Trapping and Coded Wire Tagging of Wild Coho Salmon Smolts in the Salmon River (Langley) 1978 to 1980

N.D. Schubert

Fisheries and Oceans
Field Services Branch
549 Columbia Street
New Westminster, B.C.
V3L 1B3

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ABSTRACT

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Coho salmon smolts **(Oncorhynchus kisutch)** from the Salmon River, a small lower Fraser River tributary, were captured and coded wire tagged during the springs of 1978 through 1980. A total of 13,823, 42,275 and 33,708 coho smolts were captured at fence traps during 1978, 1979 and 1980, of which 13,473 (code 2 16 52), 31,965 (code 2 16 59) and 30,232 (code 2 18 23) respectively were released with tags. Holding time prior to tagging averaged 1 to 4.5 days during which time mortality was negligible. The immediate (48 hr.) tag rejection rate averaged from 0.70% to 1.12%. Post tagging mortality was negligible.

Coho smolts emigrated primarily during a five week period beginning in late April with the 50% peak occurring in early to mid May. Mean annual fork lengths ranged from 93.9mm to 98.8mm, and mean wet weights ranged from 8.67g to 10.18g. Smolt age composition varied from 95.9% to 99.9% age 1+, the remainder being age 2+.

Key Words: Salmon River, coho salmon smolts, fence trapping, coded wire tagging.

RÉSUMÉ

Schubert, N.D. 1982. Trapping and coded-wire tagging of wild coho salmon smolts from the Salmon River (Langley), 1978 to 1980. Can. MS Rep. Fish. Aquat. Sci. 1672: 68p.

Au cours des printemps de 1978 à 1980, des saumoneaux argentés **(Oncorhynchus kisutch)** ont été capturés dans la rivière Salmon, un petit tributaire de la partie inférieure du fleuve Fraser, et étiquetés au moyen de fils métalliques codés. Au total, 13,823, 42,275 et 33,708 saumoneaux ont été pris à l'aide de clôtures en filet en 1978, 1979 et 1980, respectivement. De ces prises, 13,473 (code 2 16 52), 31,965 (code 2 16 59) et 30,232 (code 2 18 23) saumoneaux, respectivement, ont été étiquetés et relâchés. Le taux de mortalité était négligeable au cours de la période de stabulation (1 à 4,5 jours) avant l'étiquetage. Le taux instantané (48 h) de rejet des étiquettes a varié de 0.70% à 1.12% tandis que le taux de mortalité après l'étiquetage a été négligeable.

Les saumoneaux argentés ont surtout émigrés au cours d'une période de cinq semaines débutant à la fin d'avril; la période de pointe de 50% a eu lieue du début à la mi-mai. La longueur moyenne à la fourche et le poids frais variaient de 93.9mm à 98.8mm, et de 8.67 g à 10.18 g, respectivement. Quant à la composition par âge, de 95.9% à 99.9% étaient des poissons âgés d'un an; le reste était âgé de deux ans.

Mots-clés: rivière Salmon, saumoneaux argentés, clôtures en filet, étiquetage au moyen de fils métalliques codés.

INTRODUCTION

A coho smolt coded wire tagging (CWT) program was conducted in the Salmon River, a small tributary of the lower Fraser River located near Langley, B.C., during the springs of 1978, 1979 and 1980. This was one of several programs recently initiated in the Fraser River system to determine the fishery contribution, migratory pattern and survival rate of specific chinook and coho stocks. These data will assist in formulating a comprehensive salmonid management plan for the Fraser River system.

The CWT Marking technique was originally developed for Pacific Salmon **(Oncorhynchus sp.)** by Jefferts **et al.** (1963) and has been applied successfully to wild British Columbia coho stocks for a number of years (Armstrong and Argue, 1977; Argue and Armstrong, 1977; de Hrussoczy-Wirth, 1979). The technique involves implanting a magnetized and binary coded stainless steel pin in the nose cartilage of juvenile fish. These fish are further marked by removal of the adipose fin in order to facilitate external recognition as tagged fish when recovered in subsequent fisheries or on the spawning grounds. The heads of tagged fish are removed, and the tags are detected in the laboratory by their magnetic fields, removed by dissection and identified by code through microscopic inspection.

This report summarizes the capture and tagging techniques used during the three year Salmon River program and documents the species observed, the migratory timing, the number of coho smolts captured and tagged and the coho age and length characteristics. The subsequent recovery of marked coho in the fisheries and in the escapement will be the subject of a future report.

WATERSHED DESCRIPTION AND SALMONID RESOURCE

The Salmon River flows in a northerly direction for approximately 33 kilometers before entering the Fraser River at McMillan Island, immediately west of Fort Langley (Fig.1). The system drains approximately 85 km^2 of coastal lowland agricultural and residential land. The upper reaches are marshy with generally low summer stream flows. The middle stretches flow across gently sloping terrain in a shaded, meandering channel. In the lower 10 kilometers, the river is slow moving and deep as it flows in a series of tortuous meanders across meadowland.

A floodgate and pumphouse facility located at the mouth (Fig. 2) was constructed in 1949 as part of a comprehensive flood control program for the lower Fraser Valley. When Fraser River levels rise each spring, the flood gates close and all Salmon River water is pumped over the dyke. Since no provisions were made for the passage of fish through the gates, significant coho and trout smolt mortality is believed to occur each spring when emigrant fish pass through the pump mechanism. Furthermore, the facility contributes to sluggish outflows which often produce lethally high summer water temperatures and low dissolved oxygen levels (less than 1 ppm) in the lower river (Weins and Beale, unpublished).

The Salmon River hydrograph reflects seasonal precipitation patterns (Fig. 3). Maximum flows occur during the late fall and winter, with an extreme flow of 34.6 cubic meters per second (cms) recorded on December 17, 1979. Minimum flows, which are augmented by groundwater sources, normally occur between June and October. An extreme minimum flow of 0.10 cms was recorded on October 1, 1975. The mean annual discharge, based on fourteen years of data (1960 to 1964 and 1968 to 1976), was 1.41 cms (Inland

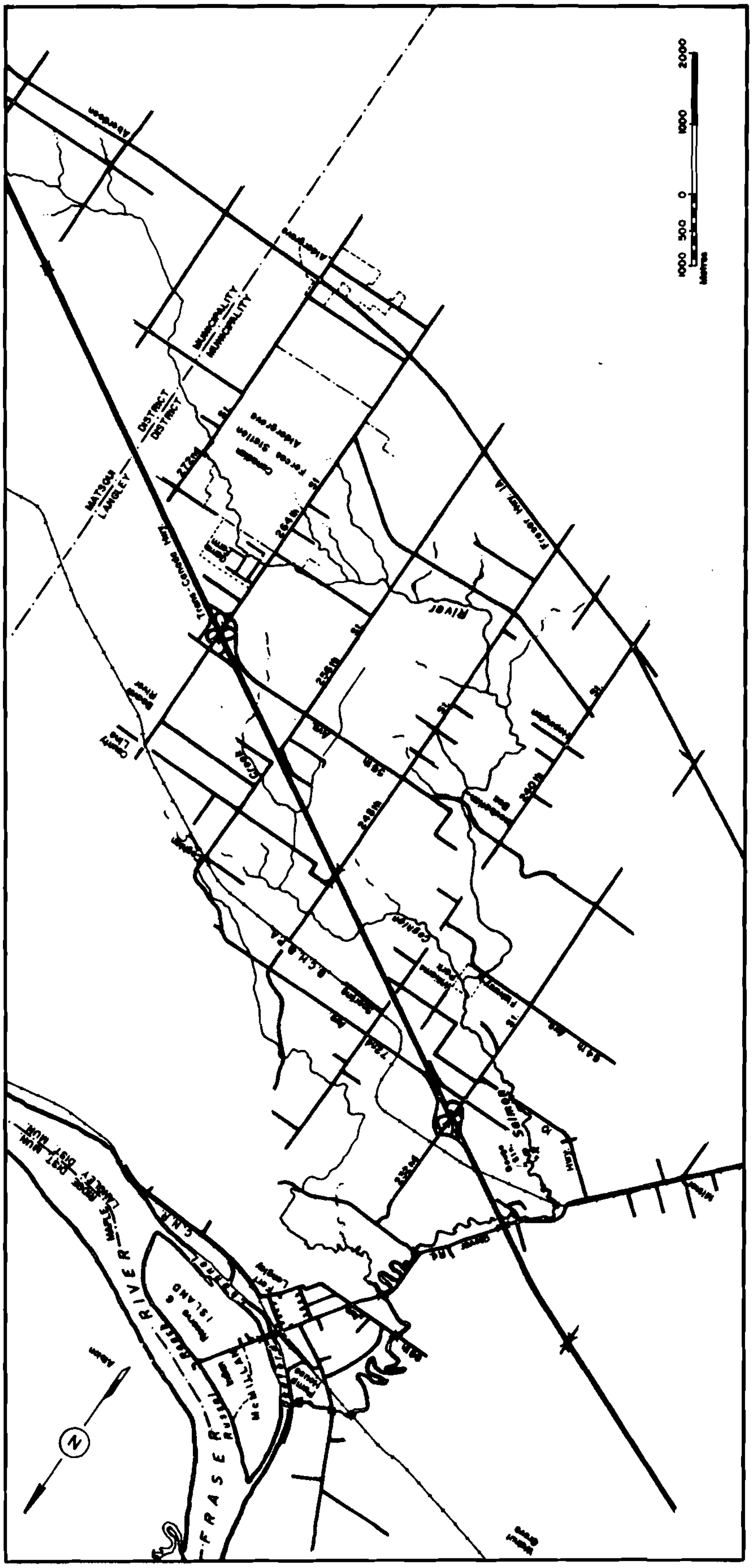

Figure 1. Study area location map.

Waters Directorate, 1976).

The Salmon River supports a number of anadromous and freshwater fish species, with coho salmon, cutthroat trout and steelhead trout dominant (Hartman 1968). Coho salmon escapements averaged approximately 1,000 during the period 1947 to 1976 (Marshall et al. 1979(representing 1.4% of the total Fraser River escapement. During the period 1970 to 1978 escapements have been higher, averaging 3,000 spawners (Appendix 9) and representing 4.5% of the Fraser River coho escapement. This increase, however, may reflect in part the more intensive enumeration effort rather than a real change in escapement. The spawning distribution, timing, and age, length, and sex composition of Salmon River coho were described by Schubert (1982). Spawning generally occurs between November and February in an 11 kilometer section of the middle and upper reaches of the mainstem and in the lower 4.5 kilometers of the principal tributary, Coghlan Creek. The spawning areas and escapement levels of the anadromous trout stocks have not been assessed (P. Caverhill, pers. comm.); however, the late summer juvenile densities and distributions were assessed during a two year study conducted in the Salmon River by the Fish and Wildlife Branch. In both years, the average density of coho fry was greater than that of cutthroat fry, and the average density of cutthroat fry was greater than that of steelhead fry (De Leeuw, 1981).

METHODS

CAPTURE TECHNIQUES

Fence Trapping

Fence traps similar to those described by Armstrong and Argue (1977) were the primary smolt capture method used during this program. The fences consisted of a series of 0.8 m X 2.4 m wooden frame panels covered with 6 mm galvanized mesh screening. These panels were installed in a converging V pattern, diverting all emigrant fish into a sluice trough which dropped into a large holding box (Fig. 4).

The fence traps were installed in mid to late April at sites in Coghlan Creek and in the Salmon River mainstem located approximately 14 km upstream from the Fraser River. The Coghlan Creek site was located approximately

Figure 2. Salmon River pumphouse

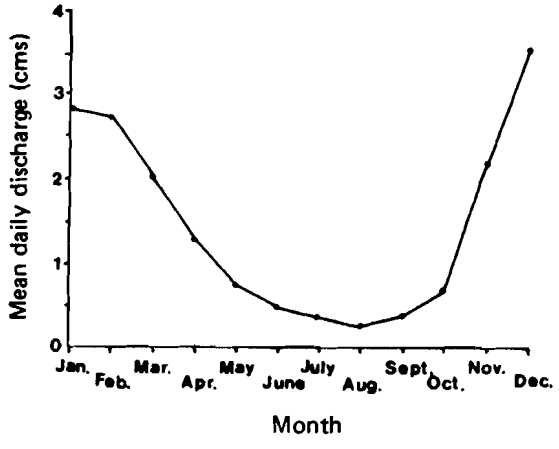

Figure 3. Mean daily discharges by month for the Salmon River at 72 Avenue, 1960 to 1980. (Stn. 08MH090)

50 meters above its confluence with the Salmon River and was used in all three years of the program. The Salmon River site, located approximately 150 meters above the Coghlan Creek confluence, was used during 1979 and 1980 only. These sites were selected for their accessibility, relative protection from vandalism, and the reduced probability of a washout. Other more general criteria used in site selection are described by Conlin and Tutty (1979).

Two operational problems were encountered during the first year of the program: first, relatively large trap box mortalities occurred once as a result of predation by minks and once as a result of turbulence from an overnight freshet; and second, smolts tended to escape from the trap box by swimming up the incoming water column into the sluice outlet. These problems were remedied by installing a plywood panel at the sluice outlet which restricted water flows to a one inch gap and excluded predators, and by attaching a loop of marquisette mesh from the top of the sluice to the trap box approximately six inches beneath the water surface to prevent smolts from escaping the trap box. (Fig. 5).

At each site, the captured fish were enumerated at least once daily, and all coho smolts were transferred to two nearby plywood holding boxes where they were held for tagging and sampling. Coho fry were not enumerated because the 6 mm mesh was too large to fully restrict their passage and unknown numbers of fry escaped before enumeration. Trout were enumerated by species and classed as smolts or presmolts. Smolts were defined as those fish with a silver coloration and with a fork length generally greater than 11 cm. Presmolts were defined as those fish with distinct parr marks and with a fork length less than 11 cm. Recently emergent fry were not enumerated. All trout were transferred to a holding box for subsequent sampling by Fish and Wildlife Branch personnel (data available at the Regional Fish and Wildlife Office). All other species were enumerated and released below the fence.

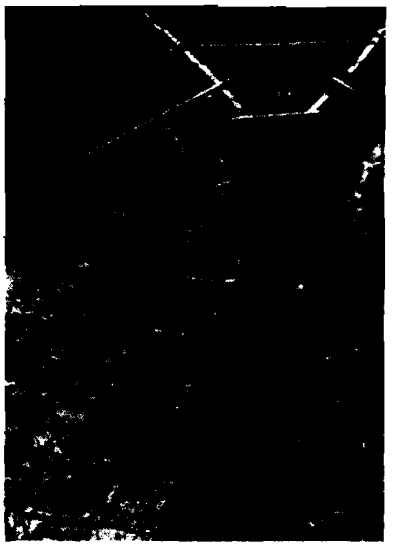

Figure 4. Coghlan Creek fence trap

Figure 5. Sluice modifications which restrict water inflows and prevent smolt escapes.

Very large diurnal coho smolt migrations were noted on a number of occasions during 1979. In order to quantify this observation, the proportion of the daily catch occurring during the 0900 h - 1600 h and the

1600 h - 0900 h periods was assessed on ten occasions during 1980.

Water and air temperatures and water levels were recorded at least once daily at each site. Temperatures were measured to the nearest one-quarter of a degree with a pocket thermometer. Relative water levels were measured on a staff gauge installed annually at each site and are therefore not comparable between years; however, daily discharges were recorded further downstream at the Inland Waters Directorate gauging station throughout the study period (Appendix 8).

Trap Efficiency: The capture efficiency of the fence traps was assessed in 1980 by releasing fifty marked coho smolts above each trap site. Coho smolts taken from the May 28 catch were measured for fork length and marked by removing the extreme distal portion of the dorsal fin. The marked smolts were released approximately fifty meters above each fence and all subsequent coho smolt captures were examined for a dorsal clip. Recaptured fish were measured prior to release below the fence.

Minnow Trapping

During 1978, Gee's minnow traps (brand name) were set in the Salmon River between the 232 Street and 64 Avenue crossings in order to supplement the Coghlan Creek fence trap catches. Up to thirty traps baited with Fraser River chum salmon roe were set each day during the period April 25 to June 9. The traps were checked at least once daily, and all coho smolts were enumerated and held for tagging at the Coghlan Creek fence site. Other species were enumerated and released.

During 1980, up to twenty similarly baited minnow traps were placed at least once weekly at five sites in the lower Salmon River in order to provide an estimate of the size of the coho smolt population which emigrated during the study period. The minnow traps were fished for durations of between six and twenty-four hours, and catches were identified to the species level and enumerated prior to release. All coho were examined for adipose clips, and the incidence of marked and unmarked smolts was recorded.

