

FRI-UW-8009

June 1980

FISHERIES RESEARCH INSTITUTE  
College of Fisheries  
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NISQUALLY RIVER JUVENILE SALMONID STUDY

by

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FINAL REPORT

for the Period April 1, 1979 to March 31, 1980

to  
The City of Tacoma  
and  
The City of Centralia

Approved

Submitted June 26, 1980

  
Director

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## NISQUALLY RIVER JUVENILE SALMONID STUDY

### INTRODUCTION

The Nisqually River supports runs of chinook, coho, chum, pink, and steelhead which are important to the commercial and sport fisheries of the region and particularly to the Nisqually Indian Tribe which conducts a fishery within the river. During the approximate 40-year period for which river catch data are available the annual Tribal harvest averaged 1,016 chinook, 3,381 coho, 17,259 chum, 1,432 pink (odd years), and 1,833 steelhead. The sport catch of steelhead in the river is estimated to have averaged about 2,500 fish over a 21-year period. Ratios of overall catch to escapement estimated for several species in Puget Sound indicate that approximately 3 chinook, 4 coho, 2 pink and 1 chum salmon are caught by commercial and sport fisheries for each one of these species escaping to spawn.<sup>1</sup> The data bases for escapement estimates in the Nisqually River are fragmentary and incomplete, and it has not been possible to obtain reliable estimates of escapement in the mainstem Nisqually River because of water turbidity.

The Nisqually River has a long, varied history of hatchery production and plantings from other facilities beginning in 1900. Annual hatchery plantings of salmon by Washington Department of Fisheries and the Nisqually Indian Tribe in the years 1977-79 averaged 610,000 chinook, 892,000 coho, 947,000 chum, and 106,480 pink (1978 only).

As a result of hearings held under jurisdiction of the Federal Energy Regulatory Commission to establish a flow regime which adequately protects the fisheries resource in that section of the Nisqually River between the city of Centralia's Yelm Project diversion dam and the associated powerhouse, it was determined that further studies would be helpful in establishing the flow requirements of anadromous fishes in the Nisqually River. Toward this end flow studies were conducted under direction of the Washington State Department of Fisheries to estimate the flow requirements of salmonids for transportation, spawning, and rearing, and fisheries studies were conducted under direction of the Fisheries Research Institute to provide information on the seasonal abundance, distribution, and size of juvenile salmonids.<sup>2</sup>

The studies were conducted in a 42.5-mile reach of the Nisqually River below the City of Tacoma's Alder (RM 44.2) and LaGrande power dams (RM 42.5). Of special concern in these studies was the 13.6 mile

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<sup>1</sup>Williams, R. W., R. M. Laramie, and J. J. Ames. 1975. A catalog of Washington streams and salmon utilization. Vol. 1. Puget Sound region.

<sup>2</sup>The studies conducted by the Fisheries Research Institute were funded by Centralia City Light and Tacoma City Light.

section from which water is diverted (Yelm Reach) between river mile (RM) 26.2 and RM 12.6 (Figs. 1 and 2).

## METHODS

### Electrofishing

From an initial survey of the main stem Nisqually River below La Grande, four representative sites were chosen; two inside the Yelm Reach and one each above and below the Yelm Reach (Figs. 1 and 2). Approximate river mile locations were 11.0, 19.6, 25.4 and 32.8 for stations 1-4 respectively. Station 1 was the lowermost station. At each site approximately 200-foot sections each of bank and bar habitat were marked with surveyors tape. All subsequent electrofishing was done at these eight locations.

The bank habitat chosen for survey typically had slopes exceeding 30 degrees but varied considerably in the amount of vegetation, current velocity, and regularity of shoreline. Because fry were attracted to vegetation growing at water's edge, the quality of bank habitat varied considerably.

The bar habitat had slopes less than 10 degrees and moderate to slow current. The bottom material was of mixed gravel and cobble, with little or no vegetation.

Sampling was conducted biweekly during April-July when catches were large, and monthly thereafter. Sampling on each trip was generally conducted by a two-man team consisting of a FRI biologist and a biologist from the Nisqually Tribe, Puyallup Tribe, Washington Department of Fisheries, or Washington Department of Game. Initially, two days were required to complete one survey, but as the catches declined all sites could be sampled in one day.

