PALLANT CREEK STEELHEAD

1986 – 87

By

A.D. de Leeuw

B.C. Ministry of Environment and Parks

Fisheries Branch

Smithers, B.C.

Fisheries Progress Report No. SK–58

September, 1987

TABLE OF CONTENTS

ABSTRACT

During the 1986—87 winter season 171 steelhead were angled and tagged by study participants in Pallant Creek, Queen Charlotte Islands. Of these, 39 were recaptured once, and 4 were recaptured twice while 1 fish was recaptured 3 times for a total of 44 recaptures. Fifty three percent of the catch was taken from the upper river during January and mid April. Migratory patterns were not detectable. The average number of days between recaptures was 39, and ranged from 0 to 167 days. Original tagging date strongly influenced probability of recapture. All November tagged fish were recaptured, while those subsequently tagged were recaptured in the following proportions: December 62% January 27%, February 19%, March 11%, April 6%, May 0%. Recaptures from other tagging years were generally taken within or near the month of their original tagging a year earlier. Three years of stream residency accounted for 90% of all readable scales examined while 61% had spent 3 years at sea prior to spawning. The dominant over-all age was 3.3 (49%) followed by 3.2 (22%), 4.3 and 3.1S1 (both 7%) and 3.1SS1 (5%). The remaining 4 ages accounted for 10%, while 19% were multiple spawners. Average length of all fish measured (152) was 75.1 cm, and ranged from 48.3 to 95.9 cm. Females (75.1 cm) were slightly larger than males (73.9 cm). The size of the 1986—87 run was estimated using the average of three multiple sample techniques and estimated at 489 steelhead with confidence limits ranging from 330 to 876 fish.

INTRODUCTION

During the winter season of 1981—82, a steelhead tagging study was initiated on Pallant Creek, Queen Charlotte Islands (Fig. I). The study was repeated in 1983—84, 1984—85, 1985—86 and again during the 1986—87 season. This report covers the latter study period.

It is hoped the work will continue annually, establishing Pallant Creek as an adult steelhead index stream for the Queen Charlotte Islands. The continued commitment of the Queen Charlotte Island Chapter of the British Columbia Steelhead Society and the Pallant Creek hatchery staff to this project, combined with the small size and accessibility of the stream, make Pallant Creek a favourable location for this type of long term study.

Like the previous years, the objectives of the 1986-87 Pallant Creek steelhead tagging study were to:

1. Describe steelhead run timing and movement.
2. Describe life history characteristics.
3. Estimate population size.

A description of the study area can be found in previous Pallant Creek reports (de Leeuw, 1985a, 1985b).

THE FISHERY

Pallant Creek contributes substantially to the overall Charlottes winter steelhead fishery. Angling occurs throughout the lower reaches downstream of the impassible barrier (Fig. 1).

Excepting the two most recent seasons, estimated steelhead angling effort has increased steadily from the early seventies to the present (Table 1). Since the initial increase in angling effort from the early seventies to the 1977—78 season, steelheading pressure has remained fairly constant. A dramatic increase occurred during the 1978—79 season coinciding with the construction of the Pallant Creek hatchery in 1978. Many of the staff are keen anglers, and have been intimately involved in the study.

Although some fish were tagged in the winter of 1980-81, the actual study was not initiated until the 1981—82 season. This first sporadic tagging (80-81) corresponded to the increased angler activity noted in the kept, fish released, and catch/day data (Table 1). Since the 1980—81 season, questionnaire estimates of catch (kept and released) and success rates have been largely the result of study participation.

Excluding the 78-79 and 85—86 season, the catch/day for Pallant Creek has been consistently higher than the Charlottes as a whole.

Table 1. Pallant Creek Steelhead Harvest Analysis Data[1], 1970—71 to 1986—87.

Season	Days Fished	Anglers	Kept	Released	Kept/ Day	Catch/ Day	Charlottes Catch/Day
70—71	8	4	8	20	1.00	3.50	.36
71—72	10	3	21	25	2.00	4.60	.52
72—73	89	12	45	86	.50	1.47	.31
73—74	26	3	26	34	1.00	2.22	.33
74—75	10	3	7	0	.67	.67	.27
75—76	73	30	23	40	.32	.86	.47
76—77	107	46	47	20	.45	.65	.37
77—78	74	30	48	92	.64	1.86	.48
78—79	177	42	35	26	.21	.38	.41
79—80	236	50	36	86	.16	.53	.48
80—81	382	53	59	709	.16	1.96	.79
81—82	227	66	41	190	.22	1.05	.93
82—83	293	50	17	511	.06	1.80	1.23
83—84	235	37	39	330	.17	1.57	.57
84—85	359	58	66	620	.18	1.92	1.32
85—86	137	41	14	185	.10	1.44	1.65
86—87	221	72	18	348	.11	1.65	1.52
Mean:	157	35	33	194	.46	1.66	.68

[1] Steelhead Harvest Analysis. B.C. Fish and Wildlife Branch annual reports.

METHODS

The river was partitioned into seven zones (Fig. 1). Adult steelhead were angled and tagged with orange, numbered anchor (spaghetti) tags. Weights were generally estimated while fork lengths were measured. sex, date of capture, tag number and colour as well as zone of capture were recorded. After removal of a few scales, fish were released at the capture site.

Scales were viewed using a dissecting microscope, and the two best examples from the sample were cleaned and mounted on gummed cards. Impressions of the scales were made on acetate cards by applying heat (85 to 9S°C) and pressure (100 Ft lbs) for 60 seconds. A Leitz Prado projector was then used to examine each scale for freshwater and ocean age determination (Narver and Withler, 1974).

Population size was determined using the Schnabel, Schumacher and Schnabel—Chapman adjusted multiple census techniques, (Ricker, 1975). The formulae were:

Schnabel:
$$N = \frac{\text{sum } (Ct\ Mt)}{R}$$

Schumacher:
$$\frac{1}{N} = \frac{\text{sum } (Mt\ Rt)}{\text{sum } (Ct\ Mt^2)}$$

Schnabel, Chapman revised:
$$N = \frac{\text{sum } (Ct\ Mt)}{R + 1}$$

where:
- t = 5—day time period
- Ct = total catch during time t
- Mt = total fish tagged and released during time t
- M = sum of Mt
- Rt = total recapture during time t
- R = sum of Rt

Fish recaptured from previous study years were treated as original captures in the above calculation.