TAGGING PROCEDURES

The coded wire tagging equipment and machine maintenance procedures used during the study were similar to those described by Armstrong and Argue (1977). The number of tags sufficient to fulfill the study objectives was estimated at approximately 30,000 based on anticipated survival and exploitation rates and on the catch distributions observed in other coho smolt CWT studies. Any coho smolts in excess of that number were enumerated and released untagged.

Every effort was made to tag within one day of capture in order to minimize mortality resulting from holding stress. Tag implant location was checked for each tag lot at the commencement of tagging by bisecting the skull of single tagged coho with a scalpel along the median plane. If the tag was not in the preferred position in the cartilaginous wedge of the chondrocranium, the implant depth was adjusted and the procedure repeated until tag placement was correct. Following this check, the remaining smolts were tagged.

During the tagging operation, the fish were anesthetized with a stock Tricaine Methane Sulfonate (TMS) solution of 7.5 g per liter of water which was further diluted as conditions dictated in 7.5 liter plastic basin. The smolts were first graded into two size classes, based on a 95 - 100 mm fork length cut off between groups, and separate nose molds and tag implant

Table 1. Summary of Salmon River study tag codes.

Year Applied	Dominant Brood Year	Code
1978	1976	02 16 52
1979	1977	02 16 59
1980	1978	02 18 23

depths were used for each group to ensure proper tag location. Coho smolts of all sizes were tagged; however, any diseased or severely damaged fish were noted and excluded from tagging. The graded smolts were then marked by adipose fin removal, tagged, and passed through the quality control device (QCD) to ensure the tag was present. Tagged smolts were allowed to recover before release below the fence.

A sample of between 100 and 500 smolts was randomly removed throughout each tagging operation and retained for twenty-four and fourty-eight hour mortality and tag retention assessments. Any smolts without tags were retagged, and the tag lot figures were adjusted to reflect the number released with tags.

All tag codes used during the study are reported in Table 1. Coho smolts from the Salmon River and Coghlan Creek were tagged with the same code; however, a different code was used each year.

BIOLOGICAL SAMPLING

Coho smolts were sampled twice weekly to assess changes in smolt age and size with time. Fifty smolts were removed randomly from the daily catch and anesthetized in the TMS solution described above. A scale smear was removed with a scalpel from the preferred region, as defined by Clutter and Whitesel (1956), and the nose-fork length was measured to the nearest millimeter. A mean wet weight was derived from a subsample of at least 25 smolts weighed to the nearest 0.1 gram on an Ohaus triple beam balance.

RESULTS AND DISCUSSION

FENCE TRAPPING RESULTS

Catches

Coho Smolts: Coho smolt fence trap catches in Coghlan Creek totalled 9,381 in 1978, 14,709 in 1979 and 12,206 in 1980 (Table 2). Catches in the Salmon River mainstem totalled 27,566 in 1979 and 21,502 in 1980. The relative contribution of Coghlan Creek to the total smolt catch averaged 35.4% (34.8% in 1979 and 36.2% in 1980). This proportion is somewhat greater than expected on the basis of available rearing habitat. De Leeuw (1981) estimated the total available rearing area (excluding zero gradient sections) above the Coghlan Creek and Salmon River fences at approximately 21,200 m^2 and 48,000 m^2 respectively; therefore, approximately 30.7% of the total available habitat produced 35.4% of the captured smolts. These data suggest that the smaller tributary may be more productive per unit area than the mainstem; however, it remains unclear if the observed catches reflect actual production levels or if they are a

Table 2. Summary of coho and trout fence trap catches, by site and year. (Data derived from Appendix 1.)

Stream	Year	Coho	Steelhead		Cutthroat		Total Trout	
		Smolts	Smolts	Pre-Smolts	Smolts	Pre-Smolts	Smolts	Presmolts
Coghlan Creek	1978*	9,381	-	-	-	-	1,515	213
	1979	14,709	395	19	547	19	942	38
	1980	12,206	292	36	1,826	119	2,118	155
Salmon River	1979	27,566	842	24	687	16	1,529	40
	1980	21,502	1,360	80	2,244	148	3,604	228

* Trout were not identified to species in 1978.

function of data limitations which are discussed later in this report.

Trout Smolts: Trout smolt catches totalled 1,515, 2,471, and 5,722 during 1978, 1979 and 1980 respectively (Table 2). Cutthroat trout dominated the trout catch in both Coghlan Creek and Salmon River in 1980 and in Coghlan Creek in 1979. Steelhead trout predominated in the 1979 Salmon River catch. Coghlan Creek again contributed a greater proportion of the total trout smolt catch than expected on the basis of rearing habitat: 38.1% in 1979 and 37.0% in 1980.

Nonsalmonid Species: Small numbers of lampreys, sticklebacks, crayfish, suckers, dace and sculpins were recorded during the study (Table 3). The 1978 and 1979 catches were identified according to genus. In 1980 the catches were identified by species as follows: Lampreys were either Pacific Lampreys **(Entosphenus tridentatus)** or Western Brook Lampreys **(Lampetra richardsoni)**, except one River Lamprey **(L. ayresi)**; all observed suckers were Longnosed Suckers **(Catostomus catostomus)**; and all sculpins were Prickly Sculpins **(Cottus asper)**. This list includes only those species which were migrating during the study period and does not reflect the species composition in the system as a whole. Hartman (1968) provided a more detailed listing of fish species composition and distribution in the Salmon River system.

Trap Efficiency

The capture efficiency of the fence traps for coho smolts was estimated at both sites during the period May 28 to June 11, 1980 by releasing fifty marked smolts above each fence. A total of 45 (90%) were recovered in Coghlan Creek and 47 (94%) were recovered in the Salmon River. Most marked smolts were recaptured within three days (range 0 to 8 days), and no size selectivity in recaptured fish was noted (Appendix 6).

The 1980 assessment was made immediately before the end of the program when deterioration of the sandbags and substrate around the fence was greatest. The value obtained, therefore, should provide a minimum estimate of the trap efficiency during normal operation. It remains unclear, however, whether the observed losses were due to residualism, predation and

Table 3. Summary of fence trap catches of nonsalmonid species, by site and year. (Data summarized from Appendix 1.)

Species	Coghlan Creek			Salmon River	
	1978	1979	1980	1979	1980
Pacific Lamprey (**Entosphenus tridentatus**)	*	15	21	29	26
Other Lamprey (**Lampetra sp.**)	*	43	32	111	44
Threespine Stickleback (**Gasterosteus aculeatus**)	27**	8	23	8	35
Crayfish (**Pacifastacus sp.**)	47**	69	58	147	316
Suckers (**Catostomus catostomus**)	11**	6	5	2	12
Dace (**Rhinichthys cataractoe**)	2**	0	2	0	1
Sculpins (**Cottus asper**)	4**	0	3	2	1

* Lampreys were not identified to species in 1978. A total of 44 of all species were captured.

** Identified to genus level only in 1978.

handling mortality, or whether they had in fact escaped through undetected holes in the fence.

Limitations of Fence Trap Data

The Salmon River program was designed to capture coho smolts for tagging and was not intended to assess annual smolt yields. Several factors suggest that the fence catches significantly underestimate the smolt yield of both the system as a whole and that portion of the system upstream of the fence traps. First, there is a certain inefficiency inherent to the operation of all fence traps regardless of trapping conditions. An attempt was made to quantify this factor during 1980, and those data are probably applicable to the 1979 program. In 1978, however, the Coghlan Creek fence was washed out during a freshet between May 14 and May 16. Since this period is normally coincident with large daily smolt emigrations, the 1978 catch figures may significantly underestimate the actual number of smolts which emigrated during the trapping period. More reliable data require the marking and release of a fixed proportion of the daily catch above the fence. Second, the traps were located approximately 14 km upstream from the mouth and excluded a large area of stream habitat which supported up to 23% of the coho fry, 25% of the cutthroat fry and 65% of the rainbow fry standing crop during late summer 1979 (De Leeuw, 1981). Third, the comparatively short study period excluded from assessment any individuals which reared and overwintered in the upstream area but which emigrated prior to the study period. Coho smolt timing studies in Carnation Creek (Anderson, 1978), in the Keogh River (de Hrussoczy-Wirth, 1979) and in Minter Creek (Salo and Bayliff, 1958) have reported a variable coho emigration prior to May, with significant emigrations in Minter Creek as early as February in some years. Since the Salmon River fences were not installed until late April, the total catch may significantly underestimate the actual smolt production from the upstream areas. Finally, the fall and early winter movement of coho juveniles into areas of primarily overwintering habitat has been documented in a number of streams (Skeesick 1970,

Bustard and Narver 1975, C.J. Cedarholm 1981, unpublished data from the Chilliwack Lake Coho CWT Program). A similar migration from the middle reaches of the Salmon River to the potentially good overwintering habitat in the lower river, either through active migration or through passive movement during freshets, may have displaced significant numbers of juveniles to areas below the fence site.

Results from minnow trapping in the lower river during 1980 support the premise that the fence trap catches significantly underestimate annual smolt yields (Appendix 2). The marked to unmarked ratio indicated a smolt yield of at least 2.2 times the fence count and was probably higher when smolts which emigrated before and after the trapping period are considered. A more reliable estimate of smolt yield may be obtained through the application of a mark recapture method during the subsequent escapement period. These data are currently being collected and will be reported in a future paper.

Migration Timing

Coho Smolts: Coho smolts emigrated from the study streams primarily during a five week period beginning in late April (Figs. 6-10). The onset of the migration occurred prior to trap installation in all years and continued sporadically when the traps were removed in mid-June. The migratory peak, as defined by the date of 50% smolt catch, occurred during early to mid-May and was virtually synchronous each year in the two study streams (Table 4). Day to day fluctuations in the pattern of migration were not strongly correlated with any single environmental variable. Migratory peaks (defined as a period of increasing smolt movement resulting in at least a doubling of the daily catch) always occurred during periods of rising water levels and were often associated with rising water temperatures, although in the latter case the data are inconclusive since the recorded 'spot' temperatures may not accurately reflect trends in daily maxima or minima. Peaks were also noted immediately prior to both full and new moons; however, Grau (1981) demonstrated that thyroxin surges were associated with the new moon only, suggesting that the migratory peaks noted may be coincidental and not indicative of a causative relationship.

The above data support the generally accepted premise that smolt migratory behavior is a complex function involving at least two broad

Table 4. Summary of coho smolt emigration data.

Stream	Year	Period Fished	50% Peak	Daily Maxima	
				Date	N
Coghlan Creek	1978	April 23 to June 9	May 9	May 9	1,582
	1979	April 27 to June 12	May 14	May 22	855
	1980	April 17 to June 11	May 8	May 6	848
Salmon River	1979	April 27 to June 14	May 15	May 4	2,440
	1980	April 18 to June 10	May 8	May 6	1,406

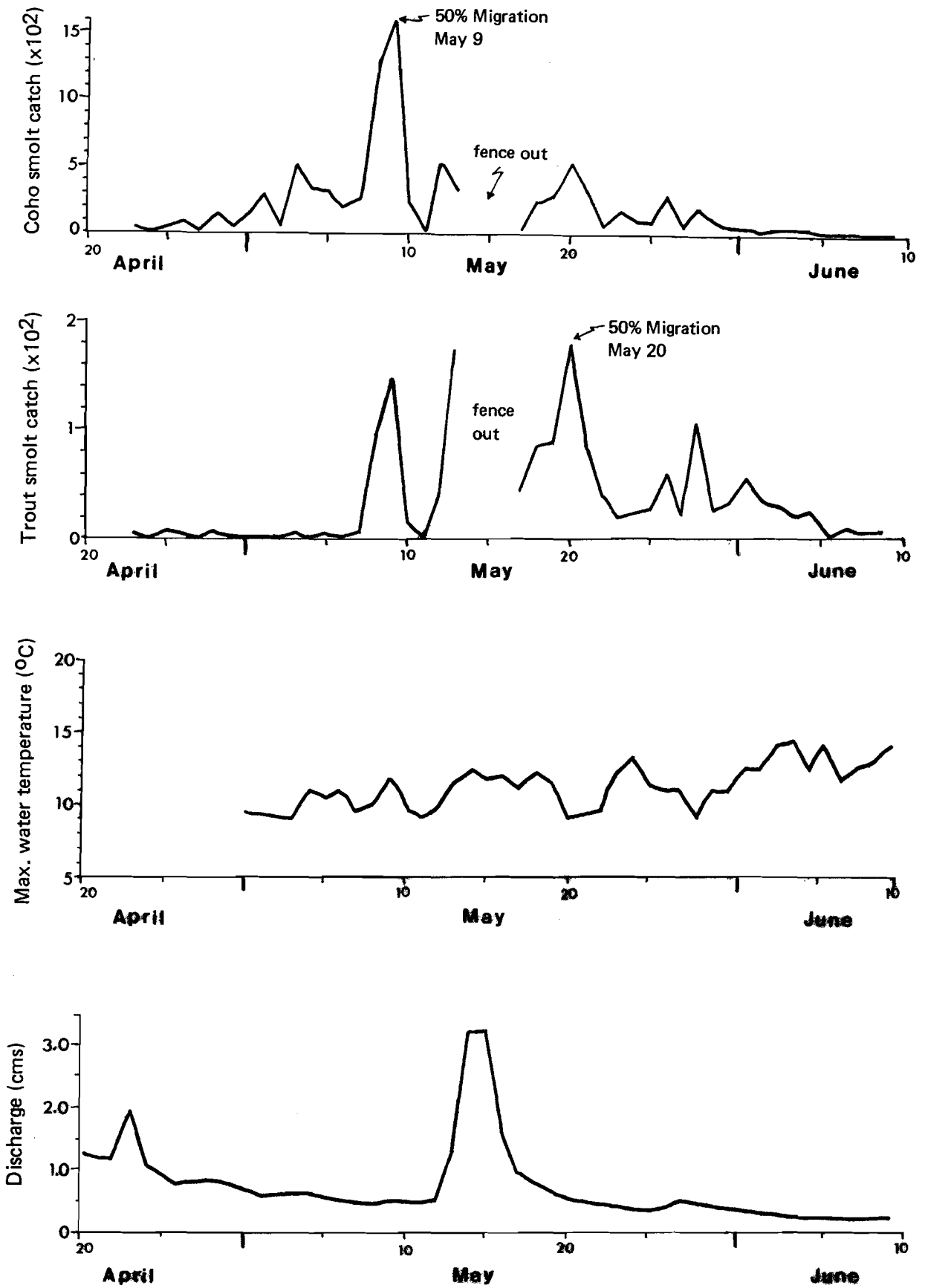

Fig. 6. Emigration of Coghlan Creek salmonid smolts in relation to date, water temperature, and discharge in 1978.

