.2+	
40513	1	OS00865	1998/04/29	Toboggan Creek	F	W	724	N	5.2+	
40513	2	OS00864	1998/04/29	Toboggan Creek	M	W	686	N	4.1S1+	
40513	3	OS00863	1998/04/29	Toboggan Creek	M	W	800	N	5.1S1S1+	
40513	4	OS00862	1998/04/29	Toboggan Creek	F	W	737	N	3.2+	
40513	5	OS00861	1998/04/29	Toboggan Creek	F	W	673	N	R.2+	
40514	1	OS00860	1998/04/29	Toboggan Creek	M	W	635	N	4.1S1+	
40514	2	OS00859	1998/04/29	Toboggan Creek	M	W	813	N	4.2+	
40514	3	OS00858	1998/04/29	Toboggan Creek	M	W	800	N	4.2+	
40514	4	OS00857	1998/04/29	Toboggan Creek	M	W	508	N	4.1+	
40514	5	OS00856	1998/04/30	Toboggan Creek	M	W	864	N	4.2+	
40515	1	OS00855	1998/04/30	Toboggan Creek	M	W	495	N	4.1+	
40515	2	OS00854	1998/04/30	Toboggan Creek	F	W	699	N	3.2+	
40515	3	OS00853	1998/04/30	Toboggan Creek	M	W	762	N	4.2+	
40515	4	OS00852	1998/04/30	Toboggan Creek	F	W	737	N	4.2+	
40515	5	ON03851	1998/05/01	Toboggan Creek	M	W	330	N	R.3+	
40516	1	ON03852	1998/05/01	Toboggan Creek	M	W	749	N	R.2+	
40516	2	ON03853	1998/05/01	Toboggan Creek	M	W	724	N	3.2+	
40516	3	ON03854	1998/05/01	Toboggan Creek	M	W	762	N	4.2+	
40516	4	ON03855	1998/05/01	Toboggan Creek	F	W	724	N	4.2+	
40516	5	ON03856	1998/05/01	Toboggan Creek	M	W	572	N	3.1+	

