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PALLANT CREEK STEELHEAD:
SOME ASPECTS OF THE LIFE
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PALLANT CREEK STEELHEAD:

SOME ASPECTS OF THEIR LIFE HISTORY,
POPULATION SIZE AND SPORT FISHERY

1981-82

by

A.D. de Leeuw

British Columbia Ministry of Environment
Fish and Wildlife Branch
Smithers, B.C.

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ABSTRACT

deLeeuw , A.D. 1985. Pallant Creek steelhead: some aspects of their life history, population size and sport fishery, 1981-82.

During the 1981-82 winter season a steelhead tagging study was undertaken on Pallant Creek, Queen Charlotte Islands. Thirty-nine steelhead were tagged from September to May, of which only 3 were recaptured. The population was calculated using multiple capture techniques and estimated at 197, 212, and 263 fish. Sex ratio favoured females over males, 3:2. The most common age group was 3.3 (56%), followed by 2.3 and 3.2, both 17%. Repeat spawner rate was 19%. Average fork length was 73.8 cm and ranged from 53.8 to 91.4 cm. These results and the sports fishery are discussed relative to other Queen Charlotte Island streams.

INTRODUCTION

Steelhead trout contribute substantially to the non-tidal sports fishery of the Queen Charlotte Islands. Approximately 1/3 to 1/2 of the total number of Queen Charlotte Islanders who purchase freshwater angling licenses also purchase steelhead licenses. In an effort to gain a better understanding of population dynamics and life history among Charlotte steelhead, a study was undertaken on Pallant Creek during the 1980-81 winter season.

The objectives-of the study were to:

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

DESCRIPTION OF THE STUDY AREA AND FISHERY

Pallant Creek flows in an easterly direction and drains an area of 8495 hectares on northern Moresby Island (Fig.1). An Impassable barrier is located 3.5 km upstream from tidal influence, and all anadromous species are limited to the area below these falls. In addition to steelhead trout (Salmo gairdneri), four species of Pacific salmon frequent the lower Pallant: sockeye (Oncorhynchus nerka), coho (O. klsutch), chum (O. keta), and pink (O. gorbuscha). Dolly Varden char (Salvelinus malma) and large numbers of prickly sculpin (cottus asper) are also found downstream of the falls.