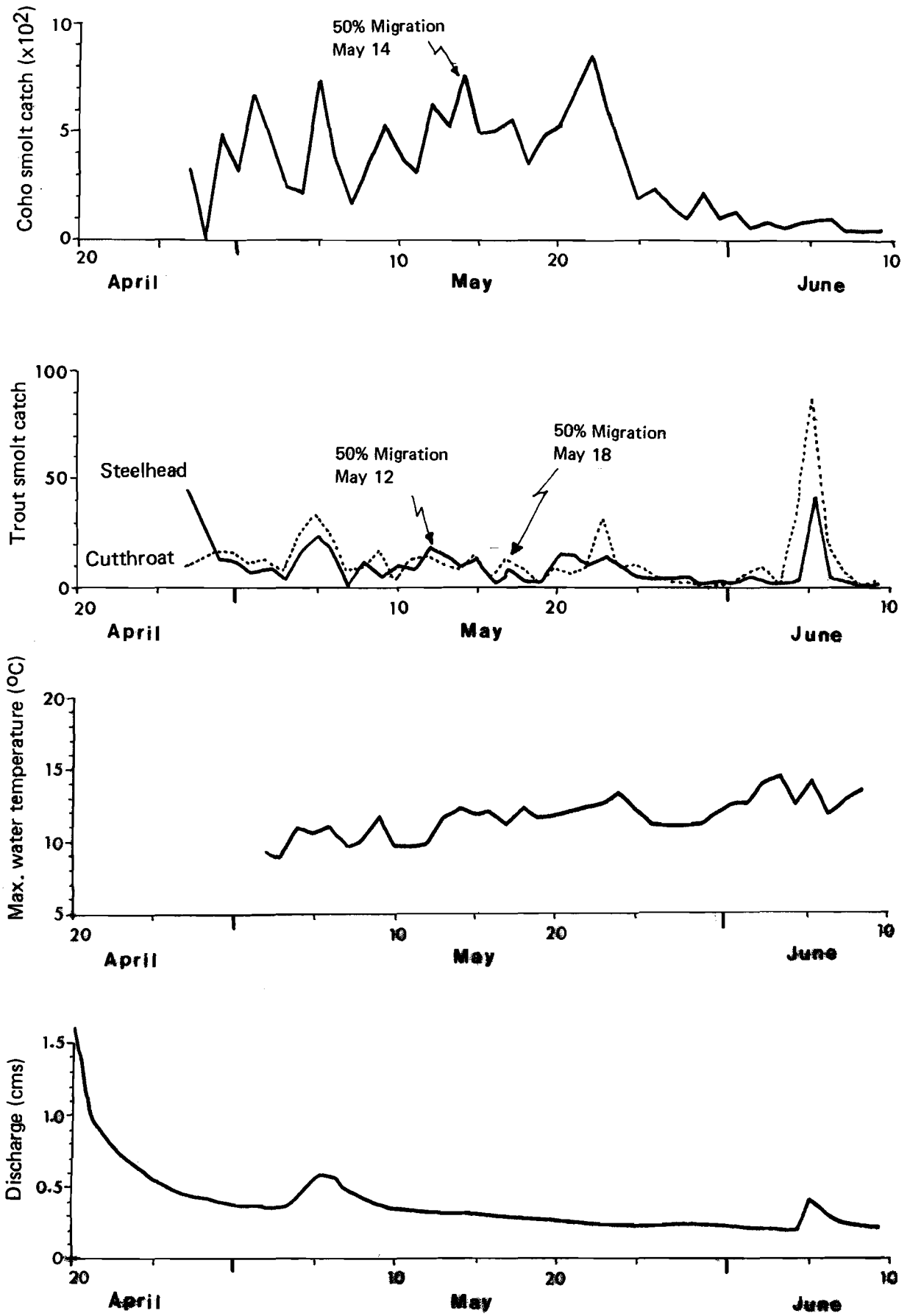

Fig. 7. Emigration of Coghlan Creek salmonid smolts in relation to date, water temperature and discharge in 1979.

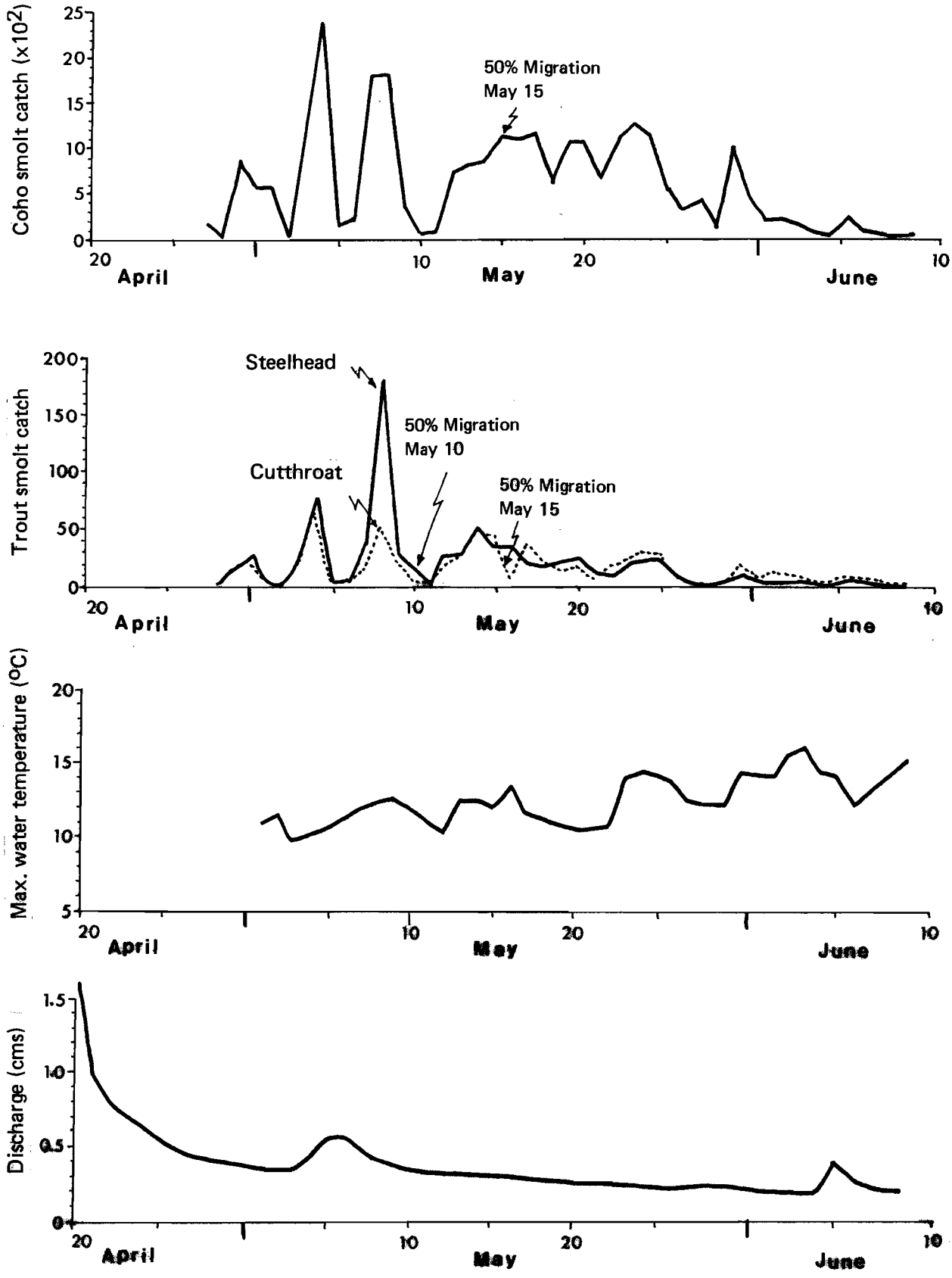

Fig. 8. Emigration of Salmon River salmonid smolts in relation to date, water temperature and discharge in 1979.

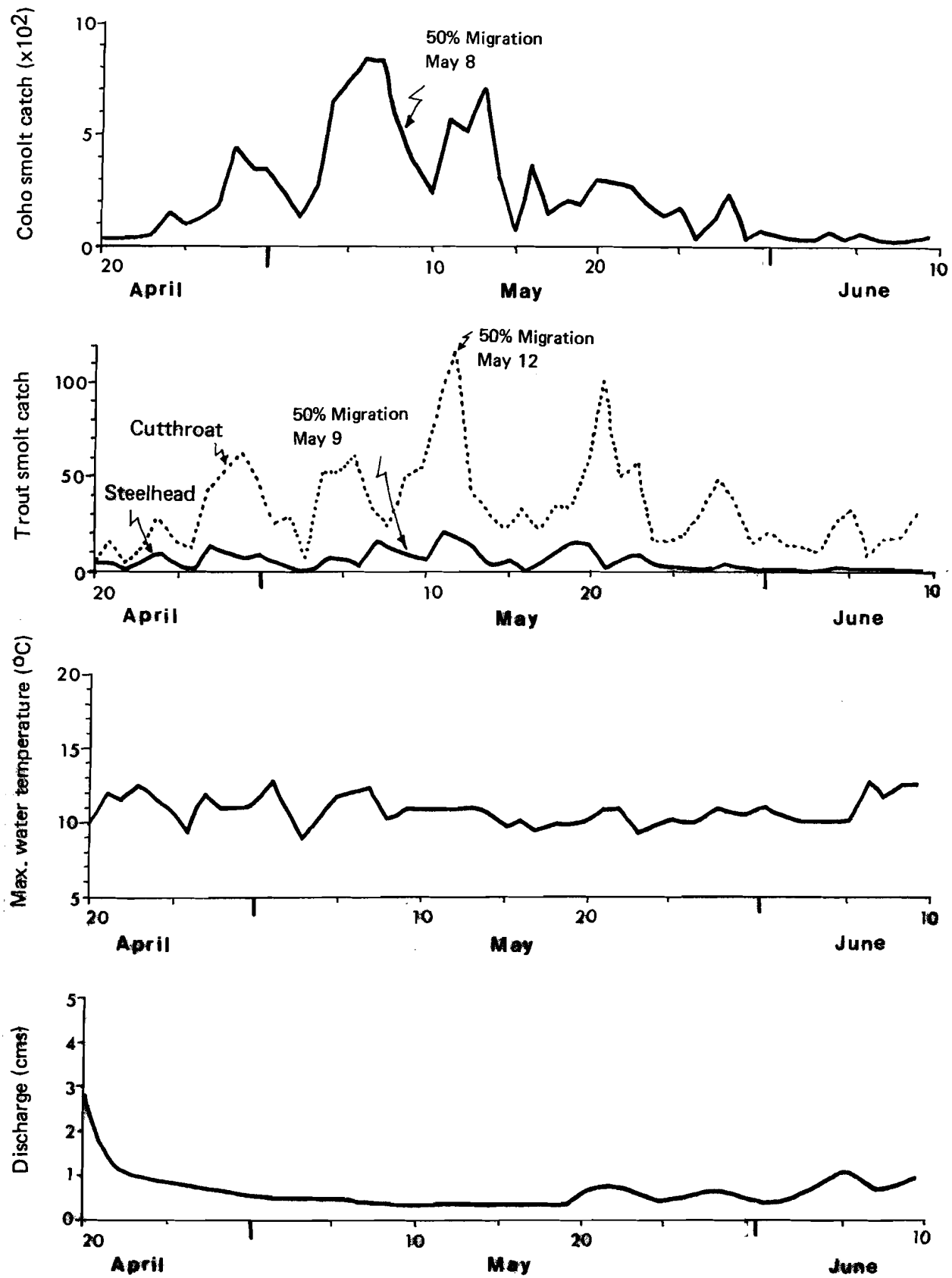

Fig. 9. Emigration of Coghlan Creek salmonid smolts in relation to date, water temperature and discharge in 1980.

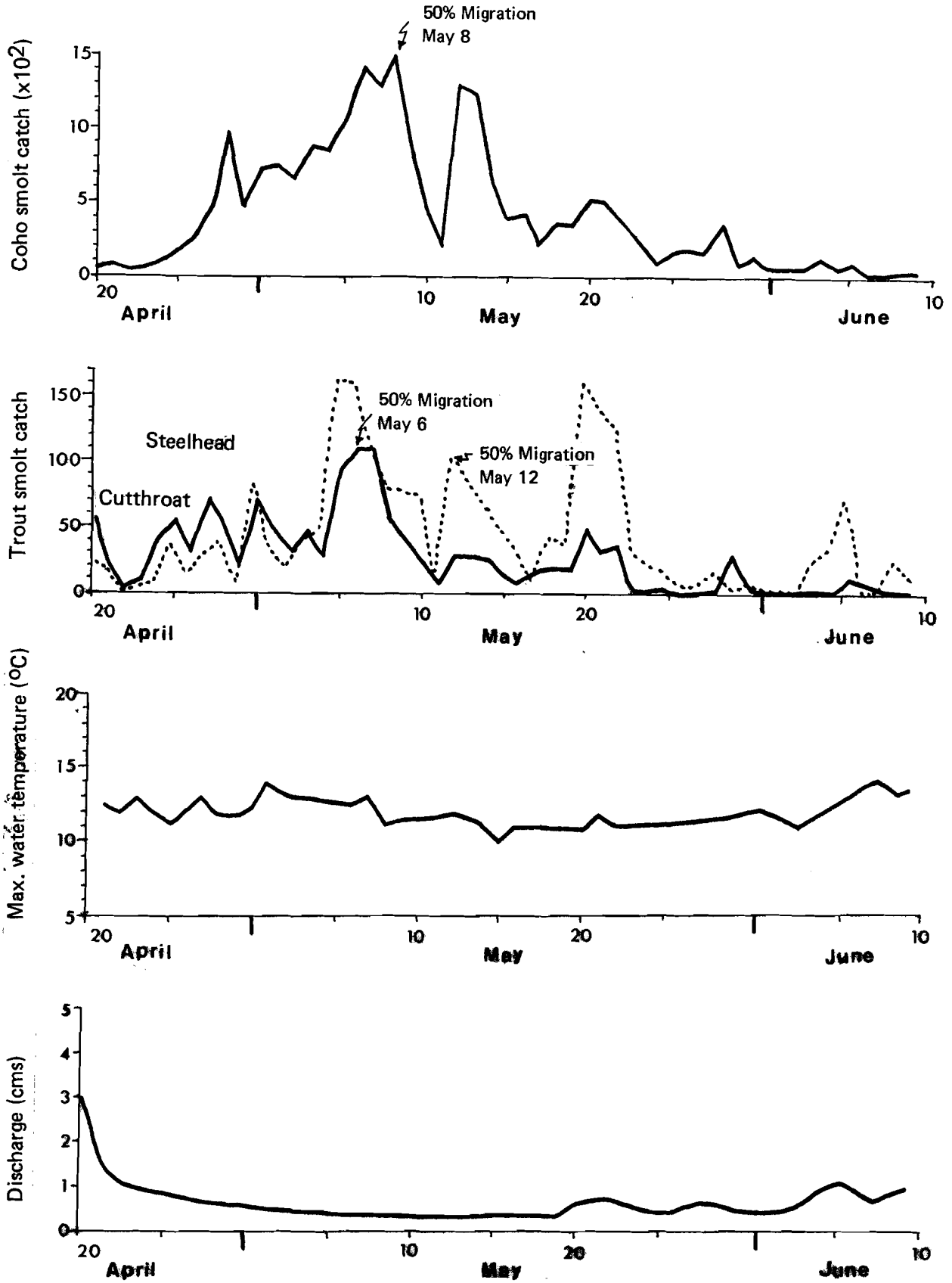

Fig. 10. Emigration of Salmon River salmonid smolts in relation to date, water temperature and discharge in 1980.

Table 5. Summary of steelhead and cutthroat trout smolt emigration data.

Stream	Year	Steelhead Trout			Cutthroat Trout		
		50% Peak	Daily Maxima		50% Peak	Daily Maxima	
			Date	N		Date	N
Coghlan Creek	1979	May 12	June 5	42	May 18	June 5	87
	1980	May 9	May 11	22	May 12	May 12	119
Salmon River	1979	May 10	May 8	186	May 15	May 8	54
	1980	May 6	May 6	110	May 12	May 5	163

mechanisms. Hoar (1953) suggested that the general state of migratory readiness results from a neuroendocrine mediated failure of the rheotactic response, possibly triggered by photoperiodism, producing a generally dome shaped curve over the spring migratory period. Osterdahl (1969) suggested that the above endogenous mechanism is influenced by short term environmental parameters which produce the marked day to day fluctuations which characterize most smolt migrations.

Trout Smolts: The overall pattern of steelhead and cutthroat trout smolt emigration was similar to that reported for coho smolts (Figs. 6-10). Migratory peaks occurred by mid-May in both study streams, although the timing in Salmon River generally preceded the timing in Coghlan Creek by a few days (Table 5). Cutthroat trout smolts emigrated up to a week earlier than steelhead trout smolts in both study streams. It should be noted that these peaks are based on data collected during the late April to mid-June study period. A similar trapping program conducted during 1981 (D.F.O., unpublished) recorded significant trout movement in late March (up to 50 smolts per day), indicating that the Salmon River system trout emigration occurs over a longer period than that assessed by this study.

The pattern of day to day variability in the trout smolt emigrations was similar to, although of lesser magnitude than, that reported for coho, suggesting that all three species were responding to the same environmental fluctuations. However, as with coho, a strong correlation with any single environmental parameter was not noted.

Periodicity

A rigorous assessment of the diel pattern of emigration was not carried out during this study; however, the traps were monitored twice daily on ten occasions during the 1980 study period in an attempt to quantify diurnal aspects of the migration (Appendix 1). These data represent minimum estimates of diurnal periodicity since it is probable that many of the 1600 h to 0900 h migrants were trapped prior to dusk or after dawn.