RESULTS AND DISCUSSION

One hundred and seventy—one steelhead were tagged in Pallant Creek from mid November to early May during the 1986—87 winter season. Of these, 39 were recaptured once, 4 were recaptured twice, and one fish was recaptured three times for a total of 44 recaptures.

An additional 3 fish were recaptured from previous study years. one fish was captured and released three consecutive years. All tagging and recapture data are tabulated in the appendices.

SPATIAL AND TEXPORAL DISTRIBUTION

The largest portion of the catch was taken from the upper river in zones 2 (24%) and 3 (29%, Table 2). This distribution was substantially different from the previous season, where the majority of fish (42%) were taken from the lower river (zone 6). During the 1984—85 season the larger portion of the catch came again from the upper river (Table 2).

Table 2. Spatial distribution of Pallant Creek Steelhead tagged during the 1984–85, 1985–86 and 1986–87 winter seasons.

Zone	Catch (%)		
	1984–85	1985–86	1986–87
1	0 (0)	1 (1)	3 (2)
2	27 (22)	16 (11)	40 (24)
3	13 (11)	29 (20)	50 (29)
4	34 (28)	13 (9)	32 (19)
5	2 (1)	14 (10)	26 (15)
6	17 (14)	60 (42)	18 (11)
7	11 (9)	10 (7)	1 (1)
Not recorded	19 (15)	--	--
Total	23 (100)	143 (100)	70 (100)

Although the catch was fairly evenly distributed throughout the December to late April season, the largest number of fish tagged during 10 day periods was in late January and mid April (Table 3). A similar trend was observed the previous season, but occurred about 2 weeks earlier. During the 84-85 season, the majority of the catch was taken in March and late April. Given that angling effort was fairly constant during the last three seasons, the temporal distribution of the catch within the season was quite variable, possibly as a result of variations in stream discharge patterns.

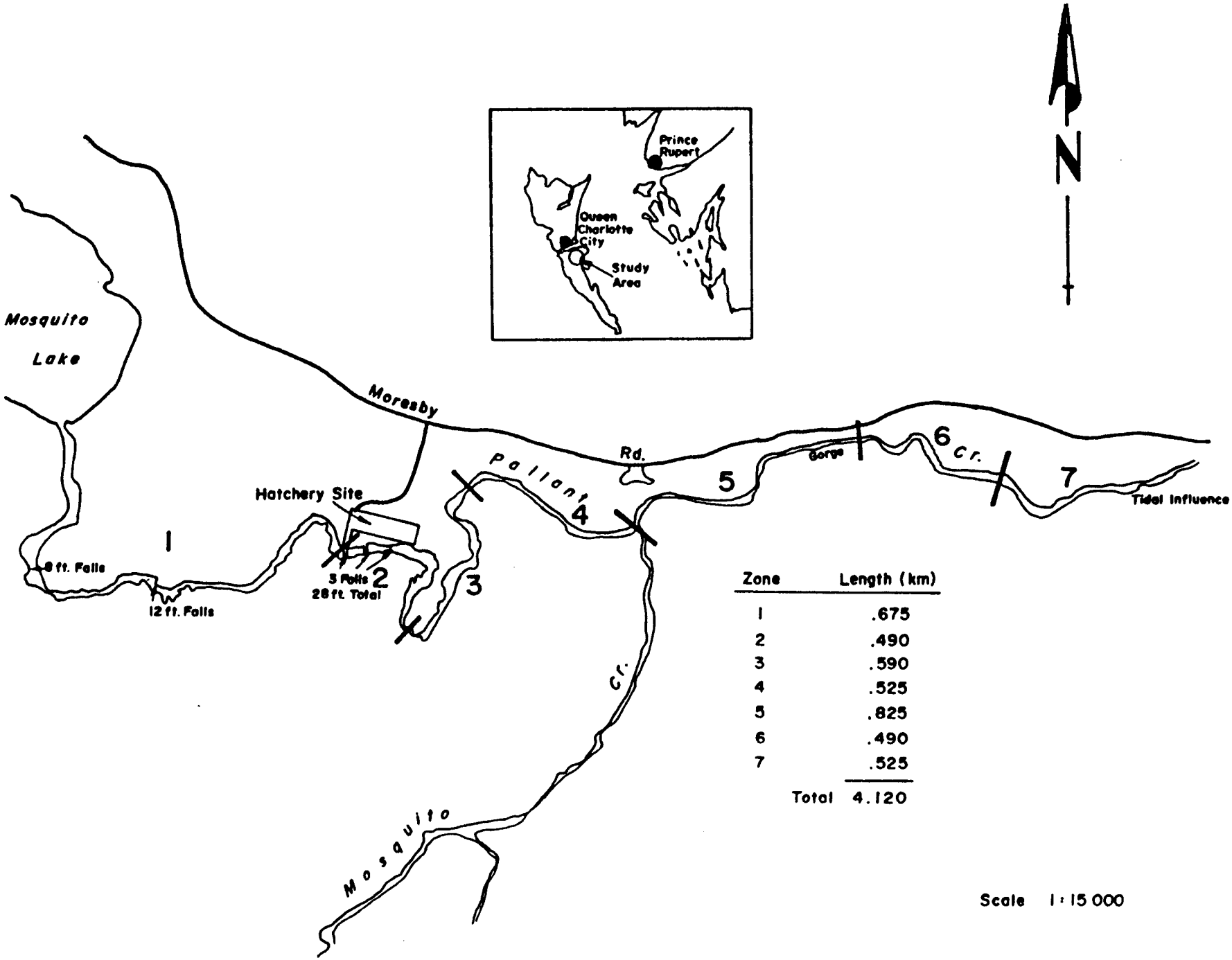

Fig. 1 Pallant Creek Angling Zone During The 1986 – 87 Steelhead Tagging Study

Table 3. Number of steelhead captured during the 1986–87 and previous tagging studies on Pallant Creek. Catch grouped in 10–day periods.

