

**Enumeration of Adult Steelhead
in the
Upper Sustut River, 2004**

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Abstract

The upper Sustut River steelhead (*Oncorhynchus mykiss*) population was enumerated from July 27 to September 30, 2004, using a floating PVC fence. The first steelhead migrated past the fence on July 28 and by September 30, a total of 1,042 steelhead had been counted moving upstream. The fence count to September 30 is the standardized value used for all inter-annual comparisons and stock trend analyses. An additional 18 steelhead were observed downstream of the fence prior to removal making the estimated spawning escapement to the upper Sustut River 1,160 steelhead. The 2004 fence count was the third highest on record and was above the estimated carrying capacity (1036) of the upper Sustut system for steelhead (Tautz *et al.* 1992). Between July 27 and September 30, a total of 483 chinook salmon (*O. tshawytscha*), 1,604 sockeye salmon (*O. nerka*), 25 coho salmon (*O. kisutch*), 17 bull trout (*Salvelinus confluentus*), 4 resident rainbow trout (*O. mykiss*) and 46 Rocky Mountain whitefish (*Prosopium williamsoni*) were counted migrating past the fence.

The ratio of female to male steelhead was 1.48:1. A total of 7.7% of all steelhead migrating past the fence exhibited gillnet marks. This falls in the lower end of historical values, which have ranged from 2.0 to 23.0% and averaged 11.3% since 1992. Female steelhead exhibited a higher gillnet mark rate than males (8.8 and 6.0%, respectively).

With the addition of the 2004 data point, the cumulative Tyee Test Fishery index to August 10 was not significantly correlated with the upper Sustut River fence count.

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1.0 Introduction

Since 1986, the upper Sustut River steelhead (*Oncorhynchus mykiss*) stock has been used as an indicator of the status of all early run Skeena River summer steelhead. These steelhead stocks are of special concern for fisheries managers as their migration timing coincides with intense commercial fisheries for sockeye (*O. nerka*) and pink (*O. gorbuscha*) salmon where they are often captured incidentally (Ward *et al.* 1993; Cox-Rogers 1994). The resulting impact on the spawning populations can be significant and potentially detrimental to the long-term viability of these important stocks. Annual enumeration of the upper Sustut River steelhead stock provides yearly spawning population estimates that are hypothesized to demonstrate trends in the abundance of all early run Skeena steelhead.

The objectives of the 2004 enumeration program were:

1. to enumerate the upper Sustut River steelhead population,
2. to examine the sex ratio of steelhead throughout the run,
3. to examine the effect of water height and temperature on steelhead migration,
4. to examine the number of gillnet marked steelhead and the distribution of gillnet marked fish throughout the run,
5. to examine the relative run timing of male and female steelhead, and
6. to examine the effect of adding the 2004 data to the regression relationship between the upper Sustut River steelhead fence count and the cumulative Tyee Test Fishery index to August 10.

2.0 Study Area

The Sustut River is located in north central British Columbia and is a tributary to the upper Skeena River (Figure 1). Originating in the Omineca Mountains approximately 220 km north of Smithers, B.C., the Sustut River flows for 8 km northwest from Sustut and Mud lakes where it joins Johanson Creek near the main spawning area for upper Sustut steelhead (Bustard 1993). The river then flows 3 km west to its confluence with Moosevale Creek before turning southwest for approximately 100 km and flowing into the Skeena River. The Sustut River drains approximately 3,574 km² and has seven main tributaries: Birdflat Creek, Bear River, Asitka River, Red Creek, Two Lake Creek, Moosevale Creek and Johanson Creek. Fish species known to inhabit the upper Sustut River include steelhead, chinook salmon (*O. tshawytscha*), sockeye salmon, coho salmon (*O. kisutch*), bull trout (*Salvelinus confluentus*), Dolly Varden char (*S. malma*), Rocky Mountain whitefish (*Prosopium williamsoni*), and burbot (*Lota*

Iota)¹ (Bustard 1993; Saimoto 1994, 1995). The physical area that defines the upper Sustut River steelhead population is the Sustut River upstream of the Moosevale Creek confluence including Johanson Creek and Sustut and Johanson lakes (Spence *et al.* 1990) (Figure 1). The physical area that defines the lower Sustut River steelhead population is the Sustut River downstream of the Bear River confluence, including Bear River and Bear Lake (Spence *et al.* 1990) (Figure 1).

3.0 Methods

3.1 Steelhead Enumeration

A floating fish counting fence constructed from 3.8 cm PVC pipe was placed in the Sustut River, 500 m upstream of the confluence with Moosevale Creek and 70 km upstream of the confluence with the Bear River (Figures 2, 3). The fence was operated between July 27 and September 30. Fish were directed into an aluminum trap box where they held until a gate was opened allowing enumeration using a plexiglass viewing box as migration upstream continued.

The total count of steelhead migrating past the fence to September 30 reflects the size of the upper Sustut River steelhead population that spawns upstream of the fence and is the value used for all inter-annual comparisons. This count is hypothesized to demonstrate trends for other upper Skeena tributaries and is therefore used as an indicator of the status of the upper Skeena River steelhead stock complex. Fish holding downstream of the fence were counted visually on September 30 prior to fence removal. The sum of the upper Sustut River steelhead fence count and the visual survey of the section of the river immediately downstream of the fence is the estimated total spawning escapement for the upper Sustut River steelhead population.

The fence was inspected daily for debris accumulation and openings passable to fish. Debris was removed and repairs made as necessary. The fence trap box was checked in the morning and evening during low levels of fish migration and was checked more frequently during heavier migration. It has been observed that activity around the fence often halts or delays migration. Therefore, periods of fish handling and the removal of debris and carcasses from the fence were limited to avoid delaying fish migration. Past fence modifications implemented to reduce stress and mortality caused by the original fence

¹ In August, 1999 a single juvenile burbot (<10 cm fork-length) was found in a beaver impoundment by Ministry Staff on the Sustut River approximately 800 meters upstream of its confluence with Johanson Creek.

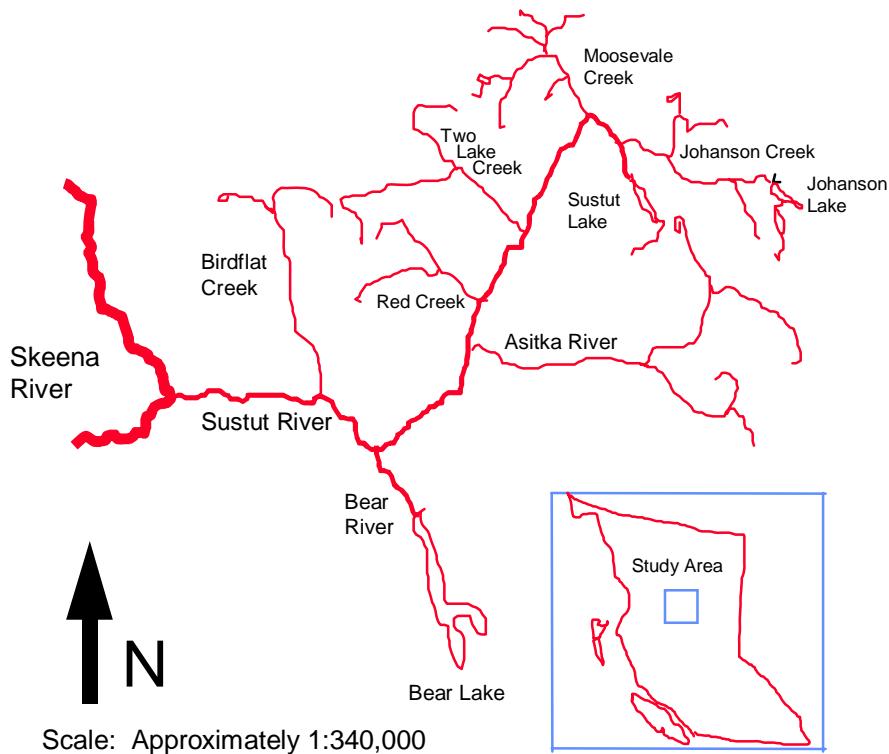


Figure 1. The Sustut River and major tributaries (from Saimoto 1995).

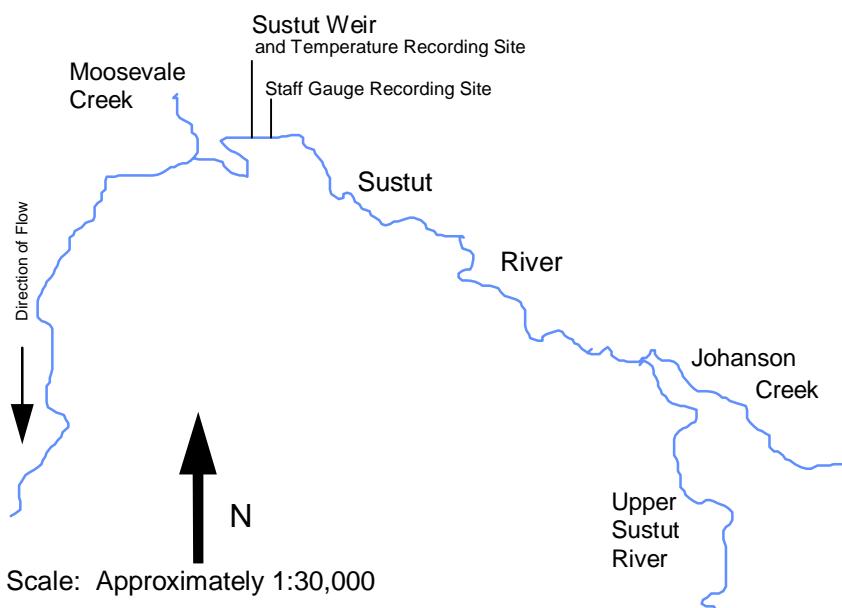


Figure 2. Detailed map of the study area (adapted from Saimoto 1995).

a**b**

Figure 3. Photograph of the steelhead enumeration fence, trap box and sampling station (a) and of the fence and downstream holding pool (b), 2004.

design and handling procedures were used again in 2004 (Williamson 1999b). Substantial additional modifications were made to the fence by contract staff to further reduce negative impacts on fish. These included covering all exposed bolts, connectors and other fence hardware to minimize abrasion injuries that can result as fish rub against fence panels, and modifying the area upstream of the fence to ensure fish had adequate low velocity sanctuaries for recovery after handling.

Experienced personnel, using the visual characteristics described in Scott and Crossman (1973) and McPhail and Carveth (1994), identified all fish passing the fence to species. In an attempt to reduce any stress-related mortality that may be associated with the collection of biological data no steelhead were tagged in 2004 and a subsample of approximately 20% of all male and female steelhead were measured for nose-fork length and had scales collected for age analysis. For enumeration purposes, a plexiglass viewing box was used to identify fish by species and sex and to observe scars, wounds and general condition. All data were recorded for each fish and summarized daily. Mortalities recovered from the fence were measured for nose-fork length and a sample of 5 scales, taken mid-laterally between the dorsal and anal fins, was collected for age analysis. Photographs were taken of all steelhead mortalities to further document fish condition. All other species of fish encountered at the fence were enumerated and sub-sampled for length, while tissue samples were collected for genetic stock identification and scales removed for age analysis.

3.2 Steelhead Migration and Physical Data

Stream temperatures were recorded once daily using a minimum-maximum thermometer (Brannon Ltd). Also, automatic data loggers (Onset Computer Corporation, Pocasset, MA) were deployed in the river and in the air near the fence site to record hourly temperatures. Water levels were recorded in the morning and the evening using an instream staff-gauge. Air temperature and weather conditions were also recorded daily. Maximum daily water temperature and level were examined against steelhead migration by graphical and statistical methods to determine if these physical factors influenced migration patterns.

3.3 Steelhead Gillnet Marks

The presence of gillnet marks was noted for all steelhead as they migrated past the fence. For the 20% of steelhead sampled, mean nose-fork lengths of gillnet marked and unmarked fish were compared for each sex using Students t-test. Temporal trends in the gillnet mark rate were examined by pooling and plotting the percent of gill net marked steelhead by week.

3.4 Male and Female Steelhead Run Timing

The run timing of male and female steelhead was examined by plotting cumulative percent male and female steelhead by date over the duration of fence operation. The date of first arrival and median migration date past the fence for male and female steelhead was also compared. Finally, daily numbers of male and female steelhead migrating past the fence were plotted and compared using the two sample Kolmogorov-Smirnov test for distribution difference.

3.5 Upper Sustut River Fence Count and Tyee Test Fishery Index

The cumulative steelhead index at the Tyee Test Fishery has been used to indicate the relative abundance of steelhead and salmon migrating into the Skeena River (Cox-Rogers and Jantz 1993; Ward *et al.* 1993; Cox-Rogers 1994; Koski *et al.* 1995; Labelle *et al.* 1995). The cumulative steelhead index to August 10 is considered to indicate the relative abundance of early run Skeena River steelhead (upper Sustut River steelhead). This date was chosen as it was the last date that tagged upper Sustut River steelhead were observed in the Tyee Test Fishery (Parken *et al.* 1997).

In 1996, all field procedures used to enumerate the upper Sustut River steelhead population were standardized to reduce the variability resulting from the different enumeration methods utilized in previous years (Parken *et al.* 1997). The total number of steelhead counted through the Sustut River fence to September 30 was used for all inter-annual comparisons. Parken *et al.* (1997) found that the August 10 cumulative Tyee Test Fishery steelhead index correlated positively with and was a significant predictor of the Upper Sustut River steelhead population. The 2004 data point was added to the regression to determine if the August 10 Tyee Test Fishery index continued to be a significant predictor of the upper Sustut River steelhead fence count.

4.0 Results

4.1 Steelhead Enumeration

Between July 27 and September 30, 1,042 steelhead migrated upstream past the upper Sustut River fence (Table 1; Appendix Tables 1, 2). An additional 18 steelhead were observed downstream of the fence prior to fence removal making the estimated spawning escapement to the upper Sustut River 1,060 steelhead.

The first steelhead migrated through the fence on July 28 and by September 3, 50% of the run had passed (Figure 4; Table 1). In order to provide a historical context for the 2004 data, the annual dates of 50% migration along with the corresponding total fence counts to September 30 are presented in

Table 1 for the years 1994 to 2004. Information prior to 1994 was not included due to the variability in enumeration methodology that existed during this period.

The date when 50% of the 2004 steelhead run migrated past the fence was the third earliest on record (Table 1). Also, the total steelhead fence count to September 30 was the third highest recorded since enumeration methods were standardized and was well above the long-term average fence count (Table 1).

Table 1. Dates when 50% of the steelhead migrated through the fence and the total count to September 30, for the years 1994 to 2004.

Year	Date of 50% Migration	Fence Count
1994	Aug-29	584
1995	Sep-08	467
1996	Sep-07	466
1997	Sep-13	649
1998	Sep-07	1064
1999	Sep-17	731
2000	Sep-07	377
2001	Sep-16	756
2002	Sep-02	812
2003	Sep-02	1115
2004	Sep-03	1042
Earliest 50% Migration Date	Aug-29	Minimum Count
Latest 50% Migration Date	Sep-17	Maximum Count
		Mean Count
		377
		1115
		733

The pattern of steelhead migration past the fence in 2004 differed from past years (Figure 4). A higher percentage of the run moved through the fence during the third week of August and again during the first two weeks of September than has been witnessed during the 1994 to 2003 period (Figure 4).

A total of three dead steelhead were recovered from the fence making the total observed steelhead handling mortality rate 0.3% (Appendix Table 3). All of these mortalities were female fish which ranged from 690 to 810 mm in nose-fork length. No consistent physical wounds or scars were noted.

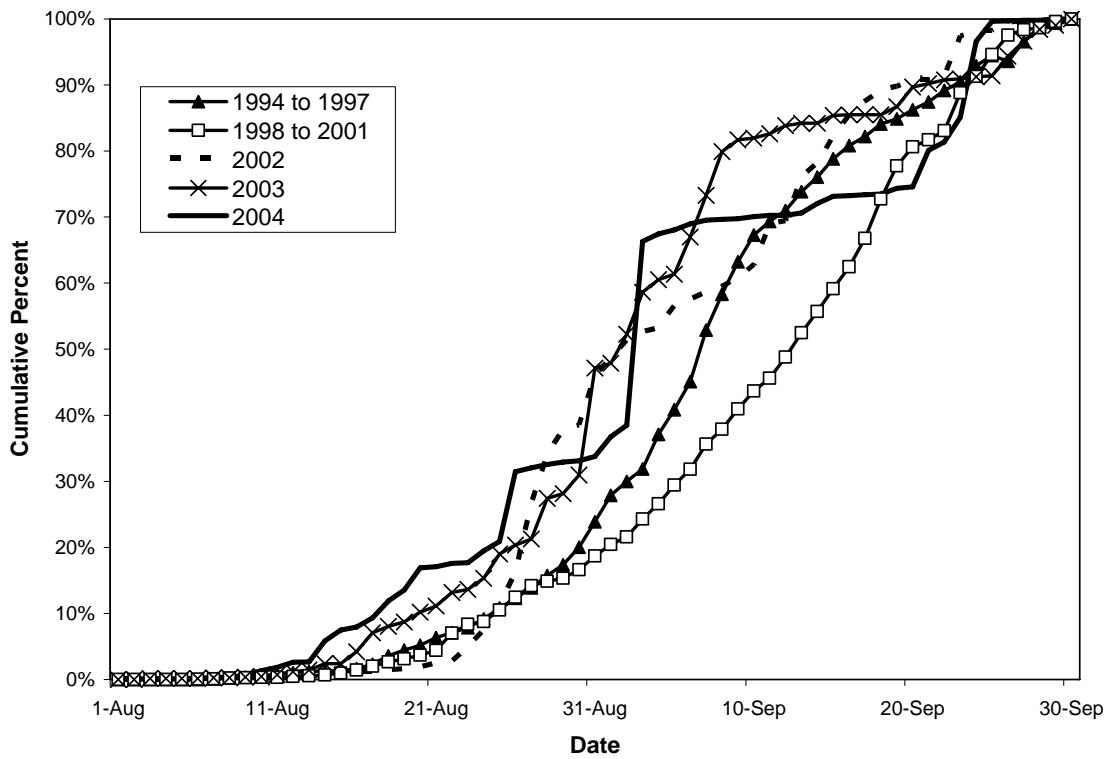


Figure 4. Daily cumulative percentage of upper Sustut River steelhead migrating past the fence for the years 1994 to 2004.