Sampling progressed upstream at all sites. Records were kept of the electrofisher operating time at each site. Effort and catch were recorded separately for bank and bar habitat. Stunned fish were dipped into a bucket of water and retained to the upper end of each site. The catch was sorted and counted by species and released except for subsamples which were placed in plastic bags on ice for length-weight measurements after completion of the day's sampling. Age I salmonids were measured and released.

Water clarity was measured on each sampling day beginning in October at stations 1 and 4 by means of a Secchi disc. The Nisqually River water was highly turbid from suspended inorganic solids during most of the surveys. High turbidity greatly reduced the efficiency of electrofishing because stunned fish were less visible.

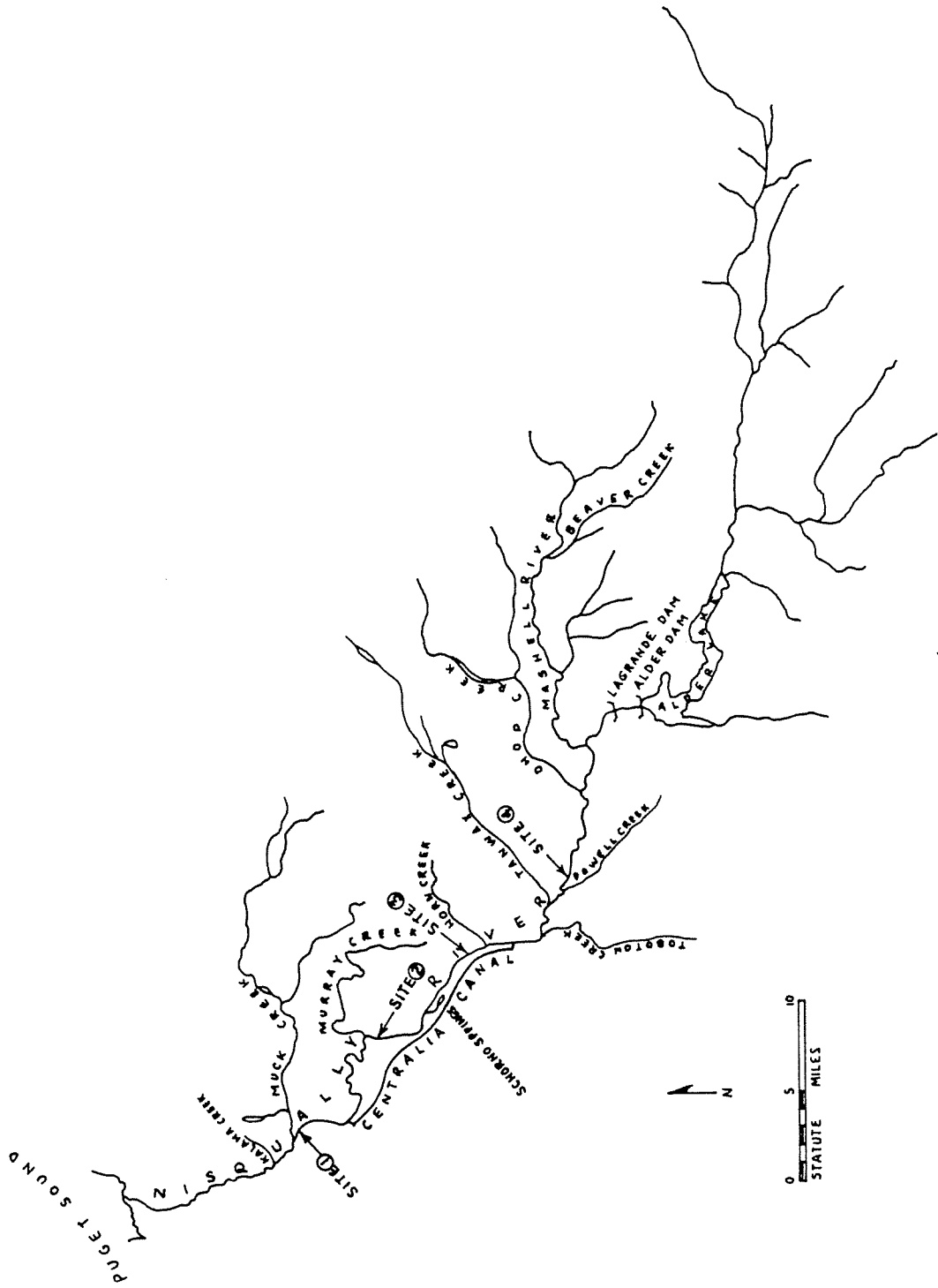


Fig. 1. Map of Nisqually River detailing major tributaries, Centralia Diversion Canal, and sites sampled.