Date	Total 1984–85	Total 1985–86	Males 1986–87	Females 1986–87	Total 1986–87
Nov 11–20	0	0	1	1	2
21–30	0	0	0	0	0
Dec 01–10	0	0	4	8	12
11–20	10	3	3	13	16
21–30	13	1	3	3	6
Jan 01–10	13	1	9	5	14
11–20	4	5	4	2	6
21–30	4	7	14	10	24
Feb 01–10	4	4	3	8	11
11–20	7	3	5	3	8
21–30	6	17	4	4	8
Mar 01–10	18	4	7	2	9
11–20	23	20	8	4	12
21–30	26	18	3	3	6
Apr 01–10	7	41	0	3	3
11–20	7	0	8	14	22
21–30	1	0	5	3	8
May 01–10	1	2	3	0	1
Total	123	143	82(48%)	88(52%)	170

Of the 47 recaptures, and excluding those caught from previous study years, 32 (73% of 44) fish were taken within the zone of original capture. Nine fish had migrated upstream, while 3 were recaptured downstream of their original capture site (Table 4). Other than one fish, all migrants were recaptured in an area adjoining the zone of original tagging. One fish was captured 3 and another 4 times within the original capture area. The majority of Pallant Creek steelhead appeared to remain in one location after their initial migration into the stream.

Thirty-five (79.5%) of the 44 recaptures (again excluding the 3 from previous years) were originally tagged in November, December and January. Only 47% of the total catch was tagged during this time. Although the remaining 53% of the catch was tagged during the later part of the season (February, March, April), only 9 of these were recaptured. The number of days between recapture of these fish was 19 (range 6—48), while the overall average number of days between recaptures was 39, and ranged from 1-167 days. The tagging data strongly suggested that early migrants stay in the river longer than late season fish. In the 1985—86 study, the average time between recaptures was 32.6 days and ranged from 0 to 163 days.

Table 4. Movement and residency of recaptured tagged steelbead in Pallant Creek, 1986—87.

Fish	Tag No. Total		Original Capture			Recapture			Total	
#	&	Color	Sex	Date	Zone	Date	Zone		km	Days
1	03672	Orange	F	Dec 9/86	2	Dec 10/86	2		0	1
2	03673	Orange	F	Dec 9/86	2	Dec 14/86	2		0	5
3	02917	Orange	F	Dec 14/86	3	Dec 21/86	3		0	7
4	03183	Orange	F	Dec 10/86	2	Dec 23/86	2		0	13
5	01887	Orange	M	Jan 4/87	4	Jan 6/87	4		0	2
6	00330	Blue	F	Dec 20/86	3	Jan 6/87	3		0	17
7	02918	Orange	F	Dec 14/86	3	Jan 6/87	2		+.54	23
8	02798	Orange	F	Dec 16/86	3	Jan 7/87	2		+.54	22
9	00887	Yellow	M	Dec 12/86	2	Jan 7/87	2		0	26
10	01887	Orange	M	Jan 4/87	4	Jan 14/87	3		+.56	10
11	01890	Orange	F	Jan 5/87	7	Jan 14/87	4		+1.84	9
12	02644	Orange	M	Dec 6/86	3	Jan 16/87	3		0	31
13	02920	Orange	F	Dec 14/86	3	Jan 20/87	2		+.54	37
14	00888	Yellow	F	Dec 14/86	3	Jan 21/87	3		0	38
15	01888	Orange	F	Jan 4/87	4	Jan 23/87	4		0	19
16	03185	Orange	F	Dec 10/86	3	Jan 24/87	4		—.56	45
17	01895	Orange	M	Jan 24/87	2	Jan 25/87	2		0	1
18	03671	Orange	M	Dec 9/86	2	Jan 30/87	2		0	52
19	01599	Orange	F	Jan 23/87	2	Feb 1/87	2		0	9
20	00327	Blue	F	Dec 17/86	2	Feb 6/87	2		0	51
21	03674	Orange	M	Dec 8/86	3	Feb 6/87	3		0	60
22	03181	Orange	F	Dec 11/86	2	Feb 13/87	2		0	64
23	03184	Orange	F	Dec 10/86	3	Feb 13/87	3		0	65
24	01826	Orange	M	Jan 21/87	2	Feb 21/87	2		0	31
***25	02773	Orange	F	Mar 24/85	3	Feb 22/87	2			
26	00324	Blue	F	Dec 17/86	2	Feb 22/87			0	68
27	01820	Orange	M	Jan 25/87	2	Feb 22/87	2		0	28

Table 4 continued. Movement and residency of recaptured tagged steelhead in Pallant Creek, 1986—87.

Fish #	Tag No. & Color	Original Capture Sex	Date	Zone	Recapture Date	Zone	Total km	Total Days
28	01892 Orange	M	Jan 23/87	2	Feb 22/87	2	0	30
*29	01897 Orange	F	Jan 23/87	2	Feb 23/87	2	0	31
**30	00327 Blue	F	Dec 17/86	2	Feb 24/87	2	0	79
****31	06936 Orange	F	Feb 9/87	6	Feb 28/87	6	0	19
32	01850 Orange	F	Feb 21/87	2	Mar 4/87	2	0	11
33	01517 Orange	M	Feb 13/87	4	Mar 8/87	3	+.56	23
34	01817 Orange	M	Mar 10/87	6	Mar 15/87	6	0	5
***35	01841 Orange	M	Mar 4/87	3	Mar 19/87	2	+.54	15
36	02643 Orange	F	Nov 14/86	1	Mar 21/87	1	0	137
37	00324 Blue	F	Dec 17/86	2	Mar 24/87	2	0	107
38	00324 Blue	F	Dec 17/86	2	Mar 30/87	2	0	113
39	02751 Orange	F	Mar 14/85	4	Mar 31/87	2		
40	01829 Orange	M	Jan 22/87	2	Apr 5/87	2	0	73
41	01825 Orange	F	Jan 21/87	4	Apr 11/87	3	+.56	70
42	01869 Orange	F	Feb 25/87	5	Apr 14/87	6	-.66	48
43	02648 Orange	M	Mar 13/86	4	Apr 15/87	2		
44	00292 Orange	F	Apr 18/87	5	Apr 26/87	5	0	8
45	02643 Orange	F	Nov 14/86	1	Apr 30/87	2	—.58	167
46	01585 Orange	F	Mar 26/87	6	May 2/87	5	+.66	37
47	02800 Orange	M	Apr 28/87	2	May 4/87	2	0	6

X = 39

* second time recaptured
** third time recaptured
*** recapture from another tag year
**** caught three consecutive years (1985—86—87)

Run timing and duration of stream residency were interrelated, posing significant management implications. Early entering steelhead exhibited higher incidence of recapture than later migrants. All November and 62% of December tagged fish were recaptured. Recapture of later tagged fish declined as the season progressed (Table 5). On the Quinsam and Campbell river system on Vancouver Island, 37% of the steelhead tagged in November and December were recaptured, while only 17% of those tagged in March and April were recaptured (Hooton and Carswell, 1981). If tagging information was indicative of general run timing and catchability, then early fish were significantly more vulnerable to anglers.