40517	1	ON03857	1998/05/01	Toboggan Creek	F	W	559	N	3.1+
40517	2	ON03858	1998/05/01	Toboggan Creek	F	W	686	N	4.2+
40517	3	ON03859	1998/05/01	Toboggan Creek	M	W	711	N	4.2+
40517	4	ON03860	1998/05/02	Toboggan Creek	F	W	762	N	4.2+
40517	5	ON03861	1998/05/02	Toboggan Creek	F	W	686	N	3.2+
40518	1	ON03862	1998/05/02	Toboggan Creek	F	W	648	N	3.2+
40518	2	ON03863	1998/05/02	Toboggan Creek	F	W	787	N	3.3+
40518	3	ON03864	1998/05/02	Toboggan Creek	F	W	686	N	3.2+
40518	4	ON03865	1998/05/02	Toboggan Creek	M	W	914	N	5.3+
40518	5	ON03866	1998/05/02	Toboggan Creek	F	W	749	N	5.2+
40519	1	ON03867	1998/05/02	Toboggan Creek	F	W	749	N	3.2+
40519	2	ON03868	1998/05/02	Toboggan Creek	F	W	711	N	3.2+
40519	3	ON03869	1998/05/02	Toboggan Creek	M	W	635	N	4.1+
40519	4	ON03870	1998/05/02	Toboggan Creek	M	W	508	N	R.1+
40519	5	ON03871	1998/05/02	Toboggan Creek	F	W	648	N	R.2+
40520	1	ON03872	1998/05/02	Toboggan Creek	M	W	787	N	3.2+
40520	2	ON03873	1998/05/02	Toboggan Creek	F	W	711	N	5.2+
40520	3	ON03874	1998/05/02	Toboggan Creek	M	W	597	N	5.1+
40520	4	ON03875	1998/05/03	Toboggan Creek	F	W	699	N	R.2+
40520	5	ON03876	1998/05/03	Toboggan Creek	M	W	889	N	5.3+
40521	1	ON03877	1998/05/03	Toboggan Creek	F	W	724	N	R.2+
40521	2	ON03878	1998/05/03	Toboggan Creek	M	W	559	N	3.1+
40521	3	ON03879	1998/05/03	Toboggan Creek	F	W	737	N	4.2+
40521	4	ON03880	1998/05/04	Toboggan Creek	F	W	762	N	3.2+
40521	5	ON03881	1998/05/04	Toboggan Creek	F	W	724	N	4.2+
40522	1	ON03882	1998/05/04	Toboggan Creek	M	W	762	N	4.2+
40522	2	ON03883	1998/05/04	Toboggan Creek	M	W	711	N	4.2+
40522	3	ON03884	1998/05/04	Toboggan Creek	F	W	686	N	3.2+
40522	4	ON03885	1998/05/04	Toboggan Creek	F	W	711	N	3.2+
40522	5	ON03886	1998/05/04	Toboggan Creek	F	W	673	N	4.2+
40523	1	ON03887	1998/05/04	Toboggan Creek	F	W	673	N	3.2+
40523	2	ON03888	1998/05/04	Toboggan Creek	F	W	711	N	5.2+
40523	3	ON03889	1998/05/05	Toboggan Creek	F	W	737	N	3.2+
40523	4	ON03890	1998/05/05	Toboggan Creek	F	W	635	N	3.2+
40523	5	ON03891	1998/05/05	Toboggan Creek	F	W	737	N	4.2+
40524	1	ON03892	1998/05/05	Toboggan Creek	F	W	737	N	4.2+
40524	2	ON03893	1998/05/05	Toboggan Creek	M	W	749	N	R.2+
40524	3	ON03894	1998/05/05	Toboggan Creek	M	W	838	N	4.2+
40524	4	ON03895	1998/05/05	Toboggan Creek	F	W	686	N	4.2+
40524	5	ON03896	1998/05/06	Toboggan Creek	M	W	838	N	4.2+
40525	1	ON03898	1998/05/06	Toboggan Creek	F	W	749	N	3.2+
40525	2	ON03899	1998/05/06	Toboggan Creek	M	W	762	N	4.2+
40525	3	ON03900	1998/05/06	Toboggan Creek	M	W	851	N	4.2+
40525	4	ON05101	1998/05/06	Toboggan Creek	F	W	749	N	5.2+
40525	5	ON05102	1998/05/06	Toboggan Creek	F	W	559	N	5.1+
40526	1	ON05103	1998/05/06	Toboggan Creek	M	W	533	N	R.1+
40526	2	ON05104	1998/05/06	Toboggan Creek	M	W	521	N	3.1+
40526	3	ON05105	1998/05/06	Toboggan Creek	F	W	533	N	3.2+
40526	4	ON05106	1998/05/06	Toboggan Creek	F	W	686	N	4.2+
40526	5	ON05107	1998/05/06	Toboggan Creek	M	W	813	N	4.2+
40527	1	ON05113	1998/05/07	Toboggan Creek	M	W	787	N	3.2+
40527	2	ON05114	1998/05/07	Toboggan Creek	F	W	699	N	3.2+
40527	3	ON05115	1998/05/07	Toboggan Creek	M	W	813	N	4.2+
40527	4	ON05116	1998/05/07	Toboggan Creek	F	W	673	N	3.2+
40527	5	ON05118	1998/05/07	Toboggan Creek	F	W	635	N	4.2+
40528	1	ON05119	1998/05/07	Toboggan Creek	F	W	699	N	R.2+
40528	2	ON05120	1998/05/07	Toboggan Creek	F	W	737	N	3.2+