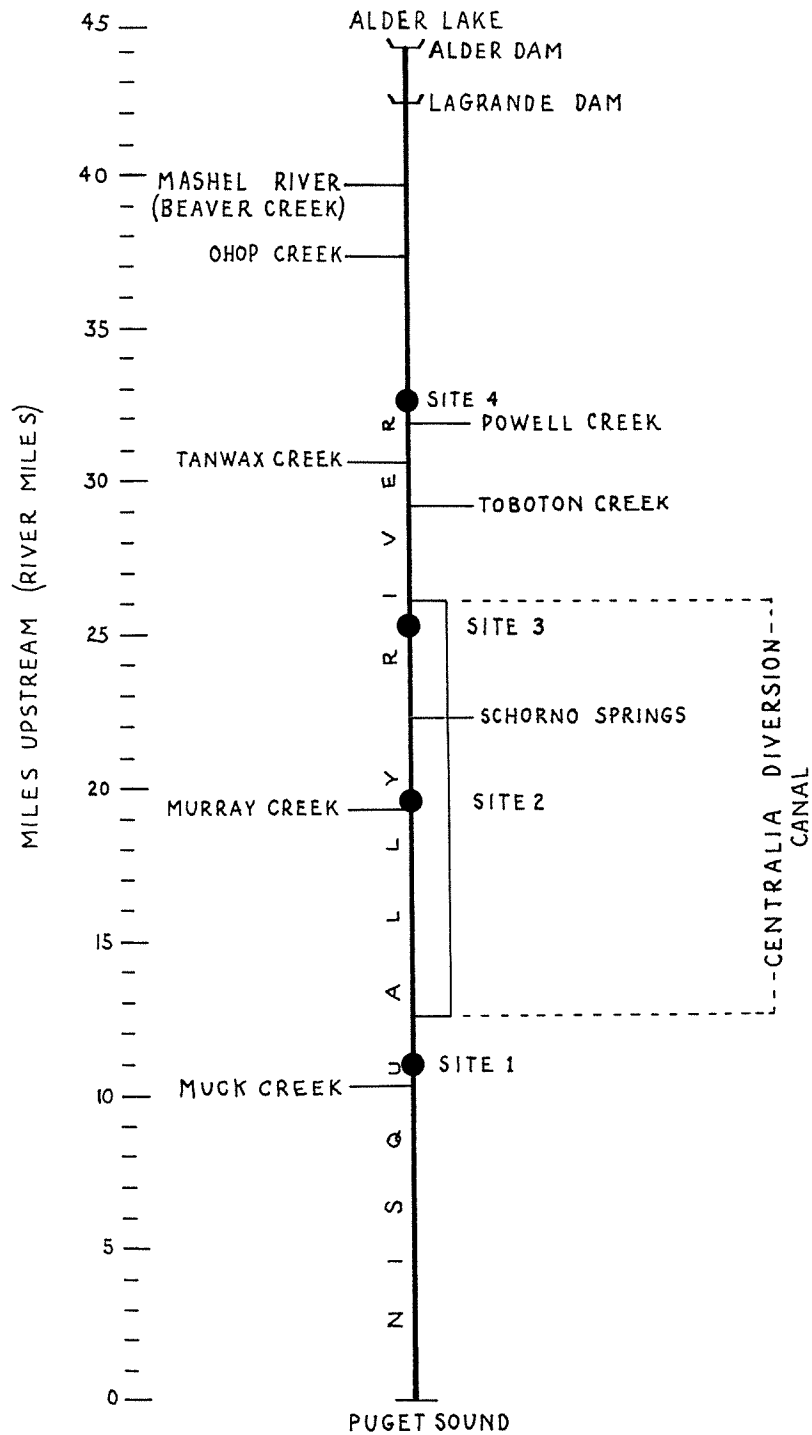


Fig. 2. River mile locations on the main stem Nisqually River of major tributary streams, Centralia Diversion Canal, dams, and study sites.