Coho, steelhead and cutthroat smolts, lampreys and crayfish were captured during the daylight period; however, coho exhibited by far the greatest propensity for diurnal migration. An estimated 49.6% of the daily coho catch (53.1% and 48.2% in Coghlan Creek and Salmon River respectively) occurred during the 0900 h to 1600 h period, often under bright, sunny conditions. There was no

significant correlation between daylight catch and either maximum daily water temperature or date; however, the proportion of daylight migrants was low when water temperatures dropped below 10.5°C (Appendix 1), suggesting that diurnal emigrations may occur after a critical water temperature is reached, and that the early part of the smolt emigration may be principally nocturnal.

An estimated 29.0% of the steelhead smolt and 16.0% of the cutthroat smolt daily catches occurred during the 0900 h to 1600 h period on the days monitored. As with coho, no significant correlation was noted with water temperature or date, and daylight catches were low when water temperatures dropped below 10.5°C. Reasons for the observed differences between species in their propensity toward daylight migration are not known.

Large diurnal migrations have not previously been reported for coho salmon; however, they have been noted frequently with Atlantic salmon (Hayes, 1953; Munro, 1965; Osterdahl, 1969; Solomon, 1978). Osterdahl (1969) reported a change in diel migration from principally nocturnal migrants in the early part of the run to principally diurnal migrants in the later part of the run. He concluded that changes in the strength of the day migration are best correlated with changes in incoming solar radiation (calories/unit area) and to a lesser degree with water temperature. Solomon (1978) suggested that diurnal migratory behavior was released at a critical maximum daily water temperature (generally 10°C) which varies annually but which is based on prevailing water temperatures in the previous weeks. Thorpe and Morgan (1978) cited data which show that the intensity of the rheotactic response of Pacific salmon smolts is inversely related to temperature and that the diel pattern of oxygen consumption peaked at mid-day and mid-night. This suggests that when water temperatures rise beyond a certain threshold, the rise in oxygen demand will result in reduced activity and the probability of downstream movements at these times would increase. Presumably, a similar mechanism occurs with coho and trout smolts; however, the demonstration of a strong correlation would require more intensive data collection techniques than were devoted to this study.

MINNOW TRAPPING RESULTS

Coho smolt minnow trap catches in the Salmon River mainstem totalled 3,902 during 1978 (Appendix 2). The catch per trap-day of coho smolts averaged 5.4 over the trapping period. A maximum catch per trap-day of 27.5 occurred on May 10, one day after the maximum daily migration observed in Coghlan Creek (Table 4).

The 1980 lower river minnow trapping results are reported in Appendix 2. A total of 868 coho smolts were captured, as well as significant numbers of Prickly Sculpins **(Cottus asper)**, Peamouth Chub **(Mylocheilus caurinus)**, Threespine Sticklebacks **(Gasterosteus aculeatus)** and Redside Shiners **Richardsonius balteatus)**. No cutthroat trout and very few coho fry or steelhead smolts were captured.

Fourty-eight percent of the coho smolts were marked with adipose clips indicating that the smolt emigration was substantially larger than that observed at the fence sites where 90.7% of the observed smolts were marked. A population estimate was not calculated from these data, however, because trapping effort was not constant over the study period.

COHO TAGGING RESULTS

1978

A total of 13,473 coho smolts were released with adipose clips and coded

wire tags (CWT's) during 1978 (Appendix 3)[1]. Adjustments made for delayed tag loss, machine sorting errors, and post tagging mortality are summarized in Table 6.

Delayed tag loss averaged 1% during 1978 and generally occurred within one day of tagging. Holding time prior to tagging averaged 4.5 days (range 1 to 11 days) during which time mortality was negligible. Post tagging mortality was also low and generally occurred immediately after tagging as a result of overanesthetization or handling stress.

Water temperatures ranged from 8°C to 14.5°C, but generally remained below 12°C for most of the program (Appendix 7).

All smolts were examined for damage or abnormalities prior to tagging. An estimated 2% of the population was affected (Appendix 4) with the most prevalent condition being an opaque clouding of the eye, termed "fog-eye", a reversible condition believed to be associated with capture and holding stress (G. Hoskins, pers. comm.). The incidence of naturally missing adipose fins was 0.036% (N=5); however, the term "naturally missing adipose fin" is used here to denote a fin which is deformed or vestigial in nature and which might later be confused with an incomplete clip. No fish with completely missing fins were noted.

1979

A total of 31,965 coho smolts were released with adipose clips and CWT's during 1979 (Appendix 3). The remainder of the smolts were enumerated

1. Trapping and tagging totals differ because daily catches were enumerated quickly to avoid stress. Tagging totals are more precise.

Table 6.Summary of coho smolt tagging results by site and year.

Location	Year	Estimated Number Trapped	Number Tagged	Estimated Post-tag Mortality	Marked and Tags Lost	Number Released with Tags	Tag Code
Coghlan Creek	1978	9,381	13,677[1]	32	172	13,473	02 16 52
	1979	14,709	11,806	5	63	11,738	02 16 59
	1980	12,206	11,006	2	171	10,833	02 18 23
Salmon River	1979	27,566	20,409	4	178	20,227	02 16 59
	1980	21,502	19,677	20	258	19,399	02 18 23
Total	1978	9,381	13,677[1]	32	172	13,473	02 16 52
	1979	42,275	32,215	9	241	31,965	02 16 59
	1980	33,708	30,683	22	429	30,232	02 18 23

1. Includes 3,902 smolts captured by minnow trapping in the Salmon River mainstem.

and released untagged below the fence. Separate results for Coghlan Creek and Salmon River, including adjustments for delayed tag loss, post tagging mortality and machine sorting errors, are summarized in Table 6.

Delayed tag loss again averaged less than 1% and generally occurred within one day of tagging. Holding time averaged 1.5 days (ranged 0 to 7 days), and holding and post-tagging mortalities were negligible.

Water temperatures ranged from 9.0°C to 16°C with Salmon River temperatures generally 1 to 2°C warmer than those in Coghlan Creek. (Appendix 7).

The incidence of damaged or diseased smolts encountered during 1979 was 4.4% (Appendix 4). The most prevalent condition, noted primarily in Salmon River smolts, was an infestation of flukes of the genus **Neascus**, commonly termed "blackspot disease." Neascus is thought to be an innocuous parasite which disappears when the fish enters salt water (Wood, 1974); however, a recent study associated "blackspot disease" with retarded growth and increased mortality in Northern Pike (Harrison and Hadley, 1982). If a similar mechanism occurs in coho salmon, then reduced smolt fitness may result in a lower smolt to adult survival in the infected individuals. The incidence of "fog-eye" dropped sharply in 1979, possibly reflecting the reduced holding time prior to tagging. No naturally missing adipose fins were noted at either site during 1979.

1980

A total of 30,232 coho smolts were released with adipose clips and CWT's during 1980 (Appendix 3). The remainder were enumerated and released below the fence. Separate results for Coghlan Creek and Salmon River, including adjustments for delayed tag loss, post tagging mortality, and machine sorting errors, are summarized in Table 6.

The average delayed tag loss was 1.1%. Holding time averaged less than one day (Range 0 to 4 days), and both holding and post-tagging mortalities were negligible.

Stream temperatures during the program ranged from 7°C to 14°C (Appendix 7).

The incidence of diseased or damaged smolts encountered during 1980 is summarized in Appendix 4. Anomalies affected 17.0% of the population, sharply higher than in the previous two years in both Coghlan Creek and Salmon River, possibly indicating a high degree of stress during the 1979 rearing season which could conceivably be reflected in a reduced smolt to adult survival for this brood. As in 1979, **Neascus** was the most prevalent problem, affecting 14.9% of the population. The incidence of naturally missing adipose fins was 0.013% (N=4) and, as defined earlier, none with completely missing fins were noted.

BIOLOGICAL SAMPLING

Coho Smolts

Age: Coho emigrated from the study streams primarily as yearling or age 1+ smolts (Table 7). Two year old or age 2+ smolts formed the remainder of the run and comprised less than 1% of the smolts captured in 1978 and 1979. In 1980, however, age 2+ migrants comprised 4.1% of the Coghlan Creek and 2.8% of the Salmon River catches. An unusually successful 1977 brood may have influenced the growth of this cohort and resulted in a higher abundance of two year old smolts during 1980. A comparison between age at smoltification and brood year escapement level was not attempted, however, due to the poor precision inherent in current escapement estimation

Table 7. Summary of annual coho smolt mean fork lengths by age class. (Note: Data has been weighted. For unweighted means, sample sizes, and age compositions, see Appendix 5.)

Stream	Year	Mean Fork Length (mm)		
		Age 1+ (%)	Age 2+ (%)	Total
Coghlan Creek	1978	94.4 (99.2)	128.8 (0.8)	95.6
	1979	93.3 (99.8)	117.0 (0.2)	93.9
	1980	97.5 (95.9)	116.6 (4.1)	98.8
Salmon River	1979	93.4 (99.9)	102.0 (0.1)	94.4
	1980	97.6 (97.2)	123.5 (2.8)	98.2

techniques and to a lack of egg to fry survival data.

In 1980, when the numbers of age 2+ smolts were sufficient to indicate a trend, the age 2+ smolts emigrated in the early part of the migratory period with the peak migration preceding that of age 1+ smolts by at least one week (Tables 8 and 9). A similar phenomenon was reported in the Cowichan River (Argue **et al.** 1979) and in the Squamish River (Argue and Armstrong 1977). Since two year old smolts are generally larger than yearing smolts, the observed higher degree of migratory readiness may be a reflection of the larger body size of older individuals. Such a relationship between coho size and smoltification has been reported elsewhere in the literature (Vanstone and Markert, 1968; Conte **et al.**, 1966).

Length and Weight: The weighted annual mean length of coho smolts ranged from 93.9 mm to 98.8 mm during the three year study period (Table 7). There was no significant difference ($p > 0.05$) in smolt size between the two study streams in the same year, or between the Coghlan Creek smolts of 1978 and 1979. The 1980 smolts in both study streams, however, were significantly larger than those in the two previous years, possibly reflecting the lower apparent rearing densities for that cohort.

The mean lengths of two year old smolts ranged from 102.0 mm to 128.8 mm and two year olds were, in all years, larger than yearling smolts which ranged in mean length from 93.3 mm to 97.6 mm; however, the difference was not significant in 1979.

The coho smolt mean length was greatest at the start of the trapping period and generally decreased through the remainder of the run (Fig. 11). Unpublished data for 1981 on the Salmon River suggest, however, that the coho smolt mean length increases from a late March size of 70 - 75 mm before following the trend reported above.

Coho smolt mean wet weights were generally collected bi-weekly (Appendix 5); however, inconsistencies in the weight sampling methodology in 1978 make difficult the calculation of comparable weighted mean annual weights. Instead, these data were derived by calculating a logarithmic functional regression of weight on length from the 1979 and 1980 sample data. Since no significant difference

Table 8 Coghlan Creek coho smolt emigration timing by year and age class. (Data derived from Appendices and 5.)

Week Ending:			April		May				June			Total
			23	30	7	14	21	28	4	11	18	
1978	Age 1+	N	-	579	1,928	3,963	1,449	998	337	55	-	9,309
		Cum %	-	6.2	26.9	69.5	85.1	95.8	99.4	100	-	
	Age 2+	N	-	0	57	0	15	0	0	0	-	72
		Cum %	-	0	79.2	79.2	100	100	100	100	-	
1979	Age 1+	N	-	1,122	2,902	3,476	3,631	2,529	727	275	18	14,680
		Cum %	-	7.6	27.4	51.1	75.8	83.1	98.0	99.9	100	
	Age 2+	N	-	0	0	0	0	29	0	0	0	29
		Cum %	-	0	0	0	0	100	100	100	100	
1980	Age 1+	N	198	1,435	3,594	3,278	1,564	1,158	311	168	-	11,706
		Cum %	1.6	11.9	41.9	70.8	83.9	93.5	96.1	100	-	
	Age 2+	N	9	261	132	37	34	25	0	2	-	500
		Cum %	1.8	54.0	80.4	87.8	94.6	99.6	99.6	100	-	

Table 9. Salmon River coho smolt emigration timing by year and age class. (Data derived from Appendices and 5.)

Week Ending:			April		May				June			Total
			23	30	7	14	21	28	4	11	18	
1979	Age 1+	N	-	1,631	6,357	4,918	6,934	5,016	2,219	452	16	27,543
		Cum %	-	5.9	29.0	46.9	72.0	90.2	98.3	99.9	100	
	Age 2+	N	-	0	0	0	0	0	23	0	0	23
		Cum %	-	0	0	0	0	0	100	100	100	
1980	Age 1+	N	191	2,868	6,567	6,232	2,756	1,589	527	173	-	20,903
		Cum %	0.9	14.6	46.1	75.9	89.0	96.7	99.2	100	-	
	Age 2+	N	70	248	253	0	0	17	11	0	-	599
		Cum %	11.7	53.1	95.3	95.3	95.3	98.2	100	100	-	

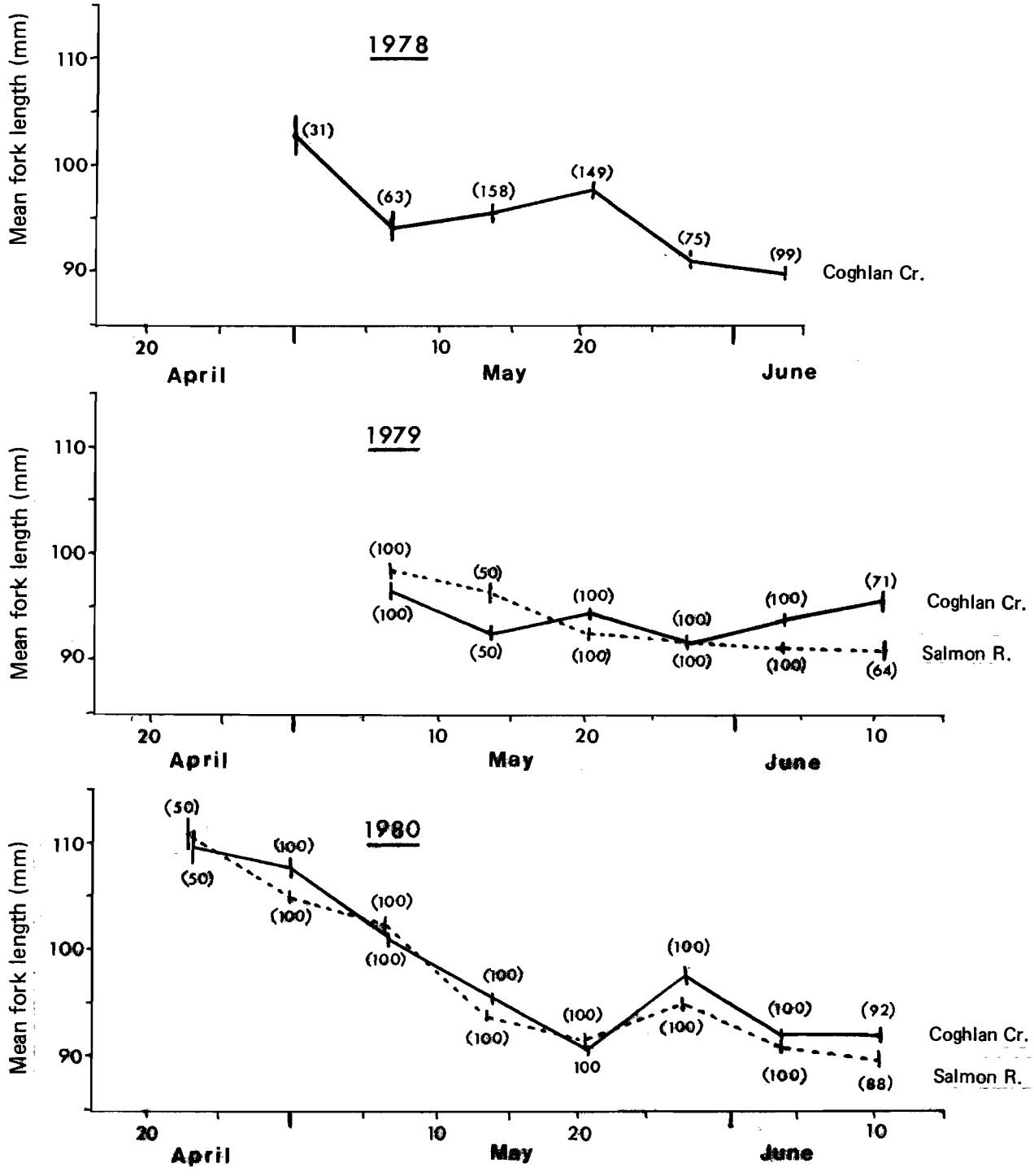

Fig. 11. Weekly summary of coho smolt mean fork lengths, 1978 to 1980 (numbers in parenthesis give sample size; vertical bars are 95% confidence limits).