Between July 27 and September 30, a total of 483 chinook salmon, 1,604 sockeye salmon, 25 coho salmon, 17 bull trout, 4 resident rainbow trout and 46 Rocky Mountain whitefish migrated past the fence (Appendix Tables 1, 4). Sampling data for all chinook, sockeye and coho salmon are presented in Appendix Tables 5 to 8.

One female steelhead tagged at the fence in 2000 was recaptured in 2004 (Table 2). Growth from the date of initial tagging to the date of recapture was 110 mm. The timing of arrival at the fence for this fish was 29 days earlier in 2004 compared with the original date of tagging in 2000. This appears to be the first record of a Sustut River steelhead returning to spawn 4 years after the initial date of tagging.

Table 2. Tagged steelhead recaptured at the Sustut River fence during 2004.

Recapture Data					Tagging Data			
Date	Sex	NF Length (mm)	Tag Colour	Tag Number	Date	Location	Sex	NF Length (mm)
19-Aug-04	F	810	white	14270	17-Sep-00	Sustut Fence	F	700

4.2 Steelhead Migration and Physical Data

All environmental data along with a description of daily weather conditions are presented in Appendix Table 9. The daily maximum water temperature ranged from 5.0 to 17.5 and averaged 11.0 °C while daily maximum air temperature ranged from 3.0 to 30.0 and averaged 15.7 °C. Daily minimum and maximum water temperatures are shown graphically in Appendix Figure 1. Water levels, as indicated by staff gauge height, ranged from 0.260 to 0.540 and averaged 0.341 m.

Maximum daily water temperature and staff gauge height were plotted with steelhead migration through the fence (Figures 5, 6). Regression analysis indicated that neither daily water temperature (ANOVA: $F=0.0149$, $p=0.9033$) nor river level (ANOVA: $F=1.249$, $p=0.2680$) was significantly correlated with steelhead movement past the fence. Since changes in environmental conditions may take some time to influence migration behavior, steelhead migration was lagged by 3 days (daily steelhead migration matched with physical data from 3 days previous). Under these conditions, regression analysis revealed that neither water temperature (ANOVA: $F=0.1892$, $p=0.6652$) nor river level (ANOVA: $F=2.2297$, $p=0.1408$) were significantly related to the movement of steelhead past the fence.

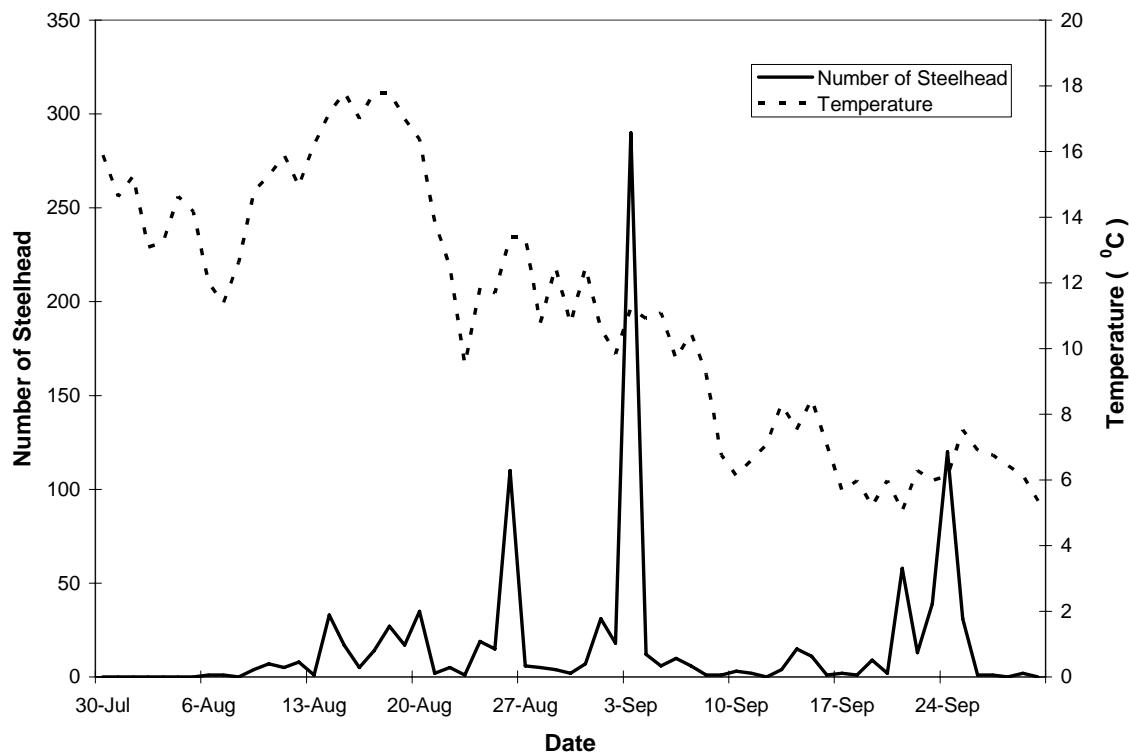


Figure 5. Daily maximum water temperature and the number of steelhead migrating past the fence.

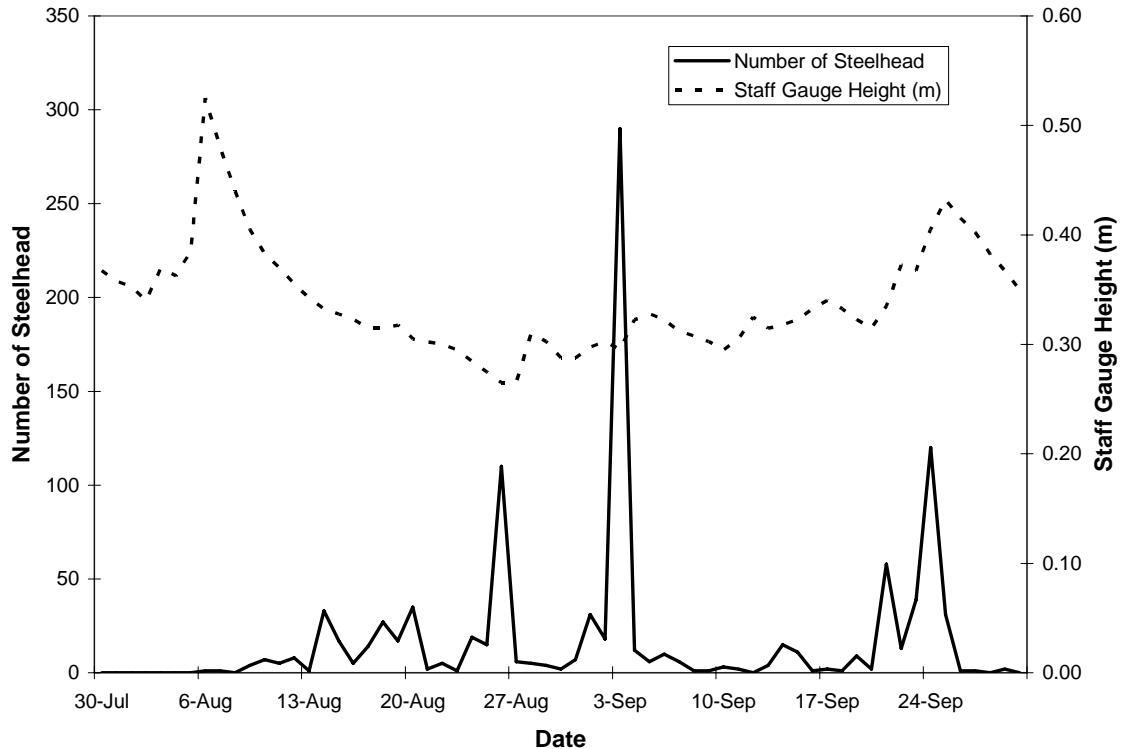


Figure 6. Daily staff gauge height and the number of steelhead migrating past the fence.

4.3 Steelhead Length Distributions by Sex

Of the 1,042 steelhead counted migrating through the fence, 420 (40.3%) were male and 622 (59.7%) were female making the ratio of female to male steelhead 1.48:1. A total of 81 male (19.3%) and 127 female (20.4%) steelhead were measured for nose-fork length. Male steelhead length ranged from 710 to 980 mm and averaged 818 mm while female steelhead length ranged from 530 to 880 mm and averaged 745 mm. The percent of the total number of steelhead measured at the fence was plotted by 20 mm increments of nose-fork length for each sex (Figure 7). Statistical analysis revealed that male steelhead were significantly larger than female steelhead (Student's t-test: $t=9.0493$; $p<0.0001$).

4.4 Steelhead Gillnet Marks

Gillnet marks were present on 7.7% of all steelhead that migrated past the fence. The percent of gillnet marked steelhead was pooled and plotted by statistical week (Figure 8). Statistical week definitions are outlined in Appendix Table 10. Weekly gillnet mark rates ranged from a low of 0% in statistical weeks 7-5, 8-1 and 10-1, to a high of 13.8% in statistical week 8-4 (Figure 8).

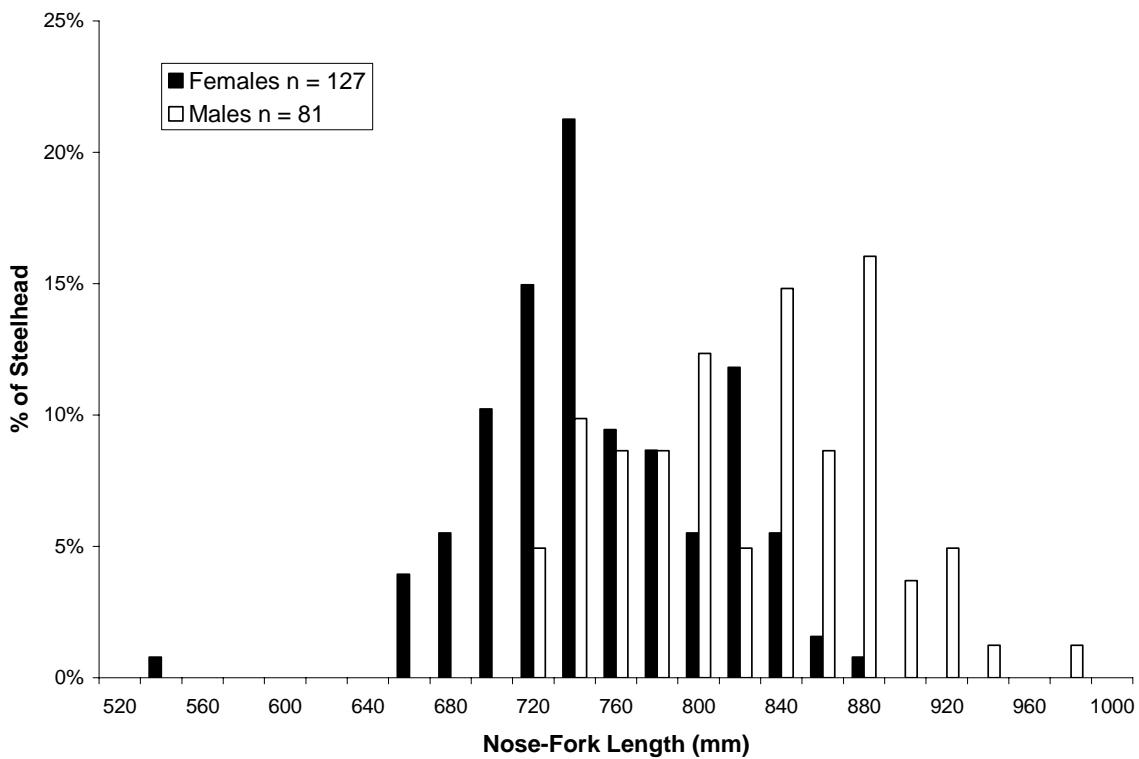


Figure 7. Percentage of male and female steelhead by 20 mm categories of nose-fork length.

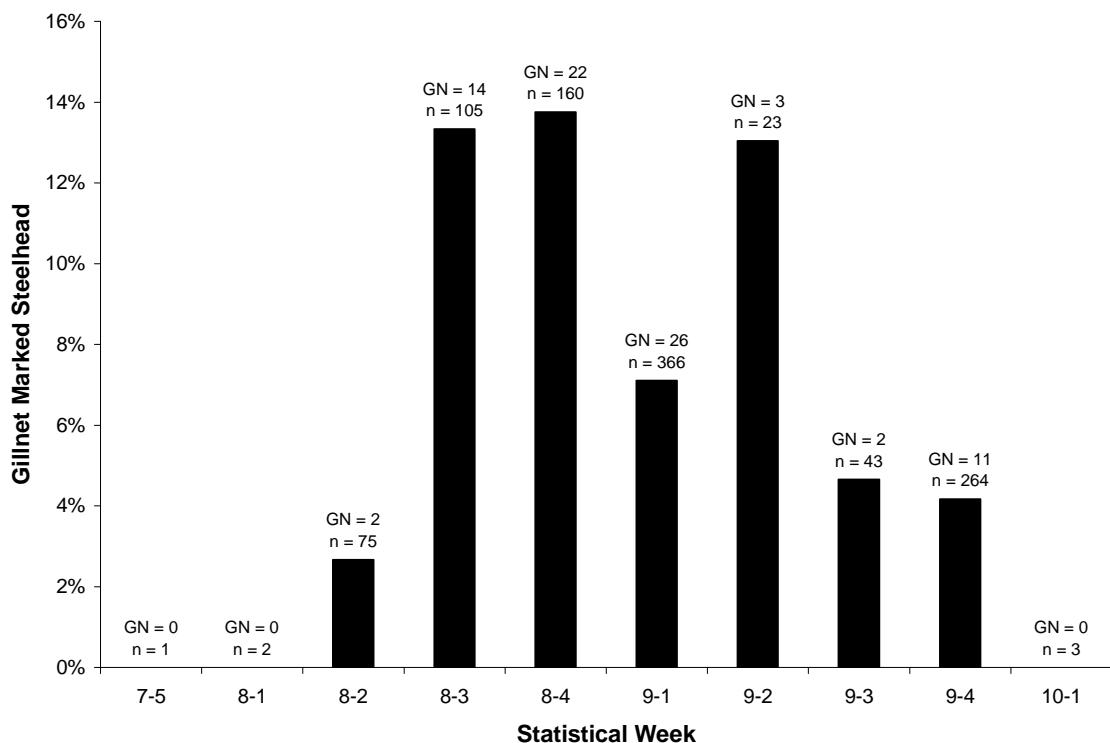


Figure 8. Percent of steelhead with gillnet marks by statistical week. GN = the number of gillnet marked steelhead and n = the total number of steelhead counted each week.

A total of 6.0% of male steelhead and 8.8% of female steelhead observed migrating past the fence exhibited gillnet marks. While the average nose-fork length of gillnet marked male and female steelhead was less than the average nose-fork length of unmarked fish, the differences were statistically significant for male steelhead only (Males - Student's t-test: $t=1.9942$; $p=0.0496$) (Females - Student's t-test: $t=1.3624$; $p=0.1755$).

4.5 Male and Female Steelhead Run Timing

The first female steelhead passed through the fence on July 28 while the first male steelhead migrated upstream on August 9 (Appendix Table 2). The median migration date was September 3 for both sexes. The plot of daily cumulative percentage of male and female steelhead arriving at the fence revealed a similar migration pattern for both sexes (Figure 9). When the daily numbers of male and female steelhead migrating past the fence were plotted and compared, the two sample Kolmogorov-Smirnov test for distribution difference revealed no significant difference ($D=0.0978$; $P=0.9722$).

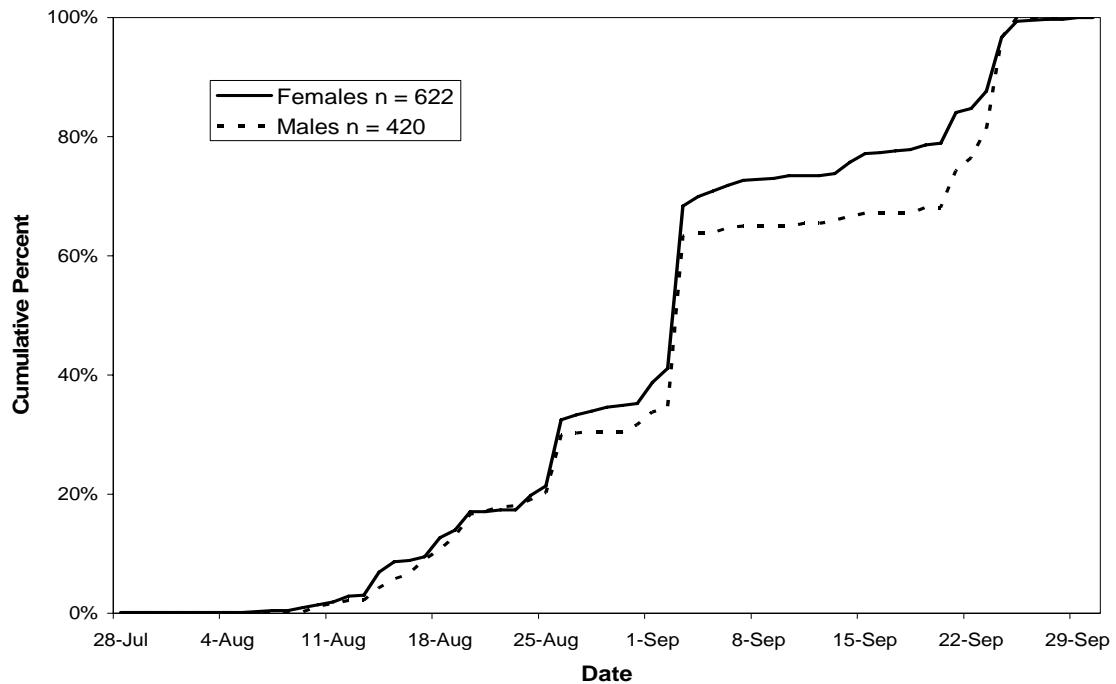


Figure 9. Daily cumulative percent of male and female steelhead migrating past the fence.