Standard lengths of subsampled fish were recorded to the nearest mm. Fish were separated into 5 mm length groups during measuring and combined weights to the nearest 0.1 g were taken of each group. Condition factors were calculated for each length group according to the formula:

$$C = \frac{W \times 10^5}{L^3}$$

where: C = condition factor, W = mean weight in g,  
L = mean length in mm

### Beach Seining

The primary purpose of the beach seining was to determine the species composition and relative abundance of salmonids in mid-river. Sites 1 and 4 were seined monthly from August-December and in March. Seining was also done at site 3 during August and December, but because this site was not sampled consistently the catch data were excluded from the analysis.

The 30-m long by 2-m deep seine was set from an outboard-powered skiff, starting at the head of an eddy pool and following the current downstream and back to shore. The catch was segregated by species, counted, and subsampled for length-weight measurements. Sampling was conducted by tribal biologists with assistance from state biologists. Catch and size data were provided to FRI for inclusion in this report.

### RESULTS

The electrofisher catches were influenced by several known factors including turbidity, change of operator, varying flow, and hatchery plantings. Secchi readings ranged from 8.0-35.0 in (20.3-88.9 cm) during the period August-March when visibility was monitored (Table 1). The secchi readings approximated the depth at which stunned fish could be seen. The largest variation in visibility occurred during September-January when the water became very turbid but the effect on sampling was minimal at this time because the catches of chinook, coho and chum had already decreased to low levels. The catches of rainbow-steelhead surely were reduced by poor visibility during this period but the data cannot be compensated because the effect of varying visibility on catch efficiency was not measured.

Operators were changed September 1, 1979, which may have reduced sampling efficiency slightly during the September survey and perhaps have changed slightly the sampling efficiency during all subsequent surveys, but this effect is believed negligible compared with the effect of varying turbidity.

Table 1. Flow and visibility in the Nisqually River during sampling.

Sampling date	Flow (cfs) <sup>3</sup>		Secchi Ave. at Stations 1 & 4 (inches)
	La Grande	McKenna	
4-10	918	569	
4-11	927	598	
4-24	1390	865	
4-26	1370	823	
5-8	2220	1680	
5-10	1930	1410	
5-22	1700	893	
5-24	1700	893	
6-5	1380	574	
6-6	1370	558	
6-20	963	437	
6-21	972	452	
7-3	1070	453	
7-5	1070	442	
7-17	1080	427	
7-19	1070	390	
8-1	1080	392	
8-2	1080	386	35.0
9-11	810	279	
9-12	686	404	10.0
10-8	1000	573	8.5
11-13	1140	562	8.0
12-10	903	581	8.5
1-15	2480	3120	19.0
2-12	2290	1840	29.0
3-19	2320	2060	34.5

<sup>3</sup>USGS water discharge records

A marked increase in flows during January (Table 1) may have precipitated the seaward movement of chinook, which previously had been residing mid-stream in eddy pools. The electrofisher catches of chinook increased slightly in the bank habitat at this time apparently as a result of displacement from mid-stream. Commensurate with high flows, rainbow-steelhead appeared to move to the bank habitat offering the best refuge from swift currents. High water flow may thus have altered the distribution of chinook and rainbow-steelhead.

Hatchery plantings of chinook, coho, chum and steelhead were made during April-June (Table 2) but had no obvious effect on catch size and distribution. The times and locations of hatchery plantings were compared with electrofisher catches and length frequencies but no effects were discernible. The timing and location of hatchery plantings relative to the sampling surveys is discussed for each species in the following section dealing with seasonal occurrence.

#### Seasonal Occurrence of Fry

The seasonal occurrence of age 0 salmonids based on catches of the electrofisher and beach seine are shown by species in Fig. 3. The ordinate scales were adjusted to equalize approximately the heights of the modes in order to emphasize timing rather than abundance of each species. The relative abundance by species by station is discussed in subsequent sections.