Table 10. summary of coho smolt mean fork lengths and wet weights by stream and year.

Stream	Year	Mean Length (mm)	Mean Weight (g)	Number per Kilogram
Coghlan Creek	1978	95.6	9.21	108.6
	1979	93.9	8.67	115.3
	1980	98.8	10.18	98.2
Salmon River	1979	94.4	8.85	113.0
	1980	98.2	9.97	100.3

was noted between the two years, those data were pooled to derive the following regression:

ln weight (g)= -11.36 + 2.98 ln length (mm)

r = 0.95

The annual weighted mean lengths (Table 7) were then used to derive annual weighted mean wet weights (Table 10). The mean wet weights ranged from 8.67 g to 10.18 g over the three year study period, with the largest smolts captured in 1980. These weights are comparable to or smaller than those reported in the literature for other coastal British Columbia streams (Argue **et al.**, 1979; Patterson **et al.**, 1979; de Hrussoczy-Wirth, 1979; Fedorenko **et al.**, 1982).

Trout Smolts

Cutthroat and steelhead trout smolts emigrated primarily as two year olds, with small numbers of one and three year olds also present. Further age and size data are awaiting analysis at the Fish and Wildlife Branch (P. Caverhill, pers. comm.).

SUMMARY

1. Fence traps were installed in the Salmon River system (Langley) during the springs of 1978, 1979 and 1980 as part of a coded wire tagging study designed to investigate the fishery contribution, migratory pattern and survival rate of that coho stock. Fences were installed in Coghlan Creek, the principal tributary, during all three years and in the Salmon River mainstem above Coghlan Creek during 1979 and 1980 only.

2. A total of 13,473, 31,965 and 30,232 coho smolts were released with tags during 1978 (code 2 16 52), 1979 (code 2 16 59) and 1980 (code 2 18 23) respectively. These figures have been adjusted for delayed tag loss (0.7% to 1.12% and mortality (0.02% to 0.20%). The size of tagged coho smolts ranged from 93.9 mm to 98.8 mm in length and from 8.85 g to 10.18 g in weight.

3. Coghlan Creek contributed an average of 35.4% of the total catch in 1979 and 1980 and appeared to be somewhat more productive per unit area than the Salmon mainstem above the fence site.

4. Trout smolts comprised between 5.5% and 14.5% of the total salmonid catch, and trout

production may form an inverse relationship to coho production. Both cutthroat and steelhead trout smolts were captured; however, cutthroat smolts were more abundant.

5. For a number of reasons, the fence trap catches significantly underestimate the annual smolt yield from the Salmon River system and should not be used to estimate production per unit area or length.

6. Coho smolts emigrated primarily during a five week period beginning in late April with migratory peaks occurring in early to mid-May. The daily pattern of migration was similar in the two study streams, and significant diurnal movements were noted during 1980.

7. Over 99% of the coho smolt population was composed of age 1+ individuals, except in 1980 when 3.3% of the emigrants were age 2+.

8. Age 2+ smolts were larger than age 1+ smolts, although the difference was not significant in 1979. Age 2+ smolts tended to emigrate in the early part of the emigration period.

9. The trout smolt emigration peaked by mid-May, with the timing in the Salmon River preceding Coghlan Creek by a few days. The peak cutthroat trout smolt emigration preceded that of steelhead by up to a week in both study streams. Preliminary analysis of the trout sample data indicates that trout smolts emigrate primarily at age 2.

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APPENDIX 1. DAILY FENCE TRAP CATCHES

Appendix 1(a). 1978 Coghlan Creek daily fence trap catches.

Date	Coho Smolts	Trout		Crayfish	Lampreys	Stickleback	Sucker	Sculpin	Other Species	Remarks
		Smolts	Presmolts							
April 23	46	5	-	-	-	-	-	-	-	Trap installed.
24	13	-	-	-	-	1	1	-	-	
25	39	8	-	8	-	2	-	-	-	
26	80	-	11	4	-	-	-	-	-	
27	30	-	-	3	-	-	-	-	-	
28	159	6	2	-	-	-	-	2	-	Dead muskrat in trap box
29	59	1	5	-	-	2	-	-	-	
30	153	1	-	1	1	1	-	-	-	1 rainbow parr trap mortality
May 1	297	-	6	2	5	1	1	-	-	
2	68	1	-	1	-	-	-	-	-	
3	521	5	-	1	1	-	-	-	1 frog	1 male steelhead kelt
4	325	-	-	1	-	-	-	-	-	1 male steelhead kelt
5	304	4	-	3	1	-	-	-	-	
6	203	1	2	-	1	-	-	-	-	18 coho killed by predator
7	267	6	2	-	-	-	-	-	-	
8	1,269	91	4	-	-	1	1	-	-	
9	1,582	146	10	-	1	-	-	-	-	
10	219	15	5	-	1	-	-	-	-	
11	20	-	-	-	-	-	-	-	-	
12	531	41	-	-	-	-	-	-	-	
13	342	172	10	-	2	-	-	-	-	Raining, high water
14	-	-	-	-	-	-	-	-	-	Trap washed out; approximately
15	-	-	-	-	-	-	-	-	-	300 coho trap mortalities.
16	-	-	-	-	-	-	-	-	-	
17	62	44	7	2	-	2	-	-	-	Trap replaced, fishing well.
18	255	84	5	-	1	1	-	-	-	
19	286	89	5	-	1	-	-	-	-	
20	533	178	10	-	-	-	-	-	-	
21	328	86	6	3	2	1	-	-	1 dace	
22	66	40	5	-	1	-	-	-	-	1 coho smolt fence mortality
23	188	18	4	-	-	-	-	-	-	
24	105	23	3	-	-	-	-	-	-	
25	96	26	3	-	1	-	-	-	1 dace	
26	292	58	56	7	-	11	4	1	-	
27	53	19	1	-	-	-	-	-	-	
28	198	105	6	1	-	-	-	-	-	
29	96	25	2	-	2	-	-	-	-	
30	51	32	4	-	1	-	-	-	-	
31	42	54	3	1	2	-	-	-	-	
June 1	21	33	5	2	2	3	-	1	-	
2	44	28	4	-	-	-	-	-	-	
3	48	19	7	-	-	-	-	-	-	
4	35	23	6	2	2	-	2	-	-	
5	1	2	1	-	4	-	-	-	-	
6	22	8	4	2	4	1	1	-	-	
7	10	5	2	1	-	-	-	-	-	
8	17	5	7	2	3	-	1	-	-	
9	5	8	-	-	5	-	-	-	-	Fence removed
TOTALS	9,381	1,515	213	47	44	27	11	4	1 frog 2 dace	

Appendix 1(b). 1979 Coghlan Creek daily fence trap catches.

Date	Coho Smolts	Rainbow Smolts	Rainbow Presmolts	Cutthroat Smolts	Cutthroat Presmolts	Cray-Fish	Pacific Lamprey	Other Lamprey	Stickle-back	Sucker	Remarks
April 27	328	45	-	10	-	27	-	5	-	4	
28	-	-	-	-	-	-	-	-	-	-	Trap installed; not fishing overnight.
29	491	13	2	17	-	4	-	1	-	-	
30	303	11	1	16	-	6	-	-	-	1	
May 1	676	7	-	11	-	5	-	-	-	-	
2	468	9	2	13	1	-	-	1	2	-	
3	240	4	2	7	-	2	-	-	-	-	
4	222	16	1	23	-	1	1	4	-	-	
5	756	24	1	34	1	5	1	3	-	-	1 coho smolt fence mortality.
6	374	17	-	25	-	1	-	-	1	-	1 male steelhead kelt.
7	166	1	-	8	1	-	-	-	-	-	
8	364	12	-	9	-	-	-	1	-	-	1 coho smolt fence mortality.
9	531	5	-	17	-	-	1	-	-	-	
10	376	10	-	3	1	-	-	-	-	-	
11	290	8	-	13	1	-	-	2	-	-	
12	631	17	-	15	2	1	-	-	1	-	Fish and Wildlife box installed.
13	523	15	1	10	2	-	-	-	-	-	
14	761	9	2	8	1	-	-	2	1	-	1 steelhead jack; 1 coho trap mortality.
15	497	13	1	15	-	-	-	2	-	-	
16	508	2	1	4	1	-	-	-	-	1	
17	560	8	1	13	-	2	-	1	1	-	
18	349	2	1	8	2	4	-	-	-	-	1 coho trap mortality.
19	484	2	-	2	-	1	2	-	-	-	
20	542	15	-	9	-	1	1	-	-	-	
21	691	15	-	6	-	-	-	1	-	-	
22	855	10	1	9	-	-	-	-	-	-	235 coho for HPD pump test.
23	609	15	1	32	-	-	-	1	-	-	Tagging completed.
24	383	8	-	9	1	-	-	-	-	-	
25	195	4	-	11	-	-	2	-	-	-	Algal bloom evident.
26	245	4	-	6	-	-	-	1	-	-	
27	164	4	-	3	-	-	-	1	-	-	3 coho trap mortalities.
28	107	5	-	2	-	-	1	1	-	-	1 cutthroat trap mortality.
29	219	1	-	1	-	-	-	-	-	-	
30	106	3	-	-	-	-	-	-	-	-	
31	133	1	-	2	1	-	2	-	-	-	
June 1	59	5	-	6	-	-	1	1	-	-	3 coho trap mortalities.
2	81	1	-	9	-	2	-	-	-	-	
3	54	-	-	-	2	1	1	-	2	-	
4	75	4	-	32	-	-	-	1	-	-	1 coho box mortality.
5	85	42	-	87	-	1	1	4	-	-	
6	97	4	1	20	1	1	-	-	-	-	
7	40	-	-	7	-	1	-	2	-	-	
9	32	2	-	3	-	2	1	3	-	-	
10	12	-	-	6	-	-	-	-	-	-	
11	9	2	-	3	-	1	-	2	-	-	
13	18	-	-	3	1	-	-	3	-	-	Trap removed
TOTALS	14,709	395	19	547	19	69	15	43	8	6	

Appendix 1(c). 1979 Salmon River daily fence trap catches.

Date	Coho Smolts	Rainbow Smolts	Rainbow Presmolts	Cutthroat Smolts	Cutthroat Presmolts	Cray-Fish	Pacific Lamprey	Other Lamprey	Stickle-back	Sucker	Remarks
April 27	150	-	-	-	-	1	-	-	-	-	2 steelhead jacks, 1 small male.
28	-	-	-	-	-	-	-	-	-	-	Trap not fishing due to low head.
29	900	17	1	15	1	15	9	10	2	-	1 steelhead female
30	581	28	1	23	-	10	1	13	1	1	61 coho fence mortalities.
May 1	568	5	1	5	-	9	1	10	-	-	
2	-	-	-	-	-	-	-	-	-	-	Trap not fishing due to low head.
3	1,097	22	1	19	1	11	-	2	-	-	
4	2,440	80	-	65	-	3	-	-	-	-	
5	144	5	-	4	-	13	1	7	1	-	1 coho trap mortality; 1 sculpin.
6	248	4	-	3	-	11	-	-	-	-	
7	1,860	37	-	14	1	-	-	-	-	-	1 sculpin.
8	1,876	186	-	54	4	1	1	8	1	-	
9	400	29	-	23	-	5	-	2	-	-	1 coho trap mortality.
10	63	13	2	4	-	3	-	2	-	-	
11	66	1	-	3	1	2	-	-	-	-	
12	788	28	-	19	-	3	1	2	1	-	Fish and Wildlife box installed.
13	848	30	-	28	-	1	-	2	-	-	Fence vandalized.
14	877	53	-	52	-	-	-	2	-	-	1 coho trap mortality.
15	1,155	35	2	44	-	2	1	1	1	-	
16	1,114	34	-	6	-	4	-	6	-	-	
17	1,192	21	6	39	-	4	1	5	-	-	
18	607	19	3	23	-	1	1	-	-	-	4 coho trap mortalities.
19	1,093	23	1	14	5	1	1	3	-	-	
20	1,103	27	1	18	-	1	1	1	-	-	
21	670	12	-	7	-	-	-	2	-	-	
22	1,090	9	1	18	-	2	6	1	-	-	
23	1,301	19	2	24	-	-	-	-	-	-	Tagging completed.
24	1,140	24	1	32	-	2	-	-	-	-	
25	583	25	1	29	1	3	-	5	-	-	1 coho trap mortality.
26	327	7	-	8	-	-	-	2	-	-	1 coho trap mortality.
27	455	2	-	3	-	-	-	1	-	-	1 coho trap mortality.
28	120	1	-	-	-	-	-	5	-	-	
29	1,039	5	-	4	1	-	-	-	-	-	2 coho trap mortalities.
30	486	10	-	19	-	1	-	1	-	-	
31	196	3	-	7	-	1	-	-	-	-	
June 1	230	6	-	13	-	1	-	-	-	-	
2	173	4	-	9	-	2	1	3	-	-	
3	70	3	-	6	1	2	-	3	-	-	
4	48	-	-	3	-	1	-	-	-	-	
5	260	8	-	8	-	10	2	1	-	-	Heavy rains overnight.
6	78	5	-	8	-	1	-	-	-	-	
7	49	2	-	7	-	1	-	1	-	-	
9	51	-	-	3	-	-	1	3	-	-	
10	9	-	-	-	-	6	-	-	1	-	
11	5	-	-	3	-	2	-	1	-	-	
13	13	-	-	1	-	10	-	4	-	-	
14	3	-	-	-	-	1	-	2	-	1	Trap Removed.
TOTALS	27,566	842	24	687	16	147	29	111	8	2	

Appendix 1(d). 1980 Coghlan Creek daily fence trap catches.

Date	Coho Smolts	Rainbow Smolts	Rainbow Presmolts	Cutthroat Smolts	Cutthroat Presmolts	Cray-fish	Pacific Lamprey	Other Lamprey	Stickle-back	Sucker	Remarks
April 17	-	1	-	-	-	-	-	-	-	-	Trap installed.
18	11	8	-	13	-	-	-	-	-	-	
19	24	6	1	17	2	-	-	-	-	-	
20	42	5	-	2	-	-	-	-	-	-	Trap flooded for several hours.
21	37	5	1	17	-	-	1	-	1	-	1 dace.
22	42	-	1	4	-	1	1	-	-	-	
23	51	7	-	13	1	-	-	1	-	-	1 coho trap mortality.
24	144	10	-	29	4	-	1	-	1	-	
25	97	3	-	16	5	-	-	1	-	-	
26	135	2	1	12	3	-	-	-	-	1	
27	179	14	1	44	5	1	-	-	2	-	1 trap mortality.
28	450	11	5	54	3	-	-	-	-	-	
29	351	7	-	64	4	-	-	-	-	-	1 fence mortality.
30	340	9	1	49	3	-	-	-	1	-	
May 1	241	3	-	26	2	-	-	1	-	-	
2	131	1	-	30	1	-	2	1	-	-	First fry emergence noted.
3	269	-	1	6	-	-	-	-	-	-	1 long nose dace; 1 sculpin.
4	661	7	2	53	2	-	-	3	-	1	
5	757	7	2	53	3	-	-	-	-	-	1 prickly sculpin.
6	848	4	-	62	3	1	-	-	1	-	
7	819	17	-	36	4	-	-	-	-	-	
8	547	11	3	23	5	-	1	-	-	-	
9	382	8	-	51	2	-	-	1	-	-	
10	255	6	-	56	3	-	-	-	-	-	
11	582	22	-	90	9	-	2	-	-	-	
12	514	17	1	119	8	1	-	3	-	-	Holding box vandalized.
13	717	12	2	43	3	1	2	-	1	-	Holding box vandalized; all trout removed.
14	318	3	-	31	2	-	-	-	-	-	
15	78	6	-	23	-	-	-	-	-	-	
16	369	-	-	34	-	-	-	2	-	-	
17	147	6	1	22	2	1	-	-	-	-	
18	205	12	-	35	5	-	-	-	-	-	
19	198	16	5	35	3	-	-	-	-	-	
20	300	14	-	57	-	4	2	-	-	-	
21	301	2	3	103	3	3	-	2	-	-	
22	276	7	1	50	5	3	1	1	-	-	
23	194	9	1	59	1	4	-	1	-	-	
24	140	3	-	17	-	-	-	-	-	-	
25	181	2	-	16	3	1	-	1	-	-	
26	34	1	-	20	1	-	-	-	-	-	
27	118	-	-	33	-	-	1	1	-	-	
28	240	4	-	50	1	-	1	1	-	-	Trap efficiency test initiated.
29	26	-	1	36	1	1	-	-	-	-	
30	67	-	-	15	1	-	-	-	-	-	
31	55	1	-	22	1	2	-	1	-	-	
June 1	42	-	-	14	-	-	1	2	1	-	
2	30	-	-	13	-	-	2	2	-	-	
3	57	-	2	10	4	-	-	2	-	1	
4	34	2		26	-	4	-	-	1	-	
5	62	1	-	34	2	8	-	1	2	1	
6	21	-	-	8	3	2	-	2	2	-	
7	16	-	-	18	-	2	-	1	1	-	
8	24	-	-	19	3	2	-	1	1	-	
9	42	-	-	31	1	12	-	-	7	1	1 prickly sculpin.
10	4	-	-	9	1	2	1	-	1	-	
11	1	-	-	4	1	2	2	-	-	-	Trap removed.
TOTALS	12,206	292	36	1,826	119	58	21	32	23	5	

Appendix 1(e). 1980 Salmon River daily fence trap catches.