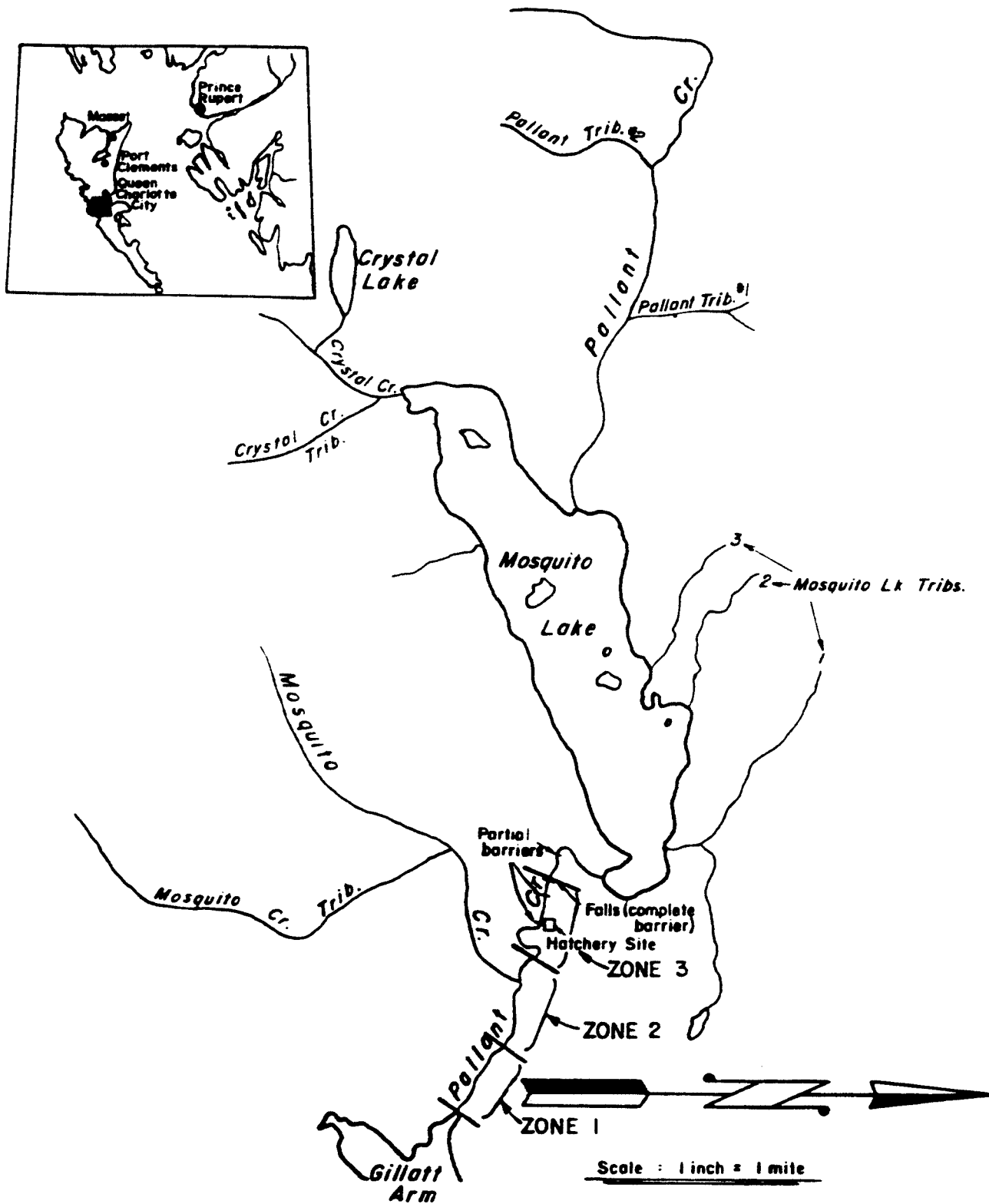


Fig. I PALLANT CREEK AND MOSQUITO LAKE SYSTEM

As is typical of many small coastal streams, Pallant Creek is subject to extreme variations in runoff despite the large lake at its headwaters. Discharges range from .223 to 125 m³/s, with an average annual flow of 15.2 m³/s (Environment Canada, 1982). Temperatures vary from .5 to 19.0° C., and total dissolved solids in mid-summer are approximately 28 ppm.

For additional information on the Pallant system, note: Caw, 1978; Marshall, et.al., 1978; Shepherd, 1978, 1982; and de Leeuw, 1984.

Angler effort on the Pallant has increased steadily from 1970 to the 1981-82 season, both in terms of days fished and number of anglers (Table 1). The number of steelhead killed per angler day has decreased, but the total killed annually has increased during the period of record. The catch per angler day (a combination of both fish kept and released) has declined somewhat over the past 10 years probably as a function of increased angler activity.

METHODS

The river was roughly partitioned into three (3) zones of equal length (Fig. 1). Adult steelhead were angled and tagged with orange, numbered anchor (spaghetti) tags. Weights were generally estimated while fork lengths were measured. Gender, date of capture, tag number and colour as well as location of capture were noted. After the removal of a few scales, fish were released at the capture site.

Table 1. Pallant Creek steelhead harvest analysis¹, 1970-71 to 1981-82.

Season	Days Fished	No. of 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	<u>227</u>	<u>66</u>	<u>41</u>	<u>190</u>	<u>.22</u>	<u>1.05</u>	<u>.93</u>
Mean:	118	29	33	111	.60	1.65	.48

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

Scales were viewed using a dissecting microscope, and the two best examples from the sample selected were cleaned and mounted on gummed cards. Impressions of the scales were made on acetate cards by applying heat and pressure. 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, 1958). The formulas were:

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

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

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

where: t = 5-day time period

Ct= total catch during time t

Mt= total fish tagged and released during time t

Rt= total recapture during time t

R = sum of Rt

RESULTS

Thirty-nine steelhead were captured and tagged from September to May (Table 2). One additional fish was caught, scale sampled but not tagged.