40528	3	ON05122	1998/05/11	Toboggan Creek	F	W	686	N	3.2+
40528	4	ON05132	1998/05/12	Toboggan Creek	F	W	699	N	5.2+
40528	5	ON05138	1998/05/12	Toboggan Creek	F	W	724	N	4.2+
40529	1	ON05140	1998/05/12	Toboggan Creek	F	W	724	N	3.2+
40529	2	ON05143	1998/05/12	Toboggan Creek	F	W	749	N	4.2+
40529	3	ON05146	1998/05/12	Toboggan Creek	M	W	787	N	4.2+
40529	4	ON05148	1998/05/12	Toboggan Creek	F	W	699	N	3.2+
40529	5	ON05172	1998/05/17	Toboggan Creek	F	W	762	N	4.2+
40530	1	na	1998/05/19	Toboggan Creek	F	W	838	N	4.2S1+
40530	2	ON08333	1998/05/19	Toboggan Creek	F	W	572	N	5.1+
40530	3	na	1998/05/19	Toboggan Creek	M	W	648	N	3.1S1+
40530	4	na	1998/05/19	Toboggan Creek	F	W	711	N	3.2+
40530	5	na	1998/05/19	Toboggan Creek	F	W	838	N	3.3+
40531	1	na	1998/05/19	Toboggan Creek	M	W	800	N	4.2+
40531	2	na	1998/05/19	Toboggan Creek	F	W	724	N	3.2+
40531	3	na	1998/05/19	Toboggan Creek	F	W	648	N	3.2+
40531	4	na	1998/05/19	Toboggan Creek	M	W	737	N	3.2+
40531	5	na	1998/05/19	Toboggan Creek	F	W	584	N	4.1+
40532	1	na	1998/05/19	Toboggan Creek	M	W	584	N	4.1+
40532	2	na	1998/05/19	Toboggan Creek	M	W	538	N	4.1+
40532	3	na	1998/05/19	Toboggan Creek	F	W	724	N	4.2+
40532	4	na	1998/05/19	Toboggan Creek	F	W	648	N	3.2+
40532	5	na	1998/05/19	Toboggan Creek	M	W	584	N	R.1+
40533	1	na	1998/05/19	Toboggan Creek	M	W	483	N	3.1+
40533	2	na	1998/05/19	Toboggan Creek	F	W	686	N	4.2+
40533	3	na	1998/05/19	Toboggan Creek	M	W	533	N	4.1+
40533	4	na	1998/05/19	Toboggan Creek	M	W	521	N	4.1+
40533	5	na	1998/05/19	Toboggan Creek	F	W	673	N	3.2+

Appendix E. Copies of field notes.

APRIL 21/98 15:45

(1) WM 29½" SB 40507 R1
S00578

(2) WF 28½" SB 40507 R2
S00579

(3) WF 31" SB 40507 R3
S00580

(4) WM 31" SB 40507 R4
S00581

1½ HRS

April 22/98

(5) WM 30" SB 40507 R5
S00582

(6) WF 26" SB 40508 R1
S00583

(7) WM 28" SB 40508 R2
S00584

(8) WM 30" SB 40508 R3
S00585

APRIL 25/98 09:00

(15) WF 27" ~~SB 450°~~
S00592 SB40509 R5

(16) WM P.T. MOE NO 4689
S00593 SB 40510 R1
29½"
(LOST 594)

(17) WF 29½ SB 40510 R2
S00595

APRIL 26/98 1830

(18) WM 35" SB 40510 R3
S00596

APRIL 27/98 17:30

(19) WM 24" SB 40510 R4
S00597

(20) WM 30½"
S00598 SB 40510 R5

(21) WF 29½" SB 40511 R1
S00599 head scar, damaged tail

(9) WM 31½" SB 40508 R4
S00586

(10) WF 29"
S00587 SB 40508 R5

(11) WM 28½" SB 40509 R1
S00588

(12) WM 28" SB 40509 R2
S00589

(13) WM 29" SB 40509 R3
S00590

(14) WM 21½" SB 40509 R4
S00591

April 28/98

(22) WM 22" SB 40511 R2
S00600

(23) WM 30" SB 40511 R3
S00873

(24) WM PT NO 7822 MOE
S00874 29" SB 40511 R4
* (S00872)

(25) WM 30" SB 40511 R5
* S00875
(S00871)

(26) WF 31"
* S00876 SB 40512 R1
(S00870)

(27) WF 27" SB 40512 R2
* S00877
(S00869)

(28) WM 34" SB 40512 R3
* S00878
(S00868)

(29) WM 23" SB 40512 R4
* S00879 (S00867)
APRIL 29/98 ✓

(30) WF 26½" SB 40512 R5
DAMAGED DORSAL FIN
S00866

(48) WM 30" SB 40516 R3
no 3854

(49) WF 28½" SB 40516 R4
no 3855

(50) WM 22½" SB 40516 R5
no 3856

(51) WF 22" SB 40517 R1
no 3857 blind in right eye

P.M

(52) WF 27" SB 40517 R2
no 3858

(53) WM 28" SB 40517 R3
no 3859

✓

April 29/98 (cont'd)

(31) WF 28½ 500865
SB 40513 R1

(32) WM 27" 500864
SB 40513 R2

P.M.