#### Chinook

Chinook from the 1978 spawning emerged earliest of the four species and reached peak abundance in the shoreline habitat during early May. Their abundance in shoreline habitat decreased rapidly during late May, June, and July, reached zero on August and occurred in very small numbers during September, October, and November. However, large number occurred in the beach seine hauls begun in August, 1979, indicating that chinook moved offshore to occupy pool habitat during the summer. Fortunately, the beach seine surveys were conducted in time to document this shift; otherwise it would have appeared that essentially all chinooks migrated from the river. The beach seine catches showed that substantial numbers of chinook remained in the pools through December. Unfortunately, due to poor condition of the boat launch sites, beach seine surveys were not conducted during January and February 1980. The March 1980 survey yielded only age 0 chinook from the 1979 spawning. The final outmigration of the 1978 brood year must have occurred largely during January and February, 1980. That the remaining chinook outmigrated during this time is not surprising in view of the high flows which eliminated the pools and surely made residence in the main river very difficult.

Table 2. Fish plantings in the Nisqually River and tributaries, 1979.<sup>4</sup>

Species	Brood year	Stock source	Planting location	Planting date	Number planted	Fish per pound	Weight each (g)	Pounds planted
Chinook	1978		Schorno Springs	6/15/79	491,011	118	3.84	4,161
Coho	1978	Puyallup	Murray	4/79	160,264	871	0.52	184
	1978	"	Taboton	4/79	92,236	870	0.52	106
	1978	"	Tanwax	4/79	162,006	871	0.52	186
	1978	"	Beaver	4/79	87,100	871	0.52	100
Chum	1978/9	Nisqually	Kalama	5/3/79	234,645	17	26.7	13,803
			Kalama	5/28/79	534,600	426	1.06	1,255
				6/13/79	366,998	442	1.03	830
Steelhead	1978		Mashele R.	4/1/79	9,750	6.5	69.8	1,500
	1978		Mashele R.	4/18/79	20,190	6.0	75.6	3,365

<sup>4</sup>Source: Nisqually Tribal biologists Paul Svoboda and Bill Harrington-Tweit.