Table 5. Total number of steelhead tagged and recaptured in Pallant Creek during the 1986-87 season grouped by month.

	Tagged	Recaptured							
Month	Number	Nov	Dec	Jan	Feb	Mar	Apr	May	Total	%[1]
Nov	2					1	1		2	100
Dec	34		4	9	6	2			21	62
Jan	44			5	5		2		12	27
Feb	27				1	3	1		5	19
Mar	27					2		1	3	11
Apr	33						1	1	2	6
May	3									0
Total	170		4	14	12	8	5	2	45	

[1] percent of monthly tagged fish.

Steelhead recaptured from previous years were taken close to their original tagging date (Table 6). Of the 7 fish recaptured the season after original tagging, 5 were taken within one month of their capture date a year earlier. Additionally, an early run fish tagged in January was recaptured the following season in November, (both are early entries) while another was captured three consecutive seasons, all within March. If general run timing in small coastal streams has a genetic basis, and November/December migrating steelhead have a greater probability of capture by anglers, this early returning segment of the run may diminish over the long term if fishing pressure and/or harvest rate increases beyond tolerable limits.

Table 6. Capture dates of steelhead recaptured one or more seasons after original tagging in Pallant Creek.

		Date of recapture in season after tagging	
Tag #	Tagging date	First	Second
02999	Sep /80—81	Sep 27/81-82	
02703	Dec 14/83—84	Apr 8/84—85	
03124	Jan 28/84—85	Nov 1/85—86	
02751	Mar 14/84—85	Mar 7/85—86	Mar 31/86—87
02763	Mar 13/84—85	Mar 9/85—86	
03641	Apr 9/84—85	Mar 12/85—86	
03643	Apr 9/84—85	Mar 31/85—86	
02273	Mar 24/84—85		Feb 22/86—87
02648	Mar 13/85—86	Apr 15/86—87	

AGE AND SIZE

Scale samples were taken from 59 fish. Of these only 41 (69%) could be interpreted for both fresh and salt water age (Table 7). The overall dominant age was 3.3 and accounted for 49% of the total followed by 3.2 (22%), 4.3 and 3.1S1 (both 7%) and 3.1SS1 (5%). The remaining four age classes accounted for 2.5% each. Three years of stream residency prior to smolting accounted for 90% of the total; the remaining fish had spent 4 years as juveniles in Pallant Creek (Table 8). Thirty—six (61%) of the 59 scales examined indicated 3 years of ocean growth prior to spawning. The remaining 3 ocean ages were: .2 (27%), .1 (10%) and .4 (2%, Table 9). The dominance of males in all age groups was a function of sampling bias as the sex ratio of all fish sampled (170) favoured females (52%).

Eleven (19%) of the 59 scale samples examined were from previous spawners. Of these, 6 had spent only 1 year at sea prior to their first spawning (Table 10), even though one year ocean fish were not encountered the previous season. Eight fish were on their second spawning migration, while 3 were in their third spawning run.

Average fork length of 3— ocean maiden fish (N=35) was, predictably, larger (78.9 cm) than 2— (N=11) ocean fish (66.4 cm).

Table 7. Steelhead trout age groups from Pallant Creek, 1986-87, N=59

Age group	Males	Females	Total	% of Total
3.2	7	2	9	22
3.3	14	6	20	49
3.4	1		1	2.5
4.2	1		1	2.5
4.3	2	1	3	7
3.1S1	2	1	3	7
3.2S1	1		1	2.5
3.1SS1		2	2	5
3.2SS1		1	1	2.5
Total	28	13	41	
R.2	1		1	
R.3	4	9	13	
R.1S1	1		1	
R.2S	1	2	3	
	7	11	18	

R = Central area of scale is resorbed, fresh water age not readable.

Table 8. Number and percent of male and female Pallant Creek steelhead of different fresh water ages, 1986—87. N = 41.

Fresh water age	Males	Females	Total	% of Total
3	25	12	37	90
4	3	1	4	10
Total	28	13	41	

Table 9. Number and percent of male and female Pallant Creek steelhead of different pre—spawning ocean ages, 1986—87, N = 59.

Ocean Age	Males	Females	Total	% of Total
.1	3	3	6	10
.2	11	5	16	27
.3	20	16	36	61
.4	1	—	1	2
Total	35	24	59	

Table 10. Number and percent of repeat spawning Pallant Creek steelhead of different ocean age groups. N. = 11.

Ocean Age	Males	Females	Total
.1S1	3	1	4
.2S1	2	2	4
.1SS1		2	2
.2SS1		1	1
Total	5	6	11

Table 11. Fork lengths (cm) of male and female Pallant Creek steelhead of different ocean ages, 1986—87.

Ocean	Males			Females			Total		
Age	n	$\bar{x}$	Range	n	$\bar{x}$	Range	n	$\bar{x}$	Range
.2	10	65.5	51.3—75.0	1		74.4	11	66.4	51.3—75.0
.3	19	80.3	70.0—89.7	16	77.2	63.5—83.3	35	78.9	63.5—89.7
.4	1		86.4				1		86.4
Total	30	75.6	51.3-89.7	17	77.1	63.5-83.4	47	76.2	51.3-89.7
Total Catch Sample	81	73.9	48.3-88.9	71	76.5	610-959	152	75.1	48.3-95.9

Differences in lengths between males and females as a function of ocean age was difficult to determine due to the small sample. Overall fork length of all fish measured (N = 152) was 75.1 cm, and ranged from 48.3 to 95.9 cm (Table 11). Females were on the average slightly larger than males. The former were 75.1 cm while the latter were 73.9 cm.