(33) WM 31½" 500863
SB 40513 R3

(34) WF 29" 500862
SB 40513 R4

(35) WF 26½" 500861
SB 40513 R5

(36) WM 25" 500860
SB 40514 R1

(37) WM 32" 500859
SB 40514 R2

(38) WM 31½" 500858
SB 40514 R3

(39) WM 20" 500857
SB 40514 R4

MAY 02/98 — A.M.

(54) WF 30" SB 40517 R4
No 3860

(55) WF - 27" SB 40517 R5
No 3861

(56) WF - 25½ SB 40518 R1
No 3862

(57) WF - 31" SB 40518 R2
No 3863

(58) WF - 27" SB 40518 R3
No 3864

(59) WM - 36" SB 40518 R4
No 3865

(60) WF - 29½" SB 40518 R5
No 3866

(61) WF - 29½" SB 40519 R1
No 3867

P.M.

(62) WF - 28" SB 40519 R2
No 3868

April 30/98

(40) WM 34" SB 40514 R5
S00856

(41) WM 19½" SB 40515 R1
S00855

(42) WF 27½" SB 40515 R2
S00854

(43) WM 30" SB 40515 R3
S00853

(44) WF 29" SB 40515 R4
S00852

May 1 '98

(45) WM 13" SB 40515 R5
No3851

(46) WM 29½" SB 40516 R1
No3852

(47) WM 29½" SB 40516 R2
No3853

(62) WM-25" SB 40519 R3
3869

(63) WM-20" SB 40519 R4
3870

P.M

(65) WF 25½" SB 40519 R5
NO3871

(66) WM 31" SB 40520 R1
NO3872

(67) WF 28" SB 40520 R2
NO3873

(68) WM 23½" SB 40520 R3
NO3874

May 04/98 cont'd.
(P.M)

(76) WM 30" SB 40522 R1
NO3882

(77) WM 28" SB 40522 R2
NO3883

(78) WF (kelt) 27" SB 40522 R3
NO3884

(79) WF 28" SB 40522 R4
NO3885 seal bit tail

(80) WF 26½" SB 40522 R5
NO3886

(81) WF 26½" SB 40523 R1
NO3887

(82) WF 28" SB 40523 R2
NO3888 damaged tail

May 05/98 (PM)

(83) WF 29" 40523 R3
NO3889

(84) WF 25" SB 40523 R4
NO3890

May 03/98 (PM).

(69) WF 27½" SB 40520 R4
NO 3875

(70) WM 35" SB 40520 R5
NO 3876

(71) WF 28½" SB 40521 R1
NO 3877

(72) WM 22" SB 40521 R2
NO 3878

(73) WF 29" SB 40521 R3
NO 3879

May 04/98 (AM).

(74) WF 30" SB 40521 R4
NO 3880 (ripe) bit tail

(75) WF 28.5" SB 40521 R5
NO 3881 seal bit tail

(85) WF 29" SB 40523 R5
NO 3891 (ripe)

(86) WF 29" SB 40524 R1
NO 3892

(87) WM 29½" SB 40524 R2
NO 3893

(88) WM 33" SB 40524 R3
NO 3894

(89) WF 27" SB 40524 R4
NO 3895

MAY 06/98 (AM) cloudy.

(90) WM - 33" SB 40524 R5
NO 3896 TAIL BITE
(LOST NO 3897)

(91) WF - 29½ SB 40525 R1
NO 3898.

(92) WM - 30" SB 40525 R2
NO 3899

(93) WM - 33½ SB 40525 R3
NO 3900

(94) WF 29¾ SB 40525 R4
NO 5101

(95) WF - 22 SB 40525 R5
NO 5102

(96) WM - 21 SB 40526 R1
NO 5103

(97) WM - 20½ SB 40526 R2
NO 5104

(98) WF - 21 SB 40526 R3
NO 5105

(PM) partly cloudy

(99) WF - 27" SB 40526 R4
NO5106. seal damaged
(bird + right eye).

(100) WM - 32" SB 40526 R5
NO5107

(101) WF - 27". no scales
NO5108

WF - 28" NO5109

WM - 30" NO5110

WF - 27½" NO5111

WF - 26½" NO5112

cloudy. MAY 07/98 (PM).