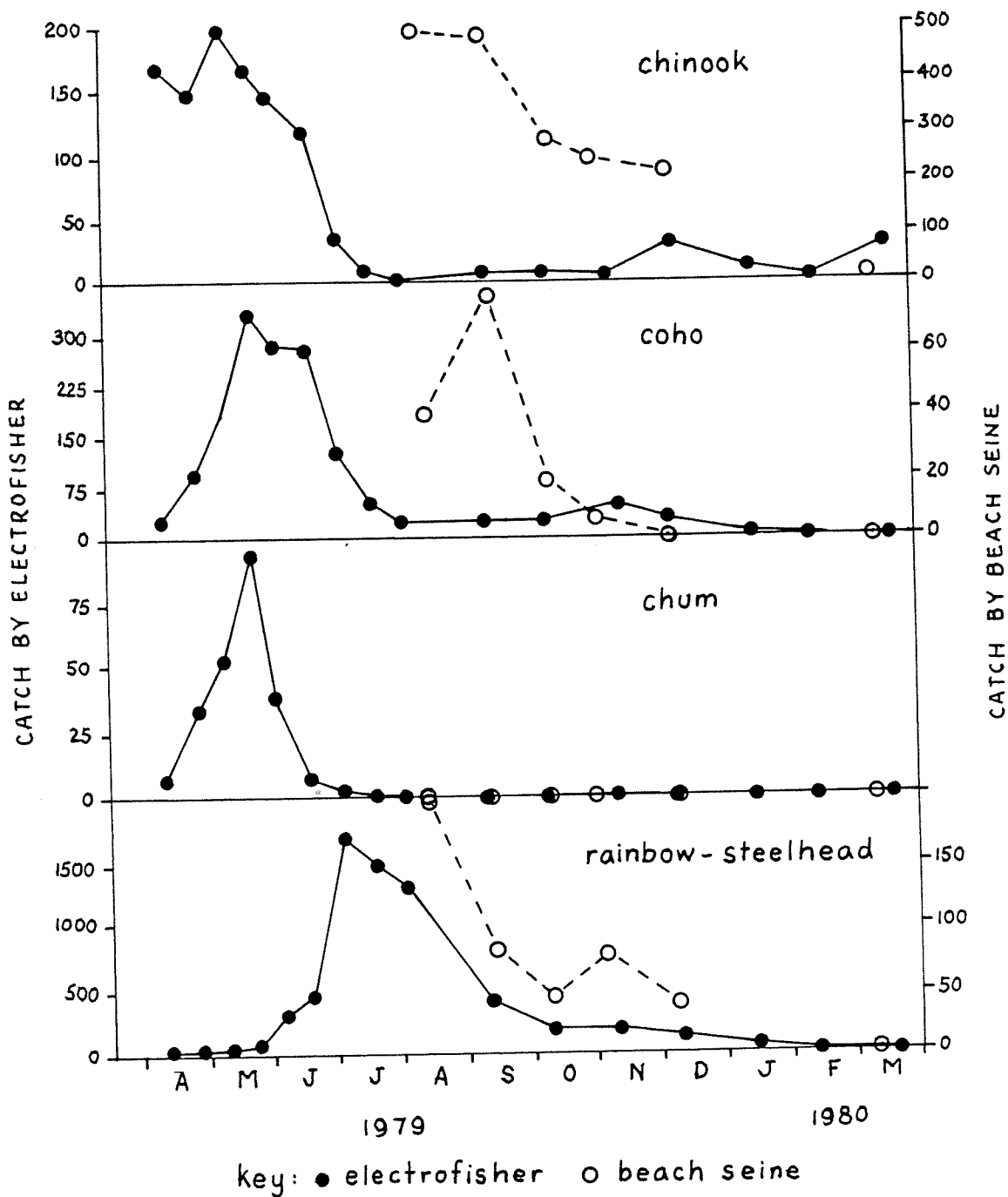


Fig. 3. Seasonal occurrence of age 0 chinook, coho, chum, and rainbow-steelhead in electrofisher and beach seine catches, all stations combined. Beach seine catches shown are for sites 1 and 4 only.

Although a substantial number of chinook was planted in the Nisqually River system during the peak of chinook abundance, the data indicate that none entered the electrofisher catches. On June 15, 1979, 491,000 chinook were released at Schorno Springs (Figs. 1 and 2) at an average size of 3.84 g (Table 2). During the next electrofisher survey five days later the chinook sampled averaged 0.75 g and a plot of the length frequency was unimodal. The catch at all sites appeared to consist entirely of the smaller wild fry.

### Coho

Relatively few coho fry were present in shoreline habitats during the first survey on April 10-11, but thereafter the numbers increased rapidly, peaking on May 22-24, 1979. Coho were abundant during June but declined during July to relatively low abundance and so continued through December.

The beach seine catches of coho indicated moderate abundance in pool habitat during August and September, low abundance until early November, and thereafter nothing. Coho, like chinook, tended to move into pool habitat during August and September. Although not confirmed by sampling, we assume that the disappearance of coho from the main-stream after September was not due to outmigration but to movement into tributaries. Age I coho occurred in the electrofisher catches during April, May, and June 1979, indicating this as a period of outmigration.

Hatchery planted coho very likely occurred in the electrofisher catches but they were not distinguishable by size or appearance. Coho were planted during April in tributary streams between sampling sites 1 and 2, 3 and 4, and above site 4 (Table 2). The average size of the hatchery coho was 0.52 g and the coho sampled in the river was 0.45 g, and bi-modality was not observed. Coho were planted in tributaries entering the Nisqually River within and above the Centralia Diversion canal but because nothing is known about how these may have distributed in the main stem of the Nisqually River their effect on the sample catches is unknown. It is thus not possible to conclude as to what proportions of the coho fry captured were of wild and of hatchery origin.

