BC Environment

Upper Sustut, Lower Sustut, and Bear River Steelhead: Summary of Current Data and Status Review, 1997

by

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Skeena Fisheries Report SK-98

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SUMMARY

This report summarizes the stock status, and current data available on, the upper Sustut, lower Sustut, and Bear River steelhead (*Oncorhynchus mykiss*) populations. The upper Sustut and lower Sustut/Bear sub-populations differ markedly in their life-history characteristics, and this may require that different management strategies are put in place for each population. The upper Sustut steelhead migrate earlier than lower Sustut steelhead, and this predisposes this population to a greater risk of incidental catch in the commercial fishery. Upper and lower Sustut steelhead also differ in size, freshwater and ocean residency, and habitat use. Total angler effort for steelhead, total catch of steelhead, and catch per unit effort trends on the Sustut River are summarized from the Steelhead Harvest Analysis database and from the Angling Guide Management System database. Management and future study recommendations are made to help in further study programs in the watershed.

ACKNOWLEDGEMENTS

I thank Dana Atagi, Chuck Parken, Joe DeGisi, and Colin Spence for helpful advice with this project. Dave Bustard was of particular help to me with this work based on his previous experience in the Sustut River system, and I thank him for his assistance. Funding for this work was provided by the Forest Renewal BC operational inventory program (Skeena Bulkley Region).

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1.0 INTRODUCTION

Of all summer/fall run steelhead (*Oncorhynchus mykiss*) that return to Skeena River tributaries each year, fish returning to the Sustut River are unique in terms of their early run timing compared to other systems (i.e., Cox-Rogers 1986; Spence *et al.* 1990; Bustard 1993a; R.S. Saimoto 1994; R.K. Saimoto 1995; Parken and Morten 1996). Sustut fish are of particular concern to fisheries managers in the Skeena Region due to this early timing, and its coincidence with major commercial fisheries for sockeye salmon (*O. nerka*) and pink salmon (*O. gorbuscha*) (Sprout and Kadowaki 1987). The upper Sustut population is also used as an index population to monitor the run strength of early migrating steelhead in the upper Skeena River (Parken and Morten 1996).

Most likely the Sustut population of steelhead can be separated into two sub-populations, with the Bear River being the geographic boundary between the upper and lower population. Based on this separation, these two populations may require different management strategies (Spence *et al.* 1990; Parken and Morten 1996; D. Atagi, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Fisheries Branch, Smithers, B.C., pers. comm.). It has been suggested that there are size and colour differences between the upper and lower population (Spence *et al.* 1990), and that the two populations begin their upstream migrations into the Skeena River at slightly different times during the year (Ward *et al.* 1993; C. Parken, Fisheries Consultant, Smithers, B.C., pers. comm.). Regardless, the Sustut River is a relatively pristine river, and is well known internationally for its large and abundant steelhead (Fennelley 1963).

The purpose of this report is to provide a summary of the data currently available on the population of steelhead that utilize the Sustut River, and to provide recommendations for future work to fill in the gaps in terms of life-history and fisheries management considerations. For the purpose of this review the Sustut River will be considered to consist of an upper and lower population, and data will be presented with specific regard to the upper and lower population where this division can be applied.

This review covers the following topics of the life-history of Sustut River steelhead:

1) Freshwater and ocean life-history review;
2) Identification and mapping of juvenile rearing areas, adult overwintering areas, and spawning site locations;
3) Review of past enhancement attempts;
4) Review of adult assessments;
5) Review of adult run timing;
6) Review of catch, angler effort, and catch per unit effort information;
7) Review of angling guide activity;
8) Review of creel survey information;
9) Review of current angling regulations;
10) Description of recreational fisheries;
11) Review of First Nations uses and harvests;
12) Review of minimum escapement requirements;
13) Summary of current stock status.

The main objective of this report is to also provide recommendations for management and future study of the population, and these recommendations are dealt with in the conclusions and recommendations section at the end of this report.

2.0 STUDY AREA

The site description of the Sustut River has been fully documented in previous studies (e.g., Chudyk 1972; Spence *et al.* 1990), and this short summary is based on those reports. The Sustut River is a tributary to the upper Skeena River (Figure 1). The waters of the Sustut originate from two headwater lakes (Sustut Lake and Johanson Lake), and the river flows in a southwesterly direction for 100 km to its confluence with the Skeena River (56°19'N, 127°22'W) at an elevation of 610 m above sea level. The river drains an area of approximately 3,574 km^2, and has seven major tributaries: Birdflat Creek, Bear River, Asitka River, Red Creek, Two Lake Creek, Moosevale Creek, and Johanson Creek (Parken and Morten 1996). Other fish species found in the system include chinook salmon (*O. tshawytscha*), sockeye salmon, coho salmon (*O. kisutch*), bull trout (*Salvelinus confluentus*), Dolly Varden (*S. malma*), and Rocky Mountain whitefish (*Prosopium williamsoni*).

For the purposes of this review the Sustut River has been broken into two sections (upper and lower) with the boundary being the Bear River confluence with the Sustut River (Figure 1). This is based on previous observations of there being two distinct sub-populations.

It is important to consider steelhead in the upper and lower Sustut River as two separate populations for a number of reasons. The primary reason is that fish in the upper and lower river have unique life-histories that may predispose them to different selective pressures from the environment, commercial harvest, angling harvest, and First Nations harvest. The second reason is that because these populations are found in different habitats in both the upper and lower river, population dynamics might vary and require different management strategies.

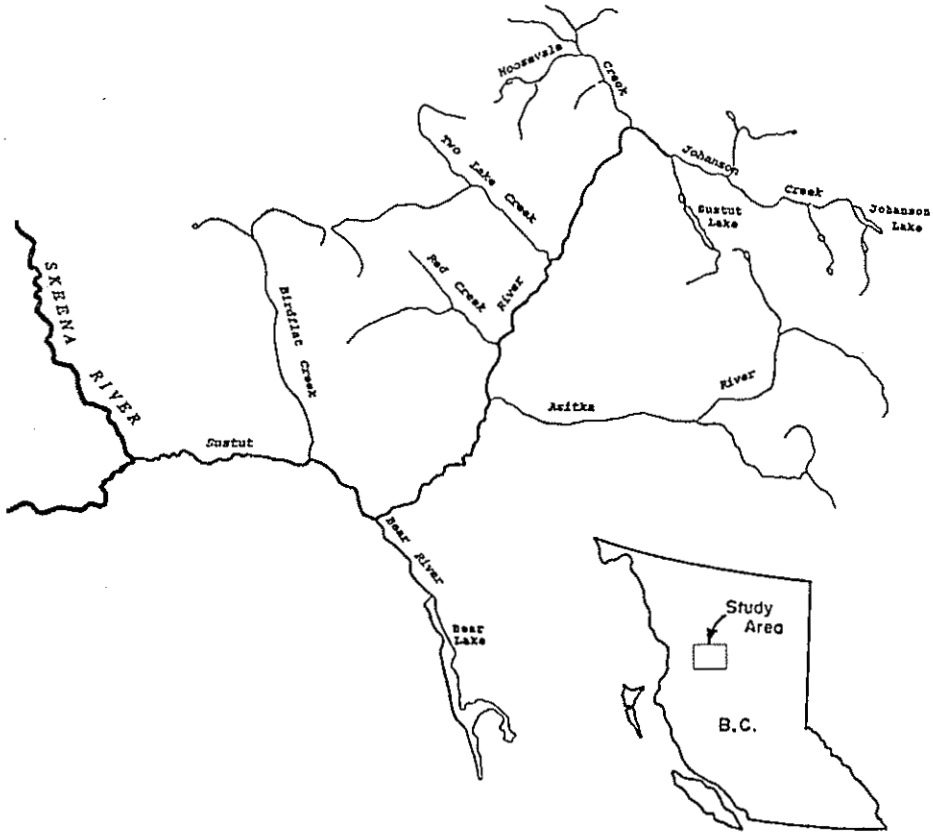

Figure 1. Location of the Sustut River watershed in northcentral British Columbia (Scale=1:340,000).

3.0 MATERIALS AND METHODS

3.1 Data Collection and Review

For this review, data were collected and reviewed from a number of sources to fully compile information available on the biology of Sustut River steelhead. These sources included:

1) M.E.L.P. stream files (Smithers, B.C.);
2) FISS/SISS database;
3) Cataloged reports in the M.E.L.P. library (Smithers, B.C.);
4) Steelhead Floy tag (TAGS) database;
5) Angling guide management system (AGMS) database;
6) Watershed Restoration Program reports;
7) Forest Renewal BC stream inventory reports;
8) Reports submitted under fish collection permit;
9) Steelhead harvest analysis (SHA) database;
10) Forest industry licensee(s);
11) Fisheries Improvement and Assessment Unit stream inventory reports;
12) Creel survey reports;
13) Primary literature sources;
14) M.E.L.P. fish scale archive data;
15) Personal communications with people that have worked in the Sustut River watershed.

3.2 Data Entry

Data were entered that were collected from M.E.L.P. aged scale information from sampled steelhead, and this entered data were used to calculate average lengths, weights, and ocean and freshwater residency periods where possible (the entered scale age data is found in Appendix I).

3.3 Database Searches

Supplied databases from the Ministry of Environment, Lands, and Parks were searched to collect information on steelhead movements and run timing, as well as information regarding angling activity from both the Steelhead Harvest Analysis database and the Angling Guide Management System database.

4.0 RESULTS AND DISCUSSION

4.1 Ocean Life-History (as determined by scale aging)

Most Sustut River steelhead spend on average two years in the ocean prior to their first spawning, but ocean residency can range from one to four years (Table 1). In terms of differentiation between the upper and lower sub-populations there are no differences (t-test, P=0.32) in the average number of years that individuals in the upper and lower river remain in the ocean prior to their first spawning (Table 2). Fish that were sampled in the upper river, however, did differ in that they were either 2 year or 3 year ocean residents, as opposed to fish sampled in the lower river which ranged from as low as 1 year of ocean residency to as high as 4 years of ocean residency (Table 2).

Table 1. Number of years that adult Sustut River steelhead (*Oncorhynchus mykiss*) remain in the ocean after migrating to sea as smolts prior to their first spawning (as determined from scale aging done by M.E.L.P.).

	Mean (years)	S.E.	Median (years)	Range (years)	N
All Individuals	2.22	0.01	2	1-4	921
Females	2.11	0.01	2	1-4	554
Males	2.39	0.03	2	1-4	363

4.2 Migration Timing through Fisheries and Oceans Canada Statistical Area 4 and into the Lower Skeena River

Sustut River steelhead begin their upstream migration through the lower Skeena River as early as June and continue through until at least well into August. A number of studies have shown that Sustut River steelhead migrate into the Skeena River through Fisheries and Oceans Canada Statistical Area 4 early in the commercial fishery season, predominantly with the peak effort of the sockeye fishery and run (Table 3). Preliminary data collected by Lough (1980) through the use of radio telemetry suggested that Sustut

Table 2. Number of years that adult steelhead (*Oncorhynchus mykiss*) of the Sustut River identified as belonging to the upper or lower river population remain in the ocean after migrating to sea as smolts prior to their first spawning (as determined from scale aging done by M.E.L.P.).

Population		Mean (years)	S.E.	Median (years)	Range (years)	N
Upper	All Individuals	2.27	0.04	2	2-3	101
	Females	2.13	0.05	2	2-3	54
	Males	2.43	0.07	2	2-3	46
Lower	All Individuals	2.30	0.04	2	1-4	199
	Females	2.13	0.04	2	1-3	108
	Males	2.49	0.06	3	1-4	91

Table 3. Migration timing of Sustut River steelhead (*Oncorhynchus mykiss*) through D.F.O. Canada Statistical Area 4 and into the lower Skeena River at Tyee.

Year	Timing	Method	Reference
1980	mid July to early Aug.	Radio Telemetry	Lough 1980
1984, 1985	mid to late July	Scale Analysis	Cox-Rogers 1985, 1986
1991	mid July, peak Aug. 2 (Upper Sustut) mid Aug. (Lower Sustut)	Back Calculation from Tag Information	Ward *et al.* 1993
1995	prior to Aug. 6	Radio Telemetry	Koski *et al.* 1995
1985-1996	June 25 to Aug. 10 (Upper Sustut) July 16 to Sept. 7 (Lower Sustut)	Back Calculation from Tag Information	C. Parken (pers. comm.)
1992-1995	June 25 to Aug. 4 (Upper Sustut) July 28 to Sept. 19 (Lower Sustut)	TAGS Database	This report (see Appendix II)

steelhead pass through Area 4 throughout the months of July, August, and September, with peak migrations during late July and early August. Cox-Rogers (1985) found from

analysis of the growth patterns of steelhead scales, that in 1984 and 1985 most of the steelhead harvested incidentally in the commercial sockeye opening were fish of Sustut River and Morice River origin. They were harvested predominately early in the fishing season (1984 and 1985, statistical week 31 and 32).

In 1992, the mode (peak) of run timing for Sustut fish migrating past the Tyee test fishery (located at the mouth of the Skeena River) was estimated at August 2, and the data suggested a secondary later peak, possibly due to the lower river population moving into the Skeena at a later date (Ward *et al.* 1993). The most recent estimates of run timing have concentrated on examining differences in timing between the upper river population and the lower river population. Although this data is in the preliminary stage, it was predicted that the mean date that tagged upper and lower Sustut River steelhead (pooled from 1985-1996 recaptures) entered Area 4 was July 17 and August 7, respectively (C. Parken, Fisheries Consultant, Smithers, B.C., pers. comm.).

4.3 Harvest Rates of Sustut River Steelhead in Area 4

Sustut River steelhead are harvested incidentally in commercial fisheries in Area 4, and perhaps the best estimates of commercial harvest rates are those predicted by Ward *et al.* (1993) based on model simulations. Predicted harvest rates for the period from 1986 to 1991 ranged from 34% (1986) to 52% (1988), with a mean (± S.E.) predicted annual harvest rate from 1986 to 1991 being 41.2% (± 3.5%).

4.4 Upstream Migration Rates

Once steelhead bound for the Sustut River enter the lower Skeena River, it was estimated for the upper Sustut population that it took about one month for these fish to reach their final destinations in the upper river (Lough 1980, 1981; Spence and Hooton 1992). To travel that distance in a month steelhead would, on average, have to migrate approximately 17 km per day. In 1994 radio tagged steelhead bound for the Sustut River traveled on average (±S.E.) 15.14 (±0.44) km per day (Koski *et al.* 1995), while in 1995 Sustut bound steelhead traveled on average 12.63 (±1.68) km per day (Alexander *et al.*

1996). The range and samples sizes of these estimates are small, suggesting that these migration statistics are all reasonable for Sustut River steelhead.

4.5 Minimum Escapement Levels

In 1992, Tautz *et al.* (1992) produced a model that predicted adult production of steelhead at carrying capacity, and the number of spawners at maximum sustainable yield (MSY) in rivers throughout the Skeena River watershed. This model was based on the total area and total useable area of streams containing steelhead for the summer low-flow period, and estimated stream width, as well as known population dynamics parameters for one B.C. steelhead population (Keogh River on Vancouver Island). For the upper and lower Sustut River these data are summarized in Table 4.

Table 4. Predicted adult steelhead (*Oncorhynchus mykiss*) production at carrying capacity (K) and the number of spawners at maximum sustainable yield (MSY) for the upper and lower Sustut River (from Tautz *et al.* 1992).

Population	Adult Production at Carrying Capacity (K)	Number of Spawners at MSY
Upper Sustut	1036	418
Lower Sustut	1875	638

4.6 Escapement Information

Most of the effort in estimating steelhead escapement into the Sustut River has concentrated on the upper Sustut population through the use of counting fences on the upper river. This is due to the early run-timing of the population, the fact that it is an index population for the upper Skeena River, and the feasibility of setting up sampling fences in this system. The fact that the upper Sustut population is likely to be impacted to a higher degree due to this easy access also requires monitoring of the population. A summary of escapement data that is available from previous reports suggests that the

number of steelhead migrating to the upper river has remained relatively stable (Table 5), although there is some yearly variation likely due to such factors as fishing effort in the commercial fishery, ocean survival (run strength), sampling methods, fence locations, and to a lesser extent, First Nations harvest. All estimates of steelhead escapement into the upper Sustut River have identified that when compared to the predicted production level at carrying capacity (K=1036 steelhead spawners: Tautz *et al.* 1992), these levels are considerably the below estimated carrying capacity. The population estimates made in the upper Sustut River, however, are above the predicted number of spawners at MSY (418: Tautz *et al.* 1992), suggesting that at the present time escapement levels in the upper river have not dropped to a point where there would be a severe conservation concern. It is possible also that K and MSY may be underestimated as Tautz *et al.* (1992) did not include Johanson Creek as potential rearing area (C. Parken, Fisheries Consultant, Smithers, B.C., pers. comm.).

In terms of lower river population estimates of escapement, the best data are available from an intense mark-recapture survey conducted in 1986 (Spence *et al.* 1990). These data indicated that the population of the lower river in 1986 had considerably more individuals within it (Table 6) than the upper river population, consistent with the model predictions by Tautz *et al.* (1992). The two highest estimates of population escapement in the lower river are markedly higher than the predicted adult production at carrying capacity (K=1875 steelhead spawners), and the number of spawners at MSY (638) estimated by Tautz *et al.* (1992). This would suggest that there is not a conservation concern in the lower river population due to minimum escapement levels not being met. However, 1986 was probably the greatest steelhead abundance ever seen throughout the entire geographical range, and may not reflect average escapement (D. Atagi, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Fisheries Branch, Smithers, B.C., pers. comm.).

Table 5. Population estimates for adult steelhead (*Oncorhynchus mykiss*) in the upper Sustut River from 1972 to 1996.

Year	Population Estimate (95% C.I. where applicable)	Method	Reference
1972	323	Aerial Redd and Fish Counts	Chudyk 1972
1986	823 (604-1287)	Mark-Recapture Estimates	Spence *et al.* 1990
1992	487 (433-541)	Fence and Snorkel Surveys	Bustard 1993a
1993	476	Fence and Snorkel Surveys	R.S. Saimoto 1994
1994	598	Fence	R.K. Saimoto 1995
1995	658	Fence	Parken and Morten 1996
1996	515	Fence	C. Parken (pers. comm.)

Table 6. Population estimates for adult steelhead (*Oncorhynchus mykiss*) in the lower Sustut/Bear River.

Year	Population Estimate (95% C.I. where applicable)	Method	Reference
1971	3000	Visual Estimate	Chudyk 1972
1986	3072 (2609-3737)	Mark-Recapture Estimate	Spence *et al.* 1990
1989	700 (mid-reach Bear River)	Visual Estimate	Bustard 1993b

4.7 Sex Ratio

Most information that is present on the sex ratio of returning steelhead to the Sustut River is from the upper river population, and is based on enumeration of fish passed through a series of counting weirs. Parken and Morten (1996) report that the sex ratio in the upper population tends to be skewed towards females. Sex ratio data from previous studies support this (Table 7), and suggest that there are a number of possible factors that might cause this discrepancy. The skewness is most likely an artifact of data collection methods as to when the counting fences are set up, as intensive biosampling for sex begins in September, after a large proportion of the males have initially migrated into the upper Sustut River (D. Atagi, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Fisheries Branch, Smithers, B.C., pers. comm.). Also, on average male steelhead are larger than females, and this difference might influence bycatch of males in the commercial fisheries of Area 4. It is also possible that there is variable year class strength between males and females that causes the predominance of females (B. Hooton, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Fisheries Branch, Smithers, B.C., pers. comm. as referenced in Bustard 1993a). One final factor that might influence the skewed sex ratio towards females is that a greater majority of the fish that are repeat spawners in the population are females, but this is likely not a major factor.

Table 7. Sex ratio of adult steelhead (*Oncorhynchus mykiss*) sampled in the upper Sustut River.

Year	Sex Ratio (females:males)	Reference
1986	1.80:1	Spence *et al.* 1990
1992	4.19:1	Bustard 1993a
1993	1.74:1	R.S. Saimoto 1994
1994	1.73:1	R.K. Saimoto 1995
1995	1.23:1	Parken and Morten 1996
1996	1.58:1	C. Parken (pers. comm.)

Data from the lower river population on sex ratio of steelhead are minimal, and based on one study. Spence *et al.* (1990) found that the sex ratio of females to males (1.98:1) in the lower river was also skewed towards females.

4.8 Size Distribution (Fork Length and Weight) of Mature Steelhead

Size data, mainly fork length, have been collected in the Sustut River over a number of years, mainly for the population utilizing the upper river (Table 8). Length and weight data have also been collected from steelhead that were sampled for scale aging over the past 20 years. Based on the tagging locations, and date of capture, these fish can be assigned as belonging to either the upper or lower population. For all sampled steelhead in the entire Sustut River, males were larger than females in both fork length (t-test, $P<0.001$) and weight (t-test, $P<0.001$) (Table 9). The fork length and weight frequency histograms (Figure 2a and 2b) for all steelhead sampled in the Sustut River were normally distributed, as were fork length (Figure 3) and weight (Figure 4) frequency histograms for females and males.

Table 8. Fork length data of male and female steelhead (*Oncorhynchus mykiss*) sampled in the upper Sustut River during different escapement studies.

Year	Male Mean (cm)	Male Range (cm)	Male N	Female Mean (cm)	Female Range (cm)	Female N	Reference
1986	84.1	76-98	66	76.3	67-88	119	Spence *et al.* 1990
1992	77.6	69-91	49	72.1	65-82	198	Bustard 1993a
1993	85.8	53-94	75	75.9	66-87	135	R.S. Saimoto 1994
1994	82.9	71-99	51	74.0	65-84	88	R.K. Saimoto 1995
1995	82.6	71-100	213	74.6	58-90	262	Parken and Morten 1996
1996	82.9	63-96	138	73.9	58-85	218	C. Parken (pers. comm.)

For steelhead sampled for scale aging that were identified as belonging to the upper river population and lower river population based on the date and location of capture, males

were larger than females in the upper river population in fork length (t-test, $P<0.001$), and males were larger than females in both fork length (t-test, $P<0.001$) and weight (t-test, $P<0.001$) in the lower population (Table 10). Lower river males were on average larger than upper river males in fork length (t-test, $P=0.02$), and lower river females were larger than upper river females in fork length (t-test, $P=0.001$) (Table 10).

Table 9. Summary of fork length and weight data collected from adult steelhead (*Oncorhynchus mykiss*) sampled in the Sustut River for scale aging from 1972 to 1996.

	Fork Length (cm)				Weight (kg)			
	Mean	**S.E.**	**Range**	**N**	**Mean**	**S.E.**	**Range**	**N**
All fish	81.0	0.3	38-104	1007	6.31	0.12	1.8-12.7	295
Females	78.2	0.2	47-97	608	5.42	0.09	2.5-9.1	169
Males	85.7	0.5	38-104	392	7.56	0.19	1.8-12.7	124

Table 10. Summary of fork length and weight data collected from adult steelhead (*Oncorhynchus mykiss*) sampled in the upper and lower Sustut River for scale aging from 1972 to 1996.

		Fork Length (cm)				Weight (kg)			
Population		**Mean**	**S.E.**	**Range**	**N**	**Mean**	**S.E.**	**Range**	**N**
Lower	All Fish	82.7	0.6	43-104	221	6.59	0.15	2.5-12.7	167
	Female	79.0	0.5	60-95	122	5.47	0.12	2.5-8.6	89
	Male	87.3	1.0	43-104	99	7.87	0.21	3.4-12.7	78
Upper	All Fish	79.7	0.6	69-97	102				
	Female	76.2	0.7	69-89	52				
	Male	84.0	0.8	73-97	46				

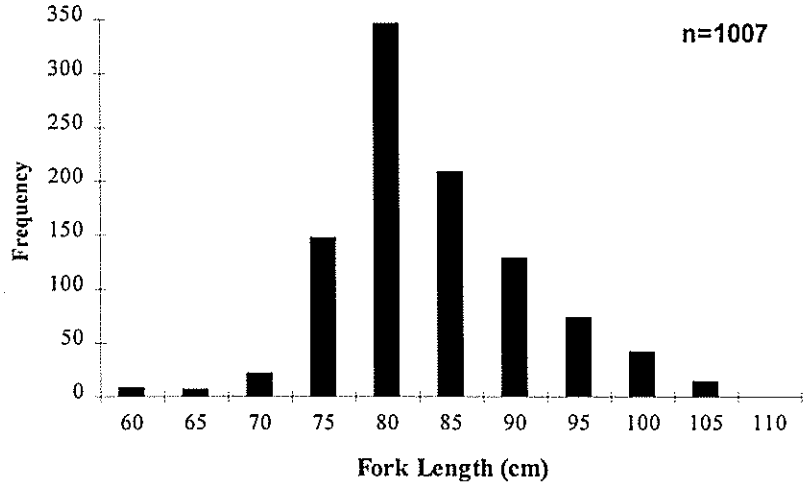

Figure 2a. Length frequency histogram of all adult steelhead (*Oncorhynchus mykiss*) sampled in the Sustut River for scale aging from 1972 to 1996.

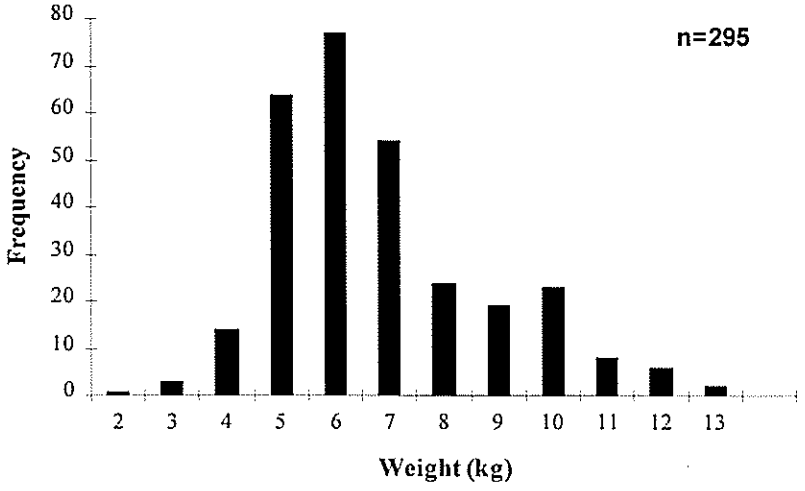

Figure 2b. Weight frequency histogram of all adult steelhead (*Oncorhynchus mykiss*) sampled in the Sustut River for scale aging from 1972 to 1996.

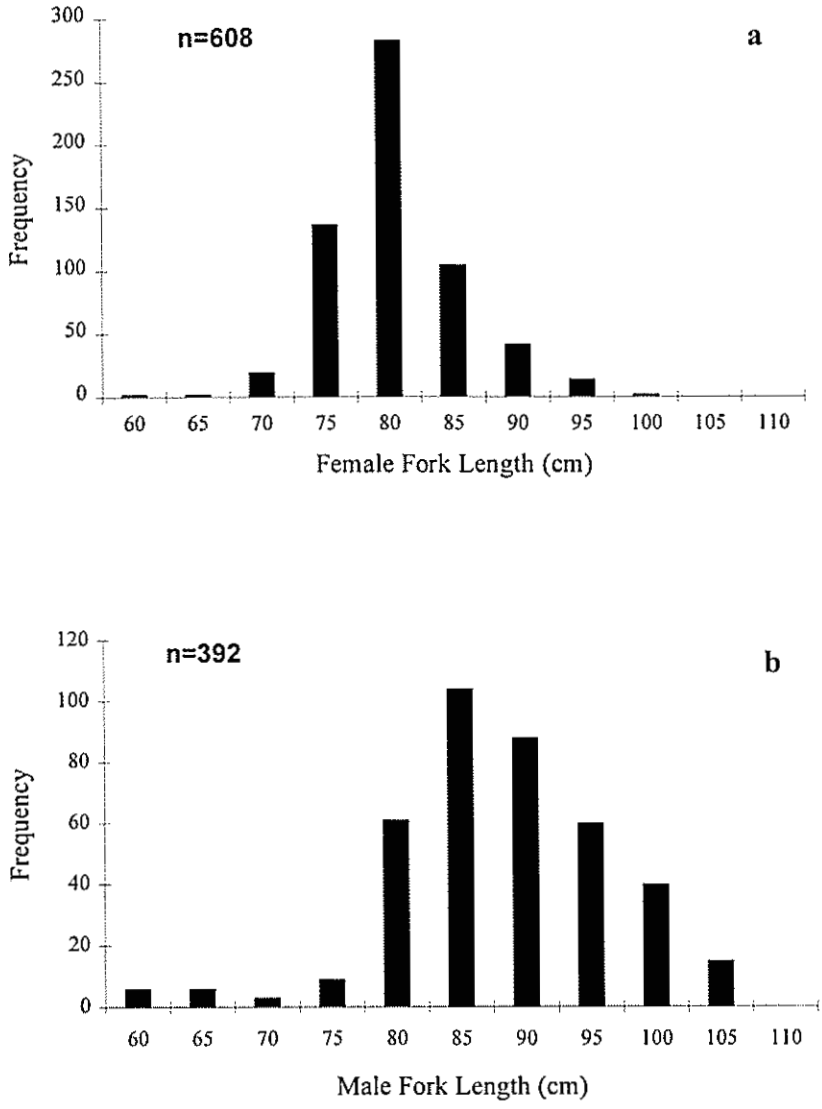

Figure 3. Length frequency histogram of adult steelhead (*Oncorhynchus mykiss*) sampled in the Sustut River for scale aging from 1972 to 1996 (a = females, b = males).