4.6. Steelhead Ages

A total of 208 scales taken from steelhead at the Sustut River fence were analyzed to determine age. The majority of the scales (155) were in good

condition (code 1) while 8 were in poor condition (code 2) with the remaining scales exhibiting either regeneration, resorption or were difficult to age for other reasons (Appendix Table 11, 12). The number of freshwater annuli ranged from three to five with the majority of scales (70.2%) reflecting 4 years of freshwater growth (Appendix Table 13). The number of marine annuli ranged from one to four with the majority of scales (61.5%) showing 2 years of marine growth (Appendix Table 14). The most prevalent age was 4.2+ (36.1%) followed by 4.3+ (28.4%) (Appendix Tables 13, 14). A total of 9.6% of the scales examined showed evidence of repeat spawning.

4.7 Upper Sustut River Fence Count and Tyee Test Fishery Index

The 2004 upper Sustut River steelhead fence count to September 30 and the cumulative Tyee Test Fishery index to August 10 were added to the historical regression relationship between these two values (Figure 10). While the relationship remained positive it was not statistically significant (ANOVA: $F=1.9283$, $p=0.1902$) indicating that the Tyee index does not function as a predictor of upper Sustut steelhead abundance under current conditions.

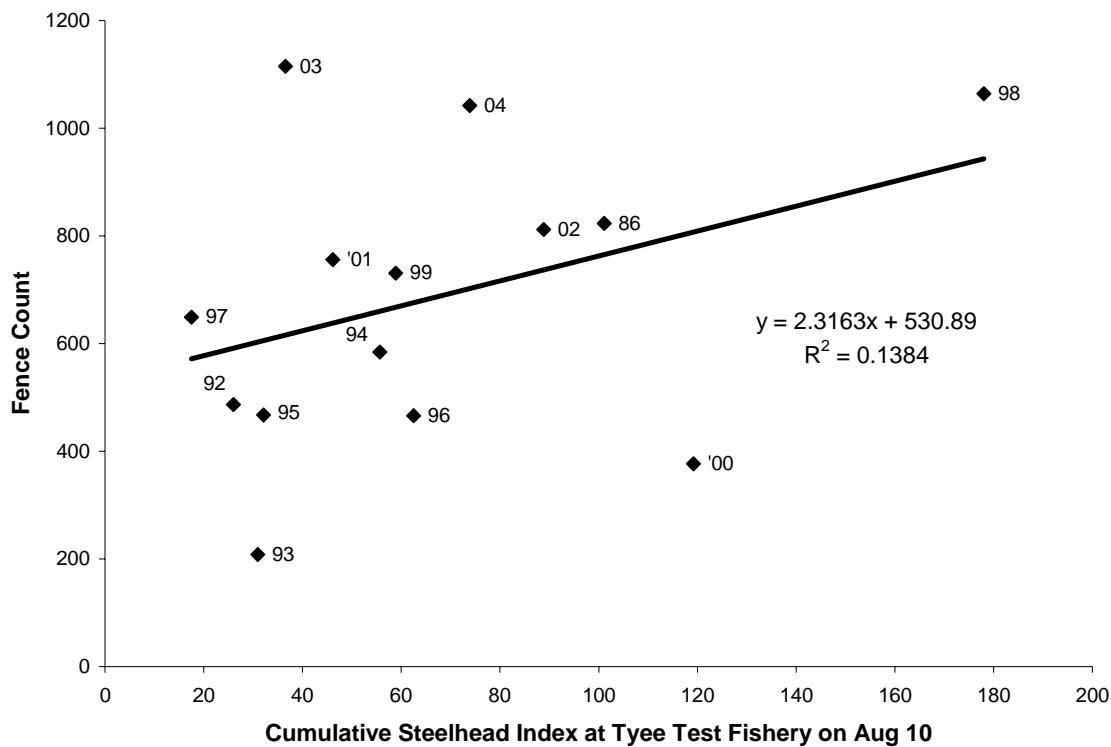


Figure 10. Linear relationship between the upper Sustut River steelhead fence count and the cumulative steelhead index at the Tyee Test Fishery on August 10.

5.0 Discussion

The 2004 upper Sustut River steelhead fence count to September 30 was 1,042 fish. This value is the third highest since enumeration methods were standardized in 1994 and approximately 30% above the long-term average (Table 3). With the addition of the steelhead observed downstream of the fence prior to fence removal, the estimated spawning escapement for the 2004 upper Sustut River steelhead run was 1,160 fish. This value is above the estimated carrying capacity of the system (1036) which was determined using a habitat based productivity model (Tautz *et al.* 1992). This is only the third time since monitoring began that the estimated carrying capacity has been reached. Parken *et al.* (1997) reviewed the early escapement data and concluded that the total population estimates fluctuated little between 1992 and 1996 and that all escapements up to 1996 were substantially below carrying capacity. Since enumeration methods were standardized in 1994, annual fence counts have ranged from a high of 1,115 in 2003 to a low of 377 in 2000 (Table 3). This

Table 3. Historical upper Sustut River steelhead data for the years 1992 to 2004.

Year	Steelhead	Date of First Migration	Date of 50% Fence Count	Average Length (mm)		Ave. Rep Spawner Growth (mm)	% Repeat Spawn ¹	% Handling Mort.	% Gillnet Marked		
				M	F				M	F	Total
1992				777	721						23.0
1993				848	740						11.0
1994	Aug-08	Aug-29	584	824	737						2.0
1995	Aug-08	Sep-08	467	826	746		1.2	4.0			6.0
1996	Aug-17	Sep-07	466	829	739	67	1.3	2.8			14.0
1997	Aug-09	Sep-13	649	814	733	98	0.6	1.5	9.2	17.8	15.4
1998	Aug-03	Sep-07	1064	827	749	74		0.8	13.4	13.8	13.7
1999	Aug-17	Sep-17	731	848	756	81	2.5	0.3	6.1	9.9	8.5
2000	Aug-08	Sep-07	377	827	741	63	0.4	0.5	10.6	16.2	14.1
2001	Aug-15	Sep-16	756	864	771	65	2.5	1.9	10.1	14.5	12.8
2002	Aug-09	Sep-02	812			54	1.9	0.5	3.6	8.4	6.3
2003	Aug-03	Sep-02	1115	780	730	58	1.2	0.3	8.3	14.2	11.8
2004	Jul-28	Sep-03	1042	818	745	110 ²		0.3	6.0	8.8	7.7
Minimum			377	777	721	54	0.4	0.3	3.6	8.4	2.0
Maximum			1115	864	771	110	2.5	4.0	13.4	17.8	23.0
Average			733	824	743	70 ³	1.5	1.3	8.4	13.0	11.3

¹ Minimum value based on tag recoveries.

² Only one fish recaptured.

³ 2004 fish not included in average.

dramatic variability witnessed over such a short period indicates the vulnerability of the upper Sustut steelhead stock to fluctuations in natural and fishery related influences. Smith and Ward (2000) established that wild steelhead abundance in some regions of British Columbia is influenced by ocean conditions that affect

marine survival. While such environmental factors are important, it is also vital to consider the number of steelhead intercepted in the various fisheries operating in the approaches to the Skeena River. The mortality associated with these fisheries greatly affects the annual spawning population size and impacts the level of subsequent production.

The date when 50% of the upper Sustut River steelhead population migrated past the fence was one of the earliest on record (Table 3). Since the timing of the return of steelhead to the Skeena River system may influence the rate of interception in commercial fisheries, the relationship between arrival at the fence and the total fence count was examined (Figure 11). The data set was

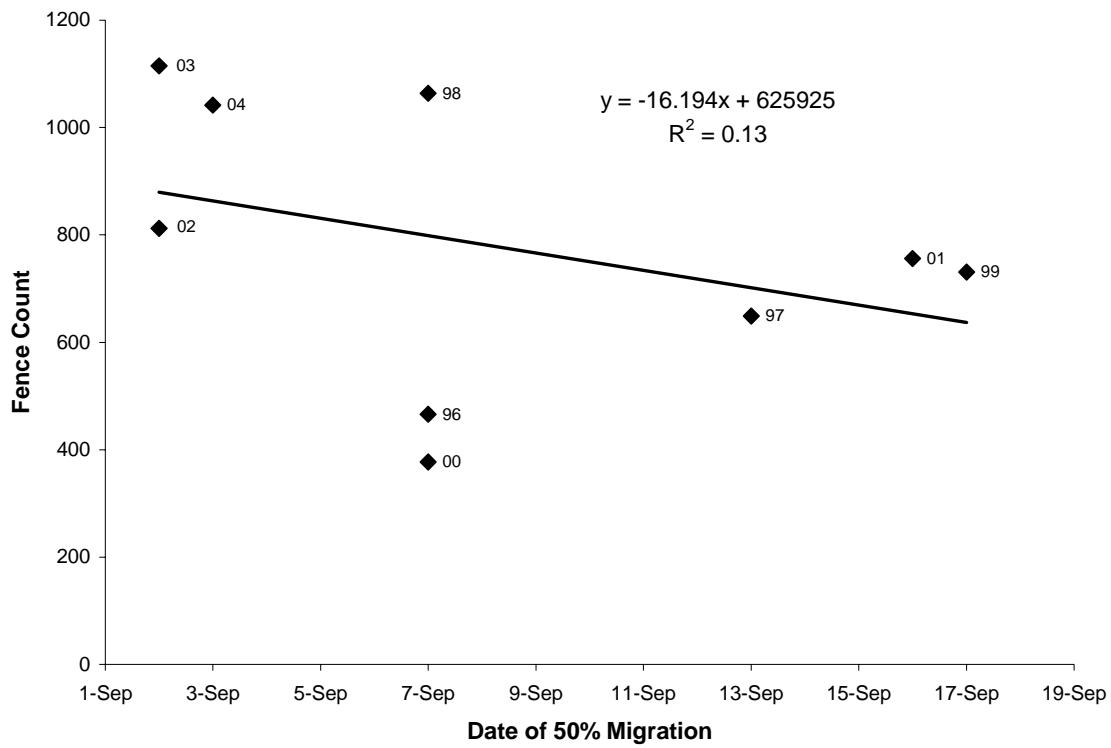


Figure 11. Linear relationship between the annual date of 50% migration and the total upper Sustut River steelhead fence count for the years 1996 to 2004.

restricted to include the years 1996 to 2004 as some additional variability in timing of fence operation existed in the earlier years. While a negative trend was apparent indicating that earlier arrival timing was associated with higher counts, the relationship was not statistically significant (ANOVA: $F=1.0462$; $P=0.3404$). Since steelhead movement within a river is often related to local environmental conditions including water temperature and river level it may not follow that relative timing at the fence site reflects the general pattern of arrival in other parts of the river. In 2001, 5 steelhead tagged at the Tyee Test Fishery in the lower Skeena River arrived at the upper Sustut fence. Migration time between these 2 sites ranged from 37 to 62 days and averaged 52 days (Diewert 2002). This

additional variability in migration timing suggests that there are many factors that determine when various portions of the run arrive in different sections of the river. The difficulty in predicting migration timing reveals the inherent risks that fishery managers face when attempting to schedule fisheries without impacting steelhead stocks. It seems that steelhead will always be vulnerable to interception and caution should be exercised when contemplating any fishery opening.

The mortality rate for steelhead migrating past the fence in 2004 was 0.3%, which matched the lowest mortality rate on record and was well below the historical average of 1.3% (Table 3). It is likely that the decision to minimize the handling stress on steelhead by collecting biological data from a subset of the population in conjunction with the modifications made to the fence to reduce abrasion injuries contributed to the low mortality rate observed.

In 2004, 59.7% of the steelhead migrating past the fence were female yielding a ratio of 1.48:1 females to males. The skewed sex ratio in favour of females is similar to that found in previous years (Parken *et al.* 1997; Williamson 1998, 1999a, 2000; Diewert 2001, 2002, 2003, 2004). Parken *et al.* (1997) postulated that this might have resulted from disproportionate sampling throughout the run during early studies. However, since 1995 all steelhead have been identified to sex and therefore the reported sex ratios accurately reflect those of the population. Hooton has indicated that past research found males dominant in the beginning of the run and females dominant near the end of the run (personal communication in Parken *et al.* 1997). This has not been the case in the upper Sustut during the past several years when females dominated throughout the run. It may be that gillnet fisheries targeting other species have selectively harvested male steelhead as their larger size and in some cases, secondary sexual characteristics, make them more susceptible to this gear type (Ricker 1975). Sandercok (1991) suggests that in theory, sex ratios should be 1:1 but that a high level of differential mortality is associated with both commercial and recreational fisheries, which are selective for larger fish and therefore males. If this is the case for upper Sustut steelhead, then years of intensive fishing as reflected by high gillnet mark rates should be associated with smaller average fish size. When the historical length data were plotted against the annual gillnet mark rate, a negative trend was indeed apparent but the relationship was not statistically significant (ANOVA: $F=1.3481$; $P=0.2726$) (Appendix Figure 2). However, when the historical gillnet mark rate was plotted with the annual percentage of upper Sustut steelhead that were female, a significant positive relationship was revealed (ANOVA: $F=10.2384$; $P=0.0108$) (Appendix Figure 3). This result supports the notion that gillnet fisheries are selectively removing males from the spawning population.

A total of 7.7% of all steelhead migrating past the fence exhibited gillnet marks. This falls in the lower end of historical values which have ranged from 2.0 to 23.0% and averaged 11.3% (Table 3). Female steelhead exhibited a higher gillnet mark rate than males (8.8 and 6.0%, respectively). Past studies have found that gillnet marked males and females were significantly smaller than unmarked fish (e.g. Diewert 2002). While this was true again in 2004 the

difference was statistically significant for male steelhead only. These results suggest that smaller steelhead are more often able to escape from gillnet encounters while larger fish remain ensnared.

Age analysis of upper Sustut River steelhead scales indicated that the majority (70.2%) spent more than four years in freshwater before migrating to the ocean. This life history pattern has implications for stock productivity since increased smolt age results in decreased fry-to-smolt survival as older smolts are exposed to mortality for additional years (Tautz *et al.* 1992). Spence *et al.* (1990) indicated that this extended period of freshwater rearing is reflective of the slow growth rate of juveniles associated with low water temperatures in the upper Sustut system. Their study pointed out that local environmental conditions reduce the productive growing season to less than 3 months, necessitating a long freshwater residency to attain smolt size.

The analysis of scale samples taken from the 2004 upper Sustut River steelhead spawning population indicated that 9.6% were repeat spawners. This value falls in the upper end of historical repeat spawner rates determined by scale analysis which have ranged from 0 to 12.7% and averaged 6.3% (Appendix Table 15). While sample sizes were quite low in some years, recent values have fluctuated considerably despite consistent sampling. This result suggests that there is a high level of variability associated with the annual rate of repeat spawners in the upper Sustut River steelhead population.

With the addition of the 2004 data point, the upper Sustut River steelhead fence count was not significantly correlated with the cumulative Tyee Test Fishery index to August 10. As a result, the test fishery index does not function as a predictor of upper Sustut steelhead abundance. A recent study on stock identification of Skeen River steelhead using microsatellite DNA loci found annual variation in the timing of migration of individual populations past the Tyee test fishing site (Beacham 2003). This natural variability may be confounded further by the timing of commercial, IFF and ESSR fisheries. Over the past several years, fisheries have been re-designed to target large Skeena sockeye returns while minimizing the impact on coho and the majority of steelhead stocks. The resulting intensified effort during the early portion of the fishery coincides with the return migration of early summer run steelhead including the upper Sustut River stock. These changes in the intensity and timing of fisheries may have introduced additional variability into the regression relationship.

5.1 The Importance of Continued Monitoring.

Commercial and recreational fisheries provide a vital contribution to food supplies, employment and culture. Without accurate stock assessments and their proper use in management, exploited fish populations can collapse, creating severe economic, social and ecological problems. Therefore, ensuring that stock assessment research progresses and that operational stock assessments use the best techniques for a given stock are fundamental for ensuring the

sustainability of commercial and recreational fisheries (U.S. National Academy of Sciences 1998).

The validity of any stock assessment project depends on long term monitoring, which allows for the evaluation of decadal trends in population parameters. The study of the effects of fishing on stocks is essentially a concern with long-term processes. In intense fisheries, accurate estimates of stock parameters (stock size, age and size structure of the population etc.) are necessary to ensure proper regulation of the fishery (Gulland 1969). Feedback on the effects of management strategies is vital to determine if fishing plans were effective in protecting important stocks from interception. Since the upper Sustut River steelhead stock is considered to be representative of all upper Skeena stocks, it is imperative that a rigorous and defensible assessment occur annually to present feedback to managers on the impact of interception fisheries on Skeena steelhead. This can only be done if consistent stock assessment data are collected using established, widely accepted methodologies. Following such methods ensures that the scientific advice given is based on figures about which there can be little dispute (Gulland 1983).