WM 31" SB 40527 R1
NO 5113

WF PT moe NO5081 SB 40527 R2
NO 5114 27½" photo #4

WM 32" SB 40527 R3
NO 5115

WF 26½" SB 40527 R4
NO5116 and NO5117

WF 25" SB 40527 R5
NO5118

WF 27½" SB 40528 R1
NO5119

WF (kelt) 29" SB 40528 R2
NO5120

Overcast, cloudy, cool * upstream
light wind May 11/98 (AM)

WM 29" Tag # N05121
partly spawned No tube

WF 27" 00380 (manual tag) orange.
Tag # N05122
SB 40528
Pow 3

WF 24.5" Tag # N05123.
Seal bit tail - upper lobe

Kelly May 11/98 (AM).

WF NTNP 27.5"
Tag # N05124
retained downstream

WF NTNP 28.5"
Tag # N05125
hook scar right max IIa
Retained downstream

WM NTNP 32.5"
Tag N05126
Retained downstream

(RAIN) MAY 12/98

**NO5126

WF - SB40528 R4 NO 5132
27½

WF 26½ NO 5133

P.M (cloud)

WF 27½" NO.5134

WM 17½" NO5135

WM 22" NO5136
seal bit on top of dorsal

WM 29½" NO5137

WF 29½" NO5138
SB 40528 R5

WF 26" NO5139

WF 28½" NO5140
SB40529 K1

WM 30½" NO5141
~~top of tail and~~ dorsal chewed

WF TP S00579
Returned downstream
seal bit tail

WF NTNP 30"
Tag" NO5127
Returned downstream

WF TP S00587
Returned downstream

WF NTNP 26.5"
Tag ~~#26~~ NO5128
Returned downstream

WF NTNP 26.5"
Tag" NO5129
Returned downstream
Seal bit tail - upper lobe

WF NTNP 30.5"
Tag" NO5130
Returned downstream

WM NO5113
TP returned downstream

WM TP
500598 returned downstream

wm 30½" n05142
top of dorsal chewed

WF 29½" n05143
SB 40529 R2

wm 31" n05144
top of tail chewed

wm 20½" n05145

wm 31" n05146
dorsal damage SB 40529 R3

WF 31½" n05147

WF 27½" n05148
SB 40529 R4

May 11/98 (cont'd)

Wm NTNP 28"
Tag # N05131
Released downstream

12 fish (4 TP / 8 NTNP).

* held the 3 raw fish in bag until kelt sampling was complete.

(CLOUD) MAY 13/98

WF 29 NO5149

MAY 14/98

Results of seining

NO5106 returned d/s ♀ TP.
NO5137 returned d/s ♂ TP.
NO5115 returned d/s ♂ TP.
NO5150 WM 33" NTNP
- returned d/s
NO5151 WF NTNP 26.5"
- scl bit fin (rt pectoral
- returned d/s
NO5152 WF NTNP 26"
- returned d/s
NO5153 WF NTNP 28"
- returned d/s
NO5154 WF NTNP 26"
- Hook scar - left nostril
- returned d/s
NO3866 returned d/s ♀ TP.

S00593 (NO4809) :- returned d/s ♂ TP.
NO3875 TP ♀ returned d/s

NO3898 TP ♀ returned d/s

NO5155 NTNP ♀ WF 30"
- Hook scar rt maxilla
- scl bite, top lobe caudal
- returned d/s

May 14/98 (con't)

NO3896 TP WM
- returned downstream

NO5164 WF NTNP 31"
- hook scar, left maxilla
- returned d/s

S00851 TP WF

NO3884 TP WF

NO5165 NTNP WF · 26"
- Hook scar left maxilla
- returned d/s

NO5166 NTNP WF · 30.5"
- returned d/s

NO5167 NTNP WF 29.0"
- returned d/s

NO5168 NTNP WM 31.5"
- hook scar rt mandible
- returned d/s

NO3860 WF TP

May 15/98

Ron S. - left on panels
♀ NO3871

NO5156 WF NTNP 26.5"
- returned d/s

NO5101 TP WF
- hook scar rt maxilla
- returned d/s

NO5157 WF NTNP 26"
- Hook scar (small) rt maxilla
returned d/s

NO5158 WF NTNP 29"
- returned d/s

NO5159 WM NTNP 28"
- returned d/s

NO3862 TP WF
- returned d/s

NO5160 WM NTNP 30"
returned d/s

NO5161 WF NTNP 28"
- returned d/s

NO5162 WF NTNP 29"
- returned d/s

NO5163 WF NTNP 32"
- returned d/s

MAY 16/98

WF 32" NO 5169 (RAIN)

MAY 17/98 (CLOUD)