Table 2. Number of steelhead captured during the 1981–82 tagging study
Pallant Creek. Catch grouped by 10-day periods.

Date	Males	Females	Total
09/21-30	0	1	1
10/1-10	0	0	0
10/11-20	0	0	0
10/21-30	0	0	0
11/1-10	1	0	1
11/11-20	0	0	0
11/21-30	0	0	0
12/1-10	1	2	3
12/11-20	3	3	6
12/21-30	1	3	4
01/1-10	0	0	0
01/11-20	0	8	8
01/21-30	1	0	1
02/1-10	1	2	3
02/11-20	0	1	1
02/21-30	0	0	0
03/1-10	2	1	3
03/11-20	1	3	4
03/21-30	2	0	2
04/1-10	0	0	0
04/11-20	0	0	0
04/21-30	1	0	1
05/1-10	1	0	1
not recorded	--	1	1
Total	15 (38%)	25 (62%)	40

SPATIAL AND TEMPORAL DISTRIBUTION

The majority of Pallant Creek steelhead were taken from the upper river in December, January and March (Tables 2 and 3). Sex ratio favoured females considerably. Twenty-five females were taken compared to fifteen males. Since only three fish were recaptured, very little can be interpreted regarding movement and residency. One fish (#02999) was originally tagged in 1980 and re-captured in September of 1981. It was taken a third time in March 1982 as a spawned fish (Table 4). The two other fish were recaptured within 20 days of the original tagging dates in the same pool.

Table 3. Pallant Creek steelhead catch by zone.

Zone	Zone length (km)	Catch	Catch/km
1	1.16	1	.9
2	1.16	11	9.5
3	1.16	20	17.2
Not recorded	----	<u>8</u>	<u>-----</u>
Total	3.5	40	11.4

Table 4. Movement and residency of recaptured steelhead in Pallant Creek 1981-82.

Tag No.	Original Capture		Condition	Recapture		Condition
	Location	Date		Location	Date	
03610	Hatchery	Jan 14	Bright	Hatchery	Jan 31	Bright
02999	--	Sep 27	Bright	Mid	Mar 19	Kelt
03619	Hatchery	Mar 4	Bright	Hatchery	Mar 24	Coloured

AGE AND SIZE

Of the 40 fish sampled, only 26 sets of scales were readable. Of these, only 18 could be interpreted for fresh water ages.

The most common age group (56%) when both the fresh and salt water ages were observable was 3.3 (3 fresh water winters, 3 marine winters) (Table 5). The next most common ages were 2.3 and 3.2 (both 17%), followed by 3.1S1 (11%). The age formula of the latter shows three fresh water winters, one complete marine winter followed by one successful spawning migration. The fish was captured on its second spawning run.

Eighty-three percent of fish sampled spent three years in the stream (3.) as juveniles prior to ocean migration (Table 6.) The remaining 17% spent only two years (2.) in fresh water before smolting.

Of the 21 first-spawning steelhead sampled, seventeen, or 81%, had spent three years (.3) in the ocean prior to returning to their natal stream (Table 7). The remaining 19% had spent only two years (.2) in the ocean.

The repeat spawner rate was 19% (5 fish). Of these, 60% had spent only one year in the ocean prior to spawning (.1S1, Table 8). All repeat spawners were females, and one fish was on its fourth spawning migration. (.1SSS1, Table 8).

Average fork lengths of all steelhead measured was 73.8 cm, range 53.8 to 91.4 cm (Table 9). Fish which had spent two years in the ocean averaged 62.7 cm whereas three-year ocean fish averaged 74 cm. Within both age groups, males were larger, the largest difference occurring during the second year.