The upper Sustut steelhead assessment project began in 1986 and has been carried out using a consistent methodology since 1994. The project consists of a fishery independent survey, which offers the best opportunity for controlling sampling conditions over time and is considered by stock assessment experts to be the best choice for achieving a reliable index (U.S. National Academy of Sciences 1998). Continuing implementation of such a vital monitoring study is the only way to ensure that the interest of upper Skeena steelhead are not pushed aside as user groups pressure managers to increase fishing effort. Accurate and precise information on steelhead stock status must be readily available to determine the impact that expanded commercial fisheries designed to maximize the catch of other species will have on intercepted steelhead stocks. It is the responsibility of stock assessment and management biologists, and the agencies that fund this important work, to make certain that high quality monitoring projects such as the upper Sustut steelhead program continue to be carried out annually.

6.0 Recommendations

1. Enumeration of the upper Sustut River steelhead population should continue to be carried out annually. The valuable time series of data that results from this project provides fisheries managers with information on abundance trends for all early run Skeena steelhead populations and provides feedback on the impact of fisheries on these important stocks.
2. Efforts to visually enumerate steelhead below the fence prior to fence removal should continue. These counts provide the basis for estimating total steelhead spawning escapement to the upper Sustut River allowing for an evaluation of stock status relative to carrying capacity. Surveys should take place

throughout the latter portion of the project to ensure that a count of steelhead below the fence is always available. A final count should be carried out as close to the date of fence removal as possible.

3. With the addition of the data from the past two years, the Tyee Test Fishery Index to August 10 has not been significantly correlated with the Upper Sustut steelhead fence count. If an in-season predictive model of upper Skeena River steelhead abundance is required, then it is recommended that the data be re-examined to determine if additional factors could be included to account for the recently observed variation noted in the relationship.
4. It is recommended that approximately 20% of the male and female steelhead migrating past the fence continue to be sampled for age and length. This compromise ensures that the valuable time series of biological data will continue while handling mortality remains at a low level. During 2004, weekly sample rates varied slightly but remained relatively consistent throughout the project (Appendix Table 16). It is recommended that the temporal sample rate be as consistent as possible throughout migration past the fence to minimize any bias associated with migration timing.
5. During periods of heavy rainfall, turbidity in the upper Sustut River near the fence site increases dramatically due to runoff from the road. It is recommended that all fish be removed from the trap box by dip net during these periods so that species and sex identification are not jeopardized by the poor conditions for visual monitoring.

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Jeff Lough and Mark Beere assisted with the installation of the enumeration weir.

Mark Beere directed this study and provided editorial reviews and valuable comments for the final draft.

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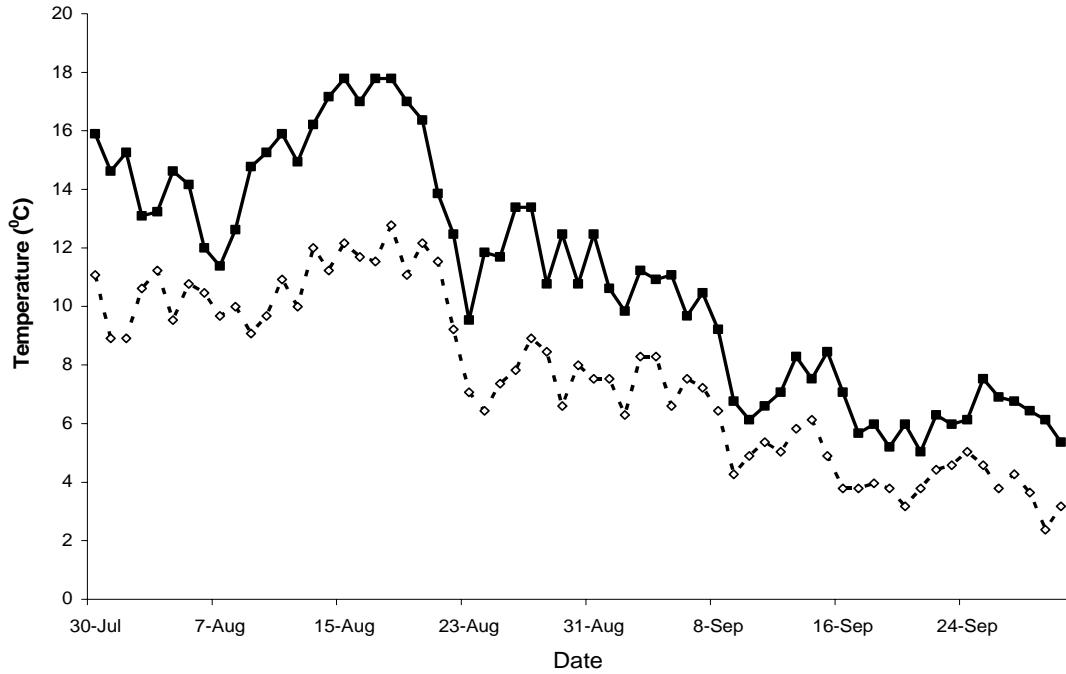
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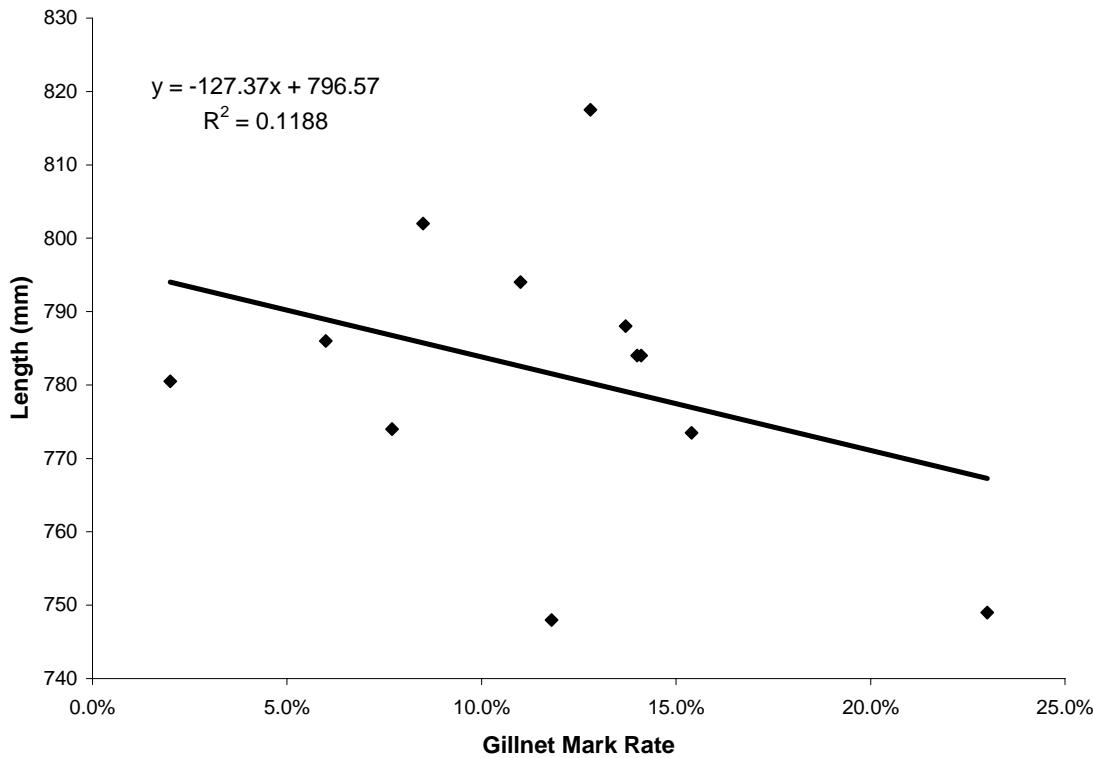
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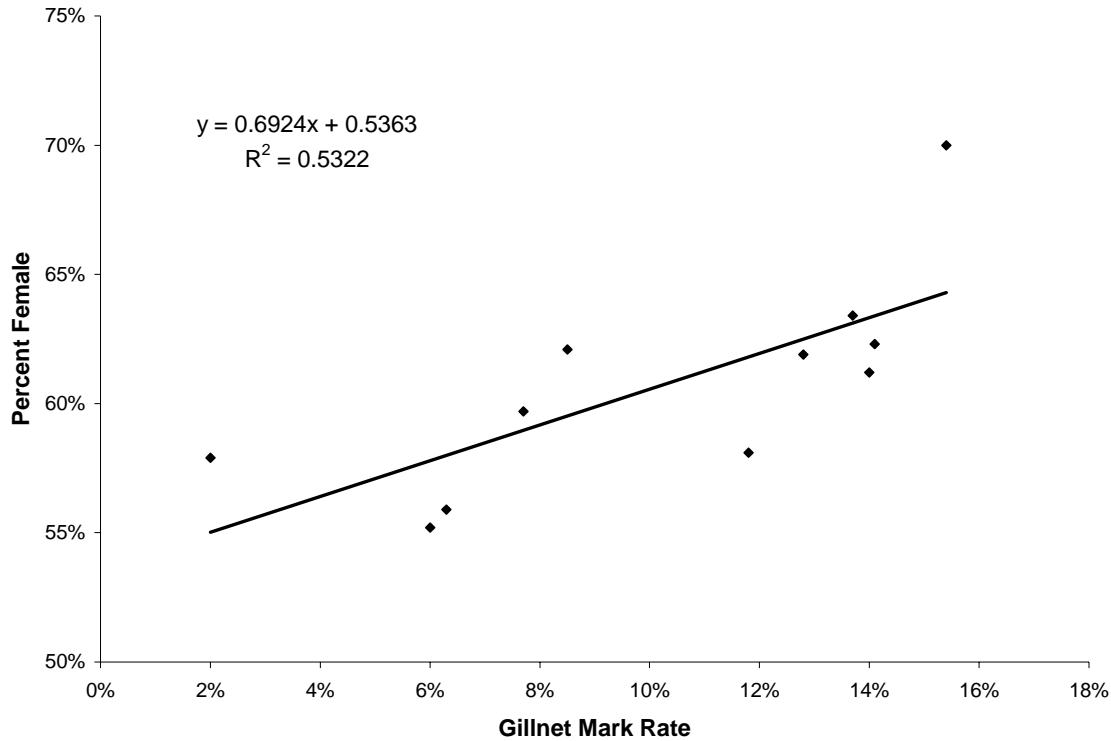
Appendix Figures



Appendix Figure 1. Daily minimum and maximum water temperatures at the Sustut River fence, July 31 to September 30, 2004.



Appendix Figure 2. Linear relationship between the annual gillnet mark rate and average length of upper Sustut River steelhead for the years 1992 to 2004.



Appendix Figure 3. Linear relationship between the annual gillnet mark rate and percent of the upper Sustut River steelhead run that was female for the years 1994 to 2004.

Appendix Tables

Appendix Table 1. Daily and cumulative totals of steelhead, rainbow trout, bull trout and Rocky Mountain whitefish migrating past the Sustut River fence, 2004.

Date	Steelhead		Rainbow Trout		Bull Trout		Whitefish	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
27-Jul	0	0	0	0	0	0	1	1
28-Jul	1	1	1	1	0	0	1	2
29-Jul	0	1	0	1	2	2	3	5
30-Jul	0	1	0	1	1	3	1	6
31-Jul	0	1	0	1	1	4	2	8
1-Aug	0	1	0	1	1	5	4	12
2-Aug	0	1	0	1	0	5	0	12
3-Aug	0	1	0	1	0	5	0	12
4-Aug	0	1	0	1	0	5	3	15
5-Aug	0	1	0	1	1	6	0	15
6-Aug	1	2	0	1	0	6	2	17
7-Aug	1	3	1	2	0	6	0	17
8-Aug	0	3	0	2	0	6	0	17
9-Aug	4	7	0	2	0	6	0	17
10-Aug	7	14	0	2	0	6	1	18
11-Aug	5	19	0	2	0	6	1	19
12-Aug	8	27	0	2	0	6	0	19
13-Aug	1	28	0	2	0	6	0	19
14-Aug	33	61	0	2	0	6	1	20
15-Aug	17	78	0	2	1	7	0	20
16-Aug	5	83	0	2	0	7	1	21
17-Aug	14	97	0	2	1	8	0	21
18-Aug	27	124	0	2	0	8	1	22
19-Aug	17	141	0	2	0	8	0	22
20-Aug	35	176	0	2	0	8	2	24
21-Aug	2	178	0	2	0	8	0	24
22-Aug	5	183	0	2	0	8	0	24
23-Aug	1	184	0	2	0	8	5	29
24-Aug	19	203	0	2	0	8	2	31
25-Aug	15	218	0	2	0	8	1	32
26-Aug	110	328	0	2	0	8	0	32
27-Aug	6	334	0	2	0	8	1	33
28-Aug	5	339	0	2	0	8	1	34
29-Aug	4	343	0	2	0	8	1	35
30-Aug	2	345	0	2	0	8	2	37
31-Aug	7	352	0	2	0	8	0	37
1-Sep	31	383	0	2	0	8	1	38
2-Sep	18	401	0	2	0	8	0	38
3-Sep	290	691	0	2	2	10	0	38
4-Sep	12	703	0	2	0	10	0	38
5-Sep	6	709	0	2	0	10	0	38
6-Sep	10	719	0	2	1	11	1	39
7-Sep	6	725	0	2	0	11	0	39

Appendix Table 1. (concluded).

Date	Steelhead		Rainbow Trout		Bull Trout		Whitefish	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
8-Sep	1	726	0	2	0	11	1	40
9-Sep	1	727	0	2	0	11	0	40
10-Sep	3	730	0	2	0	11	0	40
11-Sep	2	732	0	2	0	11	0	40
12-Sep	0	732	0	2	0	11	0	40
13-Sep	4	736	0	2	0	11	0	40
14-Sep	15	751	0	2	0	11	1	41
15-Sep	11	762	0	2	0	11	0	41
16-Sep	1	763	0	2	0	11	0	41
17-Sep	2	765	0	2	1	12	0	41
18-Sep	1	766	0	2	0	12	1	42
19-Sep	9	775	0	2	1	13	0	42
20-Sep	2	777	0	2	0	13	0	42
21-Sep	58	835	0	2	1	14	0	42
22-Sep	13	848	0	2	0	14	0	42
23-Sep	39	887	0	2	0	14	0	42
24-Sep	120	1007	0	2	0	14	0	42
25-Sep	31	1038	0	2	1	15	1	43
26-Sep	1	1039	0	2	0	15	1	44
27-Sep	1	1040	1	3	1	16	0	44
28-Sep	0	1040	0	3	1	17	1	45
29-Sep	2	1042	0	3	0	17	1	46
30-Sep	0	1042	1	4	0	17	0	46

Appendix Table 2. Steelhead sampling data from the Sustut River fence, 2004.

14-Aug 15:00 F no

Appendix Table 2. (continued).

Date	Time	Sex	(mm)	Marks	Scale Book			Comments
					Number	Position	Tag	
14-Aug	15:00	F		no				
14-Aug	16:00	M		no				
14-Aug	16:00	M		no				
14-Aug	16:00	M		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	16:00	F		no				
14-Aug	17:20	F	660	no	67419	7~47		scratched up
14-Aug	17:20	F	830	no	67419	8~48		
14-Aug	20:20	F	770	no	67419	9~49		
15-Aug	8:45	M	875	no	67419	10~50		
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	F		no				
15-Aug	15:20	M		no				
15-Aug	15:20	M		no				
15-Aug	15:20	M		no				
15-Aug	15:20	M		no				
15-Aug	15:20	M		no				
15-Aug	15:20	M		no				
15-Aug	18:00	F	805	no	67420	1~41		
15-Aug	18:00	F		no				
16-Aug	9:15	M		no				
16-Aug	9:15	M		no				
16-Aug	15:30	M		no				
16-Aug	15:30	F		no				
16-Aug	16:45	M	890	no	67420	2~42		
17-Aug	8:30	M		no				
17-Aug	8:30	M		no				
17-Aug	8:30	M		no				
17-Aug	8:30	M		no				
17-Aug	8:30	M		no				
17-Aug	15:45	M		no				
17-Aug	15:45	M		no				
17-Aug	15:45	M		no				
17-Aug	15:45	M		no				

17-Aug 15:45 M no

Appendix Table 2. (continued).

Date	Time	Sex	(mm)	Marks	Scale Book			Comments
					Number	Position	Tag	
17-Aug	15:45	F	780	no	67420	3~43		
17-Aug	15:45	F	730	no	67420	4~44		
17-Aug	15:45	F	795	no	67420	5~45		
17-Aug	17:45	F	820	no	67420	6~46		
18-Aug	9:00	M		no				
18-Aug	9:00	M		no				
18-Aug	9:00	F		no				
18-Aug	9:00	F		no				
18-Aug	9:00	F		no				
18-Aug	9:00	F		yes				
18-Aug	9:00	F		yes				
18-Aug	9:00	F		yes				
18-Aug	15:30	M		no				
18-Aug	15:30	M		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	15:30	F		no				
18-Aug	16:45	F		no				
18-Aug	16:45	F		no				
18-Aug	16:45	F	720	no	67420	7~47		scar on nose
18-Aug	16:45	M	940	no	67420	8~48		
18-Aug	16:45	M	780	yes	67420	9~49		
18-Aug	16:45	M	875	no	67420	10~50		
18-Aug	16:45	F	820	no	67421	1~41		
18-Aug	16:45	F	680	no	67421	2~42		scarred up
19-Aug	8:45	M	860	no	67421	3~43		
19-Aug	8:45	M	730	yes	67421	4~44		
19-Aug	8:45	F	730	no	67421	5~45		
19-Aug	15:30	M		no				
19-Aug	15:30	M		no				
19-Aug	15:30	M		no				
19-Aug	15:30	F		no				
19-Aug	15:30	F		no				
19-Aug	15:30	F		no				
19-Aug	15:30	F		no				
19-Aug	15:30	F		no				
19-Aug	15:45	M		no				
19-Aug	15:45	F		no				
19-Aug	16:15	M		yes				
19-Aug	16:15	F		no				
19-Aug	17:00	F	685	no	67421	6~46		
19-Aug	17:00	M	805	no	67421	7~47		

19-Aug 19:00 M no

Appendix Table 2. (continued).