POPULATION ESTIMATION

Results of steelhead population estimates are given in Table 12. Although the calculated numbers were within a fairly narrow range the estimates were suspect since post tagging mortality, tag loss and uncontrolled fish movement (immigration/emigration) could not be accounted for. Ricker (1975) states however that even if the no recruitment/— mortality conditions are only approximately satisfied, the multiple census method is still useful.

Table 12. Estimates of steelhead abundance in Pallant Creek during the 1986—87winter season.

Method[1]	Estimate	95% Confidence limits	
		Poisson distribution	Normal distribution
Schnabel	452	337 — 621	346 - 652
Schumacher	557	407 — 876	
Chapman	442	330 — 606	341 - 628
Average	484		

[1] Ricker, 1975

Compared to other study years the confidence limits were fairly narrow due to higher recapture rate. Of the 173 fish tagged (including 2 from the year previous, 44 (or 25%) were recaptured.

SUMMARY

1. One hundred and seventy-one steelhead were tagged in Pallant Creek from mid November to early May during the 1986—87 winter season. Of these 39 were recaptured once and 4 were recaptured twice. One fish was recaptured 3 times for a total of 44 recaptures. Three fish were recaptured from previous study years, one of which was captured during three consecutive years.

2. The majority of fish (53%) were taken in the upper river during January and mid April.

3 The average number of days between recaptures was 39, and ranged from 0 (recaptured same day) to 167 days. Migration distance was not measurable due to short stream length and discontinuous monitoring.

4. Probability of recapture was strongly influenced by tagging date. All fish tagged in November were recaptured, while those tagged subsequently were recaptured in the following proportions: December 62%, January 27%, February 19%, March 11%, April 6%, May 0%.

5. 1986—87 recaptures from previous tagging years were generally taken within or near the month of their original tagging.

6. The dominant age was 3.3 (49%), followed by 3.2 (22%), 4.3 and 3.1S1 (both 7%), and 3.1SS1 (5%). The remaining 4 ages accounted for 10%. Three years of stream residency accounted for 90% of the total, while
61% had spent 3 years at sea prior to spawning. Nineteen percent of all fish aged had spawned the previous season.

7. Average length of 3 and 2 year ocean fish was 78.9 and 66.4 cm respectively. Overall fork length (n = 152) was 75.1 cm and ranged from 48.3 to 95.9 cm. Females (75.1 cm) were slightly larger than males.

8. Using the average of three multiple sample techniques, the 1986—87 winter steelhead population was estimated at 489 fish (95% confidence limits 330 to 876).

ACKNOWLEDGEMENTS

This project, like the previous Pallant Creek steelhead studies, was largely the result of volunteer work by the Queen Charlotte Islands Chapter of the Steelhead Society of B.C. with the excellent help of the Pallant Creek Hatchery staff. Their assistance in this project was invaluable and greatly appreciated. Organization of field—collected data was supervised by Tom Rutherford, Community Advisor of the Salmonid Enhancement Program. Interpretation of scales collected were accomplished by R. Tetreau and G. Schultze. M. Lough calculated the population estimates. The report was typed by Betty Lockhart and Eileen Bouvier. Editorial comments by R.S. Hooton are appreciated.

The study was funded as a Public Participation Project by the Salmonid Enhancement Program.

REFERENCES

de Leeuw, A.D. 1985a. Pallant Creek steelhead: some aspects of their life history, population size and sport fishery, 1981—82. Fisheries Progress Report No. Sk-50. Ministry of Environment, Smithers, B.C.

de Leeuw, A.D. 1985b. Pallant Creek steelhead: 1983—84. Fisheries Progress Report No. SK-51. Ministry of Environment, Smithers, B.C.

Hooton, R.S. and L.B. Carswell, 1981. Steelhead tagging studies on the Campbell and Quinsam Rivers during the 1978—1979, 1979—1980, and 1980-1981 fishing seasons. Ministry of Environment and Parks, Nanaimo, B.C. Technical report, 16 pp.

Narver, D.W. and F.S. Withler, 1974. Steelhead of the Nanaimo River, aspects of their biology and the fishery from three years of anglers' catches. Fisheries and Marine Services, Nanaino, B.C., Cir. No. 99, 25 pp.

Ricker, W.E. 1975. Handbook of computations for biological statistics of fish populations. Bulletin #191. Fisheries Research Brd., Canada

Steelhead Harvest Analysis. 1970-71 through to 1986—87, Fish and Wildlife Branch, Victoria, B.C.

APPENDICES

I. Original steelhead captures from Pallant Creek, 1986—87 winter season.

II. Steelhead recaptures from Pallant Creek, 1986—87 winter season.

Appendix I. Original steelhead captures from Pallant Creek, 1986–87 winter season.