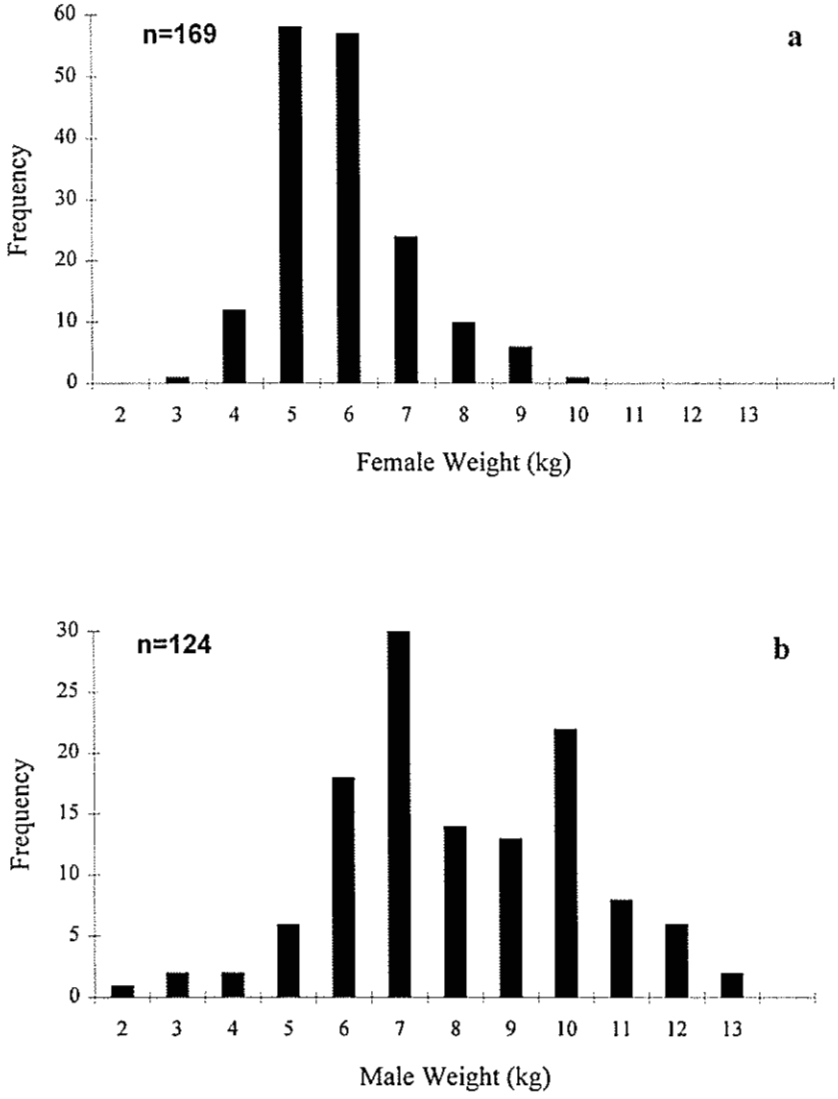

Figure 4. Weight frequency histogram of adult steelhead (*Oncorhynchus mykiss*) sampled in the Sustut River for scale aging from 1972 to 1996 (a = females, b = males).

4.8.1 Length-Weight Relationships

Few data were available on weight of steelhead in the upper Sustut River, so length-weight regressions were calculated for the entire Sustut River based mainly on the lower river sample of steelhead. For all steelhead sampled (1972-1996), the regression between weight and fork length (Log_{10} Weight = -4.67 + 2.85 Log_{10} Fork Length; n = 292; r^2 = 0.88) indicated positive allometric growth (e.g., slope ~3.0, as defined in Ricker 1975) (Figure 5a). For female steelhead, the regression between weight and fork length (Log_{10} Weight = -4.50 + 2.75 + Log_{10} Fork Length; n = 168; r^2 = 0.73) also indicated positive allometric growth (Figure 5b), as did the regression between weight and fork length (Log_{10} Weight = -4.56 + 2.79 Log_{10} Fork Length; n = 124; r^2 = 0.91) for males (Figure 5c).

4.9 Adult Overwintering Areas

Once in the Sustut River, adult steelhead overwinter until spawning begins in May. For the upper Sustut River population a number of key overwintering areas have been located, and are consistently used in different years (Figure 6). These sites include Sustut Lake and Johanson Lake as well as the outlets of both lakes (Chudyk 1972; Spence *et al.* 1990; Lough 1993; Bustard 1993a). Large concentrations of steelhead have been observed in the pools at the outlets of these lakes, suggesting that these are important overwintering areas, perhaps due to the warmer lake water flowing out at this point, but still providing appropriate velocities for suitable holding. R.S. Saimoto (1994) and R.K. Saimoto (1995) both suggest that the fish that are going to overwinter in Johanson Lake move into their overwintering areas earlier than fish that are going to overwinter in Sustut Lake. This fact might predispose the Sustut Lake fish to conservation concerns due to First Nations fishing below the confluence of Johanson Creek with the Sustut River. In 1993, Lough (1993) reports that one radio tagged steelhead was overwintering in the mainstem upper Sustut below Moosevale Creek (Figure 6). Individual sites where steelhead have been observed to overwinter in the upper Sustut River are located on Figure 6, with details found in Appendix III.

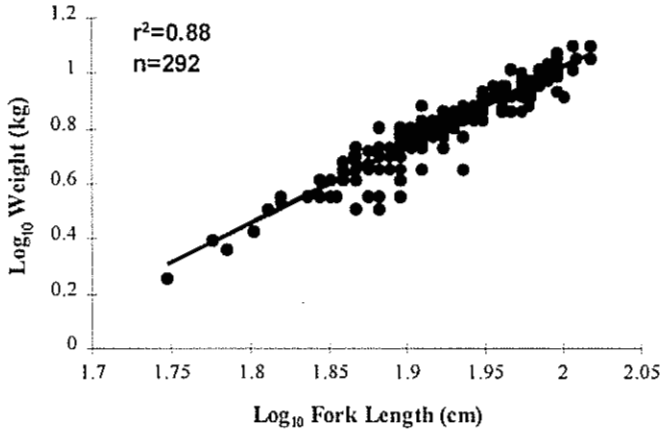

Figure 5a. Length-weight regression for steelhead (*Oncorhynchus mykiss*) in the Sustut River.

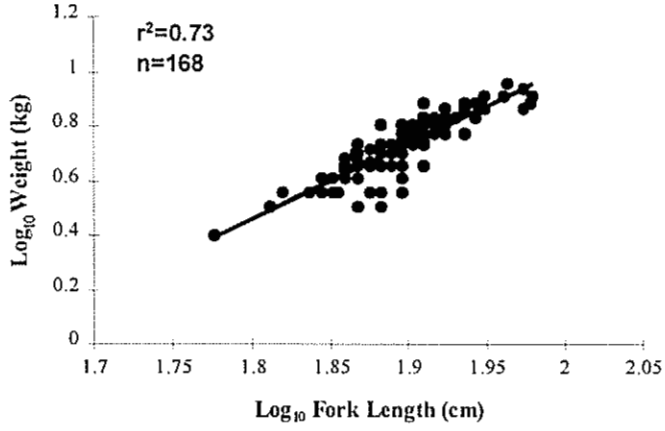

Figure 5b. Length-weight regression for female steelhead (*Oncorhynchus mykiss*) in the Sustut River.

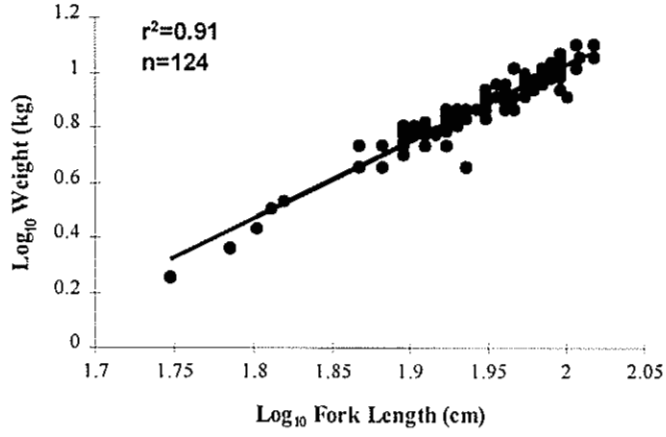

Figure 5c. Length-weight regression for male steelhead (*Oncorhynchus mykiss*) in the Sustut River.

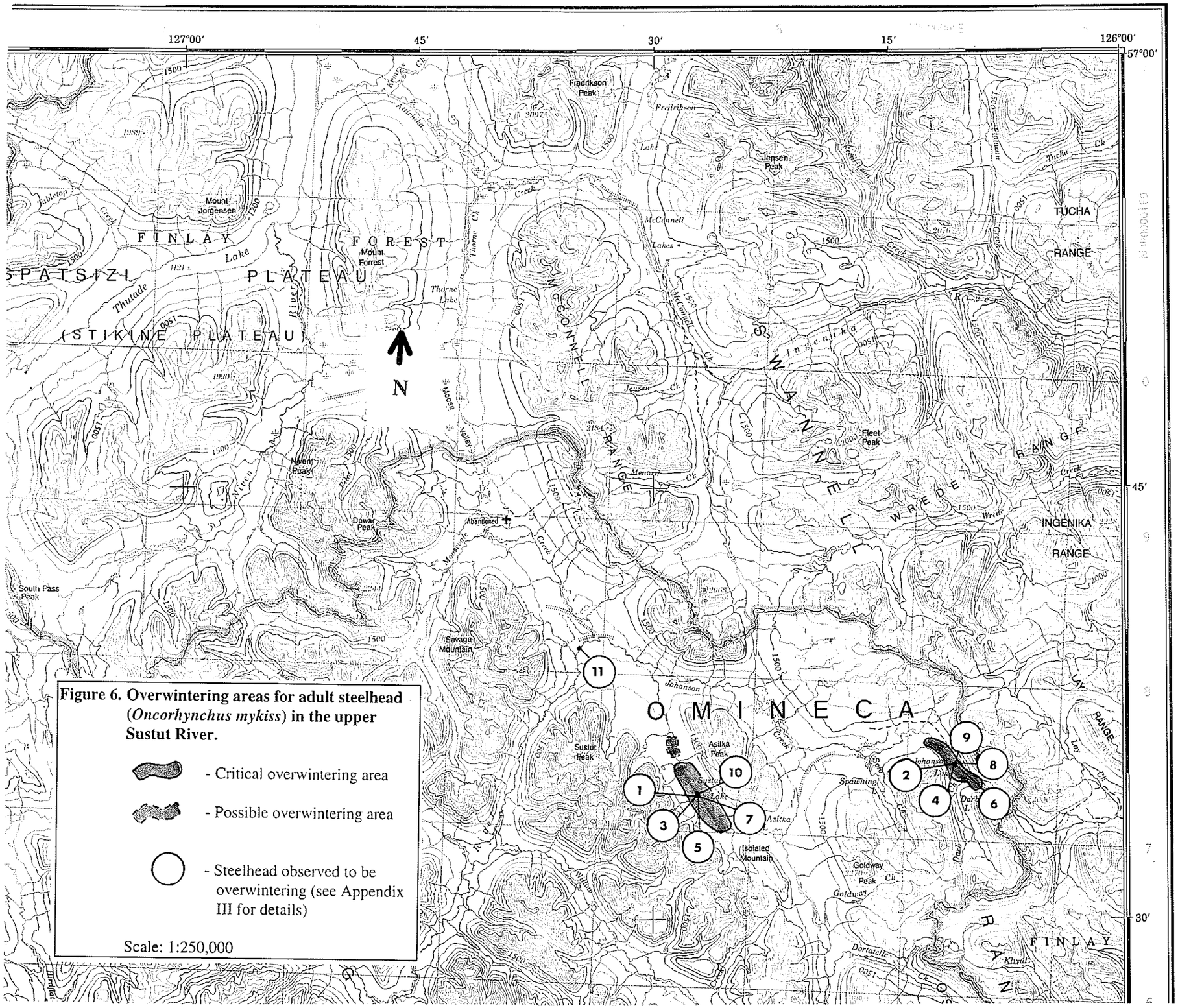

Figure 6. Overwintering areas for adult steelhead (*Oncorhynchus mykiss*) in the upper Sustut River.

- Critical overwintering area

- Possible overwintering area

- Steelhead observed to be overwintering (see Appendix III for details)

Scale: 1:250,000

The overwintering locations of the lower Sustut River population are less clear, but there are a number of sites that have been suggested, and where fish have been observed (Figure 7). Bear Lake is a known steelhead overwintering area for the lower river population (Chudyk 1972), and the possibility exists that steelhead also overwinter in the mainstem Sustut River at the Bear confluence given the number of steelhead that are angled or sampled there (e.g., Spence *et al.* 1990; C. Spence, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Fisheries Branch, Nelson, B.C., pers. comm.). Bustard (1993b) also identified Sapolio Lake as a possible candidate for overwintering steelhead within the Bear River. Given the documented use of lakes by overwintering steelhead in the upper Sustut River and other Skeena River systems (Lough 1980; Spence *et al.* 1990) this is likely to be the case. Once the Bear River joins the Sustut River there are more pools that would provide suitable habitat characteristics for overwintering steelhead (e.g., deep, slow water velocity) than are present in the upper Sustut River. This would suggest that steelhead could overwinter in the mainstem Sustut River, but at present it is not known if in fact this is the case (D. Bustard, Fisheries Consultant, Smithers, B.C., pers. comm.; C. Spence, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Fisheries Branch, Nelson, B.C., pers. comm.). Lower Sustut River fish might also overwinter in the mainstem Skeena River in pools above and below the confluence of the Sustut River with the Skeena River. Individual sites where steelhead have been observed to overwinter in the lower Sustut River are located on Figure 7, with details found in Appendix IV.

4.10 Spawning Timing

Sustut River steelhead spawn in May and June, after river ice melts and water temperatures rises above 5°C (Spence *et al.* 1990). Most studies conducted on spawning steelhead in the upper Sustut River through the tracking of radio tagged fish or direct observations have been undertaken in June (e.g., Chudyk 1972 - June 28, 1972; Spence *et al.* 1990 - June 6, 1987) or late May (e.g., Bustard 1994 - May 28, 1993). All of these studies have identified that the majority of the steelhead sampled at this time were kelts,

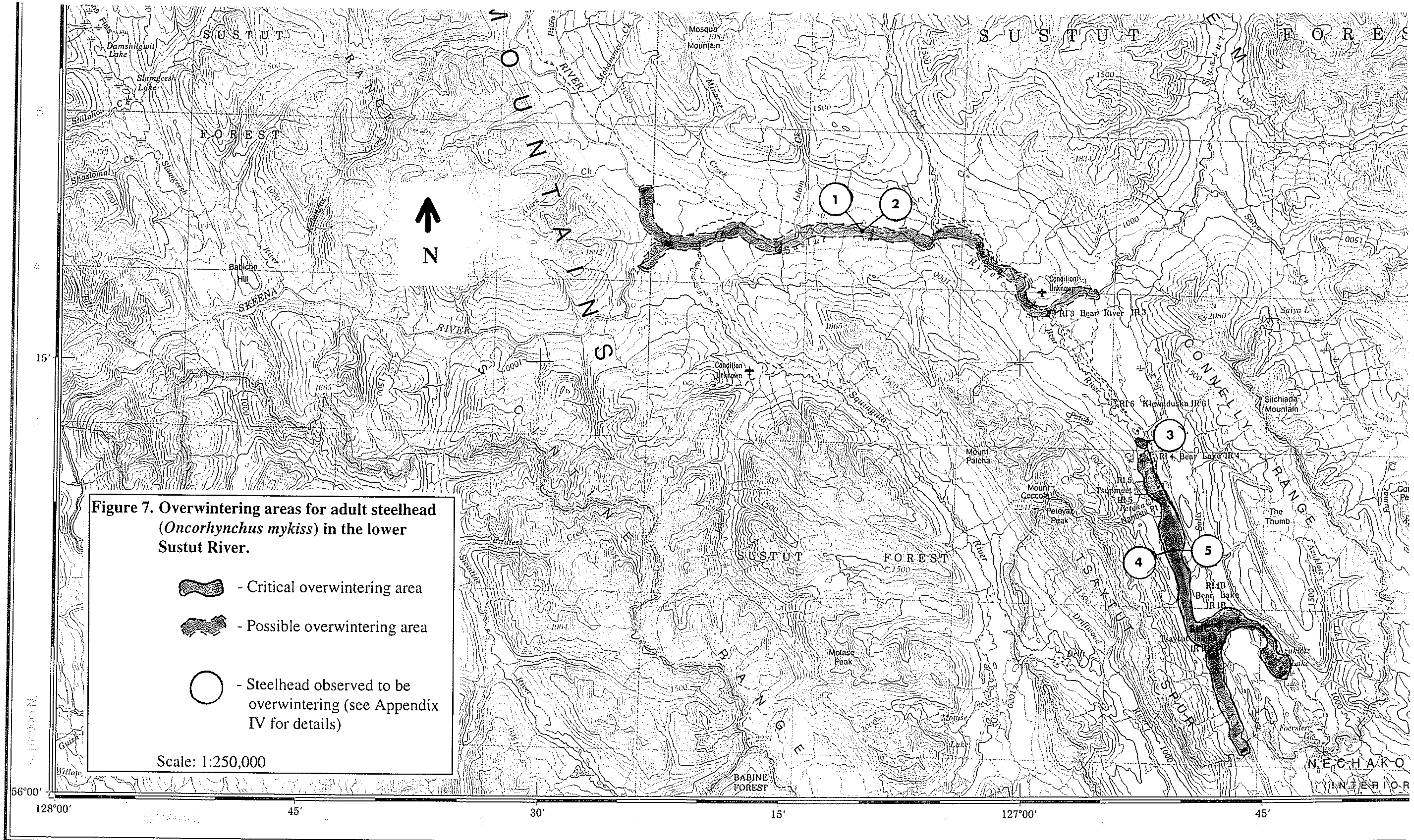

Figure 7. Overwintering areas for adult steelhead (*Oncorhynchus mykiss*) in the lower Sustut River.

and that the peak of steelhead spawning had likely occurred prior to the initiation of study in the upper river. The best estimates of the timing of steelhead spawning in the upper river are presented in data summarized from 1993 (Bustard 1994), and indicate that the peak of spawning in the upper Sustut River above the confluence with Johanson Creek, likely occurred in the week of May 21, 1993. From repeated observations in the same section of stream over time in 1993, spawning was completed by the end of the second week of June, and most fish were off the redds and holding in deeper areas within the upper river. In 1993, steelhead spawning in Johanson Creek was also observed, and it was estimated that the timing of spawning in this system was slightly later (peak of spawning between June 1-5, 1993) than in the Sustut River below Sustut Lake (Bustard 1994).

The onset of spawning is probably highly dependent on water temperature, and in other Skeena River locations has been documented to occur from water temperatures ranging from 3-12°C (Envirocon 1985). Unpublished data from the Babine River suggests that water temperatures >7-8°C are needed for steelhead to move onto spawning grounds (D. Atagi, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Fisheries Branch, Smithers, B.C., pers. comm.). Water temperatures taken in the upper Sustut River suggest that this population of steelhead begin to spawn when the water temperatures rise above 5°C (Table 11).

Spawning timing in the lower Sustut River likely follows the timing of the upper Sustut population, however there are few reports of spawning timing. In 1986 on June 6th, five steelhead kelts were sampled in the Bear River, suggesting that the peak of spawning activity had already occurred (Spence *et al.* 1990). The water temperature at this time was 7°C. Bustard (1993b) estimated that the timing of steelhead spawning in the Bear River started in mid May, peaked in late May, and ended in early June. This period is likely a reliable estimate as on May 20th, 1992, steelhead were observed to be spawning and in spawning habitats (Spence 1992).

Table 11. Water temperatures measured in the upper Sustut River when adult steelhead (*Oncorhynchus mykiss*) had begun to spawn or were spawning.

Date	Location	Water Temp. (°C)	Spawning	Notes	Reference
June 28, 1972	Sustut/Johanson confluence	7	Yes	Kelts	Chudyk 1972
June 6, 1987	Sustut/Johanson confluence	6	Yes	Kelts	Spence *et al.* 1990
May 28-June 9, 1993	upper Sustut River	8-11	Yes	Kelts	Bustard 1994

4.11 Spawning Locations

4.11.1 Upper Sustut River

In the upper Sustut River there are a number of locations that have been consistently and annually used by spawning steelhead, and these sites are fairly precise in their location. These locations are summarized in Table 12, Figure 8, and Appendix V. In the upper Sustut River there are two main locations that steelhead spawn. In Johanson Creek below Johanson Lake and above the Sustut River/Johanson Creek confluence, and in the Sustut River below Sustut Lake and above the Sustut River/Johanson Creek confluence. Limited, if any, spawning occurs in the mainstem Sustut River below the Sustut/Johanson confluence. Bustard (1994) suggests that this may be due to high water velocities and limited spawning habitat, but based on the occurrence of steelhead fry below the Moosevale Creek confluence, it is possible that some mainstem spawning occurs in this section of the Sustut River (D. Atagi, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Smithers, B.C., pers. comm.).

Table 12. Locations of steelhead (*Oncorhynchus mykiss*) spawning sites in the upper Sustut River.

Date	Location	Notes	Reference
1970	outlet of Sustut Lake	several redds, number of steelhead	Chudyk 1972
1972	Sustut River 200 yds upstream of SR/JC confluence	70 steelhead	Chudyk 1972
1987	Johanson Creek, Sustut River above SR/JC confluence	active spawning	Spence *et al.* 1990
1992	Sustut River above SR/JC confluence	12 steelhead	Lough 1992
1993	Johanson Creek, Sustut River above SR/JC confluence	redds, steelhead	Bustard 1994

From the detailed observations made in May and June 1993, it appears that more upper Sustut River steelhead spawn in Sustut River than spawn in Johanson Creek (Bustard 1994). Within both of these systems spawning was concentrated in specific areas, largely where there is an abundance of good spawning substrate and lower gradient (Figure 8). The most detailed observations of steelhead spawning locations in the upper river are those made in 1993 (Bustard 1994). In the Sustut River upstream of the Johanson Creek confluence there were six locations that were used for spawning (Figure 8). Most of the spawning activity was concentrated in a section 800 m in length just above the Junction Pool (junction of the Sustut River and Johanson Creek). Close to a hundred steelhead were observed in this section between May 29 and June 1, 1993, and Shirvell (1991) estimated that there are 10,000 m^2 of potential spawning gravels in this section. This location has also been used in past years (1972 - Chudyk 1972; 1987 - Spence *et al.* 1990; 1992 - Lough 1992). Steelhead redds were also observed in a few locations from 1,300 m below Mud Lake to 1,000 m above the Sustut/Johanson confluence (Figure 8). The

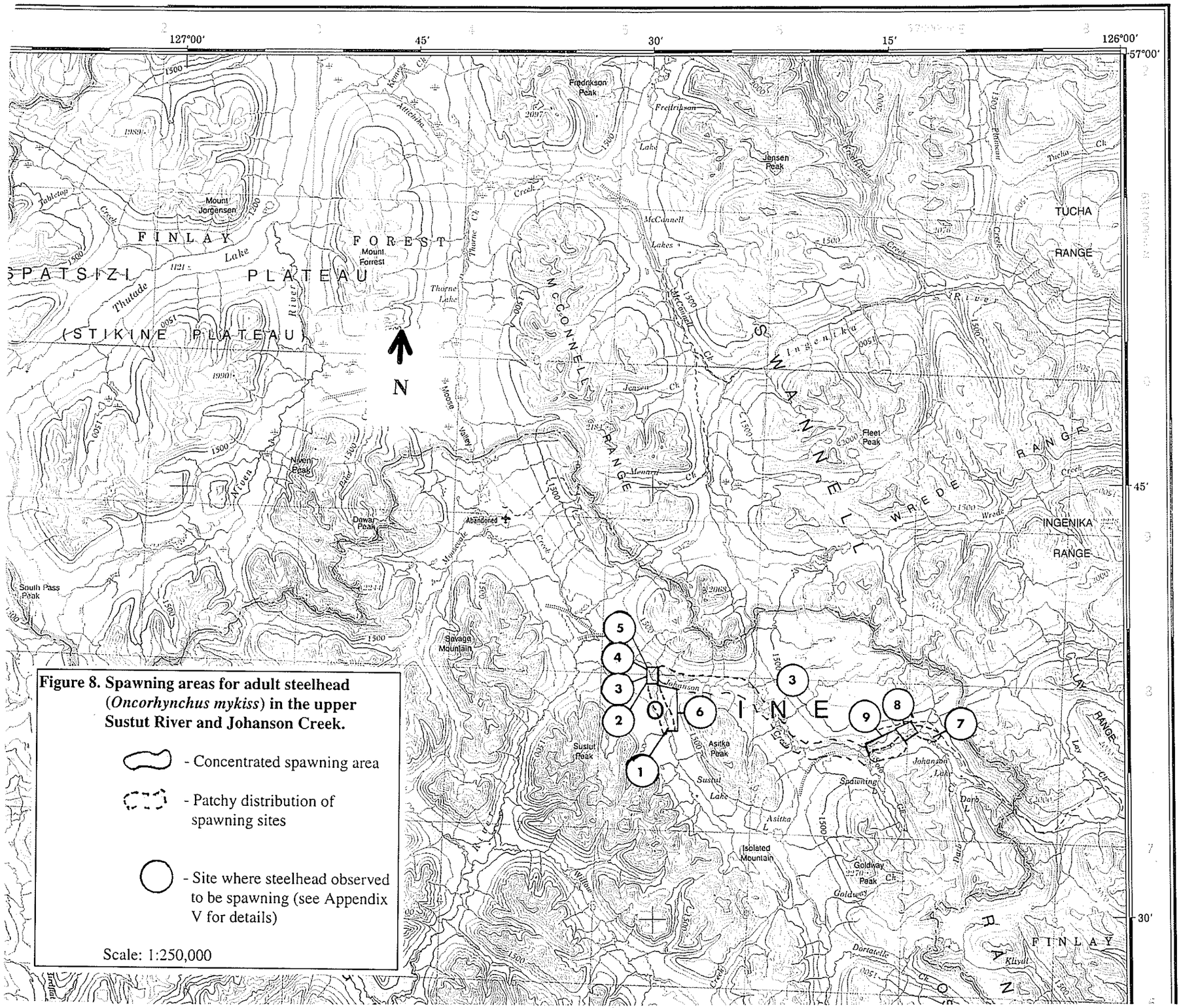

Figure 8. Spawning areas for adult steelhead (*Oncorhynchus mykiss*) in the upper Sustut River and Johanson Creek.

- Concentrated spawning area

- Patchy distribution of spawning sites

- Site where steelhead observed to be spawning (see Appendix V for details)

Scale: 1:250,000

distribution of redds in this section was spread out, and limited to isolated patches of gravel amongst boulder and cobble habitat (Bustard 1994). Steelhead spawning was not observed in the shoreline section of Sustut Lake, or between Sustut Lake and Mud Lake.

In Johanson Creek, the key spawning location in 1993 was a section of the mainstem creek 2.5 km downstream of Johanson Lake (Bustard 1994; Figure 8). This section is characterized by low gradient and abundance of gravel. Below this section the distribution of redds was again patchy, and limited to small pockets of gravel. Bustard (1994) also suggests that Tributary C and Solo Creek in the Johanson Creek watershed may be used for spawning.