Date	Coho Smolts	Rainbow Smolts	Rainbow Presmolts	Cutthroat Smolts	Cutthroat Presmolts	Cray-fish	Pacific Lamprey	Other Lamprey	Stickle-back	Sucker	Remarks
April 18	-	-	-	-	-	1	-	-	-	-	Trap not fishing property; 1 dace
19	14	2	1	2	-	5	3	-	-	-	
20	62	62	1	24	2	6	-	1	1	-	1 coho trap mortality.
21	78	21	-	19	-	4	1	-	5	-	Trap flooded for several hours.
22	46	2	1	2	-	5	-	-	-	-	
23	61	9	-	3	1	5	1	-	3	-	
24	98	43	1	9	-	1	3	-	1	1	
25	167	55	1	38	-	3	1	2	2	-	
26	254	30	-	14	-	2	-	2	-	-	1 coho trap mortality.
27	449	69	-	29	-	4	-	1	-	-	
28	967	47	3	38	1	-	-	1	-	-	1 adult steelhead.
29	451	19	-	7	-	4	-	2	-	-	1 coho trap mortality.
30	730	71	6	84	2	2	-	2	1	-	4 coho trap mortalities.
May 1	753	49	-	34	2	-	-	1	2	1	2 coho trap mortalities.
2	649	31	-	20	-	4	1	2	-	2	
3	862	46	2	40	2	3	1	3	-	1	
4	839	27	1	48	3	5	-	1	1	-	2 coho trap mortalities
5	1,037	95	-	163	1	5	1	1	-	-	
6	1,406	110	1	160	4	2	1	1	-	-	
7	1,274	109	4	111	7	5	1	-	-	-	
8	1,491	56	2	80	2	2	-	2	-	1	
9	885	39	1	78	-	4	-	-	2	-	1 coho trap mortality.
10	461	24	-	75	5	1	3	-	-	-	
11	207	10	-	12	3	6	-	-	1	-	
12	1,299	28	1	105	4	6	-	1	-	2	2 coho trap mortalities.
13	1,234	28	1	85	6	4	2	1	1	-	2 coho trap mortalities.
14	655	27	4	66	6	5	2	2	-	1	1 coho trap mortality.
15	393	15	3	49	2	6	-	2	1	-	
16	419	7	2	33	1	2	2	-	-	-	
17	210	17	3	11	2	2	-	-	-	-	
18	362	20	7	44	-	7	-	-	-	-	
19	348	19	5	37	9	9	-	-	-	-	
20	522	48	3	162	4	10	-	-	-	-	
21	502	32	17	140	18	14	-	-	3	-	4 coho fence mortalities; 1 sculpin
22	383	36	5	126	21	7	1	-	1	-	
23	242	1	-	32	-	1	-	1	-	-	
24	87	5	-	22	2	9	1	-	-	-	
25	174	1	-	17	1	2	-	-	1	-	
26	191	-	-	5	3	3	-	6	-	-	2 coho trap mortalities.
27	158	1	-	7	-	1	-	1	1	-	
28	371	3	-	17	2	4	-	-	-	-	Trap efficiency test initiated.
29	72	28	-	2	-	6	-	-	1	-	
30	133	-	-	8	1	9	1	-	-	-	
31	43	1	-	4	-	3	-	-	-	-	
June 1	58	2	-	1	-	-	-	1	1	-	
2	55	-	-	2	1	3	-	-	-	-	4 coho trap mortalities.
3	126	2	2	27	3	6	-	1	-	-	10 coho trap mortalities (predator).
4	51	-	-	34	2	8	-	2	-	-	1 Cutthroat Kelt.
5	81	11	1	73	7	19	-	2	1	1	
6	12	-	-	1	3	14	-	1	2	-	Some box predation.
7	17	-	-	1	-	6	-	-	-	-	
8	25	1	-	26	6	8	-	-	1	1	1 Steelhead Kelt.
9	21	1	1	11	4	46	-	1	-	1	
10	17	-	-	6	5	17	-	-	2	-	Trap removed.
TOTALS	21,502	1,360	80	2,244	148	316	26	44	35	12	

Appendix 1(f). 1980 assessment of diurnal migrations in Coghlan Creek and Salmon River. NOTE: 'NIGHT' denotes the period of approximately 1600 h (previous day) - 0900 h; 'DAY' denotes the period of approximately 0900 - 1600 h.

Date	Maximum Recorded water temperature* (°C)	Coho Smolts		Steelhead Smolts		Cutthroat Smolts		Lampreys		Crayfish		Stickleback	
		night	day	night	day	night	day	night	day	night	day	night	day
Coghlan Creek													
April 30	11.50	181	159	8	1	41	8	0	0	0	0	1	0
May 1	13.00	156	85	3	0	23	3	2	1	0	0	0	0
May 7	12.50	221	598	6	11	30	6	0	0	0	0	0	0
May 8	10.25	214	333	7	4	19	4	1	0	0	0	0	0
May 9	11.00	230	152	8	0	45	6	1	0	0	0	0	0
May 14	10.50	76	242	3	0	27	5	0	0	0	0	0	0
May 15	9.75	78	0	6	0	23	0	0	0	0	0	0	0
May 16	10.25	187	182	0	0	29	5	2	0	0	0	0	0
May 21	11.00	201	100	2	0	100	3	2	0	3	0	0	0
May 22	11.00	176	100	7	0	47	3	2	0	3	0	0	0
TOTAL		1,720	1,951	50	16	384	43	10	1	6	0	1	0
Salmon River													
April 30	12.25	187	543	19	52	26	58	2	0	2	0	0	0
May 1	14.00	351	402	29	20	21	13	1	0	0	0	2	0
May 7	13.00	990	884	101	8	105	6	4	1	0	0	0	0
May 8	11.00	663	828	35	21	60	20	2	0	2	0	0	0
May 9	11.50	494	391	25	14	57	21	0	0	4	0	2	0
May 13	11.50	637	597	23	5	73	12	3	0	4	0	1	0
May 14	11.00	397	258	16	11	53	13	4	0	5	0	0	0
May 15	10.00	325	68	14	1	49	0	2	0	6	0	1	0
May 21	11.75	228	274	27	5	132	18	0	0	13	1	3	0
May 22	11.00	341	42	36	0	124	2	1	0	7	0	1	0
TOTAL		4,613	4,287	325	137	700	163	19	1	43	1	10	0

*Spot temperatures.

APPENDIX 2. DAILY MINNOW TRAPPING CATCHES

Appendix 2(a). Salmon River minnow trap catch results 1978.

Date	Number of Traps	Coho Smolts	Coho Fry	Trout		Crayfish	Stickleback	Other	Remarks
				parr	smolt				
April 25	14	15	-	-	2	9	10	-	traps 300m downstream of
26	32	74	-	5	1	3	4	-	Coghlan confluence.
27	32	504	-	48	15	4	8	1 dolly varden	
28	32	371	-	66	3	10	19	-	additional traps set Coghlan
30	32	306	-	57	-	7	38	-	confluence to 64th crossing
May 4	32	108	-	42	-	-	-	-	
5	32	44	-	4	-	-	-	-	
6	32	8	-	1	-	-	1	-	
7	32	65	-	9	-	30	108	-	
10	32	880	-	32	-	1	-	1 sculpin	
17	32	12	-	3	-	-	-	-	1 rainbow dead
19	7	65	6	22	-	5	3	1 dace	
21	7	37	8	8	-	19	1	-	
22	9	31	-	2	4	-	-	1 dace	
24	9	34	36	12	-	8	2	-	
25	29	301	215	104	1	-	3	-	52 tagged coho caught below
29	36	199	223	66	-	-	-	1 sucker	Coghlan confluence
30	36	204	264	53	36	22	1	-	
31	34	90	-	154	2	2	3	1 sculpin;2 suckers	
June 1	33	167	306	110	8	19	7	-	2 traps vandalized; 20 tagged
2	31	139	279	143	-	21	6	-	coho below confluence
5	26	64	195	50	-	16	2	-	
6	34	107	490	97	-	14	6	-	
7	34	35	380	52	-	5	2	-	
8	34	14	280	16	-	24	-	-	
9	34	28	420	36	-	15	-	-	all minnow traps removed
Total		3,902	3,102	1,192	72	234	224		

Appendix 2(b). 1980 lower river minnow trapping results.

Date	Number of traps	Coho Smolts		Coho fry	Rainbow Smolts	Cutthroat Smolts	Sculpins	Sticklebacks	Peamouth Chub	Redsided Shiners	Crayfish
		tagged	untagged								
April 25	18	0	14	-	-	-	9	1	4	1	-
29	18	3	48	-	-	-	15	3	9	6	-
May 2	20	3	40	-	-	-	12	4	8	2	-
7	20	14	48	-	4	-	45	26	31	11	1
8	20	88	92	-	-	-	19	1	21	-	1
13	20	36	40	-	-	-	48	3	29	-	3
15	20	74	67	-	1	-	25	-	7	1	-
16	20	111	83	4	1	-	34	7	26	-	1
22	20	64	43	-	-	-	52	3	11	-	4
June 2	19	-	-	3	-	-	85	12	3	-	-
10	20	-	-	-	-	-	59	-	21	2	-
TOTAL	-	393	475	7	6	0	403	60	170	23	10

APPENDIX 3. DAILY TAGGING DATA

Appendix 3(a). 1978 Coghlan Creek coho smolt tagging results. (code 2/16/52)

Tagging Date		Holding Time (days)	Pre-Tag[1] Mortality	Released[2] without tagging	Undersize[3]	Total[4] Number Marked	% Reject Rate N	24hr	48hr	Total Marked and without tag Ad Only[5]	Tag Lost[6]	Post Tag Mortality Immed.	Est. 48hr[7]	Total Tagged[8] and Released
May	2	10	11	-	-	112	-	-	-	-	-	2	-	110
	3	11	8	12	306	2,469	127	0	0	9	-	2	-	2,458
	8	5	1	17	12	991	85	1.2	1.2	2	12	6	-	971
	9	1	5	9	5	1,253	100	0	0	3	-	1	-	1,249
	10	1	3	2	17	2,923	167	2.4	2.4	9	70	2	18	2,824
	12	2	1	26	12	1,378	119	2.5	2.5	1	35	-	-	1,342
	18	6	5	13	10	938	129	0	0	1	-	-	-	937
	23	5	3	-	33	1,530	119	0.8	0.8	-	13	-	-	1,517
	26	3	19	2	79	719	126	0	0	-	-	-	-	719
	31	5	9	-	192	837	133	0	1.5	-	13	1	-	823
June	7	7	-	-	220	457	122	0.8	0.8	-	4	-	-	453
	9	2	-	-	-	70	-	-	-	-	-	-	-	70
TOTALS			65	81	886	13,677	1,227	0.8	1.0	25	147	14	18	13,473

1. Sacrificed for tag placement check.
2. Diseased or damaged. See Appendix 4.
3. Nonsmolted coho less than 65mm in length.
4. Includes post tag mortalities, adipose clip only, and tag losses determined by QCD.
5. Fish clipped but untagged due to machine sorting error.
6. Based on 48hr QCD result.
7. 48hr QCD mortality expanded to include entire daily release.
8. Total release alive and with a tag.

Appendix 3(b). 1979 Coghlan Creek coho smolt tagging results. (code 2/16/59)

Tagging Date		Holding Time (days)	Pre-Tag[1] Mortality	Released[2] without tagging	Undersize[3]	Total[4] Number Marked	% Reject Rate N	24hr	48hr	Total Marked and without tag Ad Only[5]	Tag Lost[6]	Post Tag Mortality Immed.	Est. 48hr[7]	Total Tagged[8] and Released
May	3	1-7	3	2	9	2,341	85	0	1.2	-	28	1	-	2,312
	7	1-4	3	0	3	1,760	79	0	0	-	-	2	-	1,758
	9	1-2	1	0	0	1,007	102	0	0	-	-	-	-	1,007
	11	1-2	1	1	0	663	91	0	0	-	-	-	-	663
	14	1-3	1	3	2	1,964	188	0.5	0.5	-	10	2	-	1,952
	15	1	1	0	0	497	144	0.7	0.7	-	3	-	-	494
	16	1	0	1	0	507	116	0.9	0.9	-	5	-	-	502
	17	1	1	2	3	554	127	3.1	3.1	-	17	-	-	537
	18	1	3	1	1	345	168	0	0	-	-	-	-	345
	23	1-4	2	2	2	2,168	129	0	0	-	-	-	-	2,168
TOTALS			16	12	20	11,806	1,229	0.6	0.7	-	63	5	-	11,738

* See Appendix 3(a) for footnote notations.

Appendix 3(c). 1979 Salmon River coho smolt tagging results. (code 2/16/59).

Tagging Date	Holding Time (days)	Pre-Tag[1] Mortality	Released[2] without tagging	Undersize[3]	Total[4] Number Marked	% Reject Rate N	24hr	48hr	Total Marked and without tag Ad Only[5]	Tag Lost[6]	Post Tag Mortality Immed.	Est. 48hr[7]	Total Tagged[8] and Released
May 1	3-4	-	-	-	5	-	-	-	-	-	-	-	5
2	4-5	1	-	-	2,124	145	0.7	0.7	-	15	-	-	2,109
4	1	1	-	16	3,498	118	1.7	1.7	-	60	-	-	3,438
8	1-3	2	-	5	4,077	199	1.0	1.0	-	41	-	-	4,036
9	1	1	-	-	396	129	0	0	-	-	2	-	394
14	1-5	2	2	5	2,751	167	0	0.6	-	17	1	-	2,733
15	1	3	-	1	1,204	103	0	0	-	-	-	-	1,204
16	1	2	-	-	1,127	131	0.8	0.8	-	9	-	-	1,118
17	1	1	3	1	1,187	124	1.6	1.6	-	19	-	-	1,168
18	1	1	1	-	605	107	1.9	2.8	-	17	-	-	588
22	1-4	4	2	2	3,435	166	0	0	-	-	1	-	3,434
TOTALS		18	8	30	20,409	1,389	0.7	0.9	-	178	4	0	20,227

* See Appendix 3(a) for footnote notations.

Appendix 3(d). 1980 Coghlan Creek coho smolt tagging results. (code 2/18/23).

Tagging Date	Holding Time (days)	Pre-Tag[1] Mortality	Released[2] without tagging	Undersize[3]	Total[4] Number Marked	% Reject Rate N	24hr	48hr	Total Marked and without tag Ad Only[5]	Tag Lost[6]	Post Tag Mortality Immed.	Est. 48hr[7]	Total Tagged[8] and Released
April 23	0-4	2	2	-	205	205	-	0.48	-	1	-	-	204
28	0-4	3	12	-	977	202	-	0.99	2	10	-	-	965
May 1	0-2	1	10	-	851	173	1.73	2.31	3	20	-	-	828
5	0-3	-	3	-	1,932	345	-	2.32	1	45	-	-	1,886
7	0-1	1	2	-	1,281	304	0.33	0.33	-	4	-	-	1,277
9	0-1	2	7	-	1,316	246	-	4.07	1	53	2	-	1,260
12	0-2	-	5	-	1,284	276	-	0.36	-	5	-	-	1,279
14	0-1	2	7	-	926	285	-	0.70	1	6	-	-	919
16	0-1	-	4	-	561	199	0	0	-	-	-	-	561
20	0-3	-	3	-	882	204	-	1.47	2	13	-	-	867
22	0-1	-	-	-	574	187	0	0	1	-	-	-	573
23	0.5	1	3	-	217	102	0	0	3	-	-	-	214
TOTALS		12	58		11,006	2,728	-	1.00	14	157	2	0	10,833

* See Appendix 3(a) for footnote notations.