(DOWNSTREAM) PT # NO 5160 WM

WF 27" NO 5170

WF 29½" NO 5171

WF 30" NO 5172
SB 40529 R5

WF 27" NO 5173

WM 23" NO 5174

MAY 19/98

Wise Sunny - Warm

Going upstream
WM NTNP 21.5"
Tag # NO 5175
Tagged & punch -
Blind in left eye due to hook damage

Returning downstream

00987 (main return - left hand side orange NTNP WM Dorsal)
add NO 8326 to this fish 21"
returned d/s

NO 3882 TP WM
returned d/s

NO 3861 WF TP

NTNP NO 8327 WM 28"
returned d/s

NO 5198 TP WF
returned d/s

NTNP NO 8328 WF, 29"
seal bite top lobe of tail
returned d/s

May 19 1998
(cont'd)

NO3868 TP WF
returned d/s

NO4835 Af NTNP 33'
Hatchery fish, tagged
Couple years ago
- returned d/s

NO5121 WM TP
- returned d/s

same fish
SB 40830 Row 1
for NO4835
NO8329 added to this female

NTNP WF 27.5"
add tag NO8330
returned d/s

S00578 TP WM
returned d/s

NTNP WM 30.5"
added NO8331 tag
returned d/s

NTNP NO8332 WF 27.5"
returned d/s

MAY 19 98

TP S00869 WF
returned d/s

TP N03880 WF
returned d/s

* NTNP N08333 WF 22.5"
* Travelling u/s and so release upstream of fence.
SS 40.530 Row 2.

NTNP	N05642 returned d/s	WM	33"
NTNP	N05643 returned d/s	WF	26"
N03885 WF TP			
N05644	NTNP	WF	28.5"
N05645	NTNP	WF	28"
N05646	NTNP	WF	29"
N05647	NTNP	WF	27"
N05147	TP	WF	
N05648	NTNP	WF	30"

MAY 21/98

In trap 50ms U/S

N05160 WM (put d/s previously)
returned d/s P.T.

N08287 - WM - NTNP 27"

S00590 - WM - TP

S00600 - WM - TP

N05123 - WF - TP

N08283 - WF - NTNP 31"

S00599 - WF - TP

N08284 - WF - TP 27"
(lost original tag)

N05102 - WF - TP

N07822/S00872 - TP WM

N05081/N05114 - TP WF

S00867 - WM TP

May 19/98

N05111 WF TP

N05649 WF · NTNP 27"

500589 WM · TP

N05650 WM · NTNP 30.5"

N08280 WF · NTNP 27"

N04982 WM · NTNP 25.5"
(prev. tag) SB40530RB

N08281 WF · NTNP 26.5"

(deadpitch) WM · NTNP 29.5"

32 (12 TP/20 NTNP)

May 15 - Ron Saimoto
(deadpitch) WF # N03871

N08285 - NTNP - WF 27.5"

500582 - WM - TP

N05142 - WM - TP

N07471 - WF - NTNP 28"
(# previously tagged
SB40530-RA).

N08286 - WF - NTNP - 33"
SB40530-TB).

500858 - WM - TP

N05104 - WM - TP

N08287 - WM - NTNP 23.5"

500866 - WF - TP.

N05118 - WF - TP.

500860 - WM - TP

500586 - WM - TP

N05172 - WF - TP

N08288 - WM - NTNP 24"

N08289 - WM - NTNP 31.5"
(SB40531-R1).

N08290 - WM - NTNP 23.5"

N03863 - WF - TP

N08291 - WF - NTNP 28.5"

N03900 - WM - TP

* N07880 - WF - TP ?

N08292 - WF - NTNP 28.5"
(SB40531-R2).

N08293 - WF - NTNP - 25.5"
(SB40531-R3)

N08294 - WF - NTNP - 27"
dorsal damage

N03898 - WF - TP

N08295 - WF - NTNP - 29.5"

N03888 - WF - TP

MAY 22/98 (SUNNY)

WF	27"	N08296

MAY 23/98

Wm	21"	N08297
PT (WM P.D.S.T.		N08289).
WM	22½"	N08298
WF	26"	N08299

10:00 Am MAY 24/98 HIGH OVERCAST bright

WF	26½"	most in spawned	N08300	put down stream
Wm	21"		N05176	up stream

GOING DOWN

WF	TP		S00854	
WF	TP		N05170	
WF	TP		N03887	
Wm	NTNP	30½"	N05177	
Wm	TP		N003865	
Wm	NTNP	28"	N05178	
WF	TP		N05112	
WF	NTNP	27"	N05179	
WF	NTNP	28½"	N05180	
Wm	NTNP	30"	N05181	Hook scar
WF	NTNP	26½"	N05182	Hook scar
Wm	NTNP	29½"	N05183	
WF	TP		N05133	Hook scar
Wm	NTNP	29½"	N05184	Hook scar (BIG)

May 25 - Ron S.
(dead pitch) - WM # N03853

(MAY 24 cont.)