Exact spawning locations in the upper Sustut River from previous studies are located on Figure 8, with details found in Appendix V. This data shows that spawning occurs in the same locations between years.

4.11.2 Lower Sustut River

Bear River

Observations of steelhead spawning in the lower river are limited, but inferences on spawning locations in the lower river and the Bear River can be made based on the locations of juvenile steelhead that have been sampled in other studies. Chudyk (1972) reports that in 1971, 3,000 adult steelhead were observed to be spawning in the spring salmon spawning "ridge" of the Bear River. In 1987, Spence *et al.* (1990) sampled five steelhead kelts in the Bear River on June 6th. Both of these reports suggest that steelhead spawning occurs throughout the Bear River downstream of Bear Lake (Figure 9). Bustard (1993b) also reports that in late May 1989, D.F.O. personnel observed 700 steelhead spawners in the mid reach of the Bear River where chinook spawn (Figure 9). Bustard (1994a) found steelhead fry and parr in the outlet creek from Triple Lake one below the falls, suggesting that steelhead adults may use isolated pockets throughout the creek to the falls to spawn, as juvenile steelhead are know to migrate downstream as the grow. Envirocon (1985) also sampled steelhead smolts and fry throughout the Bear River

suggesting that the entire system is used for spawning by adult steelhead. Steelhead are known to overwinter in Bear Lake, and in August 1984, Envirocon (1985) sampled rainbow fry in Patcha Creek and Peteka Creek which are tributaries to Bear Lake. These fry may have been resident rainbow trout fry, but in the report are listed as steelhead fry. Exact spawning locations in the Bear River from previous studies are located on Figure 9, with details found in Appendix VI.

Lower Sustut River

There have been no observations of steelhead spawning in the lower Sustut River, however inferences can be made about suspected locations based on juvenile sampling studies that have been conducted. Bustard (1994a) found low numbers of steelhead fry or parr in the tributaries on the north side of the lower Sustut River, suggesting that these sites were not used for spawning by steelhead. Most steelhead samples were fish of parr size which would suggest that upstream colonization into rearing habitats was more likely than steelhead spawning in these locations. Bustard (1993c) identifies lower Islam Creek on the north side of the lower Sustut River as being a likely candidate for suitable spawning habitat for steelhead (Figure 9). In general, tributaries on the north side of the Sustut River receive limited steelhead spawning activity due to passage concerns associated with the railway right of way operated by Takla Track and Timber Ltd., and culverts (D. Bustard, Fisheries Consultant, Smithers, B.C., pers. comm.). He suggests if these culverts were upgraded, it might allow access to potentially suitable spawning habitat. There is also the possibility that adult steelhead use the mainstem lower Sustut River to spawn in side channels areas below the Bear River confluence.

4.11.3 Other Locations

Moosevale Creek, Birdflat Creek, Asitka River, and Two Lake Creek are also possible candidates for limited steelhead spawning locations from previous studies (Chudyk 1972), and based on limited sampling of steelhead fry in some of these systems. There have however been no direct observations of spawning to date.

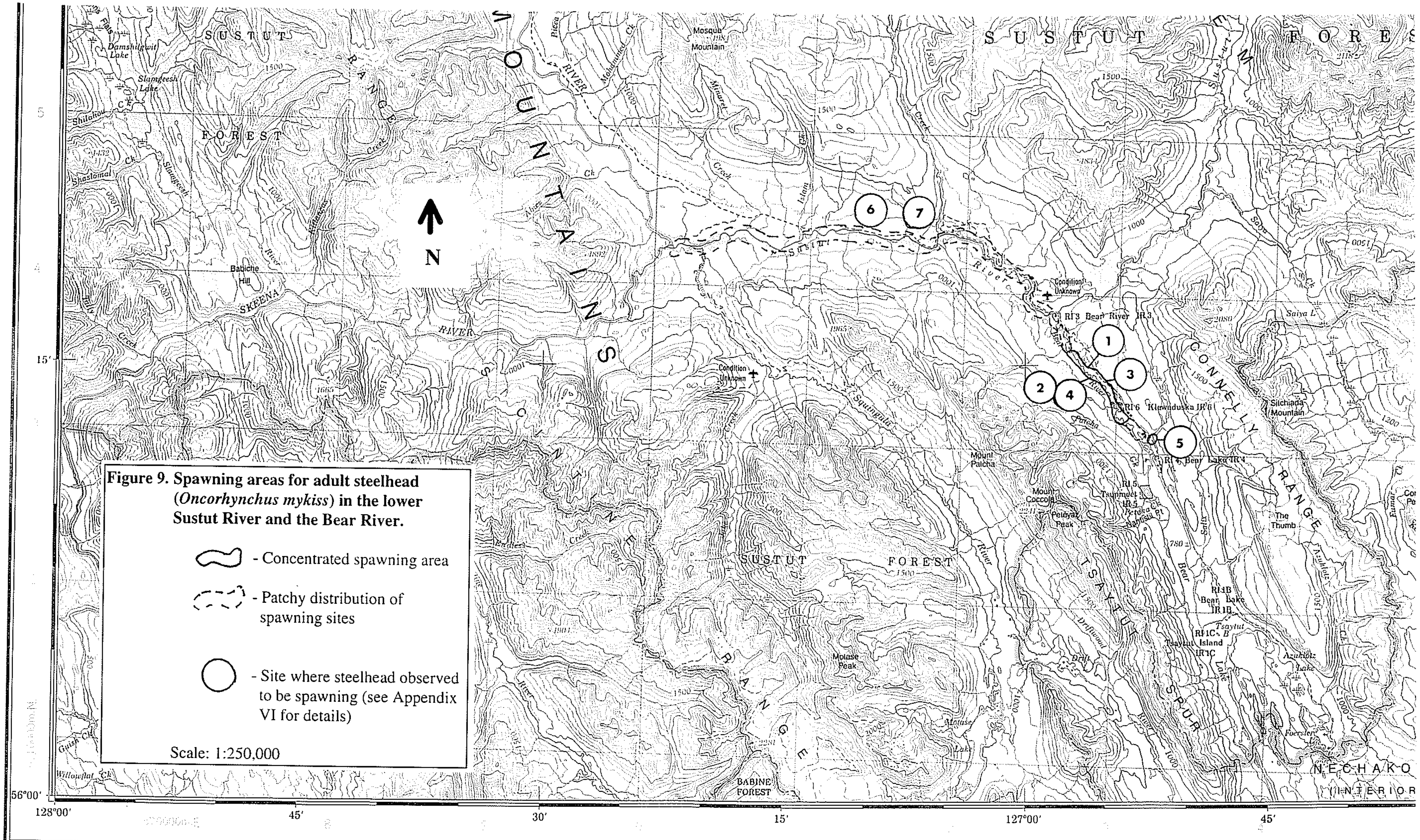

Figure 9. Spawning areas for adult steelhead (*Oncorhynchus mykiss*) in the lower Sustut River and the Bear River.

4.12 Repeat Spawning

The incidence of repeat spawning is well documented in previous studies conducted throughout the Sustut River. In general the upper Sustut River population has a low percentage of repeat spawners (Table 13), most likely due to the long migration distance back to the ocean from the Sustut River, and incidental capture in commercial nets on upstream spawning migrations and on subsequent return to the ocean as kelts.

Table 13. Percentage of repeat spawners for adult steelhead (*Oncorhynchus mykiss*) in the upper Sustut River (1994-1996).

Year	Percent Repeat Spawners	Reference
1994	6	R.K. Saimoto 1995
1995	1.2	Parken and Morten 1996[1]
1996	1.3	C. Parken (pers. comm.)[1]

[1] - 1995 and 1996 estimates based on Floy tag recoveries

From all scale aging data collected from 1972 to 1996, the percent of repeat spawners in all the samples was 6.2% (50 of 893 steelhead sampled for scales), in the lower river it was 7.8% (15 of 205 steelhead samples for scales), and in the upper river it was 8.4% (58 of 95 steelhead sampled for scales). Double repeat spawners were rare in the entire sample and averaged only 0.6% (6 of 893 steelhead sampled for scales).

4.13 Summary Data from the Steelhead Harvest Analysis

4.13.1 Period from 1968 to 1996

For the fiscal years of the period from 1968 to 1983 there was were division of steelhead anglers into resident areas from which they originated, and the total days fished and total catch are combined for B.C. residents (Skeena Region locals), B.C. residents (other than Skeena Region locals), non B.C. Canadians, and non Canadians. Based on this fact, data

of total catch, total angler days, and catch per unit effort (CPUE) are summarized for all anglers for the fiscal years of the period of from 1968 to 1996. During this time frame, the total catch of steelhead reported in returns of the mailed out questionnaires remained relatively stable from 1968 to 1983, except for a jump in catch between 1971 and 1973 (Table 14 and Figure 10). This jump in total catch corresponded to an increase in the number of angler days in those years (Table 14 and Figure 10). From 1981 to 1987 there was an increase effort and catch, and both effort and catch have fluctuated over the past five years (Table 14 and Figure 10). Catch per unit effort remained stable during the period from 1968 to 1996, except for a peak in 1983 (Figure 11). This is despite the increase in effort from 1981 to 1987. During the entire time period however, CPUE has generally remained stable and less than 1.0 fish per angler day (Figure 11).

4.13.2 Period from 1984 to 1996

B.C. Residents (Skeena Region locals)

For the period of the fiscal years from 1984 to 1996, the number of local Skeena Region anglers that have responded to the mailed out questionnaire has been below 30 individuals in each year, but the number of local anglers fishing the river has decreased over the past three years (Table 15 and Figure 12). The CPUE over this period has decreased from a high of 2.14 fish per angler day in 1986 (a year of good returns) to 0.31 fish per angler day in 1991 (Figure 13). Generally however, the CPUE trend has remained relatively stable.

B.C. Residents (other than Skeena Region locals)

During the period of the fiscal years from 1984 to 1996, there has been a decrease in the number of B.C. resident anglers that fish on the Sustut River, and a decrease in total catch of these anglers (Table 16 and Figure 14). Catch per unit effort has remained stable, and always below 1.0 fish per angler day (Figure 15).

Table 14. Summary of the number of anglers, angler days, total catch of steelhead (*Oncorhynchus mykiss*), and catch per unit effort (CPUE) of anglers on the Sustut River from steelhead harvest analysis questionnaires returned from 1968 to 1996.

Year	Number of Anglers	Angler Days	Total Catch	CPUE (fish per angler day)
1968	38	145	61	0.421
1969	72	269	122	0.453
1970	40	203	55	0.271
1971	57	536	480	0.896
1972	84	321	304	0.947
1973	48	183	371	2.027
1974	58	248	62	0.250
1975	27	70	34	0.486
1976	53	219	102	0.466
1977	48	273	107	0.392
1978	55	257	138	0.537
1979	71	314	139	0.443
1980	81	255	84	0.329
1981	35	240	69	0.288
1982	60	475	143	0.301
1983	105	290	210	0.724
1984	99	366	255	0.700
1985	116	684	468	0.684
1986	148	623	521	0.837
1987	160	804	671	0.835
1988	165	831	441	0.531
1989	161	857	502	0.586
1990	140	649	407	0.627
1991	152	659	500	0.759
1992	113	543	216	0.398
1993	83	565	544	0.963
1994	60	279	256	0.918
1995	105	505	406	0.804
1996	86	430	393	0.914

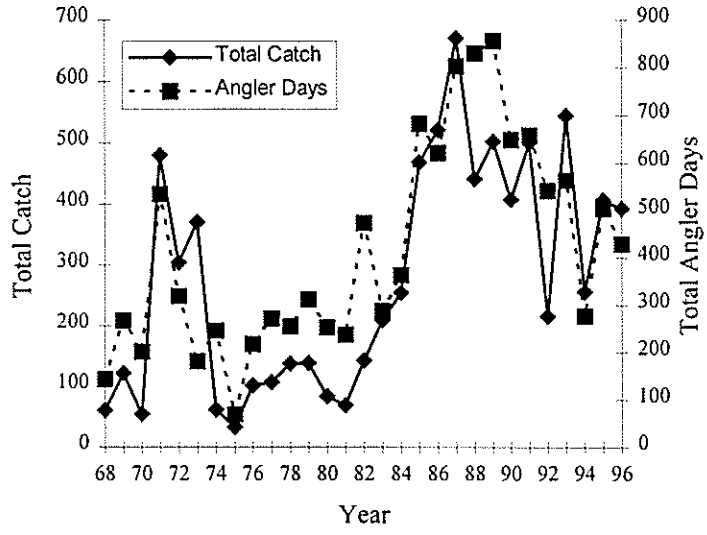

Figure 10. Summary of total catch of steelhead (*Oncorhynchus mykiss*) and total angler days for anglers on the Sustut River from 1968 to 1996 as reported on returned steelhead harvest analysis questionnaires.

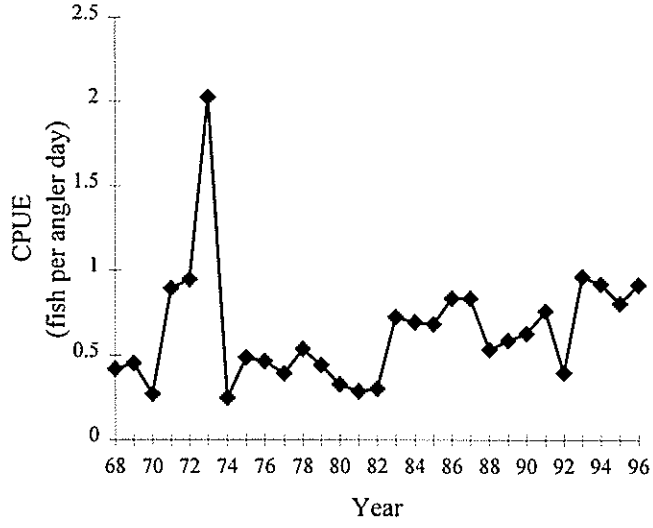

Figure 11. Summary of catch per unit effort (CPUE) of steelhead (*Oncorhynchus mykiss*) for anglers on the Sustut River from 1968 to 1996 as estimated from data provided on returned steelhead harvest analysis questionnaires.

Table 15. Summary of the number of anglers, angler days, total catch of steelhead (*Oncorhynchus mykiss*), and catch per unit effort (CPUE) of B.C. Resident (Skeena Region locals) anglers on the Sustut River from 1984 to 1996 that returned the steelhead harvest analysis questionnaires.

Year	Number of Anglers	Angler Days	Total Catch	CPUE (fish per angler day)
1984				
1985	13	114	47	0.412
1986	29	72	154	2.139
1987	17	123	141	1.146
1988	19	95	84	0.884
1989	16	98	81	0.827
1990	15	132	58	0.439
1991	19	26	8	0.308
1992	13	38	17	0.447
1993	8	176	249	1.415
1994				
1995	3	16	13	0.813
1996				

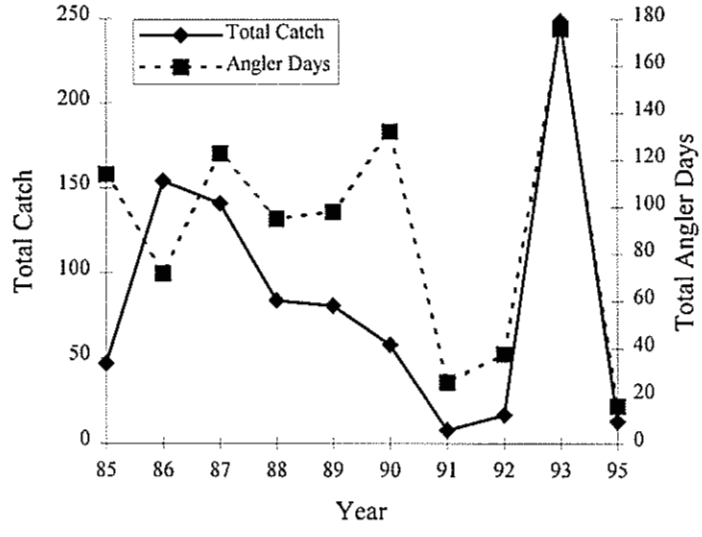

Figure 12. Summary of total catch of steelhead (*Oncorhynchus mykiss*) and total angler days for B.C. Resident (Skeena Region locals) anglers on the Sustut River from 1984 to 1996 as reported on returned steelhead harvest analysis questionnaires.

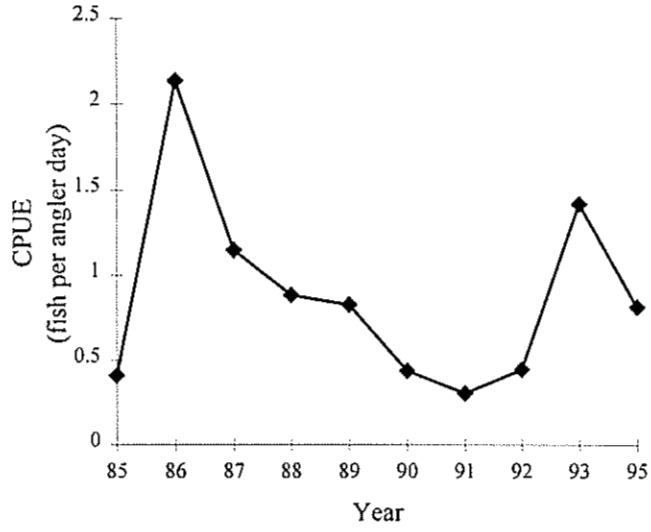

Figure 13. Summary of catch per unit effort (CPUE) of steelhead (*Oncorhynchus mykiss*) for B.C. Resident (Skeena Region locals) anglers on the Sustut River from 1984 to 1996 as estimated from data provided on returned steelhead harvest analysis questionnaires.

Table 16. Summary of the number of anglers, angler days, total catch of steelhead (*Oncorhynchus mykiss*), and catch per unit effort (CPUE) of B.C. Resident (other than Skeena Region locals) anglers on the Sustut River from 1984 to 1996 that returned the steelhead harvest analysis questionnaires.

Year	Number of Anglers	Angler Days	Total Catch	CPUE (fish per angler day)
1984	76	197	174	0.883
1985	62	347	238	0.686
1986	51	130	53	0.408
1987	66	235	104	0.442
1988	46	207	101	0.488
1989	62	257	123	0.479
1990	54	124	59	0.476
1991	51	172	87	0.506
1992	28	80	31	0.388
1993	25	137	59	0.431
1994	24	64	24	0.375
1995	25	85	75	0.882
1996	31	115	41	0.357

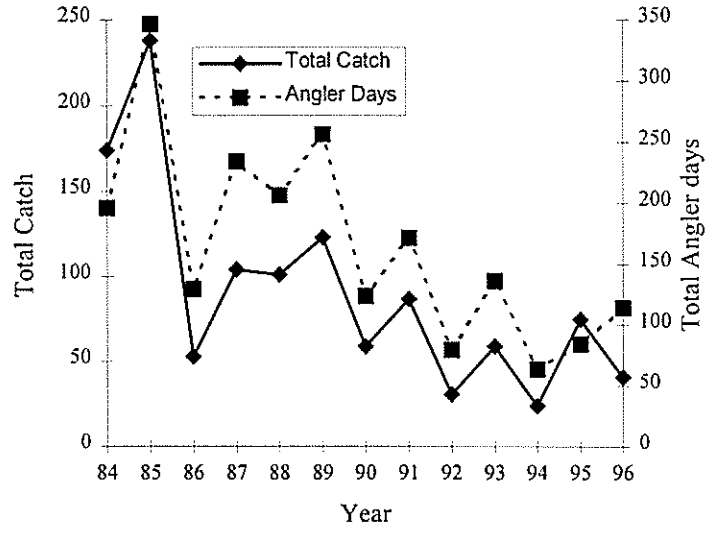

Figure 14. Summary of total catch of steelhead (*Oncorhynchus mykiss*) and total angler days for B.C. Resident (other than Skeena Region locals) anglers on the Sustut River from 1984 to 1996 as reported on returned steelhead harvest analysis questionnaires.

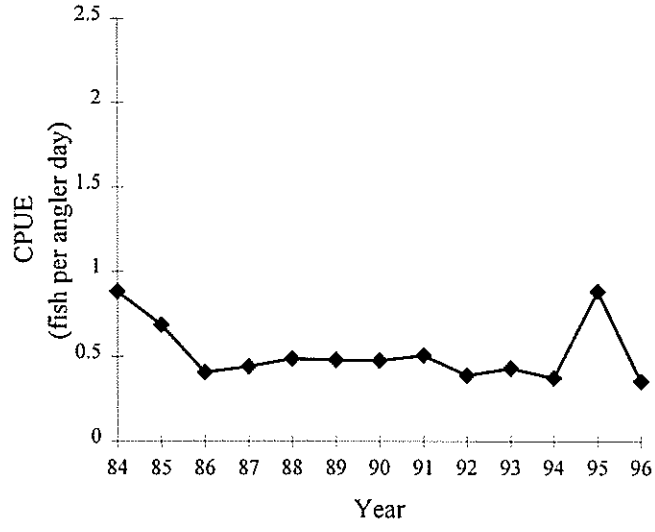

Figure 15. Summary of catch per unit effort (CPUE) of steelhead (*Oncorhynchus mykiss*) for B.C. Resident (other than Skeena Region locals) anglers on the Sustut River from 1984 to 1996 as estimated from data provided on returned steelhead harvest analysis questionnaires.

Non B.C. Canadians

In general Canadians anglers other than those from British Columbia account for very little of the angling pressure on the Sustut River (Table 17). Total catch and total number of angler days have remained minimal for this group of anglers (Table 17 and Figure 16). Catch per unit effort has remained low and stable, below 1.0 fish per angler day from 1985 to 1991 (Figure 17).

Non Canadian Anglers

Non Canadian anglers have accounted for a large number of total angler days on the Sustut River from 1984 to 1996, and a large total catch each year (Table 18 and Figure 18). Total catch and effort have remained relatively stable over the past ten years (Figure 18). Catch per unit effort has remained stable over this period, and generally below 1.0 fish per angler day (Figure 19).

Percent of Total Effort by Licensee by Year

For the period of the fiscal years from 1984 to 1996, the highest percent of total effort each year has been from non Canadian anglers, and has generally been increasing from 1984 (Table 19 and Figure 20). Non B.C. Canadian anglers account for a small proportion of the total effort each year. The proportion of total effort by B.C. Skeena Region local anglers has remained relatively constant in the years that their effort was measured, but has decreased from 1994 to 1996 (Table 19 and Figure 20). B.C. anglers other than Skeena Region locals generally account for the second highest percent of total effort in the Sustut River each year (Table 19 and Figure 20).

4.14 First Nations Uses/Harvests

In the upper Sustut River, First Nations fisheries harvests have been well documented and occur primarily from July to early September for a variety of salmon species (Bustard 1993a). In 1992, Bustard (1993a) reports that First Nations people from the Takla Band, Ft. St. James Band, Tachie Band, Ingenika Band, and Black Pine Band took part in this

Table 17. Summary of the number of anglers, angler days, total catch of steelhead (*Oncorhynchus mykiss*), and catch per unit effort (CPUE) of non B.C. Canadian anglers on the Sustut River from 1984 to 1996 that returned the steelhead harvest analysis questionnaires.

Year	Number of Anglers	Angler Days	Total Catch	CPUE (fish per angler day)
1984				
1985	4	11	6	0.545
1986	18	94	53	0.564
1987	6	19	12	0.631
1988	6	26	4	0.154
1989	3	11	3	0.273
1990	5	17	17	1
1991	9	26	15	0.577
1992				
1993				
1994				
1995				
1996				

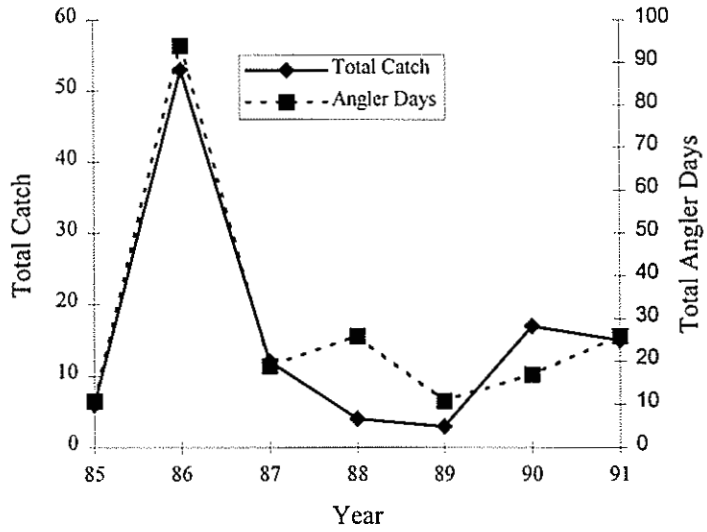

Figure 16. Summary of total catch of steelhead (*Oncorhynchus mykiss*) and total angler days for non B.C. Canadian anglers on the Sustut River from 1984 to 1996 as reported on returned steelhead harvest analysis questionnaires.

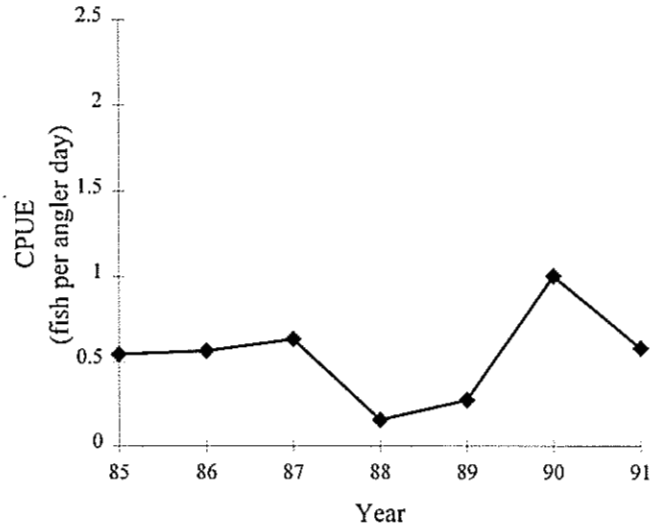

Figure 17. Summary of catch per unit effort (CPUE) of steelhead (*Oncorhynchus mykiss*) for non B.C. Canadian anglers on the Sustut River from 1984 to 1996 as estimated from data provided on returned steelhead harvest analysis questionnaires.

Table 18. Summary of the number of anglers, angler days, total catch of steelhead (*Oncorhynchus mykiss*), and catch per unit effort (CPUE) of non Canadian anglers on the Sustut River from 1984 to 1996 that returned the steelhead harvest analysis questionnaires.

Year	Number of Anglers	Angler Days	Total Catch	CPUE (fish per angler day)
1984	23	169	81	0.479
1985	37	212	177	0.834
1986	50	327	261	0.798
1987	71	427	414	0.970
1988	94	503	252	0.501
1989	80	491	295	0.601
1990	66	376	273	0.726
1991	73	435	390	0.897
1992	72	425	168	0.395
1993	50	252	236	0.937
1994	36	215	232	1.079
1995	77	404	318	0.787
1996	55	315	352	1.117

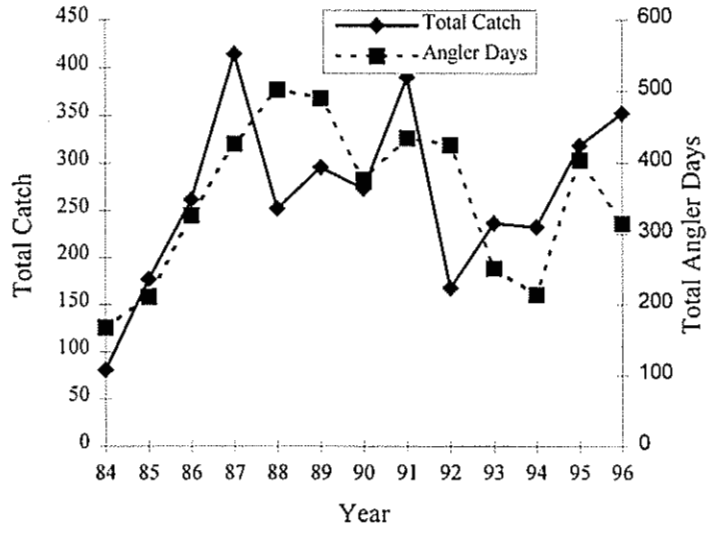

Figure 18. Summary of total catch of steelhead (*Oncorhynchus mykiss*) and total angler days for non Canadian anglers on the Sustut River from 1984 to 1996 as reported on returned steelhead harvest analysis questionnaires.