Fish No.	Date	Sex	Length mm	Weight kg.est	Tag No. & Color	Area	Remarks	Age
1	Nov 14/86	M	737		02642 Orange	1	Dark	
2	Nov 14/86	F	660		02643 Orange	1	Dark	
3	Dec 05/86	F	737	4.1	02664 Orange	3	Bright, piece of tail missing	
4	Dec 06/86	M	737	4.5	02644 Orange	3	Colored	
5	Dec 06/86	M	762	4.5	03675 Orange	3	Colored	
6	Dec 08/86	M	889	6.8	03674 Orange	3	Colored	
7	Dec 09/86	F	737	4.1	03672 Orange	2	Bright	
8	Dec 09/86	F	864	6.4	03673 Orange	2	Colored, open wound behind head	
9	Dec 09/86	M	864	6.4	03674 Orange	2	Colored	
10	Dec 10/86	F	787	4.5	03183 Orange	2	Colored, almost ripe	
11	Dec 10/86	F	813	4.5	03645 Orange	3	Bright	
12	Dec 10/86	F	660	2.7	03185 Orange	3	Bright	
13	Dec 10/86	F	787	4.1	03184 Orange	3	Bright	
14	Dec 10/86	F	737	3.6	03182 Orange	3	Bright	
15	Dec 11/86	F	737	3.6	03181 Orange	2	Colored	
16	Dec 12/86	M	711	3.6	03186 Orange	2	Colored	
17	Dec 12/86	M	838	5.4	00887 Yellow	2	Slightly colored	
18	Dec 14/86	F	711		00888 Yellow	3	Bright	
19	Dec 14/86	F	737		00889 Yellow	3	Colored	
20	Dec 14/86	F	737		02917 Orange	3	Bright	
21	Dec 14/86	F	762		02918 Orange	3	Bright	3.3
22	Dec 14/86	F	711		02919 Orange	3	Slight color	
23	Dec 14/86	F	787	4.5	02920 Orange	3	Slight color, super strong	
24	Dec 16/86	F	711		02798 Orange	3	Bright	
25	Dec 17/86	F	737	3.2	00327 Blue	2	Getting dark	
26	Dec 17/86	F	686	2.7	00324 Blue	2	Slight color	
27	Dec 19/86	M	686	2.7	003?? Blue	3	Slight color	
28	Dec 19/86	F	737	3.6	00309 Blue	3	Slight color	
29	Dec 19/86	F	737	4.1	00329 Blue	3	Bright	
30	Dec 20/86	F	711	2.7	00330 Blue	3	Bright	R.3
31	Dec 21/86	F	762	4.5	00321 Blue	3	Slight color	
32	Dec 22/86	M	737		00331 Blue	2	Colored	
33	Dec 22/86	M	762		00304 Blue	3	Colored	
34	Dec 22/86	F	635		00335 Blue	3	Bright	
35	Dec 30/86	F	762	4.5	01882 Orange	3	Colored	
36	Dec 30/86	M	749	4.5	01883 Orange	3	Colored	3.2S1
37	Jan 01/87	F	711	3.2	01884 Orange	3	Slight color	R.3
38	Jan 04/87	M	622	1.8	01885 Orange	3	Dark	R.2
39	Jan 04/87	M	737	3.6	01886 Orange	3	Colored	
40	Jan 04/87	M	787	5.0	01887 Orange	4	Bright, red stripe	3.3
41	Jan 04/87	F	787	5.0	01888 Orange	4	Bright	3.1S1

Appendix I. continued - Original steelhead captures from Pallant Creek, 1986–87 winter season.

Fish No.	Date.	Sex	Length mm	Weight kg.est	Tag No. & Color	Area	Remarks	Age
42	Jan 04/87	F	813	5.9	01889 Orange	4	Bright	
43	Jan 05/87	F	876	6.8	01890 Orange	7	Bright, scars near tail	
44	Jan 05/87	M	876	6.8	01891 Orange	5	Slight color, jumper	
45	Jan 06/87	M	864		02916 Orange	3	Strong, colored hook in mouth	3.3
46	Jan 06/87	M	864		01873 Orange	2	Colored, super strong	3.4
47	Jan 06/87	M	737		01810 Orange	2	Bright	R.3
48	Jan 06/87	M	610		01872 Orange	2	Slight color	3.2
49	Jan 06/87	M	686		01874 Orange	2	Bright	3.3
50	Jan 07/87	F	686	3.2	02799 Orange	2	Dark,healed scar right side	
51	Jan 14/87	M	737	3.6	01717 Orange	3	Dark	
52	Jan 14/87	M	762	4.1	01807 Orange	4	Bright	
53	Jan 14/87	F	762	4.5	01808 Orange	4	Bright	
54	Jan 14/87	F	737	4.1	01809 Orange	4	Bright	
55	Jan 16/87	M	610	2.3	01821 Orange	3	Bright, faint red stripe	
56	Jan 20/87	M	737	3.6	01822 Orange	2	Bright, red stripe	
57	Jan 21/87	F	787	5.0	01823 Orange	4	Bright	
58	Jan 21/87	M	660	2.7	01830 Orange	2	Darkening	
59	Jan 21/87	F	711	3.6	01824 Orange	6	Bright, faint red stripe	
60	Jan 21/87	F	762	4.5	01825 Orange	4	Bright	
61	Jan 21/87	F	787	4.5	01828 Orange	4	Bright	
62	Jan 21/87	M	686	2.7	01826 Orange	2	A bit colored	
63	Jan 22/87	M	603		01829 Orange	2	Dark	3.2
	Jan 23/87	M	635	2.3	01898 Orange	3	Bright	
65	Jan 23/87	F	737	4.1	01893 Orange	3	Bright	
66	Jan 23/87	M	686	2.3	01892 Orange	2	Dark, spawning	
67	Jan 23/87	M	864	6.4	01827 Orange	2	Darkening	
68	Jan 23/87	F	762	4.5	01599 Orange	2	Darkening	
69	Jan 23/87	F	787	5.0	01897 Orange	2	Darkening	
70	Jan 24/87	M	813	5.4	01895 Orange	2	Spawning	
71	Jan 24/87	M	826	5.4	01896 Orange	5	Silver	
72	Jan 24/87	F	826	5.4	01894 Orange	6	Silver, scar right side	
73	Jan 25/87	M	660	2.7	01875 Orange	4	Slight color	
74	Jan 25/87	M	851	5.9	01811 Orange	5	Silver, gash in nose	
75	Jan 25/87	F	800	5.4	01812 Orange	5	Silver, chunk missing from anal fin	
76	Jan 25/87	M	813	4.5	01813 Orange	1	Dark, spawning	
77	Jan 25/87	M	826	5.4	01820 Orange	2	Dark	

Appendix I. continued - Original steelhead captures from Pallant Creek, 1986–87 winter season.