Appendix 3(e). 1980 Salmon River coho smolt tagging results. (code 2/18/23).

Tagging Date	Holding Time (days)	Pre-Tag[1] Mortality	Released[2] without tagging	Undersize[3]	Total[4]. Number Marked	% Reject Rate N	24hr	48hr	Total Marked and without tag Ad Only[5].	Tag Lost[6].	Post Tag Mortality Immed.	Est. 48hr[7].	Total Tagged[8] and Released
April 23	0-4	1	1	-	239	136	-	1.47	-	4	-	-	235
28	0-4	1	10	-	1,561	138	-	1.45	7	23	2	-	1,529
30	0-2	5	3	-	1,279	304	-	1.32	2	17	-	-	1,260
May 1	0.5	4	1	-	930	231	-	2.16	-	20	-	4	906
5	0-3	4	5	-	2,462	252	-	1.59	3	39	-	-	2,420
6	0.5	2	-	-	2,042	323	1.86	2.17	-	44	-	-	1,998
7	0.5	1	-	-	1,561	248	1.61	1.61	4	25	-	-	1,532
9	0-1	2	1	-	1,932	519	-	0.19	1	4	-	4	1,923
12	0-2	3	1	-	2,040	401	-	1.25	-	26	1	-	2,013
13	0.5	2	6	-	1,560	329	0.61	0.61	1	10	-	-	1,549
14	0.5	1	2	-	655	177	1.13	1.13	-	7	-	-	648
16	0.1	2	1	-	807	246	-	0.41	-	3	-	3	801
20	0-3	5	2	-	1,262	351	-	0.85	-	11	-	-	1,251
22	0-1	2	4	-	1,087	310	0.65	0.65	-	7	1	4	1,075
23	0.5	2	1	-	260	102	-	-	-	-	1	-	259
TOTALS		37	38	-	19,677	4,067	-	1.12	18	240	5	15	19,399

* See Appendix 3(a) for footnote notations.

APPENDIX 4. SUMMARY OF ANOMALIES ENCOUNTERED DURING TAGGING

Appendix 4. Summary of anomalies encountered while tagging Coghlan Creek and Salmon River coho smolts, 1978 through 1980. Bracketed figures indicate severe anomalies which were released untagged; percentage is occurrance of anomaly in total tag lot.

Location	Year	Number Inspected	Neascus sp.	Exopthalmia	Fog Eye	Fin Rot	Lordosis	Scholiosis	General Damage	Operculum Damage Loss	Natural Adipose
Coghlan Creek	1978	13,700	75(41) 0.6%	31(20) 0.2%	98(8) 0.7%	26(8) 0.2%	*	*	18(5) 0.1%	-	5(0) 0.1%
	1979	11,834	30(0) 0.3%	35(1) 0.2%	23(0) 0.2%	19(0) 0.2%	16(0) 0.1%	1(0) 0.1%	23(8) 0.2%	4(0) 0.1%	-
	1980	11,076	592(0) 5.3%	30(21) 0.3%	90(0) 0.8%	35(0) 0.3%	19(4) 0.2%	-	62(21) 0.6%	17(2) 0.2%	2(0) 0.1%
Salmon River	1979	20,435	1,170(0) 5.7%	14(0) 0.1%	20(0) 0.1%	38(2) 0.2%	2(0) 0.1%	1(0) 0.1%	29(4) 0.1%	8(0) 0.1%	-
	1980	19,752	4,013(0) 20.3%	22(13) 0.1%	195(3) 1.0%	70(1) 0.4%	2(0) 0.1%	3(1) 0.1%	62(17) 0.3%	17(2) 0.1%	2(0) 0.1%

* Spinal deformities were not reported separately during 1978. A total of 51 (17) were noted, for an incidence at 0.37%.

APPENDIX 5. LENGTH-FREQUENCY DISTRIBUTIONS

Appendix 5(a). 1978 Coghlan Creek coho smolt length-frequency distribution by age and sample period.

Week Ending:	April 30			May 7			May 14			May 21			May 28			June 4			Total		
AGE:	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total
Fork Length (mm)																					
65-69	-	-	1	4	-	5	2	-	2	1	-	1	-	-	-	-	-	-	7	-	9
70-74	-	-	-	5	-	5	3	-	3	1	-	1	-	-	-	1	-	2	10	-	11
75-79	-	-	1	5	-	7	4	-	4	1	-	2	8	-	8	4	-	6	22	-	28
80-84	1	-	1	2	-	3	16	-	19	5	-	10	8	-	10	9	-	13	41	-	56
85-89	2	-	3	4	-	5	18	-	21	23	-	27	8	-	13	13	-	33	68	-	102
90-94	1	-	3	1	-	6	27	-	30	19	-	30	14	-	23	9	-	18	71	-	110
95-99	-	-	3	5	-	9	17	-	19	9	-	17	9	-	10	4	-	14	44	-	72
100-104	2	-	3	2	-	5	16	-	18	14	-	22	3	-	3	4	-	9	41	-	60
105-109	-	-	3	3	-	8	13	-	17	7	-	11	1	-	2	-	-	-	24	-	41
110-114	5	-	8	-	-	2	8	-	12	8	-	12	5	-	5	2	-	2	28	-	41
115-119	-	-	-	2	-	4	7	-	8	6	-	7	-	-	-	1	-	2	16	-	21
120-124	-	-	2	-	-	-	3	-	3	3	1	5	-	-	1	-	-	-	6	1	11
125-129	1	-	2	-	-	-	-	-	-	1	-	4	-	-	-	-	-	-	2	-	6
130-134	-	-	-	-	1	2	2	-	2	-	-	-	-	-	-	-	-	-	2	1	4
135-139	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2
140-144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
145-149	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
150-154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	13	-	31	34	1	63	136	-	158	98	1	149	56	-	75	47	-	99	384	2	575
%	100	-	-	97.1	2.9	-	100	-	-	99.0	1.0	-	100	-	-	100	-	-	99.5	0.5	-
x	105.0	-	102.9	88.9	130.0	94.3	95.6	-	95.9	97.6	124.0	98.0	90.9	-	91.3	89.5	-	90.1	90.0	127.0	95.1
S	15.0	-	16.1	18.4	-	18.5	12.3	-	12.3	11.9	-	12.0	9.7	-	9.5	9.4	-	8.4	17.5	4.2	12.8
Weight:																					
x (g)	-	-	-	-	-	-	-	-	11.7	-	-	10.8	-	-	8.1	-	-	7.5	-	-	10.9
N	-	-	-	-	-	-	-	-	152	-	-	46	-	-	20	-	-	20	-	-	238

Appendix 5(b). 1979 Coghlan Creek coho smolt length-frequency distribution by age and sample period.

Week Ending:	April 30			May 7			May 14			May 21			May 28			June 4			Total		
AGE:	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total
Fork Length (mm)																					
65-69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70-74	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	1	-	1	2	-	2
75-79	3	-	3	-	-	-	-	-	-	5	-	5	3	-	3	2	-	2	13	-	13
80-84	4	-	4	3	-	4	6	-	6	14	-	14	11	-	11	7	-	7	45	-	46
85-89	15	-	17	9	-	11	17	-	18	25	-	26	21	-	26	12	-	14	99	-	112
90-94	15	-	23	18	-	20	19	-	24	22	-	28	19	-	19	13	-	13	106	-	127
95-99	15	-	19	5	-	7	24	-	29	8	-	8	16	-	17	7	-	9	75	-	89
100-104	11	-	15	2	-	4	13	-	16	7	-	10	10	-	10	11	-	11	54	-	66
105-109	2	-	4	2	-	4	3	-	4	6	-	6	6	-	6	5	-	5	24	-	29
110-114	8	-	11	-	-	-	2	-	2	1	-	1	4	-	6	5	-	5	20	-	25
115-119	3	-	3	-	-	-	-	-	-	-	1	1	2	-	2	1	-	2	6	1	8
120-124	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	1	-	1	2	-	2
125-129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1
130-134	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
135-139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
140-144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
145-149	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
150-154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	77	-	100	39	-	50	85	-	100	89	1	100	92	-	100	66	-	71	448	1	521
%	100	-	-	100	-	-	100	-	-	98.9	1.1	-	100	-	-	100	-	-	99.8	8.2	-
x	96.2	-	96.6	91.7	-	92.6	93.7	-	94.5	91.0	117.0	91.6	93.7	-	93.9	95.7	-	95.8	93.7	117.0	94.2
S	10.7	-	10.0	6.1	-	6.5	7.2	-	6.9	8.4	-	9.6	9.0	-	9.2	11.0	-	10.9	9.2	-	9.2
Weight:																					
x (g)	-	-	-	-	-	9.2	-	-	8.6	-	-	7.5	-	-	9.0	-	-	-	-	-	8.6
N	-	-	-	-	-	28	-	-	29	-	-	30	-	-	30	-	-	-	-	-	117

Appendix 5(c). 1979 Salmon River coho smolt length-frequency distribution by age and sample period.

Week Ending:	May 7			May 14			May 21			May 28			June 4			June 11			Total		
AGE:	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total
Fork Length (mm)																					
65-69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70-74	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	1	-	1
75-79	-	-	-	2	-	2	4	-	5	4	-	5	8	-	8	7	-	7	25	-	27
80-84	3	-	5	6	-	7	12	-	14	12	-	13	19	-	19	9	-	10	61	-	68
85-89	5	-	6	5		5	18		21	17	-	17	19		19	14	-	15	78	-	88
90-94	9		15	9		12	15		21	22		26	16		16	12		12	83		102
95-99	15		20	9		9	14		20	22		25	21		22	6		6	86		112
100-104	6	-	10	3		6	6		9	6		9	11	1	11	6		6	38	1	57
105-109	7	-	14	2	-	3	3	-	6	3	-	6	2	-	2	3	-	6	20	-	37
110-114	3	-	7	3	-	6	-	-	3	-	-	-	-	-	1	3	-	3	9	-	20
115-119	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
120-124	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
125-129	1	-	1	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	2	-	2
130-134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
135-139	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
140-144	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
145-149	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
150-154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	49	-	100	36	-	50	73	-	100	87	-	100	96	1	100	58	-	44	399	1	514
%	100	-	-	100	-	-	100	-	-	100	-	-	99.0	1.0	-	-	-	-	99.75	0.25	-
x	97.9	-	98.5	93.9	-	96.4	91.6	-	92.5	91.0	-	91.7	90.6	102.0	91.2	90.6	-	90.9	92.1	102.0	93.4
s	8.8	-	8.2	11.2	-	12.6	8.2	-	8.5	7.1	-	7.2	8.1	-	8.4	9.4	-	9.3	8.9	-	9.2
Weight:																					
x (g)	-	-	-	-	-	8.3	-	-	9.0	-	-	8.4	-	-	7.4	-	-	-	-	-	8.3
N	-	-	-	-	-	28	-	-	30	-	-	30	-	-	31	-	-	-	-	-	119

Appendix 5(d). 1980 Coghlan Creek coho smolt length-frequency distribution by age and sample period.

Week Ending:	April 23			April 30			May 7			May 14			May 21			May 28			June 4			June 11			Total		
AGE:	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total
Fork Length (mm)																											
65-69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70-74	1	-	1	2	-	2	1	-	1	-	-	-	-	-	-	1	-	1	1	-	1	4	-	4	10	-	10
75-79	4	-	4	1	-	1	1	-	1	2	-	2	6	-	6	-	-	-	2	-	2	8	-	8	24	-	24
80-84	2	-	2	3	-	3	1	-	1	8	-	8	16	-	16	12	-	12	12	-	12	11	-	12	85	-	66
85-89	3	-	3	8	-	8	11	-	12	13	-	13	27	-	28	13	-	13	25	-	25	14	-	15	114	-	117
90-94	2	-	3	-	-	1	6	-	9	18	-	23	22	-	25	25	-	27	24	-	25	17	-	17	114	-	130
95-99	3	-	3	12	1	14	17	1	22	17	-	20	10	-	11	13	-	13	20	-	21	15	-	16	107	2	120
100-104	-	-	-	6	1	9	12	-	14	18	-	18	8	1	9	6	-	6	4	-	6	6	-	6	60	2	68
105-109	4	-	5	9	2	13	19	1	22	6	-	8	2	-	4	7	-	8	3	-	3	7	-	7	57	4	70
110-114	4	-	4	13	1	15	7	1	9	4	1	6	-	-	-	4	-	6	4	-	4	3	1	5	41	4	49
115-119	4	-	5	13	-	13	5	-	5	1	-	1	-	1	1	5	1	7	-	-	-	-	-	-	28	2	32
120-124	8	1	10	5	1	9	1	-	3	1	-	1	-	-	-	2	-	2	1	-	1	1	-	2	19	2	28
125-129	1	-	3	5	1	6	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-	-	8	1	11
130-134	4	1	5	-	1	1	1	-	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	5	3	8
135-139	1	-	1	-	2	2	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-	-	3	2	5
140-144	1	-	1	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	3
145-149	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
150-154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	43	2	50	77	14	100	82	3	100	86	1	100	91	2	100	94	2	100	96	-	100	86	1	92	656	25	742
%	95.5	4.5	-	84.6	15.4	-	96.5	3.5	-	98.9	1.1	-	97.9	2.1	-	97.9	2.1	-	100	-	-	98.9	1.1	-	96.3	3.7	-
x	108.2	127.0	109.9	105.6	122.4	107.8	100.9	186.0	101.2	95.5	113.0	95.8	89.7	110.0	90.7	97.2	123.5	97.9	92.1	-	92.1	91.5	113	92.2	96.6	119.1	97.8
s	18.9	8.5	18.1	13.9	16.6	14.8	10.5	6.2	10.4	8.8	-	8.7	7.0	8.5	7.7	13.0	9.2	13.4	8.9	-	8.4	10.4	-	11.8	12.6	14.4	13.1
Weight:																											
x (g)	-	-	14.8	-	-	11.7	-	-	10.8	-	-	9.1	-	-	7.6	-	-	9.5	-	-	7.7	-	-	8.4	-	-	9.2
N	-	-	22	-	-	60	-	-	60	-	-	76	-	-	94	-	-	86	-	-	100	-	-	92	-	-	598

Appendix 5(e). 1980 Salmon River coho smolt length-frequency distribution by age and sample period.

Week Ending:	April 23			April 30			May 7			May 14			May 21			May 28			June 4			June 11			Total		
AGE:	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total	1+	2+	Total
Fork Length (mm)																											
65-69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1
70-74	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	3	-	3
75-79	-	-	-	-	-	-	3	-	3	2	-	3	6	-	6	2	-	2	7	-	7	11	-	11	29	-	30
80-84	3	-	3	7	-	7	3	-	4	9	-	10	13	-	13	9	-	9	11	-	11	19	-	21	74	-	78
85-89	3	1	4	3	-	7	7	-	10	14	-	17	19	-	19	22	-	25	37	-	38	21	-	21	126	1	141
90-94	3	-	3	14	-	14	12	-	16	23	-	24	30	-	30	25	-	27	21	-	21	13	-	13	141	-	148
95-99	1	1	3	13	-	16	13	1	15	19	-	22	22	-	22	14	-	14	14	-	14	4	-	5	100	2	111
100-104	3	1	5	11	1	13	12	-	14	11	-	13	8	-	8	3	1	5	4	-	4	3	-	3	55	3	65
105-109	2	2	5	5	2	8	9	-	13	7	-	8	2	-	3	3	-	4	-	-	-	3	-	3	31	4	44
110-114	4	-	6	6	1	8	5	-	6	1	-	2	1	-	1	6	-	6	2	-	2	-	-	1	25	1	32
115-119	1	3	5	5	-	6	4	-	6	1	-	1	-	-	-	1	-	1	-	-	-	-	-	-	12	3	19
120-124	1	-	1	5	1	6	6	-	7	-	-	-	-	-	-	4	-	4	-	-	-	1	-	1	17	1	19
125-129	2	-	2	7	-	7	1	-	1	-	-	-	-	-	-	2	-	2	1	-	1	3	-	3	16	-	16
130-134	3	1	6	3	-	3	3	-	3	-	-	-	-	-	-	1	-	1	-	-	-	3	-	3	13	1	18
135-139	2	1	4	2	1	4	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	9
140-144	1	-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	1	2	3
145-149	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
150-154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	1	1
N	30	11	50	81	7	100	78	3	100	87	-	100	99	-	100	92	1	100	97	2	100	84	-	88	648	24	738
%	73.2	16.8	-	92.1	7.9	-	96.3	3.7	-	100	-	-	100	-	-	98.9	1.1	-	98.0	2.0	-	100	-	-	96.4	3.6	-
x	107.8	115.5	110.8	104.6	118.3	105.1	101.9	131.3	102.5	93.6	-	93.9	91.5	-	91.6	95.3	103.0	95.3	90.8	146.5	91.0	89.7	-	89.9	95.5	120.3	96.7
s	19.1	17.7	18.4	14.8	16.3	15.3	13.3	34.6	14.5	8.1	-	8.3	6.8	-	7.0	12.8	-	11.7	8.0	7.8	11.2	13.8	-	13.8	13.0	20.3	14.1
Weight:																											
x (g)	-	-	14.1	-	-	12.9	-	-	12.0	-	-	8.4	-	-	7.7	-	-	9.0	-	-	7.8	-	-	9.2	-	-	9.6
N	-	-	21	-	-	58	-	-	64	-	-	85	-	-	90	-	-	86	-	-	100	-	-	48	-	-	544

APPENDIX 6. TRAP EFFICIENCY RESULTS

Appendix 6(a). 1980 trap efficiency tests for coho smolts.