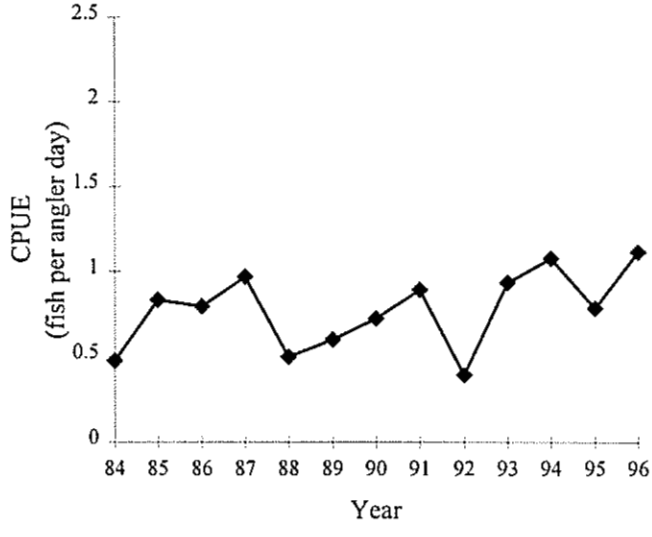

Figure 19. Summary of catch per unit effort (CPUE) of steelhead (*Oncorhynchus mykiss*) for non Canadian anglers on the Sustut River from 1984 to 1996 as estimated from data provided on returned steelhead harvest analysis questionnaires.

Table 19. Summary of the percentage of total effort by licensee by year from 1984 to 1996 for anglers that fished for steelhead (*Oncorhynchus mykiss*) on the Sustut River, and returned the steelhead harvest analysis questionnaires.

Year	Non Canadian	Non B.C. Canadian	B.C. (Skeena Region)	B.C. (other than Skeena Region)
1984	46.2			53.8
1985	31.0	1.6	16.7	50.7
1986	52.5	15.1	11.6	20.9
1987	53.1	2.4	15.3	29.2
1988	60.5	3.1	11.4	24.9
1989	57.3	1.3	11.4	30.0
1990	57.9	2.6	20.3	19.1
1991	66.0	3.9	3.9	26.1
1992	78.3		7.0	14.7
1993	44.6		31.2	24.2
1994	77.1			22.9
1995	80		3.2	16.8
1996	73.3			26.7

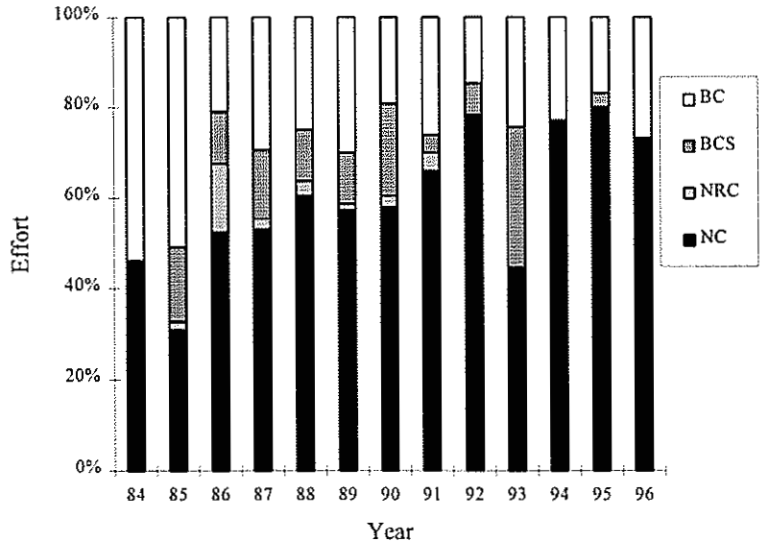

Figure 20. Summary of the percentage of total effort by licensee by year for anglers fishing for steelhead (*Oncorhynchus mykiss*) on the Sustut River from 1984 to 1996 from returned the steelhead harvest analysis questionnaires (BC = B.C. anglers (other than Skeena Region locals), BCS = B.C. anglers (Skeena Region locals), NRC = non B.C. Canadians, and NC = non Canadians).

fishery, with the Department of Fisheries and Oceans issuing permits for Takla Band members to take up to 50 chinook and 50 sockeye by snagging in the upper river in that year. Various documentation of First Nations harvests in the upper river in the past have suggested that the main area that fishing effort is concentrated in is the Junction Pool of the Sustut River and Johanson Creek confluence, primarily due to the easy access to this site (Spence *et al.* 1990; Bustard 1993a; R.S. Saimoto 1994). Bustard (1993a) also reports that some harvest activity may occur at the outlet of Johanson Lake. Documentation of the First Nations harvest rates of steelhead in the upper river are minimal, and likely fairly unreliable. There are however some data that suggest a significant proportion of steelhead are harvested in the upper river (e.g., estimated harvest of 24 to 49 steelhead in 1992 - Bustard 1993a). Fishing effort by First Nations people decreased over the period from 1992 to 1994, with the river being closed to harvest in 1994 after August 31st (R.K. Saimoto 1995). In 1995 and 1996 fishing effort was again minimal by First Nations people (Parken and Morten 1996; C. Parken, Fisheries Consultant, Smithers, B.C., pers. comm.). Generally the timing of incidental steelhead catch occurs in August as part of the Sockeye fishery, and methods employed include gill netting, gaffing, and snagging. None of the First Nations Bands listed by Bustard (1993a) were contacted for this report based on information from other contractors and D.F.O. personnel that generally there is minimal information available regarding steelhead catch and effort in the Sustut River by First Nations people (J. DeGisi, Fisheries Consultant, Smithers, B.C., pers. comm.; G. Cardinal, Aboriginal Fisheries Officer, Department of Fisheries and Oceans, Smithers, B.C., pers. comm.). Personnel from D.F.O. did report however that the main First Nations Band that utilizes the Sustut River watershed is the Takla Band, and that the territory falls under one member named Peter Abrahams (G. Cardinal, Aboriginal Fisheries Officer, Department of Fisheries and Oceans, Smithers, B.C., pers. comm.).

In the lower Sustut River, steelhead are harvested by First Nations people in the Bear River and in Bear Lake (Schultze 1984; Spence *et al.* 1990), but there are no data on the numbers of steelhead that are harvested or effort. Given the fact that the First Nations

fishery primarily occurs in Bear Lake for sockeye during the month of August (Envirocon 1985), steelhead are not likely impacted in this fishery as they haven't moved up into the lake to overwinter yet. There is the chance however that steelhead in the Bear River were harvested in the past, based on First Nations access via the Takla Track and Timber Ltd. rail line (D. Atagi, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Fisheries Branch, Smithers, B.C., pers. comm.). This access is no longer possible now that the rail line has been reactivated for timber transport.

4.15 Current Angling Regulations

General Skeena Region angling restrictions that apply to the Sustut River are the use of a single hook, and no fishing from January 1st to June 15th. Anglers fishing for steelhead are also required to purchase a steelhead tag in order to allow them to fish for steelhead. Specific angling restrictions that apply to the Sustut River are the closure of the Sustut River to angling upstream of the Bear River confluence, closure of the Bear River to angling, bait ban from September 1st to December 31st, non-retention of steelhead, and classified water from September 1st to October 31st. The Sustut was classified as a Class I water, but for the 1997/98 season all rivers that were classified as Class I or II are simply called classified waters. This classification requires that B.C. Residents purchase a Class I waters license at $1 per day, and that Canadian Residents and Non Canadian anglers purchase a Class I waters license at $20 per day. For the 1998/99 season these regulations will change so that B.C. Residents purchase a classified waters licence for all waters for $10 per year, and that Canadian Residents and Non Canadian anglers purchase a classified waters licence at $40 per day.

4.16 Juvenile Life-History

4.16.1 Fry Emergence and Downstream Migration

Once spawning occurs, fertilized steelhead eggs remain in the gravel until hatching and then fry emerge from the gravel and colonize suitable habitats. In the Sustut River in 1984, Bustard (1993b) estimated that in the Bear River the timing of emergence for fry was July 24 to August 5, with a peak around July 30. These conclusions were based on

fry migration into inclined plane traps as measured by Envirocon (1985) in 1984. Based on these conclusions, and the fact that steelhead spawning occurs from primarily in May and June throughout the Sustut River watershed, developing eggs remain in the gravel for approximately 1.5 to 2 months through spring freshet.

There is some suggestion that once emerged from the gravel, fry migrate downstream and recruit appropriate habitat. In the Bear River, Envirocon (1985) found that steelhead fry moved downstream into the lower Sustut River, suggesting that fry production in the Bear River is critical for seeding habitat throughout the mainstem Sustut. The timing of fry migration, as suggested from catches in inclined plane traps, occurred from mid July to late August with a peak in emergence and downstream migration around the end of July (Envirocon 1985).

In the upper Sustut River these downstream migrations of fry also likely occur as sampling in the Sustut River and Johanson Creek above the Sustut River/Johanson Creek confluence have revealed relatively low fry densities, but high fry densities in the mainstem Sustut River near Moosevale Creek (Envirocon 1985; Bustard 1992).

4.16.2 Fry Length and Weight

There have been a number of studies conducted from 1983 to 1993 that have concentrated on studying juvenile steelhead, and measuring fry lengths and weights has been a component of these studies. The best series of data that summarizes the estimates of fry length and weight are from studies carried out from 1983 to 1985 by Tredger (1986), and from 1991 to 1993 by Bustard (1992, 1993d, 1994b). These studies were carried out during the months of September and October, and these data are comparable for mainstem Sustut River sites (Table 20).

4.16.3 Smolt and Parr Migration

After smolting, juvenile steelhead begin their seaward migration to the ocean as smolts. In 1984, Envirocon (1985) conducted juvenile salmonid studies in the Bear River.

Table 20. Summary of the mean steelhead (*Oncorhynchus mykiss*) fry fork lengths and weights in the upper and lower Sustut River from previous studies.

Year	Lower Sustut		Upper Sustut		Reference
	Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)	
1983	39.4	0.58	NA	NA	Tredger 1986
1984	41.2	0.65	41.1	0.67	Tredger 1986
1985	41.1	0.79	40.5	0.75	Tredger 1986
1991	42.8	0.81	45.1	0.95	Bustard 1992
1992	46.4	0.97	42.3	0.93	Bustard 1993d
1993	40.3	0.74	41.7	0.86	Bustard 1994b

During these studies, inclined plane traps were used to sample juvenile salmonids and estimate downstream migration timing. In sites in the upper and lower Bear River, steelhead smolts were sampled from early April to mid August, with a peak in migration at the beginning of May. These migrations likely occurred just prior to the onset of spring freshet.

In the upper Sustut River in 1994 and 1995, downstream fish movements of juvenile salmonids were measured using a rotary screw trap located on the mainstem Sustut River just above the Moosevale Creek confluence (Bustard 1994c; Dubeau and Johannes 1996). In 1994, an estimated 7,024 steelhead parr were sampled moving downstream past the trap from May 21 to June 2, and an estimated 289 steelhead smolts were sampled moving downstream from May 20 to June 18 (Bustard 1994c). In 1995, an estimated 1,050 steelhead smolts were sampled moving downstream from May 15 to August 24 (Dubeau and Johannes 1996). In 1995, a large number of steelhead fry and parr were also captured using the rotary screw trap (94,569 and 23,529 fish respectively). These periods again most likely coincided with the onset of spring freshet, and increasing day length.

The large number of parr and fry moving downstream in both the Bear River and the upper Sustut River suggest that downstream colonization of suitable habitats may be important for survival and subsequent recruitment. In 1994, Bustard (1994c) noted a significant downstream movement of steelhead parr in the upper Sustut River from mid-May to mid-June, but minimal catches of steelhead smolts (n=10) over the entire sampling period in 1994. This was despite good estimates of parr densities in the upper Sustut River in 1992 and 1993 (Bustard 1993d, 1994b). He suggests that parr might be re-distributing themselves downstream along the mainstem Sustut River as they grow, which possibly is the case given the territoriality of juvenile steelhead (E. Keeley, Graduate Student, Department of Zoology, U.B.C., Vancouver, B.C., pers. comm.). The large movements of parr and fry noted is also an indication that habitat upstream of the sampling sites might be adequately seeded, and that these juvenile steelhead are being "forced" to migrate downstream.

4.16.4 Parr Length and Weight

Once steelhead fry survive their first winter in the Sustut River they are termed parr. Parr can remain in the stream from age 1+ to 4+, so a comparison of parr length per say has to have an age component. From 1991 to 1993, juvenile studies carried out in the Sustut River by Bustard (1992, 1993d, 1994b) have included measurements of fork length. These studies have suggested that size of age 1+ parr are relatively similar in fork length in mainstem sites in both the upper and lower river (Table 21).

Parr length and weight data were also collected in the upper Sustut River in 1994 and 1995 through the use of a rotary screw trap (Bustard 1994c; Dubeau and Johannes 1996). These data are summarized for different age classes of parr as suggested by scale aging, and identify that there were no major differences between years (Table 22).

4.16.5 Smolt Length and Weight

The best estimates of smolt length and weight are from fish sampled in 1994 and 1995 using the rotary screw trap (Bustard 1994c; Dubeau and Johannes 1996). Of the ten

smolts sampled in 1994, two fish were identified as age 3+, and eight were identified as age 4+ (Bustard 1994c). Age 3+ smolts averaged 115 mm in fork length and 16.9 g in

Table 21. Summary of the mean steelhead (*Oncorhynchus mykiss*) parr fork lengths in the mainstem sites in the upper and lower Sustut River from 1991 to 1993.

	Lower River	Upper River	
Year	**Fork Length (mm)**	**Fork Length (mm)**	**Reference**
1991	83.3	86.3	Bustard 1992
1992	81.7	85.7	Bustard 1993d
1993	81.9	81.7	Bustard 1994b

Table 22. Summary of the mean steelhead (*Oncorhynchus mykiss*) parr fork lengths and weights in the upper Sustut River in 1994 (estimated from Bustard 1994c) and 1995 (from Dubeau and Johannes 1996) sampled using a rotary screw trap.

		Fork Length (mm)			Weight (g)		
Year	**Age**	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**
1994	1+	54.8	6.1	92	1.58	0.61	92
	2+	89.7	4.8	20	7.35	1.21	20
	3+	107.3	5.2	20	12.90	2.34	20
	4+	152.1	18.6	14	34.19	11.23	13
1995	1+	80	14.3	103	5.9	4.8	103
	2+	106.9	17.5	204	13.9	8.4	103
	3+	140.3	14.9	20	29.0	9.8	20
	4+	154.5	6.4	2	33.3	6.6	2

weight, while age 4+ smolts averaged 162.5 mm in fork length and 41.5 g in weight. In 1995, juvenile steelhead identified as age 3+ averaged 140.3 mm in fork length and 29.0 g in weight, while age 4+ juvenile steelhead averaged 154.5 mm in fork length and 33.3 g in weight.

4.16.6 Stream Rearing Life-History (as determined by scale aging)

From scales collected from upstream migrating adult steelhead, it is possible to estimate the number of years that an individual reared in freshwater prior to entering the ocean. From scales collected from over the past 20 years, all steelhead sampled in the Sustut River spent on average four years in the river prior to moving into the ocean (Table 23). Fish sampled from the upper river population spent on average three years in freshwater, while fish sampled from the lower river population spent on average four years in freshwater (Table 23). Large numbers of parr are known to migrate from the upper river in May and June (Bustard 1994c; Dubeau and Johannes 1996), possibly suggesting that fish in the upper river begin their seaward migrations earlier than fish in the lower river, and this might explain the differences in the number of years of freshwater residency.

Table 23. Number of years that adult steelhead (*Oncorhynchus mykiss*) of the Sustut River identified as belonging to the upper or lower river population resided in freshwater prior to migrating to sea (as determined by scale aging).

Population	Mean (years)	S.E.	Median (years)	Range (years)
Pooled Sustut	3.72	0.02	4	2-5
Lower Sustut	3.73	0.03	4	3-5
Upper Sustut	3.35	0.05	3	3-5

It is also possible that there is the absence of the 1st annulus in scales for Sustut River steelhead (in particular the upper Sustut River) due to the short growth season. Tautz *et*

al. (1992) estimated the mean smolt age for upper Sustut steelhead as 4.5 years, and this is about one year higher than the direct estimates from scales. Most likely this is the case in the Sustut River (C. Parken, Fisheries Consultant, Smithers, B.C., pers. comm.), and has been shown to occur for other species in other coldwater rivers (e.g., Jensen and Johnsen 1982).

4.16.7 Juvenile Density Estimates

In the Sustut River, detailed juvenile steelhead surveys were carried out in 1991, 1992, and 1993 (Bustard 1992, 1993d, 1994b). These studies focused on mainstem and tributary sites throughout the Sustut watershed. For the purposes of this section I have broken the mainstem Sustut River into three sections which are a lower section (the Sustut River below the Bear River confluence), a middle section (the Sustut River from the Bear River confluence to the canyon below Moosevale Creek), and an upper section (the Sustut River above the canyon). From 1991 to 1993, fry densities on average were similar in the lower section, middle section and the upper section in 1991 and 1992, but in 1993 fry densities were high in all sections (Table 24). The highest fry densities were always found in the upper section (Table 24).

Table 24. Average steelhead (*Oncorhynchus mykiss*) fry densities in three sections of the Sustut River in 1991, 1992, and 1993 as estimated from studies conducted by Bustard (1992, 1993d, 1994b).

	Lower Section			**Middle Section**			**Upper Section**		
Year	**Mean ($fry \cdot m^{-2}$)**	**S.E.**	**N**	**Mean ($fry \cdot m^{-2}$)**	**S.E.**	**N**	**Mean ($fry \cdot m^{-2}$)**	**S.E.**	**N**
1991	0.11	0.03	10	0.08	0.02	11	0.24	0.04	8
1992	0.08	0.04	6	0.06	0.02	10	0.41	0.07	7
1993	0.21	0.03	6	0.18	0.04	9	0.36	0.07	10

This suggests that fry are generally distributed evenly throughout the Sustut River, but that the middle section has limited fry habitat based on the low densities of fry found in most years (D. Bustard, Fisheries Consultant, Smithers, B.C., pers. comm.). The middle section has high gradient and steep canyons, possibly providing limited fry habitat. The even distribution of fry densities throughout each section in the system may be indicative that most fry habitat is colonized fully.

In 1991, 1992, and 1993 tributaries to the Sustut River were also sampled for steelhead fry (Bustard 1992, 1993d, 1994b). In all years the Bear River had high densities of steelhead fry (Table 25), likely due to the fact that a large amount of steelhead spawning occurs in that system. Johanson Creek had low densities of fry in 1991 and 1992, but high densities in 1993 (Table 25). Other tributaries sampled over that period, including Two Lake Creek, Moosevale Creek, three unnamed tributaries to Johanson Creek, Darb Creek, and Solo Creek, generally had low densities of fry (Table 25).

Table 25. Average steelhead (*Oncorhynchus mykiss*) fry densities in tributaries of the Sustut River in 1991, 1992, and 1993 as estimated from studies conducted by Bustard (1992, 1993d, 1994b).

	Bear River			Johanson Creek			Other Tributaries		
Year	**Mean (fry·m^{-2})**	**S.E.**	**N**	**Mean (fry·m^{-2})**	**S.E.**	**N**	**Mean (fry·m^{-2})**	**S.E.**	**N**
1991	0.30	0.01	2	0.02	0.01	8	0.002	0.002	5
1992	0.39	0.11	2	0.06	0.04	5	0.06	0.06	5
1993	0.45	0.14	2	0.15	0.07	5	0.03	0.02	4

In the mainstem Sustut River, parr densities were on average between 0.01 and 0.05 parr ·m^{-2} in the lower section, middle section, and upper section from 1991 to 1993 (Table 26). Parr densities were generally higher in the upper section, but not to a large extent over the lower sections (Table 26).

Table 26. Average steelhead (*Oncorhynchus mykiss*) parr densities in three sections of the Sustut River in 1991, 1992, and 1993 as estimated from studies conducted by Bustard (1992, 1993d, 1994b).

Year	Lower Section Mean (parr·m^{-2})	S.E.	N	Middle Section Mean (parr·m^{-2})	S.E.	N	Upper Section Mean (parr·m^{-2})	S.E.	N
1991	0.01	0.003	9	0.01	0.01	11	0.01	0.01	9
1992	0.04	0.01	6	0.03	0.01	9	0.07	0.03	9
1993	0.04	0.01	6	0.03	0.02	9	0.05	0.01	10

Tributaries to the Sustut River that were sampled for steelhead parr generally had low densities of parr (Table 27). These levels were roughly similar to parr density estimates in the mainstem Sustut River (Table 26).

Table 27. Average steelhead (*Oncorhynchus mykiss*) parr densities in tributaries of the Sustut River in 1991, 1992, and 1993 as estimated from studies conducted by Bustard (1992, 1993d, 1994b).

Year	Bear River Mean (parr·m^{-2})	S.E.	N	Johanson Creek Mean (parr·m^{-2})	S.E.	N	Other Tributaries Mean (parr·m^{-2})	S.E.	N
1991	0	0	2	0.02	0.01	5	0.01	0.01	8
1992	0.05	0.04	2	0.02	0.01	6	0.02	0.01	5
1993	0.04	0.04	2	0.05	0.03	4	0.02	0.01	5

4.17 Juvenile Rearing Areas

4.17.1 Fry Rearing Areas

Throughout the Sustut River watershed, fry are widely distributed through out much of the system, and in general most of the mainstem Sustut River could be considered to have suitable fry habitat. The best way to identify suitable fry rearing areas is to summarize

where steelhead fry have been sampled, and the densities at those locations (Figure 21 and Appendix VII). Fry densities are generally lower in the middle section of the Sustut River, compared to the upper and lower section (Appendix VII), but they are still found there, suggesting that this section might be moderate to poor fry habitat. Steelhead fry are known to migrate out of the Bear River (Envirocon 1985) and recruit to the lower Sustut River below the Bear River confluence, suggesting that this section of the mainstem river is important for fry rearing of the lower river population (Figure 21 and Appendix VII). Densities of steelhead fry are generally low in most tributaries of the Sustut River except Johanson Creek and the Bear River (Appendix VII) which are known steelhead spawning areas. These systems might then be regarded as high quality fry rearing areas. Other tributaries to the mainstem river sampled for fry, have had a low numbers of fry (Appendix VII).

4.17.2 Parr Rearing Areas

Steelhead parr are again likely distributed throughout much of the Sustut watershed, suggesting that the entire system has at least some capacity to provide suitable parr rearing habitat. There are however some sections in the upper river and the lower river that have higher densities of parr (Figure 22 and Appendix VII), suggesting that they are more critical rearing areas. Tributary use by parr is also indicative that some systems might be high quality parr rearing areas (Figure 22 and Appendix VII).

4.18 Angling Guide Data

Currently on the lower Sustut River, there are two angling guide lodges (Suskeena Lodge and Steelhead Valhalla Lodge) that operate on the river. These two operations have had a combined total quota of 750 guided angler days (350 for each lodge) that they are able to use between September 1st and October 31st each year, since the Sustut River was classified in 1991 (Table 28). These lodges may also operate out of this classified period, but must report those angler days as well.

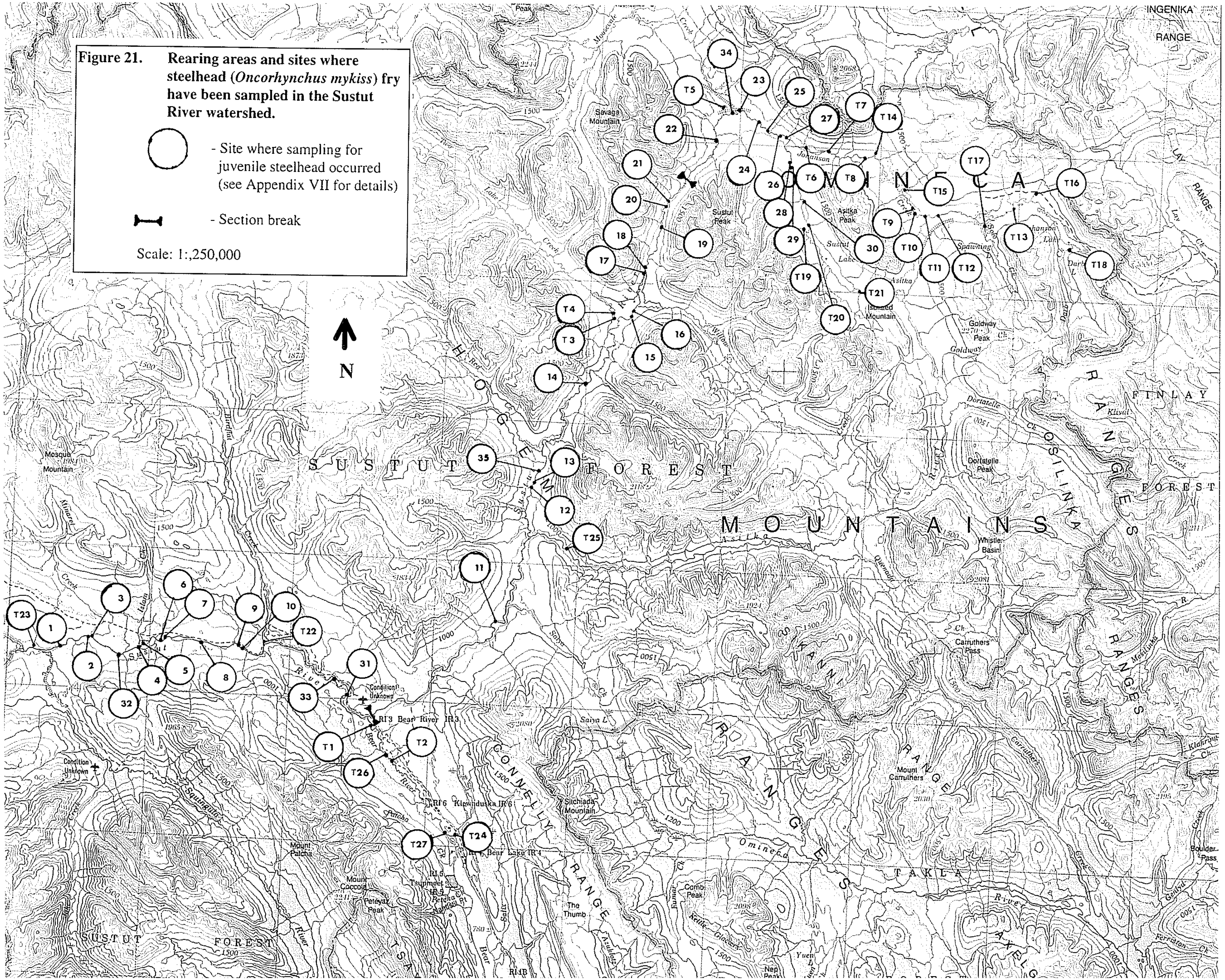

Figure 21. Rearing areas and sites where steelhead (*Oncorhynchus mykiss*) fry have been sampled in the Sustut River watershed.