Date	Time	Sex	(mm)	Marks	Scale Book			Comments
					Number	Position	Tag	
20-Aug	9:00	M		no				
20-Aug	9:00	M		no				
20-Aug	9:00	M		yes				
20-Aug	9:00	M		yes				
20-Aug	9:00	M		yes				
20-Aug	9:00	F		no				
20-Aug	9:00	F		no				
20-Aug	9:00	F		yes				
20-Aug	14:30	M		no				
20-Aug	14:30	M		no				
20-Aug	14:30	M		no				
20-Aug	14:30	M		no				
20-Aug	14:30	M		no				
20-Aug	14:30	M		no				
20-Aug	14:30	M		no				
20-Aug	14:30	M		no				
20-Aug	14:30	M		no				
20-Aug	14:30	M		no				
20-Aug	14:30	M		yes				
20-Aug	14:30	F		no				
20-Aug	14:30	F		no				
20-Aug	14:30	F		no				
20-Aug	14:30	F		no				
20-Aug	14:30	F		no				
20-Aug	14:30	F		no				
20-Aug	14:30	F		no				
20-Aug	14:30	F		no				
20-Aug	14:30	F		no				
20-Aug	14:30	F		no				
20-Aug	14:30	F		yes				
20-Aug	14:30	F		yes				
20-Aug	14:30	F		yes				
20-Aug	16:00	F	730	no	67421	8~48		
20-Aug	16:00	F	760	no	67421	9~49		
20-Aug	16:00	F	695	no	67421	10~50		
21-Aug	8:45	M	915	no	67422	1~41		
21-Aug	8:45	M	870	no	67422	2~42		
22-Aug	9:00	M	720	no	67422	3~43		
22-Aug	9:00	F	685	no	67422	4~44		
22-Aug	9:00	F	775	no	67422	5~45		scratches on side
22-Aug	9:00	M	860	no	67422	6~46		stab wound in caudal
22-Aug	9:00	M	785	no	67422	7~47		peduncle
22-Aug	9:00	M						scratched sides
23-Aug	18:45	M						
24-Aug	9:15	F						
24-Aug	9:15	F						
24-Aug	15:30	M						

24-Aug 15:30 M no

Appendix Table 2. (continued).

26-Aug 17:15 M no
26-Aug 17:15 M no

Appendix Table 2. (continued).

26-Aug 18:15 F no
26-Aug 18:15 F no

Appendix Table 2. (continued).

27-Aug	9:30	F	820	no	67424	8~48
27-Aug	9:30	F	695	no	67424	9~49

Appendix Table 2. (continued).

1-Sep 16:20 F no
 1-Sep 16:20 F no
 1-Sep 16:20 F no

Appendix Table 2. (continued).

Date	Time	Sex	NF Lgth (mm)	Marks	Scale Book			Comments
					Number	Position	Tag	
1-Sep	16:20	F		no				
1-Sep	16:20	F		no				
1-Sep	16:20	F		no				
1-Sep	16:20	F		yes				
1-Sep	16:20	F		yes				
1-Sep	17:30	M	745	yes	67426	4~44		
1-Sep	18:00	F	790	no	67426	5~45		lots of old scars
1-Sep	18:00	F		no				
2-Sep	8:40	M	795	no	67426	6~46		small piece missing from dorsal
2-Sep	8:40	F	740	yes	67426	7~47		
2-Sep	8:40	F		yes				
2-Sep	8:40	F		yes				
2-Sep	8:40	F		yes				
2-Sep	8:40	F		no				
2-Sep	16:20	F		no				
2-Sep	17:00	F		no				
2-Sep	17:00	F		no				
2-Sep	17:00	F		no				
2-Sep	17:00	F		no				
2-Sep	17:30	M	840	no	67426	8~48		
2-Sep	17:30	F	735	no	67426	9~49		
2-Sep	17:30	F		no				
2-Sep	18:00	F		no				
2-Sep	18:20	M	815	no	67426	10~50		
2-Sep	18:20	F		no				
3-Sep	9:30	M	920	no	67427	1~41		
3-Sep	9:30	M	875	no	67427	2~42		
3-Sep	9:30	F	715	no	67427	3~43		old scars top of caudal fin
3-Sep	9:30	M	855	no	67427	4~44		missing
3-Sep	9:30	F	815	no	67427	5~45		cut in caudal fin
3-Sep	9:30	M	820	no	67427	6~46		old scars on side
3-Sep	9:30	F	670	no	67427	7~47		
3-Sep	9:30	M		no				
3-Sep	9:30	M		no				
3-Sep	9:30	F		no				
3-Sep	9:30	F		no				
3-Sep	9:30	F		yes				
3-Sep	9:30	F		yes				
3-Sep	15:30	M		no				
3-Sep	15:30	M		no				
3-Sep	15:30	M		no				
3-Sep	15:30	M		no				

3-Sep	15:30	M	no
3-Sep	15:30	M	no
3-Sep	15:30	M	no

Appendix Table 2. (continued).

3-Sep 15:30 M no
3-Sep 15:30 M no
3-Sep 15:30 M no

Appendix Table 2. (continued).

3-Sep 15:30 F no
3-Sep 15:30 F no
3-Sep 15:30 F no

Appendix Table 2. (continued).

3-Sep 15:30 F no
3-Sep 15:30 F no
3-Sep 15:30 F no

Appendix Table 2. (continued).

3-Sep	15:30	F	no
3-Sep	15:30	F	no
3-Sep	15:30	F	no

Appendix Table 2. (continued).

3-Sep 17:00 F no
 3-Sep 17:00 F no
 3-Sep 17:00 F no

Appendix Table 2. (continued).

Date	Time	Sex	(mm)	Marks	Scale Book		Comments
					Number	Position	
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		no			
3-Sep	17:00	F		yes			
3-Sep	17:30	M	795	no	67427	8~48	
3-Sep	17:30	M	780	no	67427	9~49	
3-Sep	17:30	F	775	no	67427	10~50	
3-Sep	17:30	F	720	yes	67428	1~41	
3-Sep	17:30	F	710	no	67428	2~42	small piece missing off top of caudal
3-Sep	17:30	F	680	no	67428	3~43	
3-Sep	17:30	F	740	no	67428	4~44	
3-Sep	17:30	F	710	no	67428	5~45	
3-Sep	17:30	M	835	no	67428	6~46	
3-Sep	17:30	F	735	no	67428	7~47	
3-Sep	17:30	F		no			
3-Sep	17:30	M		no			
3-Sep	18:20	F	715	no	67428	8~48	squeeze mark on belly
4-Sep	9:20	F	755	no	67428	9~49	
4-Sep	9:20	F	825	no	67428	10~50	
4-Sep	9:20	F	725	no	67429	1~41	
4-Sep	9:20	F	715	no	67429	2~42	
4-Sep	9:20	F	710	yes	67429	3~43	
4-Sep	9:20	F	785	no	67429	4~44	
4-Sep	9:20	M	755	no	67429	5~45	
4-Sep	9:20	M	785	no	67429	6~46	bruised on belly
4-Sep	16:45	F	745	no	67429	7~47	
4-Sep	18:15	F	775	no	67429	8~48	
4-Sep	18:15	F	740	no	67429	9~49	
4-Sep	18:15	F	700	no	67429	10~50	scars by dorsal
5-Sep	8:30	F	770	no	67430	1~41	

5-Sep	8:30	F	720	no	67430	2~42
5-Sep	8:30	F	700	no	67430	3~43
5-Sep	18:00	F	645	yes	67430	4~44

Appendix Table 2. (continued).

Date	Time	Sex	NF Lgth (mm)	Marks	Gillnet		Scale Book		Comments
					Number	Position	Tag		
5-Sep	18:00	F	700	no	67430	5~45			large scrape on side below dorsal bruised spots on sides
5-Sep	18:00	F	740	no	67430	6~46			
6-Sep	9:30	F	840	no	67430	7~47			
6-Sep	9:30	F	680	no	67430	8~48			scrape mark on side, split dorsal
6-Sep	9:30	M	760	yes	67430	9~49			fresh stab wound hard lump by dorsal, caudal fin split away from caudal on bottom
6-Sep	9:30	M	840	no	67430	10~50			
6-Sep	15:30	M	740	no	67431	1~41			freshly split pelvic fin
6-Sep	18:15	F	660	no	67431	2~42			
6-Sep	18:15	M	740	no	67431	3~43			scar line down side below dorsal
6-Sep	18:15	F	730	no	67431	4~44			
6-Sep	18:15	F	710	no	67431	5~45			piece missing from top of caudal fin
6-Sep	18:15	F	760	yes	67431	6~46			
7-Sep	9:15	M	720	no	67431	7~47			
7-Sep	9:15	F	715	no	67431	8~48			lower part of caudal fin missing
7-Sep	9:15	F	700	no	67431	9~49			
7-Sep	16:30	F	660	no	67431	10~50			lots of scars on sides
7-Sep	16:30	F	785	no	67432	1~41			
7-Sep	16:30	F	760	no	67432	2~42			
8-Sep	9:35	F		yes					
9-Sep	9:00	F		no					
10-Sep	8:35	F		no					
10-Sep	16:30	F	720	no	67432	3~43			
10-Sep	16:30	F	685	no	67432	4~44			scar lines below dorsal
11-Sep	17:30	M	740	no	67432	5~45			
11-Sep	17:30	M	725	no	67432	6~46			
13-Sep	9:40	M		no					
13-Sep	9:40	M		no					
13-Sep	19:10	F		no					
13-Sep	19:10	F		no					
14-Sep	9:15	M	800	no	67432	7~47			deck flopper
14-Sep	9:15	M	785	no	67432	8~48			
14-Sep	9:15	F	735	no	67432	9~49			
14-Sep	9:15	F		no					
14-Sep	16:15	F	710	no	67432	10~50			
14-Sep	16:15	F	745	no	67433	1~41			

14-Sep	16:15	F	no
14-Sep	16:15	F	no
14-Sep	16:15	F	yes
14-Sep	16:15	F	yes

Appendix Table 2. (continued).

21-Sep 17:30 M no
 21-Sep 17:30 M no
 21-Sep 17:30 M no
 21-Sep 17:30 M no

Appendix Table 2. (continued).

Date	Time	Sex	NF Lgth (mm)	Marks	Scale Book			Comments
					Number	Position	Tag	
21-Sep	17:30	M		yes				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		no				
21-Sep	17:30	F		yes				
21-Sep	17:30	F		yes				
21-Sep	18:00	F	820	no	67433	5~45		
21-Sep	18:00	M	800	no	67433	6~46		
21-Sep	18:00	M	815	no	67433	7~47		
21-Sep	18:00	F	685	no	67433	8~48		
21-Sep	18:00	M	760	no	67433	9~49		
21-Sep	18:00	M	880	no	67433	10~50		
21-Sep	18:00	F	720	no	67434	1~41		
21-Sep	18:00	M	910	no	67434	2~42		
21-Sep	18:00	F	730	no	67434	3~43		
21-Sep	18:00	M	880	no	67434	4~44		
21-Sep	18:00	F	700	yes	67434	5~45		
21-Sep	18:00	F	745	yes	67434	6~46		
21-Sep	18:00	F	750	no	67434	7~47		
21-Sep	18:00	M	730	no	67434	8~48		
21-Sep	18:00	F	780	no	67434	9~49		
21-Sep	18:00	M	760	no	67434	10~50		
22-Sep	9:30	F		no				
22-Sep	9:30	F	860	no	67435	1~41		
22-Sep	9:30	F	810	no	67435	2~42		
								poke mark in left side

22-Sep 9:30 M 830 no 67435 3~43
 22-Sep 9:30 M 890 no 67435 4~44
 22-Sep 9:30 M 830 no 67435 5~45

Appendix Table 2. (continued).

Date	Time	Sex	(mm)	Marks	Scale Book			Comments
					Number	Position	Tag	
22-Sep	9:30	M	865	no	67435	6~46		
22-Sep	16:00	M	880	no	67435	7~47		
22-Sep	16:00	M	835	no	67435	8~48		
22-Sep	16:00	M	845	no	67435	9~49		
22-Sep	16:00	M	780	no	67435	10~50		
22-Sep	18:45	M		no				
22-Sep	18:45	F		no				
23-Sep	9:30	M	870	no	67436	1~41		
23-Sep	9:30	F		no				
23-Sep	9:30	F		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	M		no				
23-Sep	16:15	F		no				
23-Sep	16:15	F		no				
23-Sep	16:15	F		no				
23-Sep	16:15	F		no				
23-Sep	16:15	F		no				
23-Sep	16:15	F		no				
23-Sep	16:15	F		no				
23-Sep	16:15	F		no				
23-Sep	18:30	M		no				
23-Sep	18:30	M		no				
23-Sep	18:30	M		no				
23-Sep	18:30	M		no				
23-Sep	18:30	M		no				
23-Sep	18:30	F		no				
23-Sep	18:30	F		no				
23-Sep	18:30	F		no				
23-Sep	18:30	F		no				
23-Sep	18:30	F		no				
23-Sep	18:30	F		no				
23-Sep	18:30	F		no				
23-Sep	18:30	F		no				
23-Sep	18:30	F		no				
23-Sep	19:30	M		no				
23-Sep	19:30	M		no				
23-Sep	19:30	F		no				

23-Sep	19:30	F	no
24-Sep	9:30	M	no
24-Sep	9:30	M	no

Appendix Table 2. (continued).

24-Sep	16:00	M	no
24-Sep	16:00	M	no
24-Sep	16:00	M	no

Appendix Table 2. (continued).

24-Sep 16:45 F no
 24-Sep 16:45 F no
 24-Sep 16:45 F no

Appendix Table 2. (continued).

Date	Time	Sex	(mm)	Marks	Scale Book		Comments
					Number	Position	
24-Sep	16:45	F		no			
24-Sep	16:45	F		no			
24-Sep	16:45	F		yes			
24-Sep	16:45	F		yes			
24-Sep	19:00	M		no			
24-Sep	19:00	M		no			
24-Sep	19:00	M		no			
24-Sep	19:00	M		no			
24-Sep	19:00	F		no			
24-Sep	19:00	F		no			
24-Sep	19:00	F		no			
24-Sep	19:00	F		no			
24-Sep	19:00	F		no			
24-Sep	19:00	F		no			
24-Sep	19:00	F		no			
24-Sep	19:00	M	800	no	67436	4~44	
24-Sep	19:00	M	850	no	67436	5~45	
24-Sep	19:00	M	880	no	67436	6~46	
24-Sep	19:00	F	670	no	67436	7~47	
24-Sep	19:00	F	720	no	67436	8~48	
24-Sep	19:00	F	825	no	67436	9~49	
24-Sep	19:00	M	720	no	67436	10~50	
25-Sep	9:45	M	765	no	44181	1~41	
25-Sep	9:45	M	830	no	44181	2~42	
25-Sep	9:45	M	980	no	44181	3~43	
25-Sep	9:45	M	830	no	44181	4~44	
25-Sep	9:45	F	725	no	44181	5~45	
25-Sep	9:45	M	775	no	44181	6~46	
25-Sep	9:45	F	810	no	44181	7~47	
25-Sep	9:45	F	770	no	44181	8~48	
25-Sep	9:45	M	865	no	44181	9~49	
25-Sep	9:45	F	755	no	44181	10~50	
25-Sep	9:45	F	795	no	44182	1~41	
25-Sep	9:45	F	835	no	44182	2~42	
25-Sep	16:30	M		no			
25-Sep	16:30	F		no			
25-Sep	16:30	F		no			
25-Sep	16:30	F	725	no	44182	3~43	
25-Sep	16:30	M	745	no	44182	4~44	
25-Sep	16:30	M	900	no	44182	5~45	
25-Sep	16:30	F	760	no	44182	6~46	
25-Sep	16:30	F	820	no	44182	7~47	
25-Sep	16:30	F	745	no	44182	8~48	
25-Sep	16:30	M	770	no	44182	9~49	
25-Sep	16:30	F	830	no	44182	10~50	

25-Sep	16:30	F	760	no	44183	1~41
25-Sep	16:30	M	880	no	44183	2~42
25-Sep	16:30	M	830	no	44183	3~43

Appendix Table 2. (concluded).

Date	Time	Sex	NF Lgth (mm)	Gillnet Marks	Scale Book			Comments
					Number	Position	Tag	
25-Sep	16:30	F	680	yes	44183	4~44		
25-Sep	16:30	F	705	no	44183	5~45		
25-Sep	19:30	F	805	no	44183	6~46		
25-Sep	19:30	M	730	no	44183	7~47		
25-Sep	19:30	M	780	yes	44183	8~48		
26-Sep	19:15	F		no				
27-Sep	16:30	F		no				
29-Sep	19:30	F		no				
29-Sep	19:30	F		no				

Appendix Table 3. Steelhead handling mortalities, 2004.

Date	Sex	Length (mm)		Weight (kg)	Picture #	Comments
		NF	POH			
19-Aug	F	810	650	5.5	R1: 25; R2: 1	White tag 14270. Don't know when it got upstream. Cause of death unknown. Found on river bank beside platform. Forgot to change picture number on dry erase board used in photo.
30-Aug	F	690		3.5	R2: 2 - 3	
27-Sep	F	700		5.3	R2: 4 - 5	Lots of fungus on nose and tail.

Appendix Table 4. Daily and cumulative total of chinook, sockeye and coho salmon migrating past the Sustut River fence, 2004.