Table 5. Steelhead trout age groups from Pallant Creek, 1981–82, n=18

Age group	Males	Females	Total
2.3	2	1	3
3.2	2	1	3
3.3	4	6	10
3.1S1	0	2	2
	----	----	----
Total	8	10	18
R.2	0	1	1
R.3	2	2	4
R.1S1	0	1	1
R.2S1	0	1	1
R.1SSS1	0	1	1
	----	----	----
	2	6	8

Table 6. Number and percentage of male and female Pallant Creek steelhead of different fresh water ages, 1981–82, n=18

Fresh water age	Males	Females	Total	% of Total
2.	2	1	3	17
3.	6	9	15	83
	----	----	----	
Total	8	10	18	

Table 7. Number and percentage of male and female Pallant Creek steelhead of different ocean ages, 1981–82, n=21.

Ocean age	Males	Females	Total	% of Total
.1	0	0	0	0
.2	2	2	4	19
.3	8	9	17	81
	----	----	----	
Total	10	11	21	

Table 8. Numbers and percentage of repeat spawning Pallant Creek steelhead of different ocean age groups, n=5, or 19% total.

Ocean age	Males	Females	Total	% of Total
.1S1	0	3	3	60
.2S1	0	1	1	20
.1SSS1	0	1	1	20
	----	----	----	
Total	0	5	5	

Table 9. Fork lengths (cm) of male and female Pallant Creek steelhead of different ocean ages, 1981–82, repeat spawners excluded.

Ocean Age	<u>Males</u>			<u>Females</u>			<u>Total</u>		
	No	\bar{X}	Range	No.	\bar{X}	Range	No.	\bar{X}	Range
.2	2	66.7	61.0–72.4	2	58.7	53.8–63.5	4	62.7	53.8–72.4
.3	8	75.7	68.6–81.3	9	72.6	63.5–80.0	17	74.0	63.5–81.3
	--	----	-----	--	----	-----	--	----	-----
Total	10	73.9	61.0–81.3	11	70.0	53.8–80.0	21	71.8	53.8–81.3

POPULATION ESTIMATION

Results of the three different estimators vary from 197 to 262 steelhead (Table 10).

Table 10. Pallant Creek steelhead population estimates during the winter of 1981-82

Method	Estimate	95% Confidence Limits	
		Poisson distribution	Normal distribution
Schnabel	263	90 - 1313	121 - 1614
Schumacher	197	136 - 472	
Chapman	212	77 - 788	115 - 684

DISCUSSION

The increased catch in the upper reaches is likely the result of both better angler access and a preference by steelhead for the area (Mosquito Creek, a relatively unstable stream, enters Pallant Creek downstream of Zone 3). In terms of egg to fry survival, greater success would be experienced in this upstream area rather than in the more unstable section downstream. On the Yakoun River, spatial distribution of the catch was largely attributed to angler success rather than actual steelhead distribution (de Leeuw, 1983).

Run timing of Pallant Creek steelhead is much like the Copper (Chudyk, 1982) and Yakoun Rivers (de Leeuw, 1983). It is perhaps a little sooner, in that some fish enter Pallant Creek in September. Peaks in the catch occurred in December and March.

The predominant age group on the Pallant was 3.3, which accounted for 50% of the total sample followed by 2.3 and 3.2 (17%). These ages closely parallel Yakoun River steelhead, where 60.5% of the fish sampled were 3.3 and 23.8% were 3.2. Eighty-three percent of the Pallant Creek steelhead spent three years in the stream, while on the Yakoun, 93% were 3 year stream residents. Three years of marine growth was prevalent in both Pallant (81%) and Yakoun River (73%) steelhead. No four-year ocean fish were found in Pallant Creek (3.5% in Yakoun samples). The small Pallant Creek sample size possibly accounts for the absence of this age group.

Within ocean age groups, average fork lengths of Pallant Creek fish appeared considerably smaller than Yakoun River fish. A two-year ocean fish (.2) on Pallant. Creek averaged 63 cm and the mean .3 ocean age steelhead was 74 cm, while on the Yakoun these ages had fork lengths of 69 cm and 83 cm respectively.

Sex ratio of Pallant Creek steelhead favoured females considerably, with only 38% of the fish being males. On the Yakoun River the sex ratio was similar with 41% males.