Figure 22. **Rearing areas and sites where steelhead (*Oncorhynchus mykiss*) parr have been sampled in the Sustut River watershed.**

- Site where sampling for juvenile steelhead occurred (see Appendix VII for details)

- Section break

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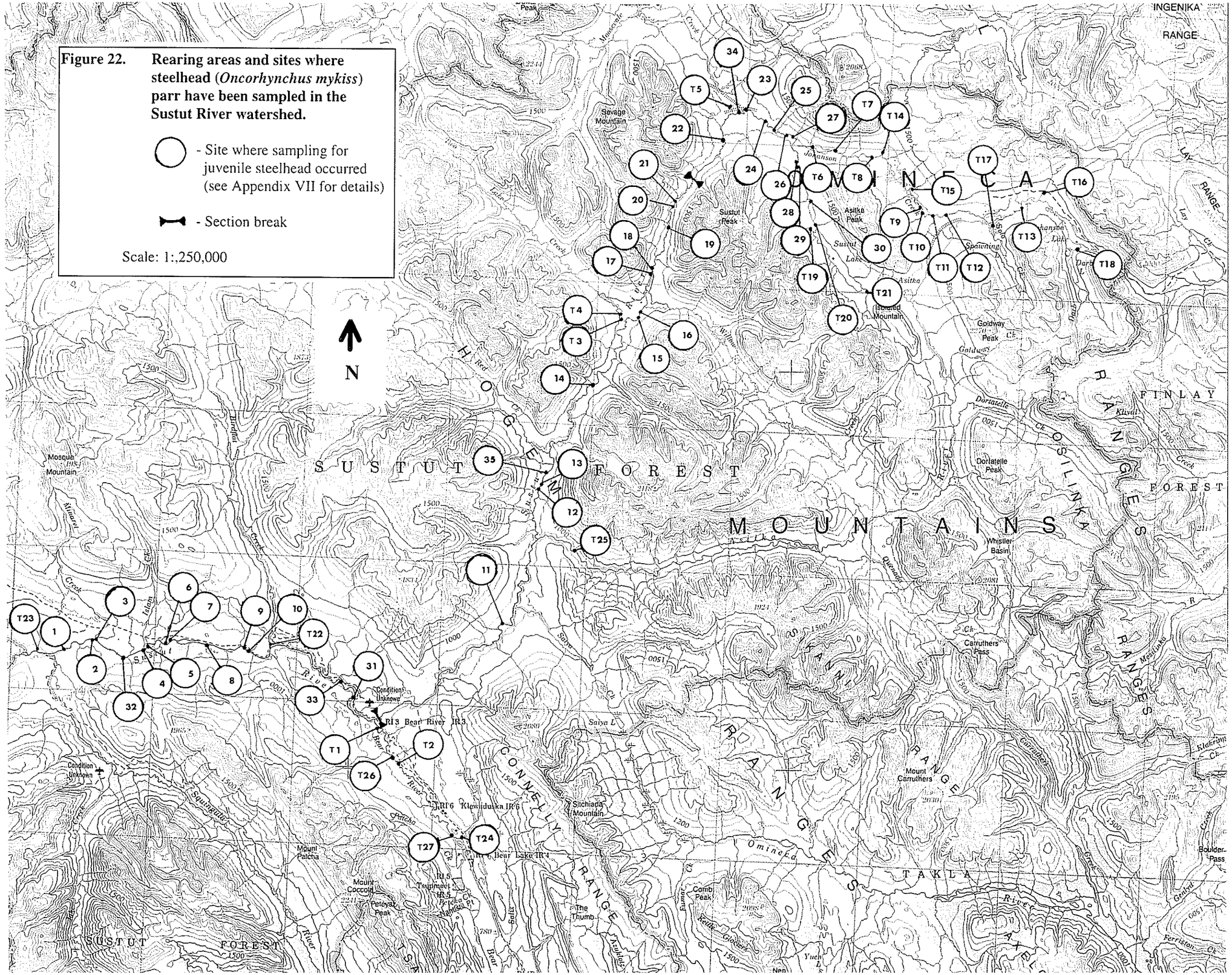

From the 1990/1991 season to the 1995/1996 season the number of guided angler days during the classified period fished out of the Steelhead Valhalla Lodge has been higher than those fished out of the Suskeena Lodge, as has been the total guided angler days each year.

The angling guide database contains data on the number of angler days guided and total catch of steelhead for angling guides from the 1990/1991 season to the 1995/1996 season. For this period, angling guides out of the two lodges have not used their allocated quota days on the Sustut River (Table 29). Total catch of steelhead from the two lodges has remained relatively constant (Table 29) with higher catches out of the Steelhead Valhalla Lodge. Catch per unit effort has remained constant and low (below 1.0 fish per angler day) for this period (Table 29) for both lodges. Prior to 1990 there is little data of steelhead catch and effort for guides on the Sustut River. This data is similar to the period from 1990/1991 to 1995/1996 for both the Suskeena Lodge and the Steelhead Valhalla Lodge. Catch per unit effort was again low for this time frame, and below 1.0 fish per angler day in all years. Again, more effort was based out of the Steelhead Valhalla Lodge.

Table 29. Number of quota angler days allocated and fished, total catch of steelhead (*Oncorhynchus mykiss*) for those angler days, and catch per unit effort (CPUE) at two fishing lodges on the Sustut River from the 1990/91 season to the 1995/96 season.

Season	Quota Angler Days Allocated	Quota Angler Days Used	Total Catch of Steelhead	CPUE
1990/91	750	402	254	0.63
1991/92	750	360	104	0.29
1992/93	750	254	149	0.57
1993/94	750	277	269	0.97
1994/95	750	314	210	0.67
1995/96	750	355	205	0.58

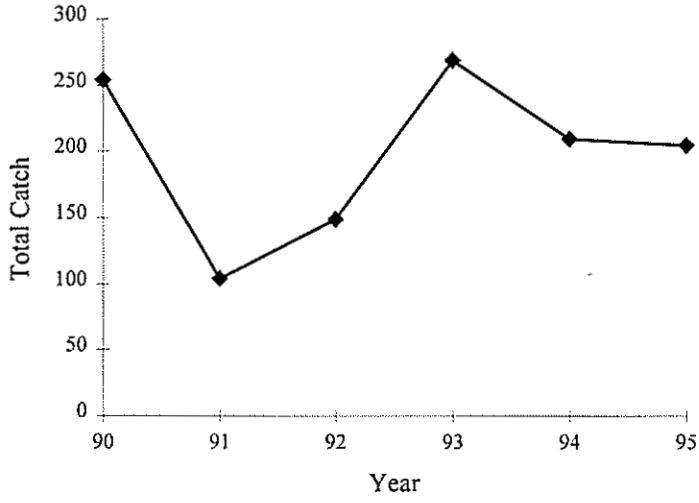

Figure 23. Summary of total catch of steelhead (*Oncorhynchus mykiss*) at two lodges on the Sustut River from the 1990/91 season to the 1995/96 season.

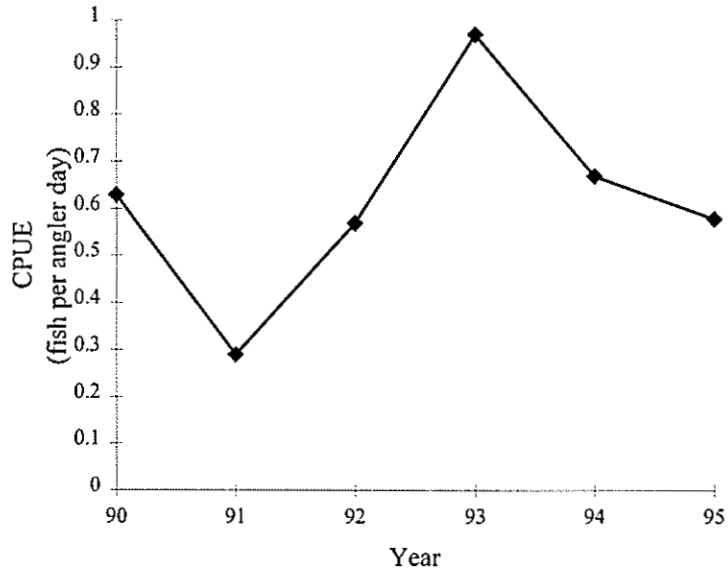

Figure 24. Summary of catch per unit effort (CPUE) for steelhead (*Oncorhynchus mykiss*) of anglers from two lodges on the Sustut River from the 1990/91 season to the 1995/96 season.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

5.1.1 Upper Sustut Sub-Population

Life-History

The upper Sustut River steelhead population has a number of unique life-history characteristics from the lower Sustut/Bear population that require different management strategies. This stock has very early run timing into the lower Skeena River that predisposes these fish to incidental harvest in the commercial fishery during the peak in effort each year. For this reason alone, the stock requires close monitoring to ensure that escapement levels do not drop to the point where there might be a conservation concern. The population size of the upper Sustut stock is also much smaller than the lower Sustut/Bear population. Currently escapement levels in the upper Sustut have not dropped to a point where there would be a conservation concern. Previous escapement data collected by D.F.O. personnel in the past (Hancock *et al.* 1983) also indicate that escapement levels to the system have been fairly stable (~500 steelhead adults each year), possibly suggesting that escapement to the upper Sustut population is simply low after 34-52% harvest in Area 4 (Ward *et al.* 1993), 25% harvest in Alaska (Tautz *et al.* 1992), and First Nations Fisheries and sport harvest in the Skeena River mainstem The small population size is an indicator however that this stock is more prone to negative effects from stochastic events that could decrease the population size.

Once in the upper Sustut River, habitat use by adult steelhead for holding until ice up, overwintering, and spawning are fairly specific. Certain areas and streams are also key for juvenile rearing, specifically with regard to parr rearing. Appropriate habitat protection for these areas should be put in place to ensure that these habitats are not negatively impacted. Based on the movements of juvenile steelhead fry and parr from the upper Sustut River (Bustard 1994c; Dubeau and Johannes 1996), it is also likely that the successful spawning in the upper Sustut River is critical for subsequent recruitment of

juvenile steelhead to appropriate habitat in the lower river. If this is in fact the case, then appropriate escapement levels in the upper river are not just necessary for the upper river, but also may be critical for the lower river.

Data from this report, and other studies, have indicated that the upper river population is unique from the lower river population in such characteristics of size, colouration, ocean and freshwater residency, and run timing. Present data being analyzed on the genetic structure of steelhead and rainbow trout in British Columbia has found that for Skeena River steelhead, most populations (including the upper Sustut) have two mitochondrial DNA haplotypes (M. McCusker, Graduate Student, University of British Columbia, Vancouver, B.C., pers. comm.). It might be possible to look at frequency differences for the two haplotypes in the lower and upper population, or do microsatellite analysis, to further determine if the two populations are unique.

Habitat Concerns

There are a number of possible habitat concerns in the upper Sustut River that must be monitored to ensure that they do not affect the steelhead, and other fish, populations that utilize the upper river. The primary concern in the near future will be the increased activity that will occur in the area with the completion of the Kemess Mine. The Omineca Mining Road will see a large increase in traffic through the upper Sustut River, and it is always possible that some sort of impact could affect the upper Sustut River. Impacts that will directly affect critical spawning habitat and incubation habitat for steelhead, and other anadromous salmonids, in the upper river must be limited.

The Sloan Connector Road (Moosevale Creek to Bear River) is also a concern primarily from possible impacts caused by road construction, increased sedimentation, and increased access (C. Parken, Fisheries Consultant, Smithers, B.C., pers. comm.). This work should be closely monitored.

Steelhead Harvest (First Nations and Illegal)

Currently the upper Sustut River is closed to angling, and this prevents any harvest of steelhead. It also limits the mortality risks associated with catch and release angling. There are, however, minimal data as to the harvest of steelhead by First Nations people, and illegal harvest through poaching. Based on this gap of information, it is not known whether or not the actual measured escapement levels in the fall correspond to actual escapement at spawning time, and this might be an area for future study. Due to this fact a continued program of enumeration and study in the upper river will have the benefits of continuing to monitor the population level, and establishing a high profile presence of the Provincial Fisheries Branch in the area. This would possibly deter illegal harvest, and help in the estimation of the extent of First Nations harvest in the upper river.

The question as to the extent of steelhead harvest by First Nations people might be also addressed by setting up a monitoring program with First Nations Bands involved in incidental harvest of steelhead while fishing for sockeye and chinook salmon. This would serve to benefit both the Provincial Fisheries Branch and First Nations people by providing information needed for management of the stock, and giving the Aboriginal fishers a better understanding of possible conservation concerns and a improved sense of steward ship for the resource.

Current Research Program

For the past five years, an enumeration program on the upper river has been undertaken by the Ministry of Environment, Lands, and Parks, Fisheries Branch, Smithers, B.C., to estimate escapement levels of steelhead. This program is an extremely important and useful tool to manage this population, and indicate the health of upper Skeena River steelhead populations. There is however one concern with regard to this operation that must be addressed. The primary concern is the affect that handling these fish has on mortality rate. The mean mortality rate from handling at the fence over the past five years has been 1.8 percent. Likely these are only the estimates of fish that end up back against the fence, so the rate may in fact be higher. Based on the large amount of data

that has been collected on size and age of steelhead in the upper river, there is a minimal need to handle most of these fish at the present time if escapements remain at the current levels. With this said however, it would be useful to collect weight information from 30 male and 30 female steelhead in the upper river as I could find few weight data for this report. This data would be helpful in comparing the length-weight relationship of the upper and lower sub-populations to further distinguish them.

5.1.2 Lower Sustut/Bear Sub-Population

Life-History

There is a limited amount of information on the life-history of the steelhead of the lower Sustut and Bear River. This population is larger than the upper river population, and thus has less of a conservation concern. The later time of migration into the lower Skeena River also decreases the concern of too much incidental harvest in commercial fisheries, but this still occurs and should continue to be monitored. Escapement levels in the lower river have not been estimated since 1986 (Spence *et al.* 1990) primarily due to access limitations, but the opportunity exists to do this on a small scale through aerial counts. This method has been suggested to be possible in the Bear River in the spring time, and may have some merit (Spence 1992). The contribution of the Bear River spawners to the lower Sustut River could also be estimated or monitored through a marking program of fry and parr in the upper river, and the use of a rotary screw trap, if access improves, to monitor downstream migration movements and rates.

It might also be useful to attempt to determine if there is any mainstem spawning of steelhead in the lower Sustut River below the Bear River confluence. It is not known if this is possible, but might be addressed through a radio telemetry study by tagging fish in the lower river in late August and September. This would allow the monitoring of movements to overwintering areas, and identification of spawning habitat in the springtime. In the lower river, both of these areas have limited data available.

Habitat Concerns

Despite its limited access, the lower Sustut River and Bear River have a number of habitat concerns that might be addressed. There have been rail lines, bridges, and culverts placed in these systems that have impacted both systems (e.g., Bustard 1993b). The Bear River has also been noted to be a system that can have high sediment loads due to habitat impacts (e.g., Chudyk 1972; Spence 1992; D. Bustard, Fisheries Consultant, Smithers, B.C., pers. comm.). Given the importance of the Bear River in providing spawning habitat for steelhead, any impacts which may increase sedimentation into the river must be limited, especially when salmonid eggs are incubating. It is also possible that some habitat enhancement work could be done on tributaries on the north side of the Sustut River where there are passage concerns due to culverts. It has been suggested that if some of these passage concerns were addressed that it might open up some habitat for spawning and rearing steelhead (D. Bustard, Fisheries Consultant, Smithers, B.C., pers. comm.).

Timber harvesting in the lower Sustut River valley (Fort St. James Forest District) is in an escalation phase, and may be an area for concern. The previously mentioned problems associated with culverts could be addressed are as a result of this timber removal. It is recommended that these culverts are assessed for their potential as barriers, and the possibility of improving fish passage if possible. This would fall under the mandate of FRBC, and this source should be examined for funding.

Steelhead Harvest (First Nations, Illegal, and Angling)

There are minimal data as to the harvest of steelhead by First Nations people in the lower Sustut and Bear rivers, and illegal harvest through poaching. Again it might be useful to determine which Aboriginal fishers are using the systems, and set up some sort of cooperative monitoring program to estimate harvest. Angling is currently only allowed in the lower Sustut River below the Bear River confluence, and there is no harvest of steelhead allowed. The situation of the two lodges on the lower river, the healthy population of steelhead in the lower river, and the fact that steelhead fishing is limited

above the Bear River confluence warrants this sport fishery to continue, and offers a good opportunity for future study. As far as is evident from the primary literature there are no data on associated risks of mortality with steelhead angling, and between the comparison of difference angling methods. Limited data from Vancouver Island suggests that there are no differences (D. Atagi, Fisheries Biologist, Ministry of Environment, Lands, and Parks, Fisheries Branch, Smithers, B.C., pers. comm.), but it would be possible to conduct a study in the lower river as to the affect of the different methods on mortality.

Current Research Program

Currently this is not an issue as there are no programs carried out in the lower river.

5.2 Recommendations

5.2.1 Upper Sustut Sub-Population

There are a number of possible recommendations for the upper river stock that could be addressed and implemented.

1. A continued program of enumeration in the upper Sustut River will be helpful in monitoring this population and for the use of the system as an index population of early run Skeena River steelhead. After taking weights for 60 steelhead (30 males and 30 females), the data collected at the fence should be changed to minimize the handling of the fish (i.e., no more lengths and weights or scales sampled). Fish should be simply enumerated and have a Floy tag applied. These two procedures would require minimal handling of the fish.

2. Another study during spawning would further identify which locations are used for spawning, and determine if there have been any changes from 1992 in the locations used. This program might also provide the means by which to estimate spawning escapement after pre-overwinter escapement, and at least provide some idea as to the extent of overwinter survival.

3. First Nations Bands that have individuals that utilize the upper Sustut River for harvest of salmonids should be contacted in an attempt to set up a monitoring program to estimate the number of steelhead harvested incidentally. This could be carried out by the First Nations Bands, M.E.L.P., and D.F.O.

4. Increased enforcement patrols should be undertaken in the upper Sustut River, given the increase in activity that will occur with the completion of the Kemess Mine. This may deter illegal harvest.

5. Any forestry or mine impacts in the upper Sustut should be closely monitored to ensure that critical overwintering, spawning, incubation, and rearing habitats are not impacted negatively. Specifically with the increased in use of the Omineca Mining Road that will occur there exists the possibility for direct impact to the upper Sustut River. Kemess Mines Inc. should be contacted to determine if appropriate measures are in place to deal with such potential problems as an oil and fuel spill into the drainage.

6. The continued program of no angling in the upper River should be continued.

5.2.2 Lower Sustut/Bear Sub-Population

There is limited information available on this stock, so most of the recommendations deal with collecting increased information on life-history.

1. Further detail spawning locations in the Bear River to a more precise level.

2. Determine if there is a method to estimate escapement in the lower river, possibly through aerial redd counts.

3. Provide lodge owners with data books, Floy tags, and tagging guns to apply tags to steelhead and to record any tag information they recover.

4. First Nations Bands that have individuals that utilize the lower Sustut and Bear River for harvest of salmonids should be contacted in an attempt to set up a monitoring program to estimate the number of steelhead harvested incidentally. This could be carried out by the First Nations Bands, M.E.L.P., and D.F.O.

5. Determine the extent to which juvenile steelhead from the Bear River recruit to the lower river population.

6. Possibly set up a study program on the lower river to measure mortality risks associated with angling.

7. Radio tag steelhead in the lower river to further determine critical overwintering and spawning locations.

8. Collect fin tissue samples for genetic study.

9. Assess culverts on the lower river for passage problems.

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Appendix I. Biological data of adult steelhead (*Oncorhynchus mykiss*) sampled in the Sustut River for scale aging.

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1972-73	72/12/09	m	86.4	4.5	4	3	+			
1977-78	77/05/10	f	76.2	3.2	4	2	+	316		
1977-78	77/05/10	f	78.7	3.6	4	2	+	315		
1977-78	77/05/10	f	81.3	4.5	4	2	S1+	294		
1977-78	77/04/10	m	100.3	8.2	4	3	+	292		
1977-78	77/04/10	m	96.5	9.1	4	3	+	289		
1977-78	77/04/10	m	88.9	6.8	4	2	+	290		
1977-78	77/04/10	f	76.2	3.2	4	2	+	291		
1977-78	77/04/10	m	83.8	5.4	4	2	+	293		
1977-78	77/05/10	f	81.3	4.5	4	2	+	295		
1977-78	77/05/10	m	55.9	1.8	4	1	+	296		
1977-78	77/05/10	f	78.7	4.5	4	2	+	297		
1977-78	77/05/10	m	83.8	5.4	4	2	+	298		
1977-78	77/05/10	f	73.8	3.2	4	2	+	299		
1977-78	77/06/10	f	86.4	5.9	5	2	S1+	300		
1977-78	77/04/10	f	88.9	7.3	4	2	S1+	312		
1977-78	77/04/10	f	76.2	3.6	4	2	+	313		
1977-78	77/04/10	f	78.7	4.1	4	2	+	314		
1977-78	19/9/77	m	88.9	7.7	4	2	+			
1977-78	13/9/77	m	91.4	8.6	4	2	+			
1977-78	15/9/77	f	81.3	7.7	4	2	+			
1977-78	20/9/77	m	78.7	5.9	3	2	+			
1977-78	23/9/77	f	73.7	5	4	2	+			
1977-78	24/9/77	m	94	10	4	3	+			
1977-78	25/9/77	m	78.7	6.1	4	2	+			
1977-78	26/9/77	m	63.5	2.7	4	1	+			
1977-78	30/9/77	m	82.5	6.1	3	2	+			
1977-78	30/9/77	f	72.4	4.8	4	2	+			
1977-78	77/04/10	f	73.7	4.1	4	2	+			
1977-78	77/10/10	m	101.6	10.4	4	3	+			
1977-78	16/10/77	f	77.5	5	4	2	+			
1983-84	14/9/83	m	94	8.2	4	3	+	or 02302	Bear-Sus Junc	Lower
1983-84	14/9/83	m	91.4	7.3	4	3	+	or 02303	Bear-Sus Junc	Lower
1983-84	14/9/83	f	81.3	5.4	4	2		or 02304	Bear-Sus Junc	Lower
1983-84	14/9/83	m	104.2	12.7	4	3	+	or 02305	Bear-Sus Junc	Lower
1983-84	14/9/83	f	78.7	4.5	4	2	+	or 02306	Bear-Sus Junc	Lower
1983-84	14/9/83	f	76.2	4.5	3	2	+	or 02307	Bear-Sus Junc	Lower
1983-84	14/9/83	f	78.7	5.4	3	2	+	or 02308	Bear-Sus Junc	Lower
1983-84	14/9/83	f	83.8	5.9	3	3	+	or 02309	Bear-Sus Junc	Lower
1983-84	14/9/83	f	76.2	5	4	2	+	or 02310	Bear-Sus Junc	Lower
1983-84	14/9/83	f	94	7.3	3	3	+		Bear-Sus Junc	Lower
1983-84	14/9/83	m	94		4	3	+	or 02313	Bear-Sus Junc	Lower
1983-84	14/9/83	m	83.8		4	2	+	or 02314	Bear-Sus Junc	Lower
1983-84	14/9/83	m	101.6		4	3	+	or 02315	Bear-Sus Junc	Lower
1983-84	14/9/83	f	73.7	4.1	4	2	+	or 02321	Bear-Sus Junc	Lower
1983-84	14/9/83	f	83.8	5.9	4	2	S1+	or 02322	Bear-Sus Junc	Lower
1983-84	14/9/83	m	78.7	5.4	4	1	S1+	or 02323	Bear-Sus Junc	Lower

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1983-84	23/9/83	f	69.9	3.6	4	2	+	or 02351	Bear-Sus Junc	Lower
1983-84	23/9/83	m	81.3	5.4	4	3	+	or 02352	Bear-Sus Junc	Lower
1983-84	23/9/83	f	72.4	4.1	4	2	+	or 02353	Bear-Sus Junc	Lower
1983-84	23/9/83	f	71.7	3.6	4	2	+	or 02354	Bear-Sus Junc	Lower
1983-84	23/9/83	f	72.4	4.1	3	2	+	or 02355	Bear-Sus Junc	Lower
1983-84	23/9/83	f	78.7	5.4	4	2	+	or 02356	Bear-Sus Junc	Lower
1983-84	23/9/83	m	91.4	9.1	3	3	+	or 02357	Bear-Sus Junc	Lower
1983-84	23/9/83	m	96.5	9.1	3	3	+	or 02358	Bear-Sus Junc	Lower
1983-84	23/9/83	f	71.1	4.1				or 02361	Bear-Sus Junc	Lower
1983-84	23/9/83	f	78.7					or 02371	Bear-Sus Junc	Lower
1983-84	23/9/83	f	81.3		4	2	+	or 02372	Bear-Sus Junc	Lower
1983-84	23/9/83	f	76.2		4	2	+	or 02373	Bear-Sus Junc	Lower
1983-84	23/9/83	m	94					or 02374	Bear-Sus Junc	Lower
1983-84	23/9/83	f	76.2	4.5				or 02375	Bear-Sus Junc	Lower
1983-84	23/9/83	m	91.4	7.7	4	3	+	or 02376	Bear-Sus Junc	Lower
1983-84	23/9/83	f	78.7	5	3	3	+	or 02377	Bear-Sus Junc	Lower
1983-84	23/9/83	f	86.4		4	3	+	or 02378	Bear-Sus Junc	Lower
1983-84	23/9/83	m	81.3		R	2	+	or 02379	Bear-Sus Junc	Lower
1983-84	83/02/10	f	76.2		4	2	+	or 02324	Bear-Sus Junc	Lower
1983-84	83/02/10	f	76.2		3	2	+	or 02325	Bear-Sus Junc	Lower
1983-84	83/02/10	f	76.2		4	2	+	or 02326	Bear-Sus Junc	Lower
1983-84	83/02/10	m	92.7		4	3	+	or 02327	Bear-Sus Junc	Lower
1983-84	83/02/10	m	97.8		4	3	+	or 02328	Bear-Sus Junc	Lower
1983-84	83/02/10	f	81.3		4	2	+	or 02329	Bear-Sus Junc	Lower
1983-84	83/09/10	m	86.4		4	2	+	or 02394	Sus-Joh Junc	Upper
1983-84	83/09/10	m	88.9		3	2	+	or 02395	Sus-Joh Junc	Upper
1983-84	83/09/10	f	68.6		4	2	+	or 02396	Joh Lk	Upper
1983-84	83/09/10	f	88.9		3	3	+	or 02397	Joh Lk	Upper
1983-84	83/09/10	f	76.2		4	2	+	bl 00403	Bear-Sus Junc	Lower
1983-84	83/09/10	f	86.4		3	3	+	bl 00407	Bear-Sus Junc	Lower
1983-84	83/09/10	f	88.9		4	3	+	bl 00408	Bear-Sus Junc	Lower
1983-84	83/09/10	f	86.4		3	3	S1+	bl 00409	Joh Lk	Upper
1983-84	83/09/10	m	91.4		4	3	+	bl 00410	Joh Lk	Upper
1983-84	83/09/10	m	86.4		3	3	+	bl 00411	Sus-Joh Junc	Upper
1983-84	83/09/10	f	76.2		3	2	+	bl 00412	Joh Lk	Upper
1983-84	83/09/10	f	76.2		4	2	+	bl 00413	Joh Lk	Upper
1983-84	83/09/10	m	88.9		3	3	+	bl 00414	Sus-Joh Junc	Upper
1983-84	83/09/10	f	78.7		4	2	+	bl 00415	Joh Lk	Upper
1983-84	83/09/10	f	81.3		4	2	+	bl 00432	Joh Lk	Upper
1983-84	83/09/10	m	83.8		4	2	+	bl 00433	Joh Lk	Upper
1983-84	83/09/10	m	48.3		6		+		Bear-Sus Junc	Lower
1983-84	83/02/10	f	87.7		4	3	+		Bear-Sus Junc	Lower
1983-84	83/02/10	f	78.7		5	2	+		Bear-Sus Junc	Lower
1983-84	83/02/10	m	97.8		4	3	+		Bear-Sus Junc	Lower
1983-84	83/02/10	m	97.8		3	3	+		Bear-Sus Junc	Lower
1983-84	14/9/83	m	78.7		4	2	+		Bear-Sus Junc	Lower
1983-84	83/01/10	f	82.6		3	2	S1+		Bear-Sus Junc	Lower
1983-84	83/01/10	f	81.3		3	2	S1+		Bear-Sus Junc	Lower
1983-84	83/03/10	f	76.2	6.4	4	2	+		Bear-Sus Junc	Lower
1984-85	84/12/09	f	75	5.2	4	2	+	x 00475	Zone 1	Lower
1984-85	84/12/09	m	73.7	5.4	4	2	+	x 00474	Zone 1	Lower