WF	NTNP	27"	N05185	snag mark left side
Wm	TP		S00871	✓
WF	NTNP	25½"	N05186	
WF	NTNP	29"	N05187	dorsel bite scal
WF	TP		N05138	
WF	NTNP	30½"	N05188	scal bite tail
Wm	TP		S00857	
WF	NTND	26½"	N05189	Gill net marks on back
Wm	NTNP	23"	N05190	
WF	PNT	27½"	N05191	
WF	TP.		S00862	
WF	NTNP	29½"	N05192	
Wm	NTNP	30"	N05193	Gill net Hook scar
Wm	NTNP	29"	N05194	Gill net
Wm	NTNP	28½"	N05195	Gill net
Wm	NTNP	23"	N05196	
WF	TP.		N03864	Gill net
WF	TP		N05139	

(upstream) - May 25/98 - cloud/sun.

Wm		22⅓	N05197
WF		29	N05198 - partial
WF		29	N05199
Wm		21	N05200
Wm		23	01955
Wm		22½	01956
WF		26⅓	01957
WF		28	01958
WF		26	01959

JUNE 04/98 sunny

DEAD PITCH NO5159
(tagged as KeH MayH)

JUNE 05/98

DEAD PITCH NTNP
WF 22½"

Dead Pitch NTNP
WM 30½"

Dead Pitch hook scar
WM NO5110 TP

June 05 KeH sampling sunny

WM SB40531 R4 29"
(102) NTNP C06715. (gill net marks)

WM NO SCALE 29½
(103) NTNP killed / (gill net marks)

WM: NO5197
TP

WM 23"
(104) NTNP C06716. (gill net marks)

June 05/98

WF NTNP C06725 27"
(114) SB40533 R2

WM NTNP C06726 21"
(115) SB40533 R3

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19 KeHs (4 TP/15 NTNP).

WF SB40531 R5 23"
105 NTNP CO 6717 (Hook scar)

WM TP N03893

WM SB40532 R1 23"
106 NTNP CO67/8 (Hook scar)

WM TP N05200 21"
107 SB40532 R2

WF SB40532 R3 28½"
108 NTNP CO6719

WM [illegible]
109 NTNP CO6720 19"

WF SB40532 R4 (tag barely legible)
110 NTNP CO6721 25½" (gill net)

WM SB40532 R5 23"
111 NTNP CO6722 (gill net)

WM 23"
112 NTNP CO6723 (large hook scar)

WM SB40533 R1 19"
113 NTNP CO6724 (predator scar on pr. D. fin)

Cloud/rain JUNE 09/98 (SEIGAN)

WM (116)	NTNP	C06727	30"
WM (117)	NTNP	C06728 SB 40533R4	20½"
WM (118)	NTNP	C06729	21"
WM (119)	NTNP	C06730	30" gillnet
WM (120)	NTNP	C06731	23½"
WM (121)	NTNP	C06732	29½"
WM (122)	NTNP	C06733	31"
WM (123)	NTNP	C06734	22"
WM (124)	NTNP	C06735	28½"
WM (125)	NTNP	C06736	22"

June 15/98

CL - Cloudy, cool, overcast

TP NO3872 WM
Released d/s

NTNP WF C06741 - 28½ incl.
Released d/s

TP WM TCH -
01955

TP NO3856 - WM

June 23/98

WM PT NO5175

WM PT N03894 -

WM PT S00597 -

WM PT N08297 -

WM (126) NTNP C06737, 32" Seal bite

WF (127) NTNP C06738, 28½" damaged

WF TP, lost tag (new one) C06739, 26½" *
SB40533 R5

WM TP N05136 -

WF (128) NTNP C06740 28"

WM NTNP (dead pitch).

WM NTNP

20 fish (5 TP / 15 NTNP).