The accuracy of the population estimates (263, 197, 212) is questionable since only 3 fish were recaptured, thus the wide confidence limits. Adult steelhead possibly migrate into and out of the Pallant Creek and/or spend only a very short period in the stream prior to spawning. This behaviour would result in a low recapture rate and therefore an over-estimation of steelhead abundance.

SUMMARY

- 1) Thirty-nine steelhead were captured and tagged from September to May, 1981-82 in Pallant Creek, Queen Charlotte Islands, of which only 3 were recaptured.
- 2) The majority of steelhead were taken in the upper river, approximately 3 km from tide water. Interpretation of fish movement was difficult due to low repeat capture rate. One fish was tagged in December, 1980, recaptured in September, 1981, and captured a third time on March 19, 1982.
- 3) Sex ratio was 62% female and 38% male, with a repeat spawner rate of 19% of which all were females.
- 4) The most common age group of Pallant Creek steelhead was 3.3, accounting for 56% of the total. The next most common ages were 2.3 and 3.2, both 17%.
- 5) Average fork length was 73.9 cm and ranged from 53.8 to 81.3 cm. Two-year ocean fish averaged 62.7 cm, whereas fish with 3 years of ocean residency averaged 74 cm.
- 6) Population estimates for the 1981-82 Pallant Creek steelhead run were 263 (Schnabel), 197 (Schumacher) and 212 (Chapman). Low recapture of tagged fish resulted in wide confidence limits.

ACKNOWLEDGEMENTS

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REFERENCES

- Billings, S.J. 1982. Steelhead harvest analysis 1981-82. Fisheries Technical Circular No. 56. Fish and Wildlife Branch, Victoria, B.C. 25 pp.
- Caw, G. 1978. An inventory of tributaries to the Copper and Pallant drainages, Moresby Island, Q.C.I. Stream inventory report. Fish and Wildlife Branch, Victoria, B.C., 78 pp.
- Chudyk, W.E. 1982. Copper Creek (Q.C.I.) Steelhead Trout, a report on the effects of non-random release of kelts from a fence barrier on their incidental capture in an Indian net fishery, and some notes on population size and life history characteristics. Skeena Fisheries Report #81-1. Ministry of Environment, Smithers, B.C.
- de Leeuw, A.D. 1983. Steelhead of the Yakoun River, some aspects of their life history, population size and the sport fishery, 1981-82. Skeena Fisheries report #82-1. Ministry of Environment, Smithers, B.C.
- de Leeuw, A.D. 1984. A fisheries Management strategy for the Pallant Creek Watershed, Queen Charlotte Islands. Skeena Fisheries Report #83-02, Ministry of Environment, Smithers, B.C.
- Environment Canada, 1981. Historical stream flow summary, B.C.
- Marshall, D.E., R.F. Brown, G.A. Buxton, V.D. Chanley and D.G. Demontier 1978. Preliminary catalogue of salmon streams and spawning escapements of Statistical Area 2E (Queen Charlotte Islands). Fisheries and Marine Service Data Report #72, 346 pp.
- Narver, O.W. and F.C. Withler, 1974. Steelhead of the Nanaimo River, aspects of their biology and the fishery from three years of anglers catches. Fisheries and Marine Services, Nanaimo, B.C. Circular No. 99, 25 pp.
- Ricker, W.E. 1970. Handbook of computations for biological statistics of fish populations. Bulletin #119. Fisheries Research Brd., Canada.
- Shepherd, B.C. 1978. Biological reconnaissance of Mathers and Pallant Creeks to December, 1977. Fisheries and Marine Service Manuscript, Rep. No. 1450.

Shepherd, B.C. 1982. Biological reconnaissance of Mathers and Pallant Creeks, Queen Charlotte Islands, December, 1977 to December, 1978. Canadian Manuscript Report of Fisheries and Aquatic Sciences, No. 1648, 121 pp.

Steelhead Harvest Analysis. 1970-71 through to 1981-82, Fish and Wildlife Branch, Victoria, B.C.

APPENDICES

- I. Original steelhead captured from Pallant Creek, 1981-82, winter season.
- II. Steelhead recaptures from Pallant Creek, 1981-82 winter season.