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1984-85	84/07/09	m	97.8	9.5	4	3	+		Zone 2	Lower
1984-85	84/11/09	m	91.4	9.1	4	2	S1+	x 00472	Zone 1	Lower
1984-85	84/11/09	m	90.2	9.1	3	2	+	x 00471	Zone 1	Lower
1984-85	84/12/09	m	80	6.4	3	2	+	x 00470	Zone 1	Lower
1984-85	84/12/09	m	83.8	6.4	4	3	+	x 00469	Zone 1	Lower
1984-85	84/12/09	m	91.4	9.1	3	2	S1+	x 00468	Zone 1	Lower
1984-85	13/9/84	m	97.8	10.4	3	3	S1+	x 00464	Zone 2	Lower
1984-85	84/10/09	m	88.9	8.6	4	2	+	x 00463	Zone 2	Lower
1984-85	84/10/09	f	76.2	4.5	4	2	+	x 00462	Zone 2	Lower
1984-85	84/10/09	f	76.2	4.5					Zone 2	Lower
1984-85	84/08/09	f	77.5	5.4	4	2	+	x 00460	Zone 1	Lower
1984-85	84/08/09	f	81.3	5.9				x 00458	Zone 1	Lower
1984-85	84/08/09	f	71.1	3.6				x 00457	Zone 1	Lower
1984-85	22/8/84	m	81.3	5.4	4	2	+	x 00456	Zone 1	Lower
1984-85	84/10/09	m	85.1	7.3	4	2	+	x 00455	Zone 1	Lower
1984-85	84/10/09	m	88.9	8.2	4	3	+	x 00454	Zone 1	Lower
1984-85	84/07/09	m	78.7	6.4	4	2	+	x 00453	Zone 1	Lower
1984-85	84/09/08	m	99.1	10.2	4	3	+	x 00452	Zone 1	Lower
1984-85	22/8/84	f	76.2	5.4	4	2	+	x 00451	Zone 1	Lower
1984-85	13/9/84	f	78.7					x 00553	Zone 3	Lower
1984-85	13/9/84	m	96.5		4	3	+	x 00553	Zone 3	Lower
1984-85	13/9/84	m	83.8		4	2	+	x 00565	Zone 3	Lower
1984-85	13/9/84	f	78.7		4	2	+	x 00564	Zone 3	Lower
1984-85	13/9/84	f	72.4		4	2	+	x 00555	Zone 3	Lower
1984-85	13/9/84	f	77.5					x 00552	Zone 3	Lower
1984-85	13/9/84	m	83		4	2	+	x 00554	Zone 3	Lower
1984-85	27/9/84	m	78.7		4	2	+		Zone 3	Lower
1984-85	27/9/84	f	76.2		4	2	+		Zone 3	Lower
1984-85	27/9/84	m	76.2		4	2	+		Zone 3	Lower
1984-85	27/9/85	m	43.2		8		+		Zone 3	Lower
1984-85	27/9/84	m	63.5		4	1	+	01576-01577	Zone 3	Lower
1984-85	27/9/84	f	73.7	4.5	4	2	+	01578-01579	Zone 3	Lower
1984-85	27/9/84	m	78.7	6.4	4	2	+	01580-01581	Zone 3	Lower
1984-85	27/9/84	m	94	9.5	4	3	3	x 00465	Zone 1	Lower
1984-85	29/9/84	m	91.4	9.1	4	3	+	x 00466	Zone 1	Lower
1984-85	27/9/84	f	88.9	8.2	4	3	+	x 00467	Zone 1	Lower
1984-85	14/9/84	m	83.8	6.8	3	2	S1+	x 00473	Zone 1	Lower
1984-85	19/9/84	f	95.3	8.2	4	2	+	x 00501	Zone 1	Lower
1984-85	29/9/84	m	94	8.6	4	3	+	x 00502	Zone 1	Lower
1984-85	84/01/10	f	76.2	5.4	4	2	+	x 00503	Zone 1	Lower
1984-85	84/01/10	m	80	6.4	3	2	+	x 00504	Zone 1	Lower
1984-85	84/01/10	f	78.7	6.4	3	2	+	x 00505	Zone 1	Lower
1984-85	18/9/84	m	83.8	6.8	3	2	+	x 00506	Zone 1	Lower
1984-85	19/9/84	m	73.7	5.4	3	2	+	x 00507	Zone 1	Lower
1984-85	22/9/84	m	83.8	7.3	4	3	+	x 00508	Zone 2	Lower
1984-85	22/9/84	m	73.7	5.4	4	2	+	x 00509	Zone 2	Lower
1984-85	84/07/10	f	76.2	5.4	4	2	+	x 00510	Zone 2	Lower
1984-85	84/10/10	f	76.2	5.4	4	2	+	x 00511	Zone 2	Lower
1984-85	84/06/10	m	91.4	8.2	4	2	+	x 00512	Zone 1	Lower
1984-85	28/9/84	m	78.7	6.4				x 00513	Zone 1	Lower
1984-85	28/9/84	m	86.4	7.3	4	2	+	x 00514	Zone 1	Lower

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1984-85	84/02/10	f	80	6.4	4	2	+	x 00515	Zone 1	Lower
1984-85	84/06/10	m	97.8	10.9	4	4	+	x 00516	Zone 1	Lower
1984-85	84/06/10	f	78.7	5.4	4	2	+	x 00517	Zone 2	Lower
1984-85	84/08/10	f	87.7	6.8	3	2	S1+	x 00523	Zone 1	Lower
1984-85	84/11/10	m	94	9.5	4	4	+	x 00525	Zone 1	Lower
1984-85	13/10/84	m	83.8	6.8	4	2	+	x 00526	Zone 1	Lower
1984-85	13/10/84	f	73.7	5.4	4	2	+	x 00527	Zone 1	Lower
1984-85	84/05/10	f	78.7		4	2	+	x 00223	Zone 1	Lower
1984-85	84/05/10	f	76.2		R	2	+	x 00401	Zone 1	Lower
1984-85	17/10/84	f	71.1		4	2	+	x 00402	Zone 3	Lower
1984-85	17/10/84	f	81.3		4	2	+	x 00403	Zone 3	Lower
1984-85	17/10/84	f	83.8		4	2	+	x 00404	Zone 3	Lower
1984-85	17/10/84	f	81.3		4	2	+	x 00405	Zone 2	Lower
1984-85	17/10/84	f	78.7		3	3	+	x 00406	Zone 3	Lower
1984-85	17/10/84?	f	68.6		4	2	+	x 00407	Zone 3	Lower
1984-85	17/10/84	f	77.5		4	2	S1+	x 00410	Zone 3	Lower
1984-85	17/10/84	f	73.7		3	2	+	x 00441	Zone 3	Lower
1984-85	17/10/84	m	77.5		3	2	+	x 00442	Zone 3	Lower
1984-85	17/10/84	m	83.8		4	2	+	x 00443	Zone 2	Lower
1984-85	17/10/84	f	88.9		4	3	+	x 00444	Zone 3	Lower
1985-86	84/04/10	m	88.9		4	3	+	x00570		
1995-96	95/11/08	m	84		4	3	+		Fence	Upper
1995-96	18/8/95	m	76		3	2	+	5701	Fence	Upper
1995-96	18/8/95	m	84		3	3	+	5702	Fence	Upper
1995-96	18/8/95	f	74		3	2	+	5703	Fence	Upper
1995-96	18/8/95	f	81		3	3	+	5704	Fence	Upper
1995-96	19/8/95	m	88		4	3	+	5705	Fence	Upper
1995-96	19/8/95	f	77		3	2	+	5706	Fence	Upper
1995-96	20/8/95	m	87		4	3	+	5707	Fence	Upper
1995-96	20/8/95	m	87		3	3	+	5708	Fence	Upper
1995-96	20/8/95	f	79.5		3	2	+	5709	Fence	Upper
1995-96	21/8/95	f	87		3	3	+	5710	Fence	Upper
1995-96	22/8/95	f	81		3	3	+	5711	Fence	Upper
1995-96	23/8/95	m	81.5		3	2	+	5712	Fence	Upper
1995-96	23/8/95	m	88		3	3	+	5713	Fence	Upper
1995-96	24/8/95	m	87.5		4	3	+	5714	Fence	Upper
1995-96	24/8/95	f	71.5		3	2	+	5715	Fence	Upper
1995-96	24/8/95	m	74		R	2	+	5716	Fence	Upper
1995-96	24/8/95	f	73		3	2	+	5717	Fence	Upper
1995-96	25/8/95	f	74		R	2	+	5718	Fence	Upper
1995-96	25/8/95.	f	73		4	2	+	5719	Fence	Upper
1995-96	25/8/95	f	74		3	2	+	5721	Fence	Upper
1995-96	25/8/95	f	80.5		3	2	+	5722	Fence	Upper
1995-96	25/8/95	f	82		3	3	+	5723	Fence	Upper
1995-96	26/8/95	m	82		3	3	+	5724	Fence	Upper
1995-96	27/8/95	d	82		3	3	+	5725	Fence	Upper
1995-96	27/8/95	d	74.5		4	2	+	5727	Fence	Upper
1995-96	27/8/95	d	73.5		4	2	+	5728	Fence	Upper
1995-96	28/8/95	d	73		4	2	+	5729	Fence	Upper
1995-96	28/8/95	m	86		3	3	+	5730	Fence	Upper
1996-97	31/8/96	m	81.8		3	2	+		Fence	Upper

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1996-97	31/9/96	m	84.4		4	2	S1+		Fence	Upper
1996-97					4	2	+		Fence	Upper
1996-97	96/01/09	f	77.7		4	2	+		Fence	Upper
1996-97	96/02/08	m	82.8		5	2	+		Fence	Upper
1996-97	96/02/08	m	81.5		4	2	S1+		Fence	Upper
1996-97	96/03/09	f	76		3	2	+		Fence	Upper
1996-97	96/03/09	f	78.9		3	2	+		Fence	Upper
1996-97	96/04/09	m	85.3		3	3	+		Fence	Upper
1996-97	96/04/09	f	71.8		4	2	+		Fence	Upper
1996-97	96/04/09	m	82.8		3	2	+		Fence	Upper
1996-97	96/04/09	m	88.5		3	3	+		Fence	Upper
1996-97	96/04/09	f	73.5		3	2	+		Fence	Upper
1996-97	96/04/09	m	79.4		3	2	+		Fence	Upper
1996-97	96/04/09	m	73.4		3	2	+		Fence	Upper
1996-97	96/04/09	m	80.2		4	2	+		Fence	Upper
1996-97	96/05/09	f	71.2		4	2	+		Fence	Upper
1996-97	96/05/09	f	80.5		3	2	+		Fence	Upper
1996-97	96/06/09	f	77.7		3	2	S1+		Fence	Upper
1996-97	96/06/09	f	69.8		4	2	+		Fence	Upper
1996-97	96/06/09	m	80.9		3	2	+		Fence	Upper
1996-97	96/06/09	f	73.9		4	2	+		Fence	Upper
1996-97	96/07/09	f	70.2		3	2	+		Fence	Upper
1996-97	96/07/09	f	74.2		3	2	+		Fence	Upper
1996-97	96/07/09	f	72		3	2	+		Fence	Upper
1996-97	96/07/09	f	69.1		3	2	+		Fence	Upper
1996-97	96/07/09	m	84.3		3	2	S1+		Fence	Upper
1996-97	96/07/09	m	79.4		3	2	+		Fence	Upper
1996-97	96/08/09	f	69.8		3	2	+		Fence	Upper
1996-97	96/08/09	m	82.7		3	2	+		Fence	Upper
1996-97	96/08/09	f	70.6		3	2	+		Fence	Upper
1996-97	96/08/09	m	86		5	2	+		Fence	Upper
1996-97	96/08/09	f	83						Fence	Upper
1996-97	96/09/09	m	86.4		3	2	S1+		Fence	Upper
1996-97	96/09/09	m	90.9		4	3	+		Fence	Upper
1996-97	96/09/09	f	84		4	2	+		Fence	Upper
1996-97	96/09/09	f	84.2		3	2	S1+		Fence	Upper
1996-97	96/09/09	m	73.9		3	2	+		Fence	Upper
1996-97	96/10/09	f	76.2		3	2	S1+		Fence	Upper
1996-97	96/10/09	f	74.7		3	2	+		Fence	Upper
1996-97	96/11/09	f	72.4		4	2	+		Fence	Upper
1996-97	96/12/09	f	74		3	2	+		Fence	Upper
1996-97	13/9/96	f	76.7		3	2	+		Fence	Upper
1996-97	13/9/96	m	84.1		3	2	+		Fence	Upper
1996-97	14/9/96	m	87		3	3	+		Fence	Upper
1996-97	14/9/96	m	81.6		3	2	+		Fence	Upper
1996-97	14/9/96	m	85.7		3	3	+		Fence	Upper
1996-97	15/9/96	f	73.7		3	2	+		Fence	Upper
1996-97	16/9/96	m	89.7		3	3	+		Fence	Upper
1996-97	17/9/96	m	75.6		3	2	+		Fence	Upper
1996-97	30/8/96	m	80.9		4	2	+		Fence	Upper
1996-97	30/8/96	m	74.2		3	2	+		Fence	Upper