### Chum

Chum fry were much less available at the shoreline than were the other species in spite of their larger adult spawning population (27,652-30,296 in 1978-79)<sup>3</sup>. This was expected in view of the well-established behavior of chums; direct nocturnal movement downstream to

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<sup>3</sup>Escapement estimates of Nisqually River chums by U.S. Fish and Wildlife Service, and Washington State Department of Fisheries, 1978-79.

tidewater upon emergence with a small portion of the population residing in the lower reaches and intertidal zone. Chums were caught during April 10-July 5 and reached peak abundance on May 20. This period of seaward migration is about 1 month later than in the major river systems of northern Puget Sound and results from the later spawning period of Nisqually chums.

Chum salmon fry were planted in Kalama Creek approximately two miles below sampling site 1 on May 28 and June 13, 1979, but almost certainly did not occur in the sample catches. It is very doubtful that planted chum would have moved upstream two miles. Further, any mixing of wild and hatchery stocks would have been readily apparent in the length-frequency curves because the hatchery chum were substantially larger (1.06 g average) than wild chum (0.46 g average).

### Rainbow-Steelhead

The timing of rainbow-steelhead fry emergence was about 1 1/2 months later than that of the other species. Rainbow-steelhead fry first appeared in the electrofisher catches in May, and reached peak abundance in July. Their numbers declined gradually in both electrofisher and beach seine catches during fall and winter.

Steelhead from the 1978 brood year were planted during April 1979 into the Mashel River, a tributary to the Nisqually River at RM 39.8 but because the analysis of salmonid abundance and distribution was concerned only with age 0 fish which emerged in 1979, the plantings did not affect the results.

### Distribution of Fry Among Sampling Stations

In comparing the abundances of fry between stations it should be explained that the sites varied somewhat in the amount of vegetation cover and irregularity of shoreline, which tended to make some sites more favorable for rearing than others, regardless of such factors as flow and nearness to spawning sites. Variation was evident particularly in the bank habitat. Bank habitat at stations 2 and 4 was more stable and offered greater amounts of vegetation than did bank habitat at stations 1 and 3 which were unstable gravel banks. In fact, sloughing occurred over about half of the bank habitat at station 3 during January-March 1980. Variations among the bar habitats were not obvious except that the station 2 bar was offshore and therefore varied in size according to water level. During January-March the bar was completely submerged and no longer functioned as shoreline habitat.

One of the most important aspects of this study concerns identifying and quantifying any differences in abundance, behavior, etc. of fishes between inside and outside the Yelm Reach. However, for analytical purposes the variability of the catches was large relative to the

number of observations, with the result that only gross differences were significant statistically.

The electrofisher catches by station by species are shown in Figs. 4-7, and in Table 3. The catches of age 0 chinook, coho, and rainbow-steelhead tended to be larger inside the Yelm Reach (stations 2 and 3) during the period of high abundance when emergent fry were present. The distribution of main-stem spawning is poorly known, but the distribution of emergent fry tends to show that the Yelm Reach is utilized at least as much as the reaches above and below.

The only conclusive difference in species abundance between stations was among chum, which occurred primarily at station 1 (75%), secondarily at station 2 (23%), in very small numbers at station 3 (2%), and not at all at station 4. This distribution reflects the distribution of spawning which occurs largely below the Yelm Reach.

#### Preference of Fry for Bank vs. Bar Habitat

The bank habitat sampled varied considerably in its attractiveness to rearing salmonids. Some bank habitat was used extensively and other bank habitat was avoided. The most important factor influencing the distribution of salmonids in bank habitat was the amount of concealing vegetation or cover at the water's edge such as grass, shrubs or tree roots. During the emergence period fry were abundant at all locations but after the emergence period relatively few fry were caught in areas lacking vegetation cover.

Preference of juvenile salmonids for bank or bar habitat was determined by analyzing the numerical differences between electrofisher catches from the two habitats. Catches were evaluated for significance by means of the Wilcoxin signed rank test. Because preference appeared to shift seasonally for some species, the data were analyzed by quarterly period. A summary of the preference by season and the significance levels of the tests are summarized in Table 4.

Chinook strongly preferred bank habitat during the April-June period. Subsequently, they moved away from the shoreline into the eddy pools of mid-stream and were largely unavailable to the electrofisher.

Coho strongly preferred bank habitat during April-September period of residence in the main stem Nisqually River. After September they moved out of the main stem, either to Puget Sound or into tributaries, and largely disappeared from the catches.