Fish No.	Date	Sex	Length mm	Weight kg.est	Tag No. & Color	Area	Remarks	Age
78	Jan 25/87	F	673	2.7	01899 Orange	3	Silver	
79	Jan 28/87	M	686	2.3	01584 Orange	4	Bright	
80	Jan 28/87	M	660	2.3	01593 Orange	4	Bright	
81	Jan 30/87	M	762	4.1	01819 Orange	5	Bright, old scar right side	3.3
82	Feb 01/87	F	787	5.0	01876 Orange	4	Bright	
83	Feb 01/87	M	762	5.0	01877 Orange	3	Slight color	
84	Feb 01/87	F	762	5.0	01878 Orange	3	Bright	3.3
85	Feb 01/87	F	787	5.0	01879 Orange	3	Colored	3.3
86	Feb 04/87	F	705	3.2	01880 Orange	3	Colored, kelt	R.2S
87	Feb 04/87	M	724	3.2	01716 Orange	5	Dark	3.3
88	Feb 07/87	F	737		01881 Orange	3	Colored, strong	R.3
89	Feb 07/87	F	737		01862 Orange	3	Bright	4.3
90	Feb 07/87	F	787		01863 Orange	3	Kelt, good shape	R.3
91	Feb 09/87	F	610		06936 Orange	6	Silver	3.2
92	Feb 10/87	F	813		01831 Orange	5	Silver	3.3
93	Feb 11/87	M	813	5.4	06939 Orange	4	Dark, spawning	3.3
94	Feb 11/87	F	762	4.1	06937 Orange	4	Bright	
95	Feb 12/87	F	762	4.5	01864 Orange	3	Bright	3.3
96	Feb 13/87	M	889	7.3	01517 Orange	4	Bright	3.3
97	Feb 17/87	M	813		01839 Orange	4	Little color	3.3
98	Feb 18/87	M	813	5.0	01518 Orange	6	Bright, fresh	3.3
99	Feb 18/87	F	813	5.9	01519 Orange	5	Bright, fresh	R.3
100	Feb 20/87	M	660	2.3	01520 Orange	2	Bright, red stripe	3.2
101	Feb 21/87	F	660		01850 Orange	2	Bright	R.3
102	Feb 21/87	F	660		01850 Orange	2	Bright	
103	Feb 21/87	M	838		01715 Orange	2	Bright	
104	Feb 22/87	M	787		01865 Orange	2	Dark, head damaged	3.3
105	Feb 22/87	M	737		01866 Orange	2	Dark	3.2
106	Feb 23/87	M	775		01867 Orange	2	Dark, possible lost tag	
107	Feb 24/87	F	851		01868 Orange	2	Kelt, good shape	
108	Feb 25/87	F	775		01869 Orange	5	Bright, fat	
109	Mar 04/87	M	711	3.2	01841 Orange	3	Bright	
110	Mar 04/87	M	813	5.0	01849 Orange	3	Dark	R.3
111	Mar 05/87	M	762	4.5	01842 Orange	6	Bright red stripe	3.1S1
112	Mar 05/87	F	813	5.4	01843 Orange	6	Bright	R.3
113	Mar 10/87	F		3.2	01814 Orange	5	Bright	
114	Mar 10/87	M		3.2	01815 Orange	3	Colored, partially spawned	
115	Mar 10/87	M	660	2.7	01816 Orange	4	Rainbow hue coloring	
116	Mar 10/87	M		2.3	01817 Orange	6	Bright	
117	Mar 10/87	M		2.5	01818 Orange	6	Bright	
118	Mar 12/87	M	762	4.1	01844 Orange	6	Bright	4.3
119	Mar 12/87	M	686		01870 Orange	6	Bright, red stripe	3.2

Appendix I continued. Original steelhead captures from Pallant Creek,
1986-87 winter season.

Fish No.	Date	Sex	Length mm	Weight kg.est	Tag No. & Color	Area	Remarks	Age
120	Mar 12/87	M		5.0	01845 Orange	3	Rosy cheeks, bright	
121	Mar 15/87	M	711		01847 Orange	6	Bright	
122	Mar 15/87	M	660		01848 Orange	6	Bright	
123	Mar 15/87	F	749		01871 Orange	4	Kelt, possible lost tag	R.2S
124	Mar 17/87	F	787		01832 Orange	6	Kelt, good shape	3.3
125	Mar 18/87	F	775		01833 Orange	5	Bright, hook in mouth	R.3
126	Mar 18/87	F	800		01834 Orange	5	Kelt, good shape	3.1SS1
127	Mar 18/87	M	838		01835 Orange	5	Colored	3.3
128	Mar 18/87	M	762		01836 Orange	5	Red stripe	3.1S1
129	Mar 18/87	M	851		01837 Orange	5	Colored	4.3
130	Mar 22/87	F	762		01838 Orange	6	Kelt, possible lost tag	
131	Mar 22/87	M	711		01846 Orange	3	Spawning	
132	Mar 23/87	F	610		01587 Orange	2	Colored	3.2
133	Mar 26/87	F	686		01585 Orange	6	Bright	
134	Mar 26/87	M	813		01861 Orange	6	Bright, slight color	
135	Mar 31/87	M	705		02663 Orange	2	Dark, spawning	
136	Apr 05/87	F	959		02662 Orange	2	Kelt, excellent shape	3.1SS
137	Apr 10/87	F	806		02672 Orange	5	Bright	
138	Apr 10/87	F	762		02669 Orange	5	Bright, kelt?	
139	Apr 11/87	M	787		02674 Orange	5	Dark	
140	Apr 11/87	F	813		02667 Orange	5	Getting colored	
141	Apr 11/87	F	762		02665 Orange	3	Silver bright kelt	
142	Apr 11/87	F	762		02666 Orange	3	Bright, kelt	
143	Apr 11/87	F	762		02673 Orange	3	Bright, kelt	
144	Apr 12/87	F	724		02661 Orange	5	Red stripe, kelt	
145	Apr 14/87	F	762		01589 Orange	4	Kelt, very strong	R.3
146	Apr 14/87	M	762		01590 Orange	4	Dark, running milt	3.3
147	Apr 14/87	M	660		01591 Orange	4	Bright	4.2
148	Apr 14/87	F	762		01586 Orange	4	Fresh, very strong	
149	Apr 14/87	M	660		01858 Orange	3	Bright, skinny	3.2
150	Apr 14/87	M	508		01859 Orange	2	Bright, spawning	3.2
151	Apr 14/87	F	686		01592 Orange	4	Bright, fresh	
152	Apr 16/87	F	660		00314 Green	2	Bright	
153	Apr 17/87	M	813		01860 Orange	3	Dark	
154	Apr 18/87	M	660	3.2	00291 Green	5	Bright	
155	Apr 18/87	F	762	4.1	00292 Green	5	Kelt	
156	Apr 18/87	F	762	4.1	00293 Green	4	Fresh	
157	Apr 18/87	F	813	5.0	00294 Green	4	Fresh	
158	Apr 18/87	F	889	4.1	00295 Green	4	Kelt	
159	Apr 18/87	F	762	3.2	00296 Green	4	Spawning	

160	Apr 18/87	M	787	4.1	00297	Green	6	Fresh
161	Apr 22/87	M	692		02668	Green	4	Dark
162	Apr 22/87	F	749		01852	Orange	4	Silver bright kelt
163	Apr 24/87	M	743		01853	Orange	5	colored

Appendix I continued. Original steelhead captures from Pallant Creek, 1986-87 winter season.