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1996-97	30/8/96	f	73.8		3	2	+		Fence	Upper
1996-97	30/8/96	f	70.5		3	2	+		Fence	Upper
1996-97	30/8/96	f	72		3	2	+		Fence	Upper
1986-87	86/06/09	f	76.2		3	2	+	(y)x00510		
1986-87	86/06/09	f	81.3		3	2	+	(y)x00511		
1986-87	86/06/09	m	88.9		4	3	+	(y)x00526		
1986-87	86/06/09	m	81.3		4	2	+	(y)x00527		
1986-87	86/06/09	f	82.6		4	2	+	(y)x00528		
1986-87	86/06/09	f	76.2		3	2	+	(y)x00529		
1986-87	86/06/09	f	78.7		4	2	+	(y)x00530		
1986-87	86/07/09	f						(y)x00512		
1986-87	86/07/09	f	77		4	2	+	(y)x00513		
1986-87	86/07/09	f	76.2		4	2	+	(y)x00535		
1986-87	86/12/09	m	78.7		4	2	+	(y)x00531		
1986-87	86/12/09	m	86.4		5	2	+	(y)x00532		
1986-87	86/12/09	m	88.9		5	2	+	(y)x00533		
1986-87	14/9/86	f	79		4	2	+	(y)x00666		
1986-87	14/9/86	f	89		4	3	+	(y)x00665		
1986-87	14/9/86	m	86		R	2	+	(y)x00667		
1986-87	13/9/86	m	86		3	3	+	(y)x00668		
1986-87	13/9/86	m	103		4	3	+	(y)x00669		
1986-87	13/9/86	f	84		3	4	+	(y)x00688		
1986-87	13/9/86	f	77		3	2	+	(y)x00670		
1986-87	13/9/86	f	79		4	2	+	(y)x00671		
1986-87	86/12/09	f	76		4	2	+	(y)x00672		
1986-87	86/12/09	f	76		3	2	+	(y)x00673		
1986-87	86/12/09	m	76		4	2	+	(y)x00674		
1986-87	86/12/09	m	71.1		4	2	+	(y)x00675		
1986-87	86/12/09	f	76.2		3	2	+	(y)x00676		
1986-87	86/12/09	m	89		3	3	+	(y)x00677		
1986-87	86/12/09	m	89		3	3	+	(y)x00678		
1986-87	86/12/09	f	82		4	2	+	(y)x00679		
1986-87	86/12/09	m	97		4	3	+	(y)x00680		
1986-87	13/9/86	f	76.2		4	2	+	(y)x00681		
1986-87	13/9/86	f	81		4	2	S1+	(y)x00682		
1986-87	86/03/09	m	85.1		4	2	+	(y)x00505		
1986-87	86/03/09	f	91.4		4	2	S1+	(y)x00515		
1986-87	86/03/09	m	81.3		4	2	+	(y)x00516		
1986-87	86/03/09	f	80		4	2	+	(y)x00517		
1986-87	86/03/09	f	76.2		4	2	+	(y)x00518		
1986-87	86/04/09	f	75		5	2	+	(y)x00519		
1986-87	86/04/09	f	77.5		5	2	+	(y)x00520		
1986-87	86/05/09	m	88.9		5	2	+	(y)x00506		
1986-87	86/05/09	m	90.2		4	3	+	(y)x00507		
1986-87	86/05/09	f	96.5		4	2	S1S1+	(y)x00508		
1986-87	86/05/09	f	73.7		4	2	+	(y)x00521		
1986-87	86/05/09	m	90.2		3	3	+	(y)x00522		
1986-87	86/05/09	f	71.1		4	2	+	(y)x00523		
1986-87	86/05/09	f	78.7		5	2	+	(y)x00524		
1986-87	86/05/09	m	88.9		3	3	+	(y)x00525		
1986-87	86/06/09	f	78.7		4	2	+	(y)x00509		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	86/10/10	f	76		4	2	+	(y)x00639	Area 6	Upper
1986-87	86/10/10	f	73.7		4	2	+	y)x00637 (w)x0093	Area4	Lower
1986-87	86/10/10	f	79		3	2	+	y)x00636 (w)x0098	Area 6	Upper
1986-87	86/04/10	m	94		3	3	+	(o)01510	Area 6	Upper
1986-87	86/04/10	m	97		4	3	+	(o)01511	Area 6	Upper
1986-87	86/04/10	f	73.7					(o)01512	Area 6	Upper
1986-87	86/04/10	f	78.7		4	2	+	(o)01514	Area 6	Upper
1986-87	86/04/10	f	86		4	2	+	(o)01515	Area 2	Lower
1986-87	13/9/86	m	82		4	2	+	(y)x00683		
1986-87	13/9/86	m	86		3	2	+	(y)x00684		
1986-87	13/9/86	f	75		4	2	+	(y)x00685		
1986-87	13/9/86	f	88		3	3	+	(y)x00686		
1986-87	13/9/86	f	76		4	2	+	(y)x00689		
1986-87	13/9/86	m	83		4	2	+	(y)x00690		
1986-87	13/9/86	f	82		4	2	+	(y)x00691		
1986-87	14/9/86	f	80		4	2	+	(y)x00692		
1986-87	14/9/86	f	75		4	2	+	(y)x00693		
1986-87	14/9/86	m	84		4	2	+	(y)x00694		
1986-87	15/9/86	m	83		4	2	+	(y)x00695		
1986-87	15/9/86	f	79		4	2	+	(y)x00696		
1986-87	15/9/86	f	74		3	2	+	(y)x00697		
1986-87	15/9/86	f	75		3	2	+	(y)x00698		
1986-87	15/9/86	f	76		3	2	+	(y)x00699		
1986-87	15/9/86	m	84		4	2	+	(y)x00700		
1986-87	15/9/86	m	104		R	3	+	(y)x00701		
1986-87	14/9/86	f	80		4	2	+	(y)x00705		
1986-87	14/9/86	f	93		5	2	S1S1+	(y)x00706		
1986-87	15/9/86	f	79		4	2	+	(y)x00707		
1986-87	15/9/86	m	83		3	2	+	(y)x00708		
1986-87	15/9/86	m	94		3	3	+	(y)x00709		
1986-87	15/9/86	f	80		4	2	+	(y)x00710		
1986-87	15/9/86	m	87		4	3	+	(y)x00711		
1986-87	15/9/86	f	87		5	2	S1+	(y)x00712		
1986-87	15/9/86	m	104		4	3	+	(y)x00713		
1986-87	15/9/86	f	78		4	2	+	(y)x00714		
1986-87	15/9/86	f	77		3	2	+	(y)x00715		
1986-87	15/9/86	f	80		3	2	+	(y)x00716		
1986-87	15/9/86	f	82		3	3	+	(y)x00717		
1986-87	13/9/86	m	38		6		+			
1986-87	16/9/86	f	75		3	2	+	(y)x00702		
1986-87	16/9/86	f	79		4	2	+	(y)x00718		
1986-87	86/07/09	m	90		4	3	+	(y)x00999		
1986-87	16/9/86	f	81.3		3	2	S1+	(y)x00656		
1986-87	16/9/86		40.6		6					
1986-87	86/11/09	f	77		4	2	+	(y)x00578		
1986-87	86/11/09	f	80		4	2	+	(y)x00577		
1986-87	86/11/09	f	79		3	2	+	(y)x00576		
1986-87	86/11/09	f	80		4	2	+	(y)x00575		
1986-87	86/11/09	f	84		4	2	S1+	(y)x00574		
1986-87	86/11/09	f	79		3	2	+	(y)x00573		
1986-87	86/11/09	f	74		3	2	+	(y)x00572		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	86/11/09	f	81.5		R	2	+	(y)x00571		
1986-87	86/11/09	m	79		3	2	+	(y)x00570		
1986-87	86/12/09	f	91.4		4	3	S1S1+	(y)x00664		
1986-87	86/12/09	f	73		3	2	+	(y)x00534		
1986-87	86/11/09	m	97		4	3	+	(y)x00564		
1986-87	86/11/09	m	80		3	2	+	(y)x00563		
1986-87	86/11/09	m	98		3	3	+	(y)x00562		
1986-87	86/11/09	f	81		3	2	+	(y)x00561		
1986-87	86/11/09	f	74		4	2	+	(y)x00560		
1986-87	86/11/09	f	76		4	2	+	(y)x00559		
1986-87	86/11/09	f	74		4	2	+	(y)x00558		
1986-87	86/11/09	m	80		4	2	+	(y)x00557		
1986-87	86/10/09	f	88		R	2	S1+	(y)x00569		
1986-87	86/10/09	f	85.5		4	3	+	(y)x00568		
1986-87	86/10/09	f	79.5		5	2	+	(y)x00567		
1986-87	86/09/09	f	81.5		4	2	+	(y)x00566		
1986-87	86/09/09	m	88.9					(y)x00565		
1986-87	86/09/09	f	69		3	2	+	(y)x00556		
1986-87	86/09/09	m	93		5	3	+	(y)x00555		
1986-87	86/09/09	m	94		4	3	+	(y)x00546		
1986-87	86/09/09	f	80		3	3	+	(y)x00545		
1986-87	86/09/09	m	63.5		4	1	+	(y)x00544		
1986-87	86/08/09	m	102		4	3	+	(y)x00395		
1986-87	86/08/09	f	82		4	3	+	(y)x00394		
1986-87	86/08/09	f	86		4	3	+	(y)x00384		
1986-87	86/08/09	f	76		4	2	+	(y)x00276		
1986-87	86/08/09	m	82.6		3	2	+	(y)x00514		
1986-87	86/08/09	m	88.9		4	3	+	(y)x00543		
1986-87	86/08/09	f	77.5		4	2	+	(y)x00542		
1986-87	86/08/09	m	86.4		3	2	+	(y)x00541		
1986-87	86/08/09	m	94		4	3	+	(y)x00540		
1986-87	86/08/09	f	78.7		4	2	+	(y)x00539		
1986-87	86/08/09	f	88.9		4	3	+	(y)x00538		
1986-87	86/08/09	f	78.7		4	2	+	(y)x00537		
1986-87	86/08/09	m	63.5		2	1	+	(y)x00536		
1986-87	86/08/09	f	80		3	2	+	(y)x00554		
1986-87	86/08/09	m	89		4	3	+	(y)x00553		
1986-87	86/08/09	m	84		3	2	+	(y)x00552		
1986-87	86/08/09	f	76					(y)x00551		
1986-87	86/08/09	f	73		3	2	+	(y)x00550		
1986-87	86/08/09	m	89		R	2	+	(y)x00549		
1986-87	86/08/09	f	81		4	2	+	(y)x00548		
1986-87	86/08/09	m	76		4	2	+	(y)x00547		
1986-87	17/9/86	f	73.7		4	2	+	(y)x00735		
1986-87	17/9/86	f	78.5		4	2	+	(y)x00704		
1986-87	17/9/86	f	76		4	2	+	(y)x00703		
1986-87	17/9/86	f	81		4	2	+	(y)x00720		
1986-87	17/9/86	m	103		4	3	+	(y)x00719		
1986-87	17/9/86	f	81.3		3	2	+	(y)x00662 (y)x00663		
1986-87	17/9/86	f	86.5		3	3	+	(y)x00661		
1986-87	17/9/86	m	89		3	2	+	(y)x00660		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	17/9/86	f	81.3		4	2	+	(y)x00659		
1986-87	17/9/86	f	78.7		3	2	+	(y)x00658		
1986-87	17/9/86	m	88.9		4	3	+	(y)x00657		
1986-87	18/9/86	m	79		4	2	+	(y)x00724		
1986-87	18/9/86	f	76		R	2	+	(y)x00723		
1986-87	18/9/86	f	78.7		5	2	+	(y)x00722		
1986-87	18/9/86	f	79					(y)x00721		
1986-87	18/9/86	f	78		4	2	+	(y)x00736		
1986-87	18/9/86	f	77.5		4	2	+	(y)x00737		
1986-87	19/9/86	f	75		3	2	+	(y)x00738		
1986-87	19/9/86	f	73.7		3	2	+	(y)x00725		
1986-87	19/9/86	m	81		4	2	+	(y)x00726		
1986-87	19/9/86	f	81.3		4	2	+	(y)x00727		
1986-87	19/9/86	f	86					(y)x00728		
1986-87	19/9/86	f	86		4	2	S1+	(y)x00729		
1986-87	19/9/86	f	79		5	2	+	(y)x00730		
1986-87	20/9/86	f	76		3	3	+	(y)x00815		
1986-87	20/9/86	m	92.7		4	3	+	(y)x00816		
1986-87	20/9/86	f	81.3		4	2	+	(y)x00731		
1986-87	22/9/86	m	84		3	2	+	(y)x00742		
1986-87	24/9/86	m	94		3	3	+	(y)x00743		
1986-87	24/9/86	f	79		5	2	+	(y)x00744		
1986-87	24/9/86	f	85		3	3	+	(y)x00745		
1986-87	24/9/86	m	78.7		4	2	+	(y)x00746		
1986-87	24/9/86	f	79		4	2	+	(y)x00747		
1986-87	21/9/86	f	82		4	3	+	(y)x00818		
1986-87	21/9/86	f	82					(y)x00819		
1986-87	21/9/86	f	76		4	2	+	(y)x00820		
1986-87	21/9/86	f	72.4		4	2	+	(y)x00817		
1986-87	21/9/86	f	76.2		4	2	+	(y)x00821		
1986-87	21/9/86	m	104.2		4	3	+	(y)x00739		
1986-87	21/9/86	m	67		4	1	+	(y)x00740		
1986-87	21/9/86	m	86.4		4	3	+	(y)x00741		
1986-87	22/9/86	m	91.4		R	3	+			
1986-87	25/9/86	f	92.7		4	3	+	(w)x00925		
1986-87	25/9/86	f	83.8					(w)x00924		
1986-87	25/9/86	m	66		4	1	+	(w)x00920		
1986-87	25/9/86	f	71.1		3	2	+	(w)x00916		
1986-87	25/9/86	f	76.2		3	2	+	(w)x00915		
1986-87	25/9/86	f	77.5		4	2	+	(w)x00914		
1986-87	25/9/86	m	83.8		4	2	+	(w)x00913		
1986-87	25/9/86	f	75		4	2	+	(w)x00912		
1986-87	25/9/86	f	78.7		4	2	+	(w)x00911		
1986-87	25/9/86	f	83.8		4	3	+	(w)x00910		
1986-87	25/9/86	f	80		3	2	+	(w)x00909		
1986-87	25/9/86	f	75		3	2	+	(w)x00908		
1986-87	25/9/86	m	82.6		3	2	+	(w)x00907		
1986-87	25/9/86	f	82.6		4	2	+	(w)x00906		
1986-87	25/9/86	f	68.6		4	2	+	(w)x00905		
1986-87	25/9/86	f	76.2		4	2	+	(w)x00904		
1986-87	25/9/86	m	88.9		3	3	+	(w)x00903		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	25/9/86	f	68.6		3	2	+	(w)x00902		
1986-87	25/9/86	f	83.8		4	3	+	(w)x00901		
1986-87	25/9/86	m	83		3	2	+	(y)x00754		
1986-87	25/9/86	f	83		4	3	+	(y)x00753		
1986-87	25/9/86	f	78.7		4	2	+	(y)x00752		
1986-87	25/9/86	m	91.4		3	3	+	(y)x00751		
1986-87	25/9/86	m	89		3	3	+	(y)x00750		
1986-87	25/9/86	f	77		4	2	+	(y)x00749		
1986-87	25/9/86	f	79		3	2	+	(y)x00748		
1986-87	25/9/86	f	89		4	3	+	(y)x00825		
1986-87	25/9/86	f	85.1		4	3	+	(w)x00917		
1986-87	25/9/86	f	80		4	2	+	(w)x00922		
1986-87	26/9/86	m	99.1		4	3	+	(y)x00840		
1986-87	26/9/86	f	82.6		3	2	+	(y)x00841		
1986-87	26/9/86	m	88.9		3	3	+	(y)x00842		
1986-87	26/9/86	f	82.6		3	3	+	(y)x00843		
1986-87	26/9/86	f	73.7		3	2	+	(y)x00844		
1986-87	26/9/86	f	77.5		3	2	+	(y)x00845		
1986-87	26/9/86	f	84		3	2	+	(y)x00846		
1986-87	26/9/86	m	82.6		3	2	+	(y)x00847		
1986-87	26/9/86	f	77.5		4	2	+	(y)x00848		
1986-87	26/9/86	m	90.1		4	3	+	(y)x00849		
1986-87	26/9/86	f	78.7		3	2	+	(y)x00850		
1986-87	26/9/86	f	77.5		4	2	+	(y)x00852		
1986-87	26/9/86	f	81.3		4	2	+	(y)x00853		
1986-87	26/9/86	f	80		4	2	+	(y)x00854		
1986-87	26/9/86	m	94		4	2	+	(y)x00855		
1986-87	26/9/86	f	73.7		3	2	+	(y)x00856		
1986-87	26/9/86	f	80		3	2	+	(y)x00857		
1986-87	26/9/86	f	71.1		4	2	+	(y)x00858		
1986-87	26/9/86	f	75		4	2	+	(y)x00859		
1986-87	26/9/86	f	71.1					(y)x00860		
1986-87	26/9/86	m	83.8		4	2	+	(w)x00918		
1986-87	26/9/86	m	81.3		3	3	+	(w)x00919		
1986-87	26/9/86	f	72.4		3	2	+	(w)x00921		
1986-87	26/9/86	f	81.3		4	2	+	(w)x00923		
1986-87	26/9/86	f	78.7		4	2	+	(w)x00926		
1986-87	26/9/86	m	78.7		4	2	+	(w)x00927		
1986-87	26/9/86	f	78.7		3	2	+	(w)x00928		
1986-87	26/9/86	f	69.9		3	2	+	(w)x00930		
1986-87	27/9/86	f	75		4	2	+	(y)x00826		
1986-87	27/9/86	f	83.8		4	2	+	(y)x00827		
1986-87	27/9/86	m	87.7		4	2	+	(y)x00828		
1986-87	27/9/86	m	88.9		3	2	+	(y)x00835		
1986-87	27/9/86	f	80		4	2	+	(y)x00836		
1986-87	27/9/86	f	76.2		3	2	+	(y)x00837		
1986-87	27/9/86	m	94		3	3	+	(y)x00838		
1986-87	27/9/86	f	88.9		3	2	S1+	(y)x00839		
1986-87	27/9/86	f	78.7		4	2	+	(y)x00861		
1986-87	27/9/86	f	76.2		3	2	+	(y)x00862		
1986-87	27/9/86	f	76.2		4	2	+	(y)x00863		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	27/9/86	m	88.9		4	2	+	(y)x00864		
1986-87	27/9/86	f	87.7		4	3	+	(y)x00865		
1986-87	27/9/86	m	83.8					(y)x00866		
1986-87	27/9/86	f	80		4	2	+	(y)x00867		
1986-87	27/9/86	f	78.7		4	2	+	(y)x00868		
1986-87	27/9/86	f	78.7		4	2	+	(y)x00869		
1986-87	27/9/86	f	81.3		4	2	+	(y)x00872		
1986-87	27/9/86	f	85.1		4	2	S1+	(y)x00874		
1986-87	27/9/86	m	95.3		4	3	+	(y)x00875		
1986-87	27/9/86	f	86.4		3	2	S1+	(y)x00876		
1986-87	27/9/86	m	92.7		4	3	+	(y)x00877		
1986-87	27/9/86	f	78.7		4	2	+	(y)x00878		
1986-87	27/9/86	f	77.5		4	2	+	(y)x00879		
1986-87	27/9/86	f	77.5		3	2	+	(y)x00880		
1986-87	27/9/86	m	86.4		4	2	+	(y)x00881		
1986-87	27/9/86	f	76.2		4	2	+	(y)x00882		
1986-87	28/9/86	m	83.8		4	2	+	(y)x00470		
1986-87	28/9/86	f	88.9		3	2	S1S1+	(y)x00471		
1986-87	28/9/86	m	88.9					(y)x00472		
1986-87	28/9/86	f	91.4		4	3	+	(y)x00473		
1986-87	28/9/86	m	85.5		4	2	+	(y)x00829		
1986-87	28/9/86	m	76.2		4	2	+	(y)x00830		
1986-87	28/9/86	f	87.7		4	3	+	(y)x00831		
1986-87	28/9/86	f	75		4	2	+	(y)x00832		
1986-87	28/9/86	m	81.3		4	2	+	(y)x00833		
1986-87	28/9/86	f	78.7		4	2	+	(y)x00834		
1986-87	28/9/86	m	86.4		4	2	+	(y)x00870		
1986-87	28/9/86	m	90.2		4	2	+	(y)x00871		
1986-87	28/9/86	f	78.7		4	2	+	(y)x00873		
1986-87	28/9/86	f	77.5					(y)x00883		
1986-87	28/9/86	f	77.5		4	2	+	(y)x00884		
1986-87	28/9/86	f	68.6		4	2	+	(y)x00890		
1986-87	28/9/86	f	78.7		4	2	+	(y)x00891		
1986-87	28/9/86	m	83.8		4	2	+	(y)x00892		
1986-87	28/9/86	f	78.7		5	2	+	(y)x00893		
1986-87	28/9/86	f	78.7		4	2	+	(y)x00894		
1986-87	28/9/86	m	96.5		4	3	+	(y)x00995		
1986-87	28/9/86	f	80		4	2	+	(y)x00996		
1986-87	28/9/86	f	76.2		4	2	+	(y)x00997		
1986-87	28/9/86	f	78.7		4	2	+	(y)x00998		
1986-87	29/9/86	f	77.5		3	2	+	(y)x00885		
1986-87	29/9/86	f	76.2		4	2	+	(y)x00886		
1986-87	29/9/86	f	78.7		3	2	+	(y)x00887		
1986-87	29/9/86	f	82.6		3	2	+	(y)x00888		
1986-87	29/9/86	f	78.7		4	2	+	(y)x00889		
1986-87	29/9/86	f	81.3					(y)x00895		
1986-87	29/9/86	f	77.5		4	2	+	(y)x00896		
1986-87	29/9/86	f	82.6		4	2	+	(y)x00897		
1986-87	29/9/86	f	83.8		3	2	+	(y)x00898		
1986-87	29/9/86	f	77.5		4	2	+	(y)x00899		
1986-87	29/9/86	m	85.1		4	2	+	(y)x00900		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	29/9/86	f	78.7		4	2	+	(y)x00901		
1986-87	29/9/86	f	71.1		4	2	+	(y)x00999		
1986-87	29/9/86	f	78.7		4	2	+	(y)x01000		
1986-87	30/9/86	f	77.5		4	2	+	(y)x00902		
1986-87	30/9/86	m	101.6		4	3	+	(y)x00903		
1986-87	21/9/86	f	76.2		R	2	+	(y)x00635		
1986-87	30/9/86	f	76.2					(w)x00995		
1986-87	86/01/09	f	78.7					(y)x00494		
1986-87	86/06/09	m	92.7					(w)x00999		
1986-87	86/06/09	f	73.7	4.5				(w)x00997		
1986-87	86/07/09	f	81.3	5.4	3	3	+	(y)x00484		
1986-87	86/08/09	m	95.3	8.6	4	3	+	(y)x00483		
1986-87	86/08/09	m	76.2	4.5	3	2	+	(y)x00482		
1986-87	86/08/09	f	76.2	4.5	R	2	+	(y)x00481		
1986-87	86/08/09	f	81.3	5.4	3	2	S1+	(y)x00480		
1986-87	86/09/09	f	85.1	6.8	3	3	+	(w)x00996		
1986-87	86/10/09	f	68.6	3.6	3	2	+	(w)x00998		
1986-87	86/10/09	f	82.6	6.4	3	2	+	(y)x00475		
1986-87	86/10/09	f	76.2	5.4	4	3	+	(y)x00476		
1986-87	86/11/09	f	76.2	4.5	5	2	+	(y)x00617		
1986-87	86/11/09	m	78.7	5	3	2	+	(y)x00477		
1986-87	86/11/09	m	104.2	11.4	R	3	+	(y)x00478		
1986-87	86/11/09	m	83.8	6.8	3	2	+	(y)x00615		
1986-87	86/12/09	f	94					(y)x00493		
1986-87	14/9/86	f	80	6.2	4	2	+	(y)x00579		
1986-87	15/9/96	f	80	5.4				(y)x00580		
1986-87	15/9/96	f	78.7	5.9	4	2	+	(y)x00583		
1986-87	15/9/96	f	78.7	5.4				(y)x00582		
1986-87	15/9/96	m	83.8	6.8	3	2	+	(y)x00581		
1986-87	15/9/96	m	81.3	5.4	4	2	S1+	(y)x00593		
1986-87	15/9/96	m	73.7	4.5	3	2	+	(y)x00618		
1986-87	15/9/96	m	83.8	6.1	3	3	+			
1986-87	15/9/96	f	77.5	5.4	3	2	+	(y)x00594		
1986-87	16/9/96	f	73.7	5	3	2	+	(y)x00619		
1986-87	16/9/96	m	96.5	10	3	3	+	(y)x00620		
1986-87	16/9/96	f	80	5.6	4	2	+	(y)x00616		
1986-87	16/9/96	f	73.7	5	3	2	+	(y)x00603		
1986-87	16/9/96	m	94	9.1	3	3	+	(y)x00602		
1986-87	16/9/96	f	83.8	6.8	R	2	+	(y)x00604		
1986-87	16/9/96	f	86.4	7.7				(y)x00489		
1986-87	16/9/96	m	80					(y)x00614		
1986-87	16/9/96	f	85.1	6.8				(y)x00591		
1986-87	16/9/96	f	82.6	6.4				(y)x00592		
1986-87	17/9/96	m	83.8	6.6	3	2	+	(y)x00479		
1986-87	17/9/96	m	87.7		4	2	S1+	(y)x00601		
1986-87	17/9/96	m	102.2	11.4				(y)x00610		
1986-87	17/9/96	f	78.7	5.4				(y)x00611		
1986-87	17/9/96	f	81.3	6.4	4	2	+	(y)x00585		
1986-87	17/9/96	m	83.8	6.4	3	2	+	(y)x00587		
1986-87	17/9/96	f	76.2	4.5	3	2	+	(y)x00586		
1986-87	17/9/96	f	77.5	5.4				(y)x00613		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	17/9/96	f	92	9.1	3	3	+	(y)x00590		
1986-87	17/9/96	f	81.3	5.4	4	2	+	(y)x00589		
1986-87	17/9/96	f	85.1	6.8	5	3	+	(y)x00605		
1986-87	17/9/96	f	82.6	6.4	4	2	+	(y)x00606		
1986-87	17/9/96	f	77.5	5.4	4	2	+	(y)x00624		
1986-87	17/9/96	f	87.7	7.7	4	2	S1+	(y)x00600		
1986-87	17/9/96	f	76.2	4.5	4	2	+	(y)x00588		
1986-87	18/9/96	f	73.7	5	4	2	+	(y)x00595		
1986-87	18/9/96	m	99.1	9.7	3	3	+	(y)x00622		
1986-87	18/9/96	f	80	5.4	3	2	+	(y)x00623		
1986-87	18/9/96	f	66	3.6				(y)x00598		
1986-87	18/9/96	f	75	4.5				(y)x00612		
1986-87	18/9/96	f	73.7	4.5	4	2	+	(y)x00607		
1986-87	18/9/96	m	78.7	5.9	3	1	S1+	(y)x00609		
1986-87	18/9/96		78.7	5.6	3	2	+	(y)x00596		
1986-87	18/9/96	m	99.1	11.4	4	3	+	(y)x00621		
1986-87	19/9/96	m	64.8	3.2				(y)x00599		
1986-87	19/9/96	f	826	6.4	3	2	+	(y)x00597		
1986-87	19/9/96	f	73.5	5	4	2	+	(y)x00608		
1986-87	96/01/10	f	78.7		4	2	+	(y)x00955		
1986-87	96/01/10	m	77.5		3	2	+	(y)x00956		
1986-87	96/01/10	f	77.5		4	2	+	(y)x00957		
1985-86	84/04/10	m	88.9		4	3	+	x00570		
1985-86	85/03/10	m	86.4		4	2	+	x 00567		
1985-86	85/03/10	m	81.3		3	2	+	x 00563		
1985-86	85/03/10	m	88.9					x 0056 ?		
1985-86	85/03/10	m	88.9		4	2	+	x00561		
1985-86	85/03/10	m	92.7		4	3	+	x 00559		
1985-86	85/04/10	m	80		3	2	+	x 00558		
1985-86	85/03/10	f	78.7					or 03453		
1985-86	85/04/10	f	76.2		4	2	+	or 03454		
1985-86	85/03/10	f	78.7		4	2	+	or 03455		
1985-86	85/03/10	f	76.2		4	2	+	or 03456		
1985-86	85/04/10	f	75		4	2	+	or 03457		
1985-86	85/04/10	f	73.7		4	2	+	or 03458		
1985-86	85/04/10	m	88.9		3	2	+	or 03459		
1985-86	85/03/10	f	76.2		4	2	+	or 03460		
1985-86	85/03/10	m	83.8		4	2	+	or 03461		
1985-86	85/03/10	m	83.8		4	2	+	or 03462		
1985-86	85/03/10	m	83.8		4	2	+	or 03463		
1985-86	85/03/10	m	96.5		4	3	+	or 03464		
1985-86	85/04/10	m	92.7		4	3	+	or 03465		
1985-86	85/03/10	f	77.5		4	2	+	or 03466		
1985-86	85/04/10	m	83.8		4	2	+	or 03467		
1985-86	85/03/10	f	76.2		4	2	+	or 03468		
1985-86	85/03/10	f	81.3		4	2	+	or 03469		
1985-86	85/04/10	f	76.2					or 03470		
1985-86	85/04/10	m	91.4		4	3	+	or 03471		
1985-86	85/04/10	m	78.7		3	2	+	or 03472		
1985-86	85/04/10	f	78.7		4	2	+	or 03473		
1985-86	85/04/10	f	76.2		4	2	+	or 03474		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1985-86	85/04/10	f	76.2		4	2	+	or 03475		
1985-86	23/8/85	f	78.7	5.4	4	2	+	x 00518	Zone 1	Lower
1985-86	24/8/85	m	78.7	5.4	4	2	+	x 00519	Zone 1	Lower
1985-86	27/8/85	f	91.4	8.2	4	3	+	x 00550	Zone 1	Lower
1985-86	28/8/85	m	66	3.4	3	1	+	x 00520	Zone 2	Lower
1985-86	30/8/85	f	86.4	7.3	3	3	+		Zone 1	Lower
1985-86	85/01/09	f	78.7	5.4				x 00549	Zone 1	Lower
1985-86	85/11/09	f	78.7	5.4	4	2	+	x 00521	Zone 3	Lower
1985-86	85/11/09	f	75	4.5	3	2	+		Zone 3	Lower
1985-86	85/11/09	f	75	4.5	4	2	+	x 00529	Zone 3	Lower
1985-86	85/11/09	f	81.3	6.4				x 00530	Zone 3	Lower
1985-86	85/12/09	f	94	8.6	3	2	S1+	x 00531	Zone 2	Lower
1985-86	85/12/09	m	88.9	7.3	4	3	+	x 00552	Zone 1	Lower
1985-86	13/9/85	f	76.2	4.5	4	2	+	x 00528	Zone 3	Lower
1985-86	13/9/85	m	92.7	8.2	4	3	+	x 00548	Zone 2	Lower
1985-86	13/9/85	m	91.4	7.7	3	3	+	x 00524	Zone 3	Lower
1985-86	13/9/85	f	78.7	5				x 00546	Zone 2	Lower
1985-86	13/9/85	m	86.4	6.8	3	2	+	x 00547	Zone 2	Lower
1985-86	17/9/85	m	83.8	7.3	4	2	+	x 00532	Zone 2	Lower
1985-86	17/9/85	f	77.5	5.4	4	2	+	x 00533	Zone 2	Lower
1985-86	17/9/85	m	95.3	9.5	3	3	+	x 00961	Zone 1	Lower
1985-86	18/9/85	f	83.8	7.3	4	2	+	x 00962	Zone 2	Lower
1985-86	21/9/85	f	78.7	5.6	4	2	+	x 00534	Zone 2	Lower
1985-86	22/9/85	f	78.7	5.9				x 00545	Zone 1	Lower
1985-86	22/9/85	f	78.7	5.9				x 00587	Zone 1	Lower
1985-86	22/9/85	f	81.3	6.4				x 00536	Zone 1	Lower
1985-86	22/9/85	f	78.7	5.6	3	2	S1+	x 00960	Zone 4	Lower
1985-86	23/9/85	m	99.1	11.8	4	3	+	x 00952		
1985-86	23/9/85	m	97.8	10	4	3	+	x 00535	Zone 2	Lower
1985-86	23/9/85	f	80	6.4	3	2	+	x 00544	Zone 1	Lower
1985-86	23/9/85	f	73.7	4.5	4	2	+	x 00542	Zone 1	Lower
1985-86	23/9/85	f	73.7	5	4	2	+	x 00538	Zone 1	Lower
1985-86	23/9/85	m	83.8	6.8	3	3	+	x 00543	Zone 4	Lower
1985-86	24/9/85	f	69.9	4.1	4	2	+	x 00541	Zone 2	Lower
1985-86	24/9/85	f	77.5	5	3	2	+	x 00953	Zone 1	Lower
1985-86	24/9/85	f	81.3	6.4	3	2	+	x 00540	Zone 2	Lower
1985-86	24/9/85	m	91.4	9.1	4	2	+	x 00539	Zone 2	Lower
1985-86	24/9/85	m	92.7	10.4	3	3	+	x 00954	Zone 1	Lower
1985-86	25/9/85	f	91.4	8.2	4	2	S1+	x 00958	Zone 4	Lower
1985-86	25/9/85	f	81.3	5.9	4	2	+	x 00986	Zone 2	Lower
1985-86	25/9/85	f	81.3	6.4	3	3	+	x 00987	Zone 2	Lower
1985-86	25/9/85	m	96.5	10.4				x 00955	Zone 2	Lower
1985-86	25/9/85	f	76.2	5.4	4	2	+	x 00957	Zone 4	Lower
1985-86	26/9/85	m	99.1	11.4	4	3	+	x 00988	Zone 1	Lower
1985-86	27/9/85	f	80	5.9	4	2	+	or 02470	Zone 2	Lower
1985-86	27/9/85	m	81.3	6.4	4	2	+	or 02475	Zone 2	Lower
1985-86	27/9/85	f	81.3	5.9	4	2	+	or 02474	Zone 2	Lower
1985-86	27/9/85	m	85.1	6.8	4	2	+	or 02473	Zone 2	Lower
1985-86	27/9/85	f	78.7	5.9	4	2	+	x 00956	Zone 2	Lower
1985-86	27/9/85	m	85.1	6.8	3	3	+	x 00959	Zone 2	Lower
1985-86	28/9/85	m	96.5	9.5	R. 3			x 00963	Zone 1	Lower