Date	Chinook		Sockeye		Coho	
	Daily	Cum.	Daily	Cum.	Daily	Cum.
27-Jul	17	17	0	0	0	0
28-Jul	71	88	1	1	0	0
29-Jul	59	147	1	2	0	0
30-Jul	35	182	0	2	0	0
31-Jul	20	202	2	4	0	0
1-Aug	61	263	0	4	0	0
2-Aug	2	265	0	4	0	0
3-Aug	60	325	5	9	0	0
4-Aug	22	347	0	9	0	0
5-Aug	42	389	3	12	0	0
6-Aug	14	403	8	20	0	0
7-Aug	19	422	1	21	1	1
8-Aug	10	432	28	49	0	1
9-Aug	12	444	60	109	1	2
10-Aug	9	453	82	191	0	2
11-Aug	5	458	56	247	0	2
12-Aug	3	461	52	299	0	2
13-Aug	1	462	3	302	2	4
14-Aug	6	468	131	433	0	4
15-Aug	2	470	47	480	0	4
16-Aug	2	472	62	542	1	5
17-Aug	2	474	40	582	1	6
18-Aug	1	475	54	636	0	6
19-Aug	5	480	111	747	1	7
20-Aug	1	481	30	777	0	7
21-Aug	1	482	1	778	0	7
22-Aug	0	482	0	778	0	7
23-Aug	0	482	43	821	0	7
24-Aug	0	482	223	1044	0	7
25-Aug	0	482	105	1149	0	7
26-Aug	0	482	65	1214	0	7
27-Aug	0	482	3	1217	0	7
28-Aug	0	482	64	1281	2	9
29-Aug	0	482	0	1281	0	9
30-Aug	0	482	0	1281	0	9
31-Aug	0	482	3	1284	0	9
1-Sep	1	483	28	1312	0	9
2-Sep	0	483	40	1352	3	12
3-Sep	0	483	66	1418	1	13
4-Sep	0	483	20	1438	0	13
5-Sep	0	483	20	1458	0	13
6-Sep	0	483	12	1470	1	14
7-Sep	0	483	0	1470	1	15
8-Sep	0	483	0	1470	0	15
9-Sep	0	483	0	1470	0	15
10-Sep	0	483	0	1470	0	15
11-Sep	0	483	18	1488	0	15

Appendix Table 4. (concluded).

Date	Chinook		Sockeye		Coho	
	Daily	Cum.	Daily	Cum.	Daily	Cum.
12-Sep	0	483	12	1500	0	15
13-Sep	0	483	17	1517	0	15
14-Sep	0	483	36	1553	1	16
15-Sep	0	483	6	1559	0	16
16-Sep	0	483	8	1567	0	16
17-Sep	0	483	5	1572	0	16
18-Sep	0	483	1	1573	0	16
19-Sep	0	483	11	1584	0	16
20-Sep	0	483	1	1585	0	16
21-Sep	0	483	6	1591	2	18
22-Sep	0	483	1	1592	1	19
23-Sep	0	483	4	1596	1	20
24-Sep	0	483	5	1601	5	25
25-Sep	0	483	1	1602	0	25
26-Sep	0	483	1	1603	0	25
27-Sep	0	483	0	1603	0	25
28-Sep	0	483	1	1604	0	25
29-Sep	0	483	0	1604	0	25
30-Sep	0	483	0	1604	0	25

Appendix Table 5. Sampling data from all chinook salmon carcasses recovered from the Sustut River fence, 2004.

Date	Time	Sex	Length (mm)		Operc. Punch	Comments
			NF	P.O.H		
30-Jul	20:45	M	1100	790	no	probably the one in box this morning; lots of decay
1-Aug	20:00	M	1130	860	no	
2-Aug	20:30	M	950	750	no	deep puncture wound, possibly from a spear
3-Aug	17:00	M	1050	840	no	
4-Aug	19:45	M	1170	890	no	
5-Aug	19:30	M	795	620	no	
6-Aug	19:45	M	1040	800	no	
6-Aug	19:45	M	1080	820	no	
6-Aug	19:45	M	1120	850	no	
7-Aug	9:45	M	1060	810	no	
7-Aug	9:45	M	700	540	no	
7-Aug	9:45	F	915	750	no	
7-Aug	9:45	M	1010	780	no	
7-Aug	20:00	M	1140	870	no	
7-Aug	20:00	M	690	540	yes	
8-Aug	9:30	M	1130	870	no	
8-Aug	9:30	F	930	750	yes	
8-Aug	9:30	F	890	710	no	
8-Aug	9:30	M	720	560	no	
8-Aug	9:30	M	1060	820	no	
9-Aug	10:20	F	950	770	no	
9-Aug	10:20	M	960	750	no	
9-Aug	20:00	M	1070	840	no	
9-Aug	20:00	M	1000	780	no	
9-Aug	20:00	M	1120	870	no	
9-Aug	20:00	M	660	510	no	
10-Aug	20:00	M	940	740	no	
10-Aug	20:00	M	660	520	yes	
10-Aug	20:00	M	1105	850	no	
10-Aug	20:00	M	810	640	no	
11-Aug	11:00	M	920	740	no	
11-Aug	11:00	M	970	770	yes	
11-Aug	11:00	M	1040	820	no	
11-Aug	11:00	M	700	540	no	
11-Aug	11:00	M	690	550	no	
11-Aug	20:00	M	1000	770	no	
11-Aug	20:00	M	940	780	no	
12-Aug	10:30	M	1150	900	no	
12-Aug	10:30	M	1060	810	no	
12-Aug	10:30	M	690	540	no	
12-Aug	10:30	M	860	680	no	
12-Aug	10:30	M	990	770	no	
12-Aug	10:30	M	1160	900	no	
12-Aug	20:00	F	950	780	no	
12-Aug	20:00	M	880	690	no	

Appendix Table 5. (continued).

Date	Time	Sex	Length (mm)		Operc. Punch	Comments
			NF	P.O.H		
12-Aug	20:00	M	790	600	no	
12-Aug	20:00	M	970	750	no	
12-Aug	20:00	M	1020	790	no	
12-Aug	20:00	M	1020	810	no	
12-Aug	20:00	M	970	760	no	
13-Aug	10:00	M	970	760	no	
13-Aug	10:00	M	730	560	no	
13-Aug	10:00	M	1100	850	no	
13-Aug	10:00	M	740	560	no	
13-Aug	10:00	F	970	780	no	
13-Aug	20:00	F	780	630	no	completely spawned
13-Aug	20:00	M	860	660	no	
13-Aug	20:00	M	860	680	no	
13-Aug	20:00	M	1040	790	no	
13-Aug	20:00	M	990	770	no	
13-Aug	20:00	M	1120	860	no	
13-Aug	20:00	F	850	690	no	
14-Aug	20:30	M	640	500	no	
14-Aug	20:30	M	650	520	no	
14-Aug	20:30	M	650	510	no	
14-Aug	20:30	M	910	710	no	
14-Aug	20:30	F	930	770	no	
14-Aug	20:30	M	1000	770	no	
14-Aug	20:30	M	720	560	no	
14-Aug	20:30	M	780	630	no	
14-Aug	20:30	M	1060	810	no	
15-Aug	20:00	M	1030	790	no	
15-Aug	20:00	M	1040	790	no	
15-Aug	20:00	M	700	540	no	
15-Aug	20:00	F	890	720	no	
15-Aug	20:00	M	720	560	no	
15-Aug	20:00	M	710	560	no	
15-Aug	20:00	M	840	660	yes	
15-Aug	20:00	F	890	730	no	
15-Aug	20:00	M	670	540	no	
15-Aug	20:00	M	960	750	no	
15-Aug	20:00	M	1150	890	no	
15-Aug	20:00	M	680	530	yes	
15-Aug	20:00	M	700	550	no	
16-Aug	11:00	F	940	770	no	
16-Aug	11:00	M	1110	880	no	
16-Aug	11:00	M	780	610	no	
16-Aug	11:00	M	680	540	no	
16-Aug	11:00	M	690	540	no	
16-Aug	11:00	F	870	710	no	
16-Aug	11:00	M	760	600	yes	
16-Aug	11:00	M	720	570	no	
16-Aug	20:00	M	720	560	no	

Appendix Table 5. (continued).

Date	Time	Sex	Length (mm)		Operc. Punch	Comments
			NF	P.O.H		
16-Aug	20:00	F	950	770	no	
16-Aug	20:00	M	820	650	no	
16-Aug	20:00	M	690	540	no	
16-Aug	20:00	M	780	610	no	
16-Aug	20:00	F	890	720	no	
17-Aug	19:45	M	680	550	no	
17-Aug	19:45	F	860	690	no	
17-Aug	19:45	M	670	520	no	
17-Aug	19:45	F	960	790	no	
17-Aug	19:45	M	850	650	no	
17-Aug	19:45	M	670	530	no	
17-Aug	19:45	M	680	530	no	
17-Aug	19:45	M	750	590	no	
18-Aug	19:30	M	1040	780	no	26 cm deep, huge hump in back
18-Aug	19:30	M	760	600	no	
18-Aug	19:30	M	1010	780	no	
18-Aug	19:30	F	810	640	no	
18-Aug	19:30	M	720	570	no	
18-Aug	19:30	M	720	570	no	
18-Aug	19:30	M	810	640	no	
18-Aug	19:30	M	720	580	no	
18-Aug	19:30	M	720	570	no	
18-Aug	19:30	M	690	550	no	
19-Aug	20:00	M	1110	850	no	
19-Aug	20:00	M	1050	810	no	
19-Aug	20:00	M	710	550	no	
19-Aug	20:00	M	970	750	no	
19-Aug	20:00	M	720	540	no	
19-Aug	20:00	M	1050	820	yes	
19-Aug	20:00	M	730	570	no	
19-Aug	20:00	M	750	580	no	
19-Aug	20:00	M	870	680	no	
20-Aug	20:00	M	740	580	no	
20-Aug	20:00	M	690	540	no	
20-Aug	20:00	M	720	570	yes	
20-Aug	20:00	M	740	590	yes	
20-Aug	20:00	M	1020	800	no	
20-Aug	20:00	M	590	470	no	
20-Aug	20:00	F	890	730	no	
20-Aug	20:00	M	940	730	no	
20-Aug	20:00	M	970	760	yes	
21-Aug	20:00	M	660	520	no	
21-Aug	20:00	M	1060	810	no	
21-Aug	20:00	M	1090	840	no	
21-Aug	20:00	M	890	680	no	
21-Aug	20:00	M	900	710	no	
21-Aug	20:00	F	850	685	no	
22-Aug	20:00	M	990	780	no	

Appendix Table 5. (concluded).

Date	Time	Sex	Length (mm)		Operc. Punch	Comments
			NF	P.O.H		
22-Aug	20:00	M	680	530	no	
22-Aug	20:00	M	630	490	no	
22-Aug	20:00	M	710	550	no	
22-Aug	20:00	M	1060	800	no	
22-Aug	20:00	M	970	750	no	
22-Aug	20:00	M	640	510	no	
23-Aug	19:45	M	715	540	no	
23-Aug	19:45	M	690	540	no	
23-Aug	19:45	M	740	580	yes	
24-Aug	9:30	M	860	770	no	
24-Aug	20:00	M	920	730	no	
25-Aug	9:45	M	1180	900	no	
25-Aug	20:00	M	580	450	yes	probably put through on Aug. 13, and called a Coho
26-Aug	20:00	F	920	730	no	
26-Aug	20:00	F	700	550	no	
26-Aug	20:00	M	750	580	yes	
28-Aug	20:00	M	700	560	no	
28-Aug	20:00	M	850	680	yes	
28-Aug	20:00	M	865	670	no	
30-Aug	16:00	M	510	405	yes	
30-Aug	16:00	F	760	610	yes	inaccurate measurement very rotten
31-Aug	8:30	F	810	660	yes	
2-Sep	8:40	M	790	630	no	very rotten
6-Sep	9:30	F	810	680	no	

Appendix Table 6. Sockeye salmon sampling data from the Sustut River fence, 2004.

Date	Time	Sex	(mm)	NF Length	Scale Book		Comments
				Number	Position		
6-Aug	1400	F	650	67407	1 - 41		
6-Aug	1600	F	580	67407	2 - 42		
7-Aug	1850	F	630	67407	3 - 43		
8-Aug	1930	M	655	67407	4 - 44		
8-Aug	1930	M	690	67407	5 - 45		
8-Aug	1930	M	710	67407	6 - 46		
9-Aug	1740	M	620	67407	7 - 47		
9-Aug	1740	F	630	67407	8 - 48		
10-Aug	8.45	M	605	67407	9 - 49	Scratched up	
10-Aug	8.45	F	560	67407	10 - 50	Very scratched up over most of body	
10-Aug	1745	M	625	67408	1 - 41		
10-Aug	1745	M	620	67408	2 - 42		
10-Aug	1745	M	680	67408	3 - 43		
10-Aug	1745	F	640	67408	4 - 44		
10-Aug	1745	M	690	67408	5 - 45	Big dent on side in front of dorsal fin	
10-Aug	1745	F	590	67408	6 - 46		
10-Aug	1900	M	680	67408	7 - 47		
10-Aug	1900	F	595	67408	8 - 48		
10-Aug	1900	F	595	67408	9 - 49		
10-Aug	1900	F	585	67408	10 - 50		
11-Aug	1900	F	570	67409	1 - 41		
11-Aug	1900	F	620	67409	2 - 42	Gillnet marks, very marked up, real fighter	
11-Aug	1900	M	605	67409	3 - 43		
11-Aug	1900	F	590	67409	4 - 44	Gillnet marks	
11-Aug	1900	M	585	67409	5 - 45	Gillnet marks - big bulge on front of belly	
12-Aug	1915	M	685	67409	6 - 46		
12-Aug	1915	F	590	67409	7 - 47		
12-Aug	1915	M	570	67409	8 - 48		
14-Aug	1720	F	655	67409	9 - 49		
14-Aug	1720	M	700	67409	10 - 50		
14-Aug	2020	F	590	67410	1 - 41		
15-Aug	855	F	565	67410	2 - 42		
15-Aug	1600	F	530	67410	3 - 43		
15-Aug	1600	F	566	67410	4 - 44		
15-Aug	1600	F	605	67410	5 - 45		
15-Aug	1600	F	585	67410	6 - 46		
15-Aug	1800	F	580	67410	7 - 47		
15-Aug	1800	F	610	67410	8 - 48		
15-Aug	1800	F	590	67410	9 - 49		
15-Aug	1800	M	655	67410	10 - 50		
15-Aug	1800	F	550	67411	1 - 41		
15-Aug	1800	F	590	67411	2 - 42		
15-Aug	1945	F	590	67411	3 - 43		
15-Aug	1945	F	580	67411	4 - 44		
15-Aug	1945	F	585	67411	5 - 45		

Appendix Table 6. (continued).

Date	Time	Sex	(mm)	Scale Book		Comments
				Number	Position	
15-Aug	1945	F	630	67411	6 - 46	
15-Aug	1945	M	680	67411	7 - 47	
15-Aug	1945	F	640	67411	8 - 48	
15-Aug	1945	F	560	67411	9 - 49	
15-Aug	1945	F	630	67411	10 - 50	
16-Aug	1645	F	640	67446	1 - 41	
16-Aug	1645	M	720	67446	2 - 42	
16-Aug	1830	F	630	67446	3 - 43	
16-Aug	1830	M	680	67446	4 - 44	
16-Aug	1830	F	575	67446	5 - 45	
17-Aug	1545	M	690	67446	6 - 46	
17-Aug	1545	F	580	67446	7 - 47	
17-Aug	1545	F	600	67446	8 - 48	
18-Aug	1645	M	715	67446	9 - 49	
18-Aug	1645	F	600	67446	10 - 50	Gillnet marks; very marked up
18-Aug	1645	F	550	67447	1 - 41	
18-Aug	1645	F	570	67447	2 - 42	Gillnet marks all along body; lots of scars; bones sticking out at front of dorsal.
18-Aug	1645	M	680	67447	3 - 43	Gillnet marks
18-Aug	1645	M	610	67447	4 - 44	Half of dorsal fin ripped off
19-Aug	845	M	655	67447	5 - 45	
20-Aug	1600	F	630	67447	6 - 46	
21-Aug	845	F	575	67447	7 - 47	
23-Aug	1745	F	550	67447	8 - 48	
23-Aug	1745	M	580	67447	9 - 49	
23-Aug	1745	F	560	67447	10 - 50	
23-Aug	1845	F	650	67448	1 - 41	
23-Aug	1545	F	640	67448	2 - 42	Gillnet marks
24-Aug	1545	M	730	67448	3 - 43	
24-Aug	1545	F	585	67448	4 - 44	
24-Aug	1545	M	620	67448	5 - 45	Gillnet marks
24-Aug	1545	F	650	67448	6 - 46	
24-Aug	1545	F	680	67448	7 - 47	
24-Aug	1630	F	600	67448	8 - 48	
24-Aug	1630	M	630	67448	9 - 49	
24-Aug	1630	M	700	67448	10 - 50	
24-Aug	1630	F	630	67449	1 - 41	
24-Aug	1630	F	675	67449	2 - 42	
24-Aug	1630	F	600	67449	3 - 43	
24-Aug	1630	F	575	67449	4 - 44	
24-Aug	1630	M	680	67449	5 - 45	
24-Aug	1630	M	590	67449	6 - 46	
24-Aug	1630	F	540	67449	7 - 47	
24-Aug	1630	M	705	67449	8 - 48	
24-Aug	1630	F	660	67449	9 - 49	
24-Aug	1630	F	675	67449	10 - 50	
24-Aug	1630	M	690	67450	1 - 41	

24-Aug 1630 F 580 67450 2 - 42 Fungus strip behind dorsal fin
 Appendix Table 6. (continued).