Fish No.	Date	Sex	Length mm	Weight kg.est	Tag No. & Color	Area	Remarks	Age
164	Apr 24/87	M	889		01854 Orange	4	Dark	3.3
165	Apr 24/87	M	832		01855 Orange	4	Dark	R.1S1
166	Apr 24/87	F	711		01856 Orange	5	Slight color	
167	Apr 24/87	F	826		01857 Orange	5	Kelt, getting silver	R.3
168	Apr 28/87	M	737		02800 Orange	2	Gray	
169	May 02/87	F			00298 Green	6	Bright kelt	
170	May 03/87	F	743		00283 Green	5	Semi—bright kelt	
171	May 04/87	M	483		00317 Green	2	Colored resident??	
172	Feb 06/87	M	744		killed			R.3
173	Mar 13/87	M	769					3.3
174	Feb 28/87	M	858					R.2S

Appendix II Steelhead recaptures from Pallant Creek, 1986–87 winter season.

Fish No.	Date Recap	Sex	Length mm	Weight kg.est	Tag No & color	Tag Date	Tag Zone	Zone Recap	Remarks
1	Dec 10	F			03672 Orange	Dec 09/86	2	2	Bright
2	Dec 14	F			03673 Orange	Dec 09/86	2	2	
3	Dec 21	F			02917 Orange	Dec 14/86	3	3	Still bright
4	Dec 23	F			03183 Orange	Dec 10/86	2	2	Colored
5	Jan 06	M			01887 Orange	Jan 04/87	4	4	Bright, strong
6	Jan 06	F			00330 Blue	Dec 20/86	3	3	Bright, strong
7	Jan 06	F			02918 Orange	Dec 14/86	3	2	Bright
8	Jan 07	F			02798 Orange	Dec 16/86	3	2	Bright, fungus patch on nose
9	Jan 07	M			00887 Yellow	Dec 12/86	2	2	Dark, scarred
10	Jan 14	M		*	01887 Orange	Jan 04/87	4	3	Red stripe getting dark
11	Jan 14	F			01890 Orange	Jan 05/87	7	4	Bright
12	Jan 16	M			02644 Orange	Dec 06/86	3	3	Dark, spawning
13	Jan 20	F			02920 Orange	Dec 14/86	3	2	Darkening
14	Jan 21	F			00888 Yellow	Dec 14/86	3	3	Darkening
15	Jan 23	F			01888 Orange	Jan 04/87	4	4	Colored a bit
16	Jan 24	F			03185 Orange	Dec 10/86	3	4	Slight color
17	Jan 25	M			01895 Orange	Jan 24/87	2	2	Colored
18	Jan 30	M			03671 Orange	Dec 09/86	2	2	Dark, Spawning
19	Feb 01	F			01599 Orange	Jan 23/87	2	2	
20	Feb 06	F			00327 Blue	Dec 17/86	2	2	Dark, firm
21	Feb 06	M			03674 Orange	Dec 08/86	3	3	
22	Feb 13	F			03181 Orange	Dec 11/86	2	2	Good shape firm
23	Feb 13	F			03184 Orange	Dec 10/86	3	3	Colored, injury on head, soft
24	Feb 21	M			01826 Orange	Jan 21/87	2	2	
25	Feb 22	F	826	***	02773 Orange	Mar 24/85	3	2	Colored, spawning
26	Feb 22	F			00324 Blue	Dec 17/86	2	2	Dark, soft
27	Feb 22	M			01820 Orange	Jan 25/87	2	2	Colored
28	Feb 22	M			01892 Orange	Jan 23/87	2	2	Dark
29	Feb 23	F			01897 Orange	Jan 23/87	2	2	Getting dark
30	Feb 24	F		*	00327 Blue	Dec 17/86	2	2	Dark, getting soft
31	Feb 28	F			06936 Orange	Feb 09/87	6	6	Silver bright
32	Mar 04	F			01850 Orange	Feb 21/87	2	2	Bright
33	Mar 08	M			01517 Orange	Feb 13/87	4	3	Dark
34	Mar 15	M			01817 Orange	Mar 10/87	6	6	Bright
35	Mar 19	M			01841 Orange	Mar 04/87	3	2	Colored
36	Mar 21	F			02643 Orange	Nov 14/86	1	1	Kelt
37	Mar 24	F		*	00324 Blue	Dec 17/86	2	2	Kelt, good shape
38	Mar 30	F		**	00324 Blue	Dec 17/86	2	2	Kelt
39	Mar 31	F	787	****	02751 Orange	Mar 14/85	4	2	Spawned out, good shape
40	Apr 05	M			01829 Orange	Jan 22/87	2	2	Dark
41	Apr 11	F			01825 Orange	Jan 21/87	4	3	Fairly bright
42	Apr 14	F			01869 Orange	Feb 25/87	5	6	Kelt, bright but skinny

Appendix II Steelhead recaptures from Pallant Creek, 1986—87 winter season.

Fish No.	Date Recap	Sex	Length mm	Weight kg.est	Tag No & color	Tag Date	Tag Zone	Zone Recap	Remarks
43	Apr 15	M	787	12.00***	02648 Orange	Mar 13/86	4	2	Spawning
44	Apr 6	F			00292 Orange	Apr 18/87	5	5	Kelt,good shape
45	Apr 30	F		*	02643 Orange	Nov 14/86	1	2	Semi-bright Kelt
46	May 02	F			01585 Orange	Mar 26/87	6	5	Bright,kelt
47	May 04	M			02800 Orange	Apr 28/87	2	2	Dark,bloated

* Second time recaptured
** Third time recaptured
*** Recapture from another tag
**** Caught three consecutive years (1985—86-87)