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1985-86	28/9/85	m	92.7	7.3	4	3	+	or 02472	Zone 2	Lower
1985-86	28/9/85	f	80	5.9	4	3	+		Zone 2	Lower
1985-86	29/9/85	f	81.3	5.6	3	2	+	x 01000	Zone 2	Lower
1985-86	30/9/85	f	82.6	5.9	4	2	+	or 02469	Zone 3	Lower
1985-86	30/9/85	f	83.8	6.4	4	2	+	or 02471	Zone 3	Lower
1985-86	85/01/10	f	75	3.6	4	2	+	x 00964	Zone 1	Lower
1985-86	85/01/10	m	99.1	10	R. 3		+	or 02462	Zone 3	Lower
1985-86	85/01/10	m	85.1	6.8	3	2	+	or 02468	Zone 3	Lower
1985-86	85/01/10	f	76.2	4.5	4	2	+	or 02461	Zone 3	Lower
1985-86	85/02/10	m	81.3	5.4	4	2	+	x 00989	Zone 1	Lower
1985-86	85/02/10	f	81.3	4.5	4	2	S1+	x 00990	Zone 4	Lower
1985-86	85/03/10	m	85.1	6.4	4	2	S1+		Zone 1	Lower
1985-86	85/05/10	f	73.7	4.1	4	2	+	or 02465	Zone 2	Lower
1985-86	85/05/10	f	77.5	4.5	4	2	+	or 02467	Zone 2	Lower
1985-86	85/05/10	m	95	8.6	4	3	+	or 02466	Zone 2	Lower
1985-86	85/05/10	f	78.7	4.5	3	2	+	or 02464	Zone 2	Lower
1985-86	85/05/10	m	82.6	5.9	4	2	+	or 02463	Zone 2	Lower
1985-86	85/05/10	m	88.9	7.3	4	2	+	x 00991	Zone 4	Lower
1985-86	85/06/10	f	81.3	5.4	4	2	+	x 00992	Zone 1	Lower
1985-86	85/06/10	f	95	7.7	3	3	+	or 03375	Zone 3	Lower
1985-86	85/07/10	f	81.3	5.9	4	2	+	or 03374	Zone 2	Lower
1985-86	85/08/10	m	94	9.1	3	3	+	or 03362	Zone 1	Lower
1985-86	85/08/10	f	81.3	6.8	4	2	+	x 00965	Zone 2	Lower
1985-86	85/09/10	f	80	5.4	4	2	+	or 03364	Zone 1	Lower
1985-86	85/09/10	m	96.5	10	3	3	+	or 03363	Zone 1	Lower
1985-86	85/09/10	m	78.7	5	4	2	+	x 00993	Zone 2	Lower
1985-86	85/10/10	m	96.5	9.1	3	3	+	x 00966	Zone 1	Lower
1985-86	85/10/10	m	88.9	6.8	4	2	+	x 00968	Zone 1	Lower
1985-86	85/11/10	m	91.4	8.2	4	3	+	or 03371	Zone 1	Lower
1985-86	85/11/10	m	90.2	8.2	4	3	+	or 03366	Zone 1	Lower
1985-86	85/11/10	m	81.3	5.9	4	2	+	or 03367	Zone 1	Lower
1985-86	85/11/10	m	104.2	11.4	3	3	+	x 00969	Zone 2	Lower
1985-86	85/11/10	m	86.4	6.8	4	3	+	x 00970	Zone 1	Lower
1985-86	85/11/10	f	72.4	4.5	4	2	+	or 03372	Zone 1	Lower
1985-86	85/11/10	f	59.7	2.5	3	1	+	or 03365	Zone 1	Lower
1985-86	85/12/10	f	75	4.5	4	2	+	or 03369	Zone 2	Lower
1985-86	85/12/10	m	99.1	8.6	3	3	+	or 03368	Zone 2	Lower
1985-86	13/10/85	m	85.1	7.3	3	3	+	or 03370	Zone 1	Lower
1985-86	14/10/85	f	77.5	5.4	4	2	+	or 03373	Zone 2	Lower
1985-86	16/10/85	m	101.6	12.7	3	3	+	x 00975	Zone 1	Lower
1985-86	17/10/85	m	83.8	6.4	4	2	+	x 00994	Zone 2	Lower
1985-86	19/10/85	f	82.6	6.4	4	2	+	x 00976	Zone 2	Lower
1985-86	19/10/85	f	72.4	4.3	3	2	+	or 02451	Zone 2	Lower
1985-86	19/0/85	m	80					or 02452	Zone 2	Lower
1985-86	20/10/85	f	77.5	5	4	2	+	x 00951	Zone 1	Lower
1985-86	29/9/85	f	78.7	5.4				x 00411		
1985-86	85/01/10	f	77.5	5.4				x 00412		
1985-86	85/02/10	m	83.8					x 00413		
1985-86	85/02/10	m	90.2					x 00415		
1985-86	85/05/10	f	76.2					x 00421		
1985-86	85/05/10	m	82.6					x 00422		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1985-86	85/09/10	f	76.2					x 00423		
1985-86	85/04/09	m	77.5					x 00424		
1985-86	24/9/85	f	83.8					x 00425		
1985-86	19/9/85	f						x 00426		
1985-86	15/9/85	m	86.4					x 00427		
1985-86	15/9/85	f	78.7					x 00428		
1985-86	30/8/85	f	61					x 00429		
1985-86	24/9/85	f	82.6					x 00430		
1985-86	85/05/10	m	97.8					x 00445		
1985-86	25/9/85	f	86.4					x 00447		
1985-86	85/03/10	f	76.2					x 00448		
1985-86	28/9/85	f	90.2					x 00449		
1985-86	85/05/10	f	81.3					x 00450		
1986-87	20/9/86	m	80	5.9				(y)x00755		
1986-87	20/9/86	f	77.5	5				(y)x00756		
1986-87	20/9/86	f	77.5	5.4	4	2	S1+	(y)x00757		
1986-87	20/9/86	f	73.7	4.5				(y)x00758		
1986-87	20/9/86	m	78.7	5.6	4	2	+	(y)x00759		
1986-87	20/9/86	f	76.2	5.4	4	2	+	(y)x00760		
1986-87	20/9/86	f	64.8	3.2				(y)x00761		
1986-87	20/9/86	f	75	4.5	3	3	+	(y)x00762		
1986-87	20/9/86	f	80	6.1				(y)x00763		
1986-87	20/9/86	f	80	5.4	4	2	+	(y)x00764		
1986-87	20/9/86	m	81.3	6.6				(y)x00795		
1986-87	21/9/86	f	73.7	4.5				(y)x00796		
1986-87	22/9/86	m	83.8	7	3	2	+	(y)x00814		
1986-87	22/9/86	f	81.3	5.9	4	2	+	(y)x00809		
1986-87	22/9/86	f	78.7	5.6	4	2	+	(y)x00813		
1986-87	14/9/86	f	73.7	4.5	4	2	+	(y)x00797		
1986-87	25/9/86	m	83.8	6.8	4	2	+	(y)x00798		
1986-87	25/9/86	f	86.4	7.7	4	2	+	(y)x00799		
1986-87	25/9/86	f	73.7	4.5	4	2	+	(y)x00800		
1986-87	25/9/86	m	99.1	10.4	4	3	+	(y)x00801		
1986-87	26/9/86	f		4.5				(y)x00802		
1986-87	26/9/86	f	73.7	4.5	4	2	+	(y)x00803		
1986-87	26/9/86	f	78.7	5.9	3	2	+	(y)x00804		
1986-87	26/9/86	m	76.2	5.4	4	2	+	(y)x00806		
1986-87	27/9/86		77.5	5.4	5	2	+	(y)x00785		
1986-87	27/9/86	f	78.7	5.6	4	2	+	(y)x00786		
1986-87	27/9/86	m	61	2.3				(y)x00794		
1986-87	28/9/86	f	73.7	4.7	4	2	+	(y)x00765		
1986-87	28/9/86	m	99.1	10.9	4	3	+	(y)x00766		
1986-87	28/9/86	f	91.4	8.2	4	3	+	(y)x00767		
1986-87	28/9/86	f	75	4.7	3	2	+	(y)x00768		
1986-87	28/9/86	f	86.4	7.3	4	2	S1+	(y)x00793		
1986-87	28/9/86	f	82.6	6.8	4	2	+	(y)x00805		
1986-87	30/9/86	m	86.4	7.3	3	2	+	(y)x00787		
1986-87	86/02/10	m	87.7	7.3	3	2	+	(y)x00811		
1986-87	86/02/10	m	76.2	4.5	3	2	+	(y)x00812		
1986-87	30/9/86	f	78.7		4	2	+	(o)01806		
1986-87	30/9/86	f	76.2		5	2	+	(o)01805		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	30/9/86	f	81.3		4	2	+	(o)01804		
1986-87	30/9/86	f	76.8					(o)01803		
1986-87	30/9/86	f	77.5		4	2	+	(o)01802		
1986-87	30/9/86	m	83.8		4	2	+	(o)01801		
1986-87	30/9/86	f	76.2		3	2	+	(o)01721		
1986-87	30/9/86	m	76.2		4	2	+	(o)01720		
1986-87	30/9/86	m	97.8		3	3	+	(o)01719		
1986-87	30/9/86	f	77.5		4	2	+	(o)01718		
1986-87	30/9/86	f	76.2		4	2	+	(o)01714		
1986-87	30/9/86	f	75		3	2	+	(o)01713		
1986-87	30/9/86	f	78.7		R	2	+	(o)01712		
1986-87	30/9/86	f	78.7		4	2	+	(o)01711		
1986-87	30/9/86	m	88.9		4	3	+	(y)x00976		
1986-87	30/9/86	m	83.8		3	2	+	(y)x00975		
1986-87	30/9/86	m	82.6		4	2	+	(y)x00824		
1986-87	30/9/86	f	69.9		R	2	+	(y)x00823		
1986-87	30/9/86	m	83.8		4	2	S1+	(y)x00954		
1986-87	30/9/86	m	82.6		4	2	+	(y)x00953		
1986-87	30/9/86	m	85.1		4	2	+	(y)x00952		
1986-87	30/9/86	f	83.8		3	2	S1+	(y)x00951		
1986-87	30/9/86	f	78.7		4	2	+	(y)x00950		
1986-87	30/9/86	f	83.8		4	2	+	(y)x00949		
1986-87	30/9/86	f	78.7		3	2	+	(y)x00948		
1986-87	30/9/86	f	77.5		4	2	+	(y)x00947		
1986-87	30/9/86	m	94		3	3	+	(y)x00946		
1986-87	30/9/86	f	82.6		4	2	+	(y)x00945		
1986-87	30/9/86	f	77.5		4	2	+	(y)x00944		
1986-87	30/9/86	m	81.3		4	2	+	(y)x00943		
1986-87	30/9/86	f	81.3		4	2	+	(y)x00942		
1986-87	30/9/86	f	73.7		4	2	+	(y)x00941		
1986-87	30/9/86	f	76.2		4	2	+	(y)x00940		
1986-87	30/9/86	m	95.3		4	3	+	(y)x00939		
1986-87	30/9/86	f	72.4		3	2	+	(y)x00938		
1986-87	30/9/86	f	75		4	2	+	(y)x00937		
1986-87	30/9/86	m	81.3		3	2	+	(y)x00936		
1986-87	30/9/86	f	67.3		4	2	+	(y)x00935		
1986-87	30/9/86	f	71.1		4	2	+	(y)x00934		
1986-87	30/9/86	m	83.8		4	2	+	(y)x00933		
1986-87	30/9/86	m	83.8		4	2	+	(y)x00931		
1986-87	30/9/86	f	76.2		4	2	+	(y)x00930		
1986-87	30/9/86	m	83.8		4	3	+	(y)x00929		
1986-87	30/9/86	f	73.7		4	2	+	(y)x00928		
1986-87	30/9/86	m	76.2		3	2	+	(y)x00927		
1986-87	30/9/86	f	76.2		4	2	+	(y)x00926		
1986-87	30/9/86	m	83.8		4	2	+	(y)x00924		
1986-87	30/9/86	f	78.7		4	2	+	(y)x00923		
1986-87	30/9/86	m	77.5		4	2	+	(y)x00922		
1986-87	30/9/86	f	75		4	2	+	(y)x00921		
1986-87	30/9/86	f	76.2		3	2	S1+	(y)x00920		
1986-87	30/9/86	f	83.8		4	3	+	(y)x00919		
1986-87	30/9/86	f	71.1		3	2	+	(y)x00918		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	30/9/86	m	81.3		3	3	+	(y)x00917		
1986-87	30/9/86	m	78.7		4	2	+	(y)x00916		
1986-87	30/9/86	f	73.7		4	2	+	(y)x00915		
1986-87	30/9/86	f	77.5		4	2	+	(y)x00914		
1986-87	30/9/86	f	72.4		3	2	+	(y)x00913		
1986-87	30/9/86	f	75		4	2	+	(y)x00912		
1986-87	30/9/86	m	77.5		4	2	+	(y)x00911		
1986-87	30/9/86	f	75		4	2	+	(y)x00910		
1986-87	30/9/86	f	68.6		3	2	+	(y)x00909		
1986-87	30/9/86	f	73.7		4	2	+	(y)x00908		
1986-87	30/9/86	f	73.7		5	2	+	(y)x00907		
1986-87	30/9/86	f	76.2		4	2	+	(y)x00906		
1986-87	30/9/86	f	71.1		3	2	+	(y)x00905		
1986-87	30/9/86	f	73.7		4	2	+	(y)x00904		
1986-87	86/02/10	f	76.2		4	2	+	(w)x00494		
1986-87	86/02/10	m	81.3		5	2	+	(w)x00493		
1986-87	86/02/10	f	77.5		4	2	+	(w)x00492		
1986-87	86/02/10	f	72.4		4	2	+	(w)x00491		
1986-87	86/02/10	m	80		4	2	+	(w)x00490		
1986-87	86/02/10	m	81.3		4	2	+	(w)x00489		
1986-87	86/02/10	f	68.6		4	2	+	(w)x00488		
1986-87	86/02/10	f	73.7		4	2	+	(w)x00487		
1986-87	86/02/10	f	81.3		4	3	+	(w)x00486		
1986-87	86/02/10	m	45.7		8		+			
1986-87	86/02/10	m	83.8		4	2	+	(y)x00981		
1986-87	86/02/10	f	78.7		3	2	+	(y)x00979		
1986-87	86/01/10	m	78.7		4	2	+	(w)x00485		
1986-87	86/01/10	f	76.2		4	2	+	(w)x00484		
1986-87	86/01/10	m	80		4	2	+	(w)x00483		
1986-87	86/01/10	f	76.2		4	2	+	(w)x00482		
1986-87	86/01/10	m	81.3		3	2	S1+	(w)x00481		
1986-87	86/01/10	f	78.7		4	2	+	(w)x00480		
1986-87	86/01/10	m	88.9		5	2	+	(w)x00479		
1986-87	86/01/10	f	72.4		4	2	+	(w)x00478		
1986-87	86/01/10	f	83.8		4	2	S1+	(w)x00477		
1986-87	86/01/10	f	76.2		4	2	+	(w)x00476		
1986-87	86/01/10	f	78.7		4	2	+	(y)x00984		
1986-87	86/01/10	f	78.7		4	3	+	(y)x00983		
1986-87	86/01/10	m	91.4		4	2	+	(y)x00982		
1986-87	86/01/10	f	76.2		3	2	+	(y)x00978		
1986-87	86/01/10	m	83.8		3	2	+	(y)x00977		
1986-87	86/01/10	m	76.2		3	3	+	(y)x00974		
1986-87	86/01/10	m	82.6		4	2	+	(y)x00973		
1986-87	86/01/10	f	78.7		4	2	+	(y)x00972		
1986-87	86/01/10	f	78.7		4	2	+	(y)x00971		
1986-87	86/01/10	m	78.7		3	2	+	(y)x00970		
1986-87	86/01/10	f	78.7		3	2	+	(y)x00969		
1986-87	86/01/10	f	78.7		5	2	+	(y)x00968		
1986-87	86/01/10	f	72.4		4	2	+	(y)x00967		
1986-87	86/01/10	f	77.5		4	2	+	(y)x00966		
1986-87	86/01/10	f	76.2		4	2	+	(y)x00965		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	86/01/10	m	82.6		3	2	+	(y)x00964		
1986-87	86/01/10	f	72.4		4	2	+	(y)x00963		
1986-87	86/01/10	f	76.2		4	2	+	(y)x00962		
1986-87	86/01/10	m	81.3		3	2	+	(y)x00961		
1986-87	86/01/10	f	78.7		3	2	+	(y)x00960		
1986-87	86/01/10	f	73.7		4	2	+	(y)x00958		
1986-87	86/03/10	m	78.7		3	2	+	(w)x00495		
1986-87	86/03/10	f	71.1		4	3	+	(w)x00496		
1986-87	86/03/10	f	74		4	2	+	(w)x00497		
1986-87	86/03/10	m	79		4	2	+	(w)x00498		
1986-87	86/03/10	f	84		4	2	S1+	(w)x00499		
1986-87	86/03/10	f	72		3	2	+	(w)x00500		
1986-87	86/03/10	f	78.7		4	2	+	(w)x00573		
1986-87	86/03/10	m	83.8		4	2	+	(w)x00574		
1986-87	86/03/10	f	76.2		4	2	+	(w)x00575		
1986-87	86/03/10	f	73.7		3	2	+	(w)x00576		
1986-87	86/03/10	f	72.4		4	2	+	(w)x00577		
1986-87	86/03/10	f	82.6		4	3	+	(w)x00578		
1986-87	86/03/10	f	75		4	2	+	(w)x00579		
1986-87	86/03/10	f	78.7		4	2	+	(w)x00580		
1986-87	86/03/10	f	76.2		4	2	+	(w)x00581		
1986-87	86/03/10	f	72.4		4	2	+	(w)x00582		
1986-87	86/03/10	m	83.8		4	3	+	(w)x00583		
1986-87	86/03/10	m	91.4		3	3	+	(w)x00584		
1986-87	86/03/10	f	73.7		4	2	+	(w)x00585		
1986-87	86/03/10	m	94		4	3	+	(w)x00586		
1986-87	86/03/10	f	78.7		4	2	+	(w)x00587		
1986-87	86/03/10	m	90.2		4	3	+	(w)x00588		
1986-87	86/03/10	m	96.5		4	3	+	(w)x00589		
1986-87	86/03/10	m	94		4	3	+	(w)x00590		
1986-87	86/03/10	m	78.7		4	2	+	(w)x00591		
1986-87	86/03/10	m	55		5	2	+	(w)x00592		
1986-87	86/03/10	f	84		5	2	+	(w)x00593		
1986-87	86/03/10	f	78.7		4	2	+	(w)x00594		
1986-87	86/03/10	m	76.2		5	2	+	(w)x00595		
1986-87	86/03/10	m	89		4	3	+	(w)x00596		
1986-87	86/03/10	f	76.2		4	2	+	(w)x00597		
1986-87	86/03/10	m	95		4	2	+	(w)x00598		
1986-87	86/03/10	f	77		3	2	+	(w)x00599		
1986-87	86/03/10	f			4	2	+	(w)x00600		
1986-87	86/03/10	f	71.1		3	2	+	(w)x00946		
1986-87	86/03/10	f	73.7		3	2	+	(w)x00947		
1986-87	86/03/10	f	73.7		4	2	+	(w)x00948		
1986-87	86/03/10	m	83.8		4	2	+	(w)x00949		
1986-87	86/03/10	f	76.2		5	2	+	(w)x00950		
1986-87	86/03/10	m	86.4		3	2	+	(y)x00985		
1986-87	86/03/10	f	87.7		4	2	+	(y)x00986		
1986-87	86/03/10	m	86.4					(y)x00987		
1986-87	86/03/10	m	96.5		4	3	+	(y)x00988		
1986-87	86/03/10	f	76.2		4	2	+	(y)x00989		
1986-87	86/03/10	m	78.7		5	2	+	(y)x00991		

Year	Date	Sex	Length (cm)	Weight (kg)	Age			Tag #	Location	Population
					fw	sw	plus			
1986-87	86/03/10	m	91.4		3	3	+	(y)x00992		
1986-87	86/03/10				4	2	+	(y)x00993		
1986-87	86/03/10	f	78.7		4	2	+	(y)x00994		
1986-87	86/03/10	f	68.6		3	2	+	(o)01501		
1986-87	86/03/10	f	76.2					(o)01502		
1986-87	86/03/10	f	71.1		3	2	+	(o)01503		
1986-87	86/03/10	f	79		4	2	+	(o)01504		
1986-87	86/03/10	f	73.7		4	2	+	(o)01505		
1986-87	86/03/10	f	71.1		3	2	+	(o)01506		
1986-87	86/03/10	m	76.2		4	2	+	(o)01507		
1986-87	86/03/10	f	83.8		4	2	S1+	(o)01508		
1986-87	86/03/10	f	86.4		4	3	+	(o)01509		
1986-87	86/03/10	m	86.4		4	2	+	(o)01521		
1986-87	86/03/10	f	73.7		4	2	+	(o)01522		
1986-87	86/03/10	f	76.2		4	2	+	(o)01523		
1986-87	86/03/10	f	75		4	2	+	(o)01524		
1986-87	86/03/10	f	72.4		4	2	+	(o)01525		
1986-87	86/03/10	f	83.8		4	2	+	(o)01549		
1986-87	86/03/10	m	77.5		4	2	+	(o)01594		
1986-87	86/04/10	m	81.3		4	2	+	(y)x00990		
1986-87	86/04/10	m	83.8					(w)x00416		
1986-87	86/04/10	f	78.7		4	2	+	(w)x00435		
1986-87	86/04/10	f	76.2		4	2	+	(w)x00945		
1986-87	86/04/10	m	99.1		4	3	+	(w)x00446		
1986-87	86/04/10	f	78.7		4	2	+	(w)x00971		
1986-87	86/04/10	f	83.8		4	3	+	(w)x00973		
1986-87	86/04/10	m	85.1		3	2	+	(w)x00974		
1986-87	86/04/10	f	75		3	2	+	(w)x00977		
1986-87	86/04/10	m	88.9		4	2	+	(o)01513		
1986-87	86/04/10	f			5	2	+	(o)01595		
1986-87	86/04/10	f	72.4		4	2	+	(o)01596		
1986-87	86/04/10	m	76.2		4	2	+	(o)01597		
1986-87	86/04/10	m	90.2		4	3	+	(o)01598		
1986-87	86/10/10	m	86.4		4	2	+	(y)x00770		
1986-87	86/10/10	f	83.8		4	3	+	(y)x00771		
1986-87	86/07/10	f	69.9					(y)x00772		
1986-87	86/07/10	m	90.2		4	3	+	(y)x00773		
1986-87	86/10/10	f	80		4	2	+	(y)x00774		
1986-87	86/09/10	m	78.7		5	2	+	(y)x00775		
1986-87	86/08/10	m	80		4	2	+	(y)x00776		
1986-87	86/08/10	m	86.4		4	2	+	(y)x00777		
1986-87	86/03/10	f	75		4	2	+	(y)x00807		
1986-87	86/03/10	f	47		5		+	(y)x00808		
1986-87	30/9/1986	m	81.3		3	2	+	(y)x00810		
1986-87	86/10/10	f	76.2		3	2	+	(w)x00228		
1986-87	86/10/10	m	83.8		4	2	+	(w)x00940		
1986-87	86/10/10	f	76		4	2	+	(w)x00937		
1986-87	86/10/10	f	73		4	2	+	(w)x00938		
1986-87	86/10/10	m	86		4	3	+	(y)x00638		

Appendix II. Summary of adult steelhead (*Oncorhynchus mykiss*) tagged in D.F.O. Statistical Area 4 and the lower Skeena River and recovered in the Sustut River as found in the Steelhead Floy tag database.

TAG DATE	LOCATION	LOCATION DESCRIPTION	RECOVERY DATE	LOCATION	LOCATION DESCRIPTION	POPULATION
89/08/14	SK	TYEE GN	89/10/11	SU	SUSTUT RIVER	Lower
90/08/01	SK	OLD REMO	90/10/22	SU	5 MI. U/S SUSKEENA	Lower
90/08/09	SK	DELTA CREEK	90/10/23	SU	SUSTUT/SKEENA CONFL.	Lower
92/07/28	3-04	Birnie Island	92/10/13	SU	Sustut River	Lower
92/08/15	SK	TYEE GN	92/09/12	SU	lower sustut	Lower
92/08/20	4-12	Smith Island	92/10/05	SU	Sustut River	Lower
93/09/05	SK	Old Remo	95/10/12	SU	5 mi. U/S Birdflat Creek	Lower
95/09/19	SK	Kitselas Fish wheel	95/10/11	SU	Meat hole(D/S Bear river	Lower
92/07/16	4-12	Smith island	92/09/20	SU	Upper Sustut R.	Upper
92/07/18	SK	TYEE GN	92/08/25	SU	Sustut/Moosevale Jnctn.	Upper
92/07/23	SK	TYEE GN	92/08/25	SU	D/S Moosevale Creek	Upper
92/07/31	SK	Old Remo	92/09/19	SU	Upper Sustut R.	Upper
92/08/02	4-09	Tugwell Island	92/08/29	SU	Moosevale Junction	Upper
92/08/02	4-09	Tugwell Island	92/09/22	SU	Sustut/Johanson Jnctn.	Upper
92/08/04	4-12	Inverness	92/09/19	SU	Upper Sustut R.	Upper
93/07/17	4-15	Inverness	93/09/11	SU	Johanson Fence	Upper
93/08/??	4-02	Outside Stephens	95/09/10	SU	Lower Fence	Upper
94/07/25	4-09		94/09/18	SU	Lower Sustut fence	Upper
95/??/??	SW		95/09/06	SU	Lower Sustut Fence	Upper
95/06/25	SK	Tyee Test Fishery	95/09/15	SU	Upper Sustut Fence	Upper
95/07/23	SK	Kitselas Fish Wheel	95/08/23	SU	Bear river confluence	Upper
95/07/26	4-02	West side of Stephens Island	95/09/23	SU	Lower Sustut Fence	Upper
95/07/28	SK	TYEE GN	95/09/26	SU	lower Sustut fence	Upper
95/08/??	4-12		95/09/08	SU	Lower Sustut Fence	Upper

Appendix III. Summary of locations where adult steelhead (*Oncorhynchus mykiss*) were observed to overwinter in the upper Sustut River.

Site	Year	Location	Notes	Reference
1		Sustut Lake	Steelhead sampled	Fennelley 1963
2	1986	Johanson Lake	Steelhead observed in lake	Spence *et al.* 1990
3	1986	Sustut Lake	Steelhead observed in lake	Spence *et al.* 1990
4	1983	Johanson Lake	Steelhead observed in lake	Shultze 1984
5	1971	Sustut Lake	Steelhead observed in lake	Chudyk 1972
6	1971	Johanson Lake	Steelhead observed in lake	Chudyk 1972
7	1992	Sustut Lake	Steelhead tracked to lake	Bustard 1993a
8	1992	Johanson Lake	Steelhead tracked to lake	Bustard 1993a
9	1993	Johanson Lake	Steelhead tracked to lake	Lough 1993
10	1993	Sustut Lake	Steelhead tracked to lake	Lough 1993
11	1993	Sustut River	Steelhead tracked	Lough 1994

Appendix IV. Summary of locations where adult steelhead (*Oncorhynchus mykiss*) were observed to overwinter in the lower Sustut River and Bear River.

Site	Year	Location	Notes	Reference
1		Lower Sustut River, Skeena River, Sustut River above Bear River	Suspected	C. Spence pers. comm.
2		Lower Sustut River, Skeena River, Sustut River above Bear River	Suspected	D. Bustard pers. comm.
3		Sapolio Lake	Suspected	Bustard 1993b
4		Bear Lake	Suspected	Bustard 1993b
5		Bear Lake	Observed	Spence *et al.* 1990

Appendix V. Summary of locations where adult steelhead (*Oncorhynchus mykiss*) were observed to spawn in the upper Sustut River.

Site	Year	Location	Notes	Reference
1	1970	Outlet of Sustut Lake	Several redds, number of steelhead	Chudyk 1972
2	1972	Sustut River 200 yds upstream of SR/JC confluence	70 steelhead, June 28/72	Chudyk 1972
3	1987	Johanson Creek, Sustut River above SR/JC confluence	Steelhead observed spawning, June 6/87	Spence et al. 1990
4	1992	Sustut River above SR/JC confluence	12 steelhead, June 10/92	Lough 1992
5	1993	Sustut River to 800 m above SR/JC confluence	Estimated minimum 66 redds	Bustard 1994
6	1993	Sustut River from outlet of lake to main spawning section 1000 m above SR/JC confluence	Patchy distribution of redds, 40 steelhead spawners	Bustard 1994
7	1993	Outlet of Johanson Lake	Several steelhead observed	Bustard 1994
8	1993	Johanson Creek 2.5 km downstream of lake	Concentrated steelhead spawning, many redds	Bustard 1994
9	1993	Johason Creek from Site 9 to Solo Creek	Patchy distribution of spawners	Bustard 1994

Appendix VI. Summary of locations where adult steelhead (*Oncorhynchus mykiss*) were observed to spawn in the lower Sustut River and Bear River.

Site	Year	Location	Notes	Reference
1	1971	Bear River mid reaches	3000 steelhead spawning	Chudyk 1972
2	1987	Bear River	Sample 5 steelhead kelts	Spence *et al*. 1990
3	1989	Bear River mid reaches	700 steelhead spawners observed	Bustard 1993b
4	1994	Bear River	Steelhead observed in spawning habitats, May 20/92	Spence 1992
5	1994	Triple Lakes outlet creek	Steelhead fry sampled	Bustard 1994a
6		Lower Sustut River	Suspected use in side channels	D. Bustard pers. comm
7		Lower Sustut River	Suspected use in side channels	C. Spence pers. comm

Appendix VII. Summary of sites where steelhead (*Oncorhynchus mykiss*) fry and parr were sampled in the Sustut River watershed.

Site	Bustard Site	Section	Year (fry per m^2)			Year (parr per m^2)				Reference
			1991	1992	1993	1991	1992	1993		
1	S1	Lower	0.11	0.17	0.17	0	0.04	0.02		Bustard 1992, 1993d, 1994b
2	S2	Lower	0.01	NS	0.12	0	NS	0.02		Bustard 1992, 1993d, 1994b
3	S3	Lower	0.06	0.05	NS	0	0.02	NS		Bustard 1992, 1993d, 1994b
4	S4	Lower	0.27	0.01	0.21	0.02	0.03	0.01		Bustard 1992, 1993d, 1994b
5	S5	Lower	0.02	NS	NS	0	NS	NS		Bustard 1992, 1993d, 1994b
6	S6	Lower	0.11	0.01	0.17	0	0.08	0.1		Bustard 1992, 1993d, 1994b
7	S7	Lower	0.08	NS	NS	0.01	NS	NS		Bustard 1992, 1993d, 1994b
8	S8	Lower	0.18	NS	NS	0	NS	NS		Bustard 1992, 1993d, 1994b
9	S9	Lower	0.25	NS	0.23	0.02	NS	0.03		Bustard 1992, 1993d, 1994b
10	S10	Lower	0.04	0.21	NS	0	0.03	NS		Bustard 1992, 1993d, 1994b
11	S11	Middle	0	0	0.08	0.01	0	0.01		Bustard 1992, 1993d, 1994b
12	S12	Middle	0.01	0.01	0.11	0	0.03	0		Bustard 1992, 1993d, 1994b
13	S13	Middle	0.04	0.05	0.12	0	0	0		Bustard 1992, 1993d, 1994b
14	S14	Middle	0.06	0.01	0.1	0	0.02	0.01		Bustard 1992, 1993d, 1994b
15	S15	Middle	0.08	0.1	0.24	0	0.03	0.03		Bustard 1992, 1993d, 1994b
16	S16	Middle	0.04	0.17	0.45	0.01	0.01	0		Bustard 1992, 1993d, 1994b
17	S17	Middle	0.26	0.1	0.22	0.02	0.03	0.06		Bustard 1992, 1993d, 1994b
18	S18	Middle	0.12	NS	NS	0	NS	NS		Bustard 1992, 1993d, 1994b
19	S19	Middle	0.14	0.07	0.17	0.06	0.1	0.17		Bustard 1992, 1993d, 1994b
20	S20	Middle	0.06	0.07	0.14	0.01	0.07	0.02		Bustard 1992, 1993d, 1994b
21	S21	Middle	0.02	NS	0.59	0.03	NS	0		Bustard 1992, 1993d, 1994b
22	S22	Upper	0.32	0.59	0.76	0	0.1	0.05		Bustard 1992, 1993d, 1994b
23	S23	Upper	0.32	NS	0.42	0	NS	0.03		Bustard 1992, 1993d, 1994b
24	S24	Upper	0.11	0.43	0.06	0	0.19	0.03		Bustard 1992, 1993d, 1994b
25	S25	Upper	0.19	0.31	0.46	0	0.01	0.02		Bustard 1992, 1993d, 1994b
26	S26	Upper	0.34	0.21	0.1	0.02	0	0.02		Bustard 1992, 1993d, 1994b
27	S27	Upper	0.04	0.61	0.47	0	0.02	0.09		Bustard 1992, 1993d, 1994b
28	S28	Upper	0.37	0.18	0.23	0.03	0.13	0.14		Bustard 1992, 1993d, 1994b
29	S29	Upper	0.22	0.51	0.13	0.06	0.17	0.1		Bustard 1992, 1993d, 1994b
30	S30	Upper	0	0	0.35	0	0	0.05		Bustard 1992, 1993d, 1994b
31	S10a	Lower	NS	0.2	0.34	NS	0.04	0.06		Bustard 1992, 1993d, 1994b
32		Lower	Sampled in 1983 on a side channel in mainstem (0.28 fry per m^2 and 0.17 parr per m^2)							Schultze 1984
33		Lower	Sampled in 1984 (0.18 fry per m^2 and 0.05 parr per m^2) and 1985 (0.38 fry per m2 and 0.08 parr per m2)							Tredger 1986
34		Upper	Sampled in 1984 (0.12 fry per m^2 and 0.10 parr per m^2) and 1985 (0.70 fry per m2 and 0.10 parr per m2)							Tredger 1986
35		Middle	Sampled in 1984, 0.06 fry per m^2 and 0.04 parr per m^2							Tredger 1986
T1	Sb1	Tributary	0.29	0.5	0.59	0	0.01	0		Bustard 1992, 1993d, 1994b
T2	Sb2	Tributary	0.31	0.27	0.31	0	0.08	0.07		Bustard 1992, 1993d, 1994b
T3	St1	Tributary	0	NS	NS	0	NS	NS		Bustard 1992, 1993d, 1994b
T4	St2	Tributary	0	NS	NS	0	NS	NS		Bustard 1992, 1993d, 1994b
T5	Sm1	Tributary	0.01	NS	NS	0.02	NS	NS		Bustard 1992, 1993d, 1994b
T6	Sj1	Tributary	0	0.01	0.04	0	0.02	0		Bustard 1992, 1993d, 1994b
T7	Sj2	Tributary	0.02	0.02	0.4	0.02	0.04	0.03		Bustard 1992, 1993d, 1994b
T8	Sj3	Tributary	0	NS	NS	0	NS	NS		Bustard 1992, 1993d, 1994b
T9	Sj4	Tributary	0	0.06	0.08	0.06	0	0		Bustard 1992, 1993d, 1994b
T10	Sj5	Tributary	0.03	NS	NS	0	NS	NS		Bustard 1992, 1993d, 1994b
T11	Sj6	Tributary	0.01	NS	NS	0	NS	NS		Bustard 1992, 1993d, 1994b
T12	Sj7	Tributary	0.01	0	0	0.01	0.03	0.04		Bustard 1992, 1993d, 1994b
T13	Sj8	Tributary	0.09	0.19	0.22	0	0	0.04		Bustard 1992, 1993d, 1994b
T14	SUa1	Tributary	0	0	0.01	0.06	0.05	0.12		Bustard 1992, 1993d, 1994b
T15	Sub2	Tributary	0	0	0.02	0.01	0.03	0.04		Bustard 1992, 1993d, 1994b
T16	SUc3	Tributary	NS	0.28	0.7	NS	0	0.03		Bustard 1992, 1993d, 1994b
T17	Sjs1	Tributary	NS	0	0	NS	0	0		Bustard 1992, 1993d, 1994b
T18	Sjd1	Tributary	NS	0	NS	NS	0.05	NS		Bustard 1992, 1993d, 1994b
T19	Ss1	Tributary	NS	0	NS	NS	0	NS		Bustard 1992, 1993d, 1994b
T20	Ss2	Tributary	NS	0	NS	NS	0	NS		Bustard 1992, 1993d, 1994b
T21	Ss3	Tributary	NS	0	NS	NS	0	NS		Bustard 1992, 1993d, 1994b
T22	E4	Tributary	RBT assumed ST sampled in 1994 (Birdflat Creek) (0.6 fish per m^2)							Bustard 1994a
T23	MT1	Tributary	RBT assummed ST sampled at site							Bustard 1994a
T24	MT21-23	Tributary	RBT assummed ST sampled at site							Bustard 1994a
T25		Tributary	Sampled in 1984, no ST fry or parr found, Asitka River							Tredger 1986
T26		Tributary	Sampled in 1984, 1.35 fry per m^2 and 0.06 parr per m^2, Bear River							Tredger 1986
T27		Tributary	Sampled in 1993 by snorkelling, fry and parr seen							Bustard 1993b

Table 28. Number of quota angler days allocated during the classified period (September 1st to October 31st), number of quota angler days used during the classified period, and total number of angler days fished at two fishing lodges on the Sustut River from the 1990/91 season to the 1995/96 season.

Season	Quota Angler Days Allocated	Quota Angler Days Used	Total Angler Days Fished
1990/91	750	403	486
1991/92	750	452	589
1992/93	750	290	444
1993/94	750	301	412
1994/95	750	369	477
1995/96	750	358	403