Date	Time	Sex	(mm)	Scale Book		Comments
				Number	Position	
24-Aug	1630	F	660	67450	3 - 43	
24-Aug	1630	M	700	67450	4 - 44	
24-Aug	1630	M	705	67450	5 - 45	
24-Aug	1630	F	650	67450	6 - 46	
24-Aug	1630	F	605	67450	7 - 47	
24-Aug	1630	M	710	67450	8 - 48	
24-Aug	1630	F	620	67450	9 - 49	
24-Aug	1630	M	620	67450	10 - 50	
24-Aug	1630	F	570	67442	1 - 41	
24-Aug	1630	F	625	67442	2 - 42	
24-Aug	1630	M	690	67442	3 - 43	
24-Aug	1630	M	580	67442	4 - 44	
24-Aug	1630	M	580	67442	5 - 45	
25-Aug	1545	F	640	67442	6 - 46	Top half of tail torn off
25-Aug	1545	F	675	67442	7 - 47	
25-Aug	1545	M	585	67442	8 - 48	
25-Aug	1545	F	635	67442	9 - 49	
25-Aug	1545	M	690	67442	10 - 50	
25-Aug	1545	F	580	67443	1 - 41	
25-Aug	1545	F	600	67443	2 - 42	
25-Aug	1545	F	605	67443	3 - 43	
25-Aug	1545	F	560	67443	4 - 44	Mess of gillnet marks; hole in side
27-Aug	1600	F	570	67443	5 - 45	
27-Aug	1600	M	710	67443	6 - 46	
27-Aug	1600	M	620	67443	7 - 47	
28-Aug	915	F	655	67443	8 - 48	
28-Aug	915	M	705	67443	9 - 49	Fungus on nose; rotten
28-Aug	1545	M	610	67443	10 - 50	
28-Aug	1545	F	645	67444	1 - 41	
28-Aug	1545	M	710	67444	2 - 42	
28-Aug	1545	F	605	67444	3 - 43	
28-Aug	1545	F	600	67444	4 - 44	
28-Aug	1545	F	585	67444	5 - 45	
28-Aug	1545	M	715	67444	6 - 46	
28-Aug	1545	F	650	67444	7 - 47	
28-Aug	1545	F	650	67444	8 - 48	
28-Aug	1545	F	660	67444	9 - 49	
28-Aug	1545	F	650	67444	10 - 50	
28-Aug	1545	F	560	67445	1 - 41	
28-Aug	1545	M	650	67445	2 - 42	
1-Sep	1730	F	635	67445	3 - 43	Lower portion of caudal fin missing
1-Sep	1800	F	685	67445	4 - 44	
1-Sep	1800	M	605	67445	5 - 45	Puncture wound by dorsal
2-Sep	1820	M	625	67445	6 - 46	
2-Sep	1820	M	700	67445	7 - 47	

3-Sep	1800	M	640	67445	8 - 48
		F	585	67445	9 - 49

Appendix Table 6. (concluded).

Date	Time	Sex	NF Length (mm)	Scale Book		Comments
				Number	Position	
3-Sep	1800	F	560	67445	10 - 50	
4-Sep	920	M	705	67439	1 - 31	Only 4 scales taken
4-Sep	1645	M	600	67439	2 - 42	Gillnetted
4-Sep	1815	F	540	67439	3 - 43	
5-Sep	830	M	680	67439	4 - 44	
5-Sep	1800	M	640	67439	5 - 45	
5-Sep	1800	M	630	67439	6 - 46	
5-Sep	1800	F	560	67439	7 - 47	
6-Sep	1815	M	660	67439	8 - 48	
11-Sep	1730	F	625	67439	9 - 49	
11-Sep	1730	M	560	67439	10 - 50	
14-Sep	915	M	690	67440	1 - 41	Damaged gills; gillnetted
14-Sep	915	M	670	67440	2 - 42	Fungus on adipose fin and tail
14-Sep	915	F	630	67440	3 - 43	
14-Sep	1615	M	650	67440	4 - 44	
14-Sep	1615	F	570	67440	5 - 45	
14-Sep	1900	M	650	67440	6 - 46	
17-Sep	1700	F	635	67440	7 - 47	
21-Sep	1800	F	635	67440	8 - 48	
22-Sep	930	F	625	67440	9 - 49	
24-Sep	1900	M	670	67440	10 - 50	

Appendix Table 7. Sampling data for all sockeye salmon carcasses recovered from the Sustut River fence, 2004.

Date	Time	Sex	Length (mm)		Comments
			NF	P.O.H	
24-Aug	1730	F	61 0 59	490	Clean
24-Aug	1730	F	56 0	485	Clean outside; parasites on liver
24-Aug	1730	F	61 0	460	Gash on right side; parasites in liver
25-Aug	945	F	64 5 61	490	Depression in side at dorsal fin; dorsal fin split; parasites in pyloric caeca
27-Aug	1000	F	70 0 58	510	Fresh scrape below dorsal; flesh missing on dorsal fin
27-Aug	1000	M	71 0	550	Big hole on lower portion of side near belly
27-Aug	1000	F	65 0	470	
28-Aug	2000	M	65 0	570	
31-Aug	830	M	54 0	520	Lots of fungus on nose and around fins
3-Sep	1700	F	57 5 0	450	
4-Sep	1000	F	69 0	470	Still moving gills slightly but too far gone to revive
6-Sep	945	M	59 0	540	Fungus on nose and around fins; still alive - released downstream
14-Sep	945	M	69 0	460	Most of fins rotted off
16-Sep	945	M	68 0	540	gaff hole in sides; still alive but not enough to revive
22-Sep	1915	M	70 0	545	
22-Sep	1915	M	69 0	550	
25-Sep	1930	M	60 5 0	560	
28-Sep	1930	F	55 0	485	
28-Sep	1930	F	55 0	440	

Appendix Table 8. Sampling data from all coho salmon migrating past the Sustut River fence, 2004.

Date	Time	Sex	NF Length (mm)	Scale Book		Comments
				Number	Position	
7-Aug	1850	F	465	67412	1 - 41	Small amount of fungus on tail
9-Aug	1740	M	460	67412	2 - 42	
13-Aug	1530	M	610	67412	3 - 43	
13-Aug	1815	M	585	67412	4 - 44	
16-Aug	1830	M	485	67412	5 - 45	
17-Aug	1645	M	505	67412	6 - 46	
19-Aug	1700	M	450	67412	7 - 47	Old scratches on side
28-Aug	1545	M	550	67412	8 - 48	No punch, got away
28-Aug	1545	F	690	67412	9 - 49	
2-Sep	840	F	645	67412	10 - 50	Fungus spot on nose
2-Sep	1620	M	680	67437	1 - 41	
2-Sep	1620	M	640	67437	2 - 42	
3-Sep	1530	M	600	67437	3 - 43	
6-Sep	1815	F	645	67437	4 - 44	
7-Sep	915	M	670	67437	5 - 45	
14-Sep	1615	M	630	67437	6 - 46	
21-Sep	1800	M	690	67437	7 - 47	
21-Sep	1800	M	630	67437	8 - 48	
22-Sep	1600	F	690	67437	9 - 49	
23-Sep	1930	M	670	67437	10 - 50	
24-Sep	930	M	660	67438	1 - 31	
24-Sep	1645	M	640	67438	2 - 42	
24-Sep	1645	M	720	67438	3 - 43	
24-Sep	1645	M	725	67438	4 - 44	
24-Sep	1645	M	735	67438	5 - 45	

Appendix Table 9. Daily staff gauge height, air and water temperature and weather conditions for the upper Sustut River, 2004.

Date	Time	Staff Gauge (m)	Temperature (°C)				Weather
			Water		Air		
			Max	Min	Max	Min	
27-Jul	22:00	0.39					mostly clear
28-Jul	8:45	0.385					mostly clear
	20:15	0.375	15.0	12.0	25.0	4.5	20% clear patches
29-Jul	8:45	0.385					a few clear patches
	20:15	0.375	14.5	14.0	26.5	9.5	25% clear patches
30-Jul	8:30	0.37					50% clear
	20:30	0.365	14.0	11.5	19.5	4.5	80% clear
31-Jul	8:50	0.36					mostly clear
	20:40	0.355	14.0	9.5	25.0	-3.0	mostly clear
1-Aug	8:30	0.355					clear, with very thin clouds
	20:00	0.35	14.0	10.0	21.0	-3.0	mostly cloudy
2-Aug	8:35	0.345					high cloud cover
	20:30	0.335	13.0	10.5	20.0	7.0	cloudy, starting to rain
							partly clearing, rain last night
3-Aug	8:30	0.365					50% clear
	20:30	0.375	14.0	11.0	18.5	8.5	completely clear
4-Aug	8:40	0.365					mostly clear
	19:40	0.36	13.5	10.5	23.0	-0.5	partly clear
5-Aug	8:45	0.355					overcast lots of rain
	19:30	0.415	13.5	10.5	16.5	4.0	around 5 am
6-Aug	8:50	0.51					overcast slight mist
	19:50	0.54	13.0	10.0	13.5	8.5	clear patches
7-Aug	9:00	0.49					high overcast
	20:00	0.47	12.0	10.0	14.5	5.5	partly clear
8-Aug	8:30	0.455					partly clear
	20:00	0.425	14.0	10.0	19.5	4.5	mostly clear
9-Aug	8:45	0.415					clear
	20:00	0.395	14.5	9.5	22.5	-2.0	mostly clear
10-Aug	8:45	0.39					mostly clear with thin clouds
	20:10	0.375	14.5	10.0	24.0	-1.5	high cloud cover with a few clear patches
11-Aug	8:30	0.375					mostly clear
	19:45	0.365	14.5	11.0	23.5	2.5	mostly clear
12-Aug	9:00	0.36					clear with some clouds
	20:00	0.35	15.0	10.0	26.5	-1.0	clear; some high, thin clouds
13-Aug	9:00	0.345					clear with some clouds
	20:00	0.34	16.5	12.0	27.5	7.5	clear; some high, thin clouds
14-Aug	9:00	0.335					completely clear
	20:30	0.33	17.0	11.5	29.5	2.5	mostly clear
15-Aug	8:45	0.33					mostly clear
	20:15	0.325	16.5	12.5	29.5	7.5	partly cloudy

Appendix Table 9. (continued).

Date	Time	Staff Gauge (m)	Temperature (°C)				Weather
			Water		Air		
			Max	Min	Max	Min	
16-Aug	9:15	0.325					clear with a few thin clouds
	20:00	0.32	17.5	12.0	29.0	3.5	partly cloudy
17-Aug	8:30	0.315					completely clear
	20:00	0.315	17.0	11.5	30.0	2.0	partly cloudy
18-Aug	9:00	0.315					completely clear, some rain last night
	19:45	0.315	17.0	13.5	28.5	7.5	partly cloudy
19-Aug	8:45	0.32					completely clear
	20:00	0.315	16.0	11.0	27.5	1.5	partly cloudy
20-Aug	9:00	0.305					mostly clear
	20:00	0.305	12.5	15.5	21.5	5.5	mostly cloudy; raining lightly
21-Aug	8:45	0.3					cloudy; light rain
	20:00	0.305	13.5	12.0	13.5	9.0	45% clear
22-Aug	9:00	0.3					cloudy
	20:00	0.3	12.0	8.5	10.5	3.0	overcast; low cloud; lightly raining
23-Aug	8:45	0.295					clear above fog
	19:45	0.295	10.5	6.5	15.5	-1.5	partly clear
24-Aug	9:15	0.29					completely clear
	20:00	0.28	?	6.0	18.5	-4.5	high broken clouds
25-Aug	9:15	0.275					completely clear
	19:45	0.275	?	?	21.5	-3.5	partly cloudy
26-Aug	9:30	0.265					clear
	20:00	0.265	?	?	20.0	-1.0	partly clear
27-Aug	9:30	0.26					overcast
	20:00	0.27	?	?	14.0	6.0	overcast, raining
28-Aug	9:15	0.305					mostly cloudy
	20:00	0.315	12.5	?	15.1	4.0	partly cloudy
29-Aug	9:15	0.305					clear with a few clouds
	19:30	0.3	12.0	5.5	15.5	-3.5	partly cloudy
30-Aug	9:00	0.295					clear patches/rain showers
	19:30	0.28	12.0	7.0	15.0	2.0	40% clear
31-Aug	8:15	0.285					cloudy; light rain
	19:30	0.29	12.0	7.0	12.5	-0.5	a few clear patches; light rain
1-Sep	8:45	0.295					cloudy, some low cloud
	19:15	0.3	11.5	6.5	12.5	2.0	overcast, misting
2-Sep	8:40	0.305					foggy, clear above
	17:30	0.3	11.5	5.5	16.5	-1.0	high overcast
3-Sep	9:20	0.295					cloudy
	19:15	0.295	10.5	9.0	15.0	6.5	high overcast
4-Sep	9:20	0.31					cloudy: rain through night
	19:15	0.335	11.0	8.5	15.0	4.5	50% clear

Appendix Table 9. (continued).

Date	Time	Staff Gauge (m)	Temperature (°C)				Weather
			Water		Air		
			Max	Min	Max	Min	
5-Sep	8:30	0.33					foggy, but starting to lift high cloud cover, a few clear patches high broken clouds with clear patches
	19:15	0.325	11.0	6.0	13.0	-1.5	
6-Sep	9:30	0.325					high broken clouds with clear patches 50% clear
	19:15	0.32	10.5	6.5	13.0	2.5	
7-Sep	9:15	0.315					mostly cloudy, a few clear patches overcast
	19:15	0.31	10.0	6.5	12.0	0.0	
8-Sep	9:25	0.31					cloudy, light snow cloudy, cold, and windy
	19:20	0.305	10.0	5.5	7.0	-1.0	
9-Sep	9:00	0.305					low cloud; light snow overcast, flakes of snow drifting around
	19:10	0.3	6.5	4.0	3.5	-2.5	
10-Sep	8:30	0.3					cloudy; very fine light snow cloudy
	19:10	0.29	6.5	4.5	6.0	-1.0	
11-Sep	9:20	0.3					cloudy, misty rain cloudy
	18:40	0.31	7.0	4.5	8.0	1.0	
12-Sep	9:30	0.325					some clouds, sunny a few clear patches
	19:15	0.325	8.0	4.0	11.0	1.0	
13-Sep	9:30	0.315					some clouds, sunny a few clear patches
	19:10	0.315	8.0	4.0	11.0	1.0	
14-Sep	9:15	0.315					cloudy, light rain 60% clear
	19:15	0.32	8.5	5.5	11.0	3.0	
15-Sep	9:30	0.32					cloudy, wet snow 60% clear
	18:45	0.325	7.5	4.0	9.5	-2.5	
16-Sep	9:45	0.325					overcast, snowing 80% clear
	20:30	0.34	7.5	2.5	4.0	-4.0	
17-Sep	9:20	0.34					mostly cloudy cloudy
	19:00	0.34	6.0	4.0	5.0	-2.0	
18-Sep	9:00	0.335					cloudy, light snow cloudy, a few clear spots
	19:00	0.33	5.0	3.5	4.0	-1.0	
19-Sep	9:15	0.325					partly clear mostly clear
	19:45	0.32	5.5	3.0	7.0	-2.0	
20-Sep	9:00	0.315					mostly cloudy overcast
	19:00	0.315	5.5	2.5	3.0	-6.0	
21-Sep	9:15	0.32					cloudy, raining partly cloudy
	19:00	0.35	6.0	3.0	9.0	1.5	
22-Sep	9:30	0.375					partly clear overcast, raining
	19:15	0.37	5.5	3.5	8.0	2.0	
23-Sep	9:30	0.37					overcast raining overcast raining
	19:30	0.365	6.0	3.5	7.0	2.0	
24-Sep	9:30	0.395					mostly cloudy, raining partly clear
	19:00	0.415	7.5	4.5	9.5	4.5	
25-Sep	9:45	0.435					mostly clear completely clear
	19:45	0.43	6.5	4.0	10.5	0.5	

Appendix Table 9. (concluded).

Date	Time	Staff Gauge (m)	Temperature (°C)				Weather
			Water		Air		
			Max	Min	Max	Min	
26-Sep	9:30	0.415					completely clear
	19:15	0.415	7.0	3.5	12.0	-5.0	high clouds
27-Sep	9:30	0.405					mostly cloudy
	19:45	0.4	6.5	3.0	9.0	-4.0	mostly clear
28-Sep	9:00	0.39					completely clear
	19:30	0.375	6.5	2.5	12.0	-4.0	completely clear
29-Sep	9:30	0.37					partly clear
	19:30	0.365	5.5	1.5	10.0	-8.0	partly clear
30-Sep	10:30	0.35					mostly clear

Appendix Table 10. Statistical week definitions for 2004.

Statistical Week	Calendar Week
7-5	July 26 to August 1
8-1	August 2 to 8
8-2	August 9 to 15
8-3	August 16 to 22
8-4	August 23 to 29
9-1	August 30 to September 5
9-2	September 6 to 12
9-3	September 13 to 19
9-4	September 20 to 26
10-1	September 27 to October 3

Appendix Table 11. Age data based on scale analysis for all steelhead sampled at the Sustut River fence, 2004.