Date	COGHLAN CREEK # Marks Released	COGHLAN CREEK # Marks Recovered	COGHLAN CREEK Percent Recovery	SALMON RIVER # Marks Released	SALMON RIVER # Marks Recovered	SALMON RIVER Percent Recovery
May 28	50	7	14	50	1	2
May 29	-	3	6	-	19	38
May 30	-	22	44	-	16	32
May 31	-	7	14	-	3	6
June 1	-	4	8	-	1	2
June 2	-	-	-	-	2	4
June 3	-	1	2	-	2	4
June 4	-	-	-	-	2	4
June 5	-	1	2	-	1	2
TOTAL	50	45	90%	50	47	94%

Appendix 6(b). Length-frequency distribution and chi-squared analysis of marked releases compared to marked recoveries during the 1980 coho smolt trap efficiency test.

Length (mm)	COGHLAN CREEK # Released	COGHLAN CREEK Observed	COGHLAN CREEK Expected Recovery	SALMON RIVER #Released Recovery	SALMON RIVER Observed Recovery	SALMON RIVER Expected Recovery
76-80	1	0	0.9	3	2	2.8
81-85	9	6	8.1	12	11	11.3
86-90	15	15	13.5	11	11	10.3
91-95	10	10	9.0	12	12	11.3
96-100	6	6	5.4	4	4	3.8
101-105	2	2	1.8	5	4	4.7
106-110	3	2	2.7	0	0	0
111-115	2	2	1.8	0	0	0
116-120	1	1	0.9	1	2	0.9
121-125	0	0	0	1	1	0.9
126-130	1	1	0.9	1	1	0.9
TOTAL	50	45	$\chi^2=2.04$ ($p<0.01$)	50	47	$\chi^2=0.46$ ($p<0.005$)

APPENDIX 7. DAILY WATER TEMPERATURE AND STREAM FLOWS

Appendix 7(a). 1978 and 1979 water temperatures and staff gauge readings in Coghlan Creek and Salmon River.

Date		Coghlan Creek						Salmon River		
		1978			1979			1979		
		Time	Temperature	Level	Time	Temperature	Level	Time	Temperature	Level
April	23	0800	9.5°C	-	-	-	-	-	-	-
	24	1200	9.5	-	-	-	-	-	-	-
	25	0830	10.0	-	-	-	-	-	-	-
	26	1630	12.0	-	-	-	-	-	-	-
	27	0900	10.0	-	-	-	-	-	-	-
	28	1200	10.0	1.50 ft.	-	-	-	-	-	-
	29	1000	10.0	1.50	-	-	-	-	-	-
	30	1330	10.0	1.40	0915	9.5°C	1.25 ft.	-	-	-
May	1	1600	10.5	1.40	-	-	-	1800	11.0°C	-
	2	1630	10.5	1.40	1730	9.3	1.40	1745	11.5	-
	3	0930	9.0	1.40	1400	9.0	1.25	1530	9.8	1.50 ft.
	4	1600	8.5	1.45	1700	11.0	1.29	1245	10.3	1.52
	5	0930	8.0	1.40	1530	10.5	1.39	1320	10.8	1.59
	6	1400	11.0	-	1415	11.0	1.31	1300	11.5	1.60
	7	1300	12.0	1.35	1415	9.5	1.28	1600	12.0	1.55
	8	1000	10.0	-	1700	10.0	1.27	0930	11.0	1.53
	9	1100	10.0	1.38	1315	11.8	1.24	1520	12.5	1.50
	10	0830	8.5	1.35	1330	9.5	1.24	1055	9.5	1.50
	11	1300	12.0	1.35	1000	9.8	1.24	1130	9.8	1.48
	12	1000	10.0	1.40	1300	9.8	1.23	1450	10.3	1.47
	13	1130	9.0	1.68	1300	11.5	1.24	1430	12.5	1.47
	14	1200	10.0	2.00	1545	12.3	1.23	1230	12.5	1.47
	15	0830	-	2.00	1400	11.8	1.24	1245	12.0	1.46
	16	1720	11.0	1.60	1430	12.0	1.24	1245	13.5	1.56
	17	1000	12.0	1.60	1330	11.0	1.24	1300	11.5	1.45
	18	0900	9.5	1.50	1330	12.3	1.23	1015	10.8	1.45
	19	1200	12.0	1.50	1330	11.5	1.21	1200	11.0	1.42
	20	1400	13.0	1.40	0800	9.0	1.22	1445	10.5	1.42
	21	1230	11.5	1.41	-	-	-	-	-	-
	22	0700	9.0	1.40	0830	9.5	1.20	1600	10.8	1.44
	23	0830	8.0	1.40	1445	12.5	1.18	1400	14.0	1.43
	24	0830	8.0	1.40	1430	13.3	1.22	1530	14.5	1.44
	25	0900	9.0	1.39	1000	11.3	1.22	1100	12.8	1.42
	26	0900	10.0	1.39	1400	11.0	1.24	1439	13.5	1.42
	27	1000	10.0	1.39	1330	11.0	1.22	1400	12.3	1.44
	28	1000	10.5	1.44	0830	9.0	1.23	0830	10.0	1.44
	29	1115	9.5	1.40	1240	11.0	1.22	1445	12.0	1.46
	30	1130	10.0	1.39	1145	11.0	1.23	1305	14.3	1.40
	31	0920	10.0	1.39	1350	12.5	1.18	1415	14.3	1.40
June	1	1045	11.5	1.37	1230	12.5	1.20	1400	14.0	1.40
	2	1100	12.5	1.36	1335	14.0	1.20	1335	15.5	1.40
	3	1200	14.0	1.35	1630	14.5	1.18	1445	16.0	1.38
	4	1030	13.0	1.33	1415	12.3	1.18	1430	14.3	1.39
	5	1200	14.5	1.34	1330	14.0	1.25	1545	13.9	1.49
	6	1145	14.0	1.35	1330	11.5	1.25	1300	12.0	1.45
	7	1000	12.0	1.33	1430	12.5	1.23	1500	13.0	1.40
	9	-	-	-	1345	14.0	1.21	1400	15.0	1.40
	10	-	-	-	1300	14.5	1.21	1330	15.0	1.40
	11	-	-	-	1130	12.0	1.20	1140	14.0	1.30
	12	-	-	-	-	-	-	-	-	-
	13	-	-	-	1000	11.0	1.18	1115	12.3	1.40

Appendix 7(b). 1980 morning and afternoon water temperatures and staff gauge readings in Coghlan Creek and Salmon River.

Date		Coghlan Creek						Salmon River					
		Morning			Afternoon			Morning			Afternoon		
		Time	Temperature (°C)	Level (ft)	Time	Temperature (°C)	Level (ft)	Time	Temperature (°C)	Level (ft)	Time	Temperature (°C)	Level (ft)
April	18	0930	9.75	1.45	-	-	-	-	-	-	-	-	-
	19	1100	10.25	1.45	-	-	-	1100	10.75	0.85	-	-	-
	20	1100	-	2.10	-	-	-	-	-	-	-	-	-
	21	1000	9.25	1.57	1600	12.00	1.50	0930	9.50	1.15	1600	12.50	1.14
	22	0815	8.50	1.47	1550	11.50	1.45	0845	9.50	1.04	1545	12.00	1.00
	23	0845	9.25	1.41	1530	12.50	1.39	0915	10.00	0.97	1530	13.00	0.95
	24	0900	9.75	1.41	1430	11.50	1.41	0945	10.50	0.97	1415	12.00	0.93
	25	0830	8.75	1.39	1330	10.75	1.38	0930	9.50	0.89	1300	11.25	0.89
	26	0830	9.50	1.37	-	-	-	0900	10.25	0.91	-	-	-
	27	-	-	-	1230	12.00	1.35	-	-	-	1345	13.00	0.88
	28	0845	10.50	1.34	1620	11.00	1.34	0915	11.25	0.85	1645	11.75	0.85
	29	0845	9.00	1.33	1545	11.00	1.33	0845	10.00	0.87	1545	11.75	0.86
	30	0845	7.75	1.33	1540	11.50	1.32	0915	9.00	0.84	1600	12.25	0.83
May	1	0845	9.00	1.29	1545	13.00	1.31	0915	10.00	0.82	1515	14.00	0.82
	2	0900	10.75	1.31	1410	11.00	1.29	1000	11.75	0.83	1430	13.00	0.80
	3	0945	9.00	1.30	-	-	-	1030	11.00	0.80	-	-	-
	4	-	-	-	1230	-	1.25	-	-	-	-	-	-
	5	0830	10.50	1.26	1600	11.75	1.27	0900	11.50	0.84	1700	12.50	0.78
	6	0845	10.25	1.29	1515	12.00	1.28	1040	11.75	0.80	1545	12.50	0.78
	7	0830	9.00	1.27	1600	12.50	1.25	0945	10.00	0.78	1530	13.00	0.78
	8	0845	9.50	1.27	1330	10.25	1.27	0915	10.50	0.78	1315	11.00	0.78
	9	0900	9.50	1.27	1500	11.00	-	0945	10.50	0.78	1530	11.50	-
	10	1145	-	1.26	-	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-	-	-	-	-
	12	0900	10.50	1.28	1500	11.00	1.27	0945	10.50	0.80	1600	12.00	0.76
	13	0900	10.00	1.27	1645	11.00	-	1030	11.00	0.77	1610	11.50	-
	14	0830	9.25	1.25	1530	10.50	-	0900	10.25	0.75	1530	11.00	-
	15	0930	9.00	1.25	1630	9.75	-	0945	9.50	0.76	1630	10.00	-
	16	0830	9.50	1.26	1600	10.25	-	0900	10.00	0.75	1600	11.00	-
	17	0930	9.50	1.24	-	-	-	1005	10.00	0.76	-	-	-
	18	0900	10.00	1.24	-	-	-	0800	11.00	0.75	-	-	-
	19	1030	10.00	1.26	-	-	-	1000	11.00	0.74	-	-	-
	20	0930	9.50	1.42	1600	10.25	1.44	0900	10.25	0.84	1630	10.75	0.84
	21	0945	10.25	1.43	1545	11.00	1.41	1030	11.00	0.86	1530	11.75	0.85
	22	0845	10.00	1.37	1500	11.00	1.37	0930	10.50	0.85	1600	11.00	-
	23	1015	9.25	1.38	-	-	-	1015	9.75	0.83	-	-	-
	24	1000	-	1.31	-	-	-	-	-	-	-	-	-
	25	1100	10.25	1.30	-	-	-	1130	11.00	0.77	-	-	-
	26	0900	10.00	1.32	-	-	-	0930	11.00	0.77	-	-	-
	27	1000	10.00	1.35	1420	10.25	-	1100	11.50	0.78	-	-	-
	28	0830	10.25	1.36	1445	11.00	-	1000	10.75	0.83	1430	11.50	0.83
	29	0830	10.50	1.34	-	-	-	0930	11.25	0.80	-	-	-
	30	1000	10.75	1.31	-	-	-	1130	12.00	0.78	-	-	-
	31	-	-	-	1230	11.00	1.29	-	-	-	1300	12.00	0.78
June	1	1155	10.50	1.32	-	-	-	-	-	-	1230	11.50	0.81
	2	0900	9.75	1.32	1400	10.00	1.30	0900	10.50	0.83	1400	10.75	0.84
	3	1030	10.00	1.37	-	-	-	1100	11.00	0.87	-	-	-
	4	0830	10.00	1.40	-	-	-	0900	10.75	0.90	-	-	-
	5	0930	10.25	1.42	-	-	-	0845	11.00	0.97	-	-	-
	6	0900	10.50	1.34	-	-	-	1030	10.25	0.90	-	-	-
	7	-	-	-	1500	12.75	1.32	-	-	-	1530	14.00	0.84
	8	-	-	-	1500	11.75	1.43	-	-	-	1600	13.00	0.88
	9	0915	12.50	1.39	-	-	-	1030	13.00	0.94	-	-	-
	10	1100	11.50	1.31	1430	12.50	-	1130	13.00	0.85	1430	14.00	-
	11	0900	10.00	1.27	-	-	-	-	-	-	-	-	-

APPENDIX 8. ANNUAL MEAN MONTHLY DISCHARGES

Appendix 8. Annual mean monthly discharges (in M^3/sec) for the Salmon River at 72 Avenue (Station number 08MH090).

Year	January	February	March	April	May	June	July	August	September	October	November	December
1960	-	3.16	1.43	1.45	1.45	0.504	0.253	0.231	0.269	0.892	2.31	-
1961	4.05	5.16	3.33	1.15	1.02	0.388	0.213	0.193	0.205	0.571	1.47	1.77
1962	3.11	1.55	1.28	1.16	1.03	0.397	0.190	0.296	0.323	0.778	3.14	1.37
1963	1.54	2.19	1.47	1.35	0.66	0.147	0.194	0.130	0.130	0.578	3.33	1.39
1964	3.87	2.06	2.65	1.52	0.88	1.030	0.826	0.631	1.300	-	-	-
1968	-	-	-	-	-	-	-	-	-	-	-	-
1969	-	-	1.94	-	-	0.302	0.265	0.225	0.733	1.480	2.27	-
1970	2.61	1.93	1.14	1.86	0.55	0.242	0.232	0.200	0.254	0.315	1.25	1.12
1971	4.50	3.39	3.12	1.22	0.52	0.818	0.465	0.284	0.327	0.967	3.70	1.94
1972	3.76	4.35	3.90	1.85	0.84	0.391	1.090	0.316	0.501	0.412	1.54	1.99
1973	-	-	-	0.75	0.48	0.390	0.270	0.235	-	0.427	2.59	-
1974	3.69	3.83	2.45	1.56	1.19	0.654	0.335	0.212	0.207	0.221	1.06	1.54
1975	3.11	2.19	1.81	0.65	0.57	0.284	0.205	0.307	0.184	2.230	3.15	1.67
1976	3.66	2.90	1.78	1.68	0.75	0.693	0.378	0.389	0.527	0.497	1.22	1.38
1977	1.96	1.14	1.69	0.90	0.41	0.501	0.227	0.216	0.244	0.467	2.66	1.17
1978	1.93	1.73	1.24	1.09	0.75	0.298	0.175	0.263	0.604	0.427	1.78	1.00
1979	0.66	2.78	1.27	0.96	0.32	0.208	0.166	0.152	0.202	0.276	0.35	1.05
1980	1.65	2.87	2.02	1.50	0.44	0.790	0.518	0.169	0.364	0.312	3.47	3.82
Mean	2.86	2.75	2.09	1.29	0.74	0.473	0.353	0.262	0.398	0.678	2.21	1.63

APPENDIX 9. SUMMARY OF COHO SALMON ESCAPEMENTS

Appendix 9. Summary of coho salmon escapements to the Salmon River system. (from Marshall **et al.** 1979).

Year	Escapement	Year	Escapement	Year	Escapement
950	200	1960	200	1970	1,500
1951	400	1961	200	1971	3,500
1952	3,500	1962	75	1972	1,500
1953	3,500	1963	75	1973	750
1954	400	1964	200	1974	3,500
1955	200	1965	200	1975	3,600
1956	200	1966	200	1976	3,500
1957	200	1967	200	1977*	3,500
1958	200	1968	200	1978*	5,500
1959	75	1969	75		

* From Schubert 1982.