APPENDIX I. Original steelhead captures from Pallant Creek, 1981–82 winter season.

Fish No	Date	Sex	Length (cm)	Weight (kg)	Tag No. (orange)	Area	Remarks	Age
1 ¹	Sep 27	F	71.8	–	02999	Lower river	Bright	–
			–	–	03000	Lower river	–	–
2	Nov 8	M	81.3	4.5	02977	Hatchery	Coloured	R.3
3	Dec 9	M	74.4	4.1	03626	Hatchery	Coloured	3.3
4	Dec 9	F	71.8	3.6	03627	Upper river	Bright	3.3
5	Dec 10	F	72.4	3.6	02989	Upper river	Coloured	3.3
6	Dec 11	F	68.6	3.2	02985	–	Coloured	2.3
7	Dec 11	F	80.0	5.4	02986	–	Bright	3.3
8	Dec 11	M	71.1	3.6	02987	Middle	Coloured	3.3
9	Dec 11	M	68.6	3.2	02988	Hatchery	Coloured	2.3
10	Dec 19	F	74.4	–	03574	–	Bright	
11	Dec 19	M	82.0	–	03573	–	Coloured	
12	Dec 23	F	71.1	3.6	03601	Hatchery	Coloured	
13	Dec 23	F	71.8	–	03602	Louis Pool	Coloured	R.2S1
14	Dec 28	F	76.2	4.5	03606	Hatchery	Coloured	3.3
15	Dec 28	M	78.7	4.5	03607	Hatchery	Coloured	3.3
16	Jan 12	F	63.5	2.7	03608	Hatchery	Coloured	3.3
17	Jan 12	F	91.4	6.4	03609	Hatchery	Bright	R.1S1
18	Jan 14	F	74.4	4.1	03610	Hatchery	Bright	R.3
19	Jan 14	F	78.7	4.5	03611	Hatchery	Coloured	R.SSS1
20	Jan 14	F	53.8	4.1	03631	–	Coloured	3.2
21	Jan 12	F	74.4	–	02991	–	–	
22	Jan 12	F	84.6	–	02992	–	–	
23	Jan 12	F	74.4	–	02993	–	–	
24	Jan 31	M	78.7	4.5	03612	Hatchery	Dark	2.3
25	Feb 2	F	71.1	3.2	03613	Hatchery	–	R.3
26	Feb 2	F	81.3	5.4	03614	Middle	–	3.1S1
27	Feb 3	M	76.2	4.5	03603	Hatchery	Bright	3.3
28	Feb 12	F	71.8	–	03604	Canyon	Bright	
29	Mar 4	M	76.2	4.5	03619	Hatchery	Bright	R.3
30	Mar 5	F	69.2	–	00825	Canyon	Bright	
31	Mar 5	M	64.1	–	00826	Hatchery	Dark	
32	Mar 11	F	71.1	3.6	03621	Louis Pool	Bright	3.1S1
33	Mar 12	M	61.0	1.8	03625	Junction	Bright	3.2
34	Mar 12	F	63.5	2.3	03536	Middle	Bright	R.2
35	Mar 20	F	75.0	3.6	03565	Hatchery	Kelt	3.3
36	Mar 25	M	72.4	–	03534	Middle	Bright	3.2
37	Mar 25	M	84.6	–	03615	Middle	Dark	
38	Apr 23	M	76.9	–	03581	Hatchery	Kelt	
39	May 4	M	76.9	–	03580	Middle	Kelt	

¹Recapture of a fish tagged in September, 1980.

APPENDIX II. Steelhead recaptures from Pallant Creek, 1981-82, winter season.

Fish No	Date	Sex	Length (cm)	Weight (kg)	Tag No & Colour	Area	Remarks	Age
<u>RECAPTURES</u>								
1	Jan 31	F			Orange 03610	Hatchery	Bright	
2 ¹	Mar 19	F			" 02999	Middle	Kelt	
3	Mar 24	M			" 03619	Hatchery	Coloured	

¹ This fish was originally tagged in September, 1980.