Date	Sex	NF Lgth (mm)	r	Cond			
				Scale Book Numbe	Position	Code	Age
Date	Sex	NF Lgth (mm)	r	Scale Book Numbe	Position	Code	Age
6-Aug	F	705	67419	1~41	1	4.2+	
10-Aug	F	845	67419	2~42	1	4.3+	
10-Aug	M	845	67419	3~43	5	4.3+	
10-Aug	M	850	67419	4~44	1	4.3+	
10-Aug	F	735	67419	5~45	1	4.2+	
10-Aug	F	730	67419	6~46	2	4.2+	fw poor condition
10-Aug	F	660	67419	7~47	1	4.2+	
10-Aug	F	830	67419	8~48	1	4.3+	
10-Aug	F	770	67419	9~49	1	4.2+	
15-Aug	M	875	67419	10~50	1	4.3+	
15-Aug	F	805	67420	1~41	1	4.2+	
15-Aug	M	890	67420	2~42	1	4.3+	
15-Aug	F	780	67420	3~43	1	5.3+	
15-Aug	F	730	67420	4~44	1	4.2+	
15-Aug	F	795	67420	5~45	1	4.3+	R.2S1
15-Aug	F	820	67420	6~46	6	+	
15-Aug	F	720	67420	7~47	1	4.2+	
15-Aug	M	940	67420	8~48	1	4.3+	
15-Aug	M	780	67420	9~49	1	5.2+	
15-Aug	M	875	67420	10~50	1	4.3+	
15-Aug	F	820	67421	1~41	1	4.3+	
15-Aug	F	680	67421	2~42	1	4.2+	
19-Aug	M	860	67421	3~43	5	4.3+	
19-Aug	M	730	67421	4~44	1	4.2+	
19-Aug	F	730	67421	5~45	1	4.2+	
19-Aug	F	685	67421	6~46	1	4.2+	
19-Aug	M	805	67421	7~47	1	3.2+	
19-Aug	F	730	67421	8~48	1	5.2+	
19-Aug	F	760	67421	9~49	5	4.3+	
19-Aug	F	695	67421	10~50	1	4.2+	
21-Aug	M	915	67422	1~41	1	4.3+	
21-Aug	M	870	67422	2~42	1	4.3+	
22-Aug	M	720	67422	3~43	2	4.2+	fw poor condition
22-Aug	F	685	67422	4~44	1	4.2+	
22-Aug	F	775	67422	5~45	9	4.3+	
22-Aug	M	860	67422	6~46	6	R.3+	
22-Aug	M	785	67422	7~47	6	R.2+	
22-Aug	F	785	67422	8~48	9	5.2+	
22-Aug	F	770	67422	9~49	1	4.3+	
25-Aug	F	815	67422	10~50	9	4.3+	
25-Aug	F	680	67423	1~41	6	R.2+	
25-Aug	M	875	67423	2~42	1	4.3+	
25-Aug	F	740	67423	3~43	1	5.2+	
25-Aug	F	790	67423	4~44	1	4.2+	

26-Aug	M	830	67423	5~45	1	4.3+
26-Aug	F	805	67423	6~46	1	3.2S1+
26-Aug	F	530	67423	7~47	1	5.1+

Appendix Table 11. (continued).

Date	Sex	NF Lgth (mm)	Scale Numbe r	Cond			
				Book		Code	
				Numbe r	Position		
Date	Sex	NF Lgth (mm)	Scale Numbe r	Position	Code	Age	Comments
26-Aug	F	740	67423	8~48	1	5.2+	
26-Aug	F	730	67423	9~49	1	4.2+	
26-Aug	M	790	67423	10~50	1	4.2+	
26-Aug	M	910	67424	1~41	1	4.3+	
26-Aug	F	730	67424	2~42	6	R.2+	
26-Aug	F	740	67424	3~43	1	4.2+	
26-Aug	M	760	67424	4~44	1	4.2+	
26-Aug	F	780	67424	5~45	6	R.2+	
26-Aug	M	740	67424	6~46	1	4.2+	
26-Aug	F	715	67424	7~47	1	4.2+	
27-Aug	F	820	67424	8~48	1	4.3+	
27-Aug	F	695	67424	9~49	1	5.2+	
27-Aug	F	880	67424	10~50	1	5.3+	
27-Aug	F	805	67425	1~41	1	4.2S1+	
27-Aug	F	735	67425	2~42	1	4.2+	
27-Aug	M	830	67425	3~43	6	R.3+	
28-Aug	F	730	67425	4~44	9	4.2+	
28-Aug	F	720	67425	5~45	1	4.2+	
28-Aug	F	725	67425	6~46	1	4.2+	
28-Aug	M	840	67425	7~47	1	4.3+	
29-Aug	F	765	67425	8~48	1	4.2S1+	
29-Aug	F	820	67425	9~49	1	4.3+	
29-Aug	F	740	67425	10~50	6	R.2+	
30-Aug	F	810	67426	1~41	1	4.3+	
30-Aug	F	825	67426	2~42	2	4.2S1+ fw poor condition	
30-Aug	M	800	67426	3~43	1	4.2+	
30-Aug	M	745	67426	4~44	1	4.2+	
30-Aug	F	790	67426	5~45	1	4.3+	
2-Sep	M	795	67426	6~46	1	4.2+	
2-Sep	F	740	67426	7~47	1	4.2S1+	
2-Sep	M	840	67426	8~48	1	3.3+	
2-Sep	F	735	67426	9~49	1	4.3+	
2-Sep	M	815	67426	10~50	5	3.3+	
3-Sep	M	920	67427	1~41	6	R.3+	
3-Sep	M	875	67427	2~42	6	R.3+	
3-Sep	F	715	67427	3~43	1	3.2+	
3-Sep	M	855	67427	4~44	5	4.3+	
3-Sep	F	815	67427	5~45	5	4.3+	
3-Sep	M	820	67427	6~46	1	4.3+	
3-Sep	F	670	67427	7~47	1	4.2+	
3-Sep	M	795	67427	8~48	1	5.2+	
3-Sep	M	780	67427	9~49	6	R.2+	
3-Sep	F	775	67427	10~50	1	4.3+	
3-Sep	F	720	67428	1~41	1	4.2+	

3-Sep	F	710	67428	2~42	1	4.2+
3-Sep	F	680	67428	3~43	1	4.2+
3-Sep	F	740	67428	4~44	1	4.2+
3-Sep	F	710	67428	5~45	1	5.2+

Appendix Table 11. (continued).

Date	Sex	NF Lgth (mm)	Scale Book Numbe	Cond			Comments
				r	Position	Code	
						Age	
3-Sep	M	835	67428	6~46	1	4.3+	
3-Sep	F	735	67428	7~47	1	4.2+	
3-Sep	F	715	67428	8~48	1	5.2+	
4-Sep	F	755	67428	9~49	1	4.2+	
4-Sep	F	825	67428	10~50	1	4.3+	
4-Sep	F	725	67429	1~41	1	4.3+	
4-Sep	F	715	67429	2~42	1	4.2+	
4-Sep	F	710	67429	3~43	1	4.2+	
4-Sep	F	785	67429	4~44	1	4.3+	
4-Sep	M	755	67429	5~45	1	4.2+	
4-Sep	M	785	67429	6~46	1	4.2+	
4-Sep	F	745	67429	7~47	1	5.2+	
4-Sep	F	775	67429	8~48	2	4.2+	fw poor condition
4-Sep	F	740	67429	9~49	6	R.2+	
4-Sep	F	700	67429	10~50	6	R.2+	
5-Sep	F	770	67430	1~41	1	4.3+	
5-Sep	F	720	67430	2~42	1	4.2+	
5-Sep	F	700	67430	3~43	1	4.2+	
5-Sep	F	645	67430	4~44	1	4.2+	
5-Sep	F	700	67430	5~45	1	4.2+	
5-Sep	F	740	67430	6~46	1	4.2S1+	
6-Sep	F	840	67430	7~47	1	4.3+	
6-Sep	F	680	67430	8~48	1	5.2+	
6-Sep	M	760	67430	9~49	1	4.2+	
6-Sep	M	840	67430	10~50	1	4.3+	
6-Sep	M	740	67431	1~41	1	4.2+	
6-Sep	F	660	67431	2~42	6	R.2+	
6-Sep	M	740	67431	3~43	1	4.2+	
6-Sep	F	730	67431	4~44	1	4.3+	
6-Sep	F	710	67431	5~45	1	4.2+	
6-Sep	F	760	67431	6~46	1	5.2+	
7-Sep	M	720	67431	7~47	1	4.2+	
7-Sep	F	715	67431	8~48	1	4.2+	
7-Sep	F	700	67431	9~49	1	5.2+	
7-Sep	F	660	67431	10~50	5	4.2+	
7-Sep	F	785	67432	1~41	1	4.3+	
7-Sep	F	760	67432	2~42	1	4.2+	
7-Sep	F	720	67432	3~43	1	5.2+	
7-Sep	F	685	67432	4~44	1	5.2+	
11-Sep	M	740	67432	5~45	1	4.2+	
11-Sep	M	725	67432	6~46	1	4.2+	
14-Sep	M	800	67432	7~47	1	4.3+	
14-Sep	M	785	67432	8~48	5	3.2S1+	

14-Sep	F	735	67432	9~49	1	4.2+
14-Sep	F	710	67432	10~50	1	4.3+
14-Sep	F	745	67433	1~41	1	4.2+
14-Sep	M	710	67433	2~42	1	4.2+
17-Sep	F	700	67433	3~43	6	R.2+

Appendix Table 11. (continued).

Date	Sex	NF Lgth (mm)	Scale Book Numbe	Cond			Comments	
				.				
				r	Position	Code		
17-Sep	F	695	67433	4~44	1	4.2+		
17-Sep	F	820	67433	5~45	1	4.2S1+		
17-Sep	M	800	67433	6~46	1	4.3+		
17-Sep	M	815	67433	7~47	1	4.3+		
17-Sep	F	685	67433	8~48	1	4.2+		
17-Sep	M	760	67433	9~49	1	5.2+		
17-Sep	M	880	67433	10~50	6	R.3+		
17-Sep	F	720	67434	1~41	1	4.2+		
17-Sep	M	910	67434	2~42	6	R.3+		
17-Sep	F	730	67434	3~43	1	5.2+		
17-Sep	M	880	67434	4~44	1	4.3+		
17-Sep	F	700	67434	5~45	1	5.2+		
17-Sep	F	745	67434	6~46	1	4.3+		
17-Sep	F	750	67434	7~47	1	4.2+		
17-Sep	M	730	67434	8~48	1	5.2+		
17-Sep	F	780	67434	9~49	6	R.3+		
17-Sep	M	760	67434	10~50	1	4.2+		
17-Sep	F	860	67435	1~41	1	4.3S1+		
17-Sep	F	810	67435	2~42	9	4.2+		
17-Sep	M	830	67435	3~43	8	4.3+	vague 3rd ma on edge	
17-Sep	M	890	67435	4~44	1	4.2S1+		
17-Sep	M	830	67435	5~45	1	4.2+		
17-Sep	M	865	67435	6~46	1	3.3+		
17-Sep	M	880	67435	7~47	6	R.3+		
17-Sep	M	835	67435	8~48	2	4.3+	fw poor condition	
17-Sep	M	845	67435	9~49	1	4.3+		
17-Sep	M	780	67435	10~50	8	4.3+		
23-Sep	M	870	67436	1~41	1	4.3+		
23-Sep	F	760	67436	2~42	8	4.2S1+		
23-Sep	F	670	67436	3~43	8	4.2+		
23-Sep	M	800	67436	4~44	6	R.3+		
23-Sep	M	850	67436	5~45	1	5.3+		
23-Sep	M	880	67436	6~46	1	4.3+		
23-Sep	F	670	67436	7~47	1	4.2+		
23-Sep	F	720	67436	8~48	1	4.2+		
23-Sep	F	825	67436	9~49	1	4.3+		
23-Sep	M	720	67436	10~50	1	4.2+		
						R.2S1		
25-Sep	M	765	44181	1~41	6	+		
25-Sep	M	830	44181	2~42	1	3.2S1+		
25-Sep	M	980	44181	3~43	1	4.4+		
25-Sep	M	830	44181	4~44	2	5.2S1+	fw poor condition	

25-Sep	F	725	44181	5~45	1	5.2+
25-Sep	M	775	44181	6~46	1	4.2+
25-Sep	F	810	44181	7~47	1	5.2S1+ R.2S1
25-Sep	F	770	44181	8~48	6	+
25-Sep	M	865	44181	9~49	6	R.3+
25-Sep	F	755	44181	10~50	5	5.2+
25-Sep	F	795	44182	1~41	1	4.3+

Appendix Table 11. (concluded).

Date	Sex	(mm)	NF Lgth r	Scale Book Numbe	Cond		
					Position	Code	Age
25-Sep	F	835	44182	2~42	6		R.2S1
25-Sep	F	725	44182	3~43	6		R.3+
25-Sep	M	745	44182	4~44	1		5.2+
25-Sep	M	900	44182	5~45	1		4.3+
25-Sep	F	760	44182	6~46	1		4.3+
25-Sep	F	820	44182	7~47	1		4.2S1+
25-Sep	F	745	44182	8~48	1		4.2+
25-Sep	M	770	44182	9~49	1		4.2+
25-Sep	F	830	44182	10~50	1		5.3+
25-Sep	F	760	44183	1~41	8		4.3+
25-Sep	M	880	44183	2~42	1		4.3+
25-Sep	M	830	44183	3~43	2		4.3+ fw poor condition
25-Sep	F	680	44183	4~44	2		4.2+ fw poor condition
25-Sep	F	705	44183	5~45	1		4.2+
25-Sep	F	805	44183	6~46	1		4.2S1+
25-Sep	M	730	44183	7~47	1		4.2+
25-Sep	M	780	44183	8~48	1		4.3+

Appendix Table 12. Scale condition code definitions.

Condition Code	Definition
1	good condition
	poor condition or questionable age (i.e. difficult to interpret due to poor quality)
2	freshwater age unreadable (e.g. U.2+)
3	unreadable (e.g. U.U+)
4	starting to regenerate (may underestimate freshwater age)
5	regenerated (e.g. R.2+)
6	missing
7	resorption at scale edge (e.g. Last marine annulus just visible on edge of scale)
8	first freshwater annulus very vague, but must be present due to high curculi count and spacing relative to other freshwater annuli.

Appendix Table 13. Summary, by sex and freshwater age, of all steelhead sampled at the Sustut River fence, 2004.

Age	Male		Female		Total	
	N	%	N	%	N	%
3.2+	1	1.2%	1	0.8%	2	1.0%
3.2S1+	2	2.5%	1	0.8%	3	1.4%
3.3+	3	3.7%	0	0.0%	3	1.4%
Total	6	7.4%	2	1.6%	8	3.8%
4.2+	23	28.4%	52	40.9%	75	36.1%
4.2S1+	1	1.2%	9	7.1%	10	4.8%
4.3+	31	38.3%	28	22.0%	59	28.4%
4.3S1+	0	0.0%	1	0.8%	1	0.5%
4.4+	1	1.2%	0	0.0%	1	0.5%
Total	56	69.1%	90	70.9%	146	70.2%
5.1	0	0.0%	1	0.8%	1	0.5%
5.2+	5	6.2%	17	13.4%	22	10.6%
5.2S1+	1	1.2%	1	0.8%	2	1.0%
5.3+	1	1.2%	3	2.4%	4	1.9%
Total	7	8.6%	22	17.3%	29	13.9%
R.2+	2	2.5%	8	6.3%	10	4.8%
R.2S1+	1	1.2%	3	2.4%	4	1.9%
R.3+	9	11.1%	2	1.6%	11	5.3%
Total	12	14.8%	13	10.2%	25	12.0%
Grand Total	81	100.0%	127	100.0%	208	100.0%

Appendix Table 14. Summary, by sex and marine age, of all steelhead sampled at the Sustut River fence, 2004.

Age	Male		Female		Total	
	N	%	N	%	N	%
5.1+	0	0.0%	1	0.8%	1	0.5%
Total	0	0.0%	1	0.8%	1	0.5%
3.2+	1	1.2%	1	0.8%	2	1.0%
3.2S1+	2	2.5%	1	0.8%	3	1.4%
4.2+	23	28.4%	52	40.9%	75	36.1%
4.2S1+	1	1.2%	9	7.1%	10	4.8%
5.2+	5	6.2%	17	13.4%	22	10.6%
5.2S1+	1	1.2%	1	0.8%	2	1.0%
R.2+	2	2.5%	8	6.3%	10	4.8%
R.2S1+	1	1.2%	3	2.4%	4	1.9%
Total	36	44.4%	92	72.4%	128	61.5%
3.3+	3	3.7%	0	0.0%	3	1.4%
4.3+	31	38.3%	28	22.0%	59	28.4%
4.3S1+	0	0.0%	1	0.8%	1	0.5%
5.3+	1	1.2%	3	2.4%	4	1.9%
R.3+	9	11.1%	2	1.6%	11	5.3%
Total	44	54%	34	26.8%	78	37.5%
4.4+	1	1.2%	0	0.0%	1	0.5%
Total	1	1.2%	0	0.0%	1	0.5%
Grand Total	81	100.0%	127	100.0%	208	100.0%

Appendix Table 15. Historical review of the repeat spawner rate for the upper Sustut River steelhead population, based on scale sample analysis.

Year	Scales Read	Repeat Spawners		Source
		N	%	
1977 - 86	223	12	5.4%	Spence <i>et al.</i> 1990
1983	13	1	7.7%	Baxter 1997
1994	na	na	6.0%	Baxter 1997
1995	29	0	0.0%	Baxter 1997
1996	55	7	12.7%	Baxter 1997
2001	89	6	6.7%	Diewert 2002
2003	228	5	2.2%	Diewert 2004
2004	208	20	9.6%	Current report

Appendix Table 16. Number of steelhead past the fence and the number and percent of steelhead sampled, by sex, for statistical weeks 7-5 to 10-1.

Statistical Week	Steelhead Past the Fence			Steelhead Sampled				Total			
				Male		Female					
	M	F	Total	N	%	N	%				
7-5	0	1	1	0	0%	0	0%	0	0%		
8-1	0	2	2	0	0%	1	50%	1	50%		
8-2	24	51	75	3	13%	7	14%	10	13%		
8-3	51	54	105	12	24%	14	26%	26	25%		
8-4	53	107	160	8	15%	25	23%	33	21%		
9-1	140	226	366	14	10%	32	14%	46	13%		
9-2	7	16	23	7	100%	13	81%	20	87%		
9-3	11	32	43	3	27%	5	16%	8	19%		
9-4	134	130	264	34	25%	30	23%	64	24%		
10-1	0	3	3	0	0%	0	0%	0	0%		
Total	420	622	1042	81	19%	127	20%	208	20%		