Chums were more abundant in bank than in bar habitat during the April-June period of outmigration but the difference was not significant statistically. Random occurrence between bank and bar habitat seems logical for chums in view of their relatively direct outmigration

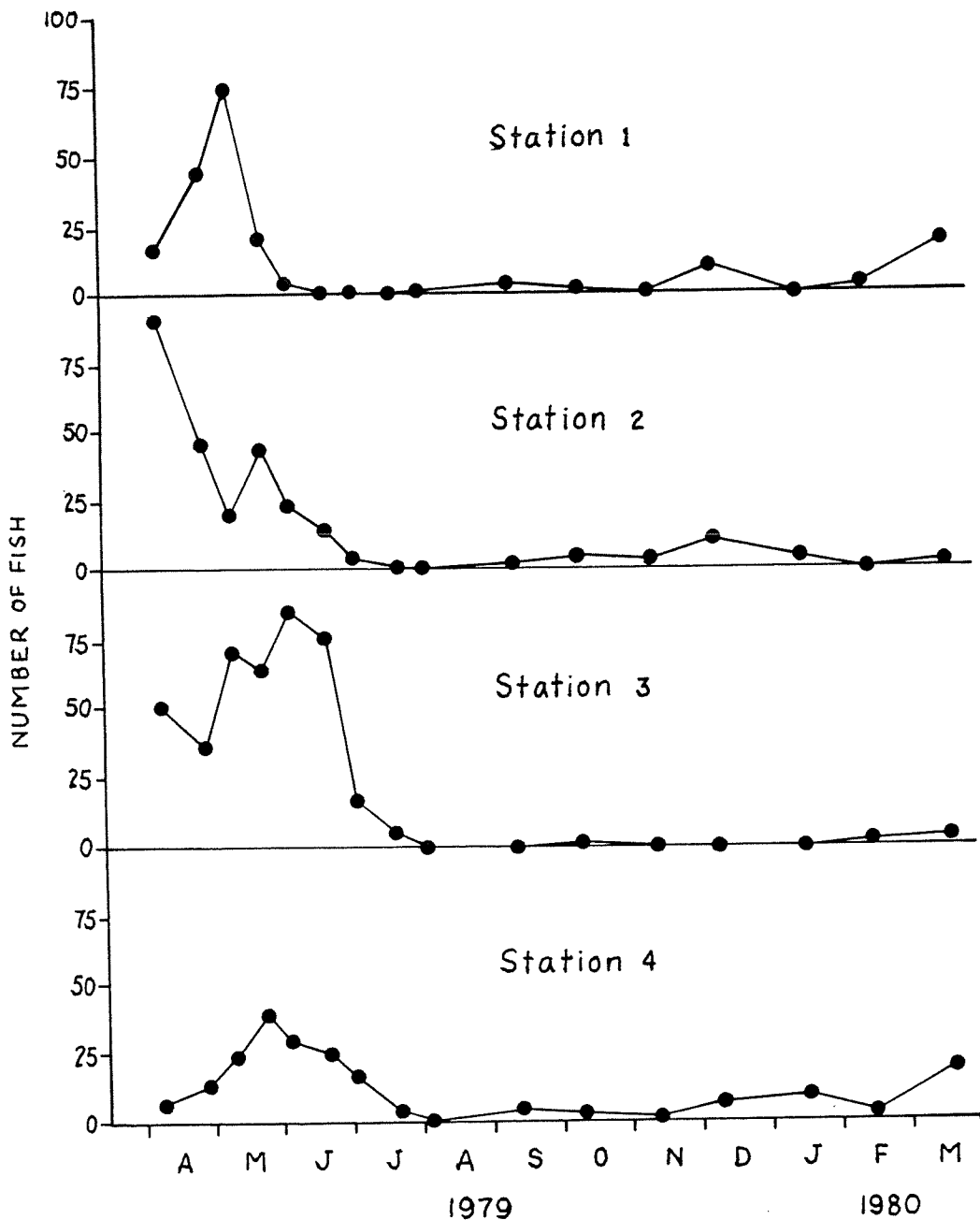


Fig. 4. Seasonal abundance of age 0 chinook in shoreline habitat, by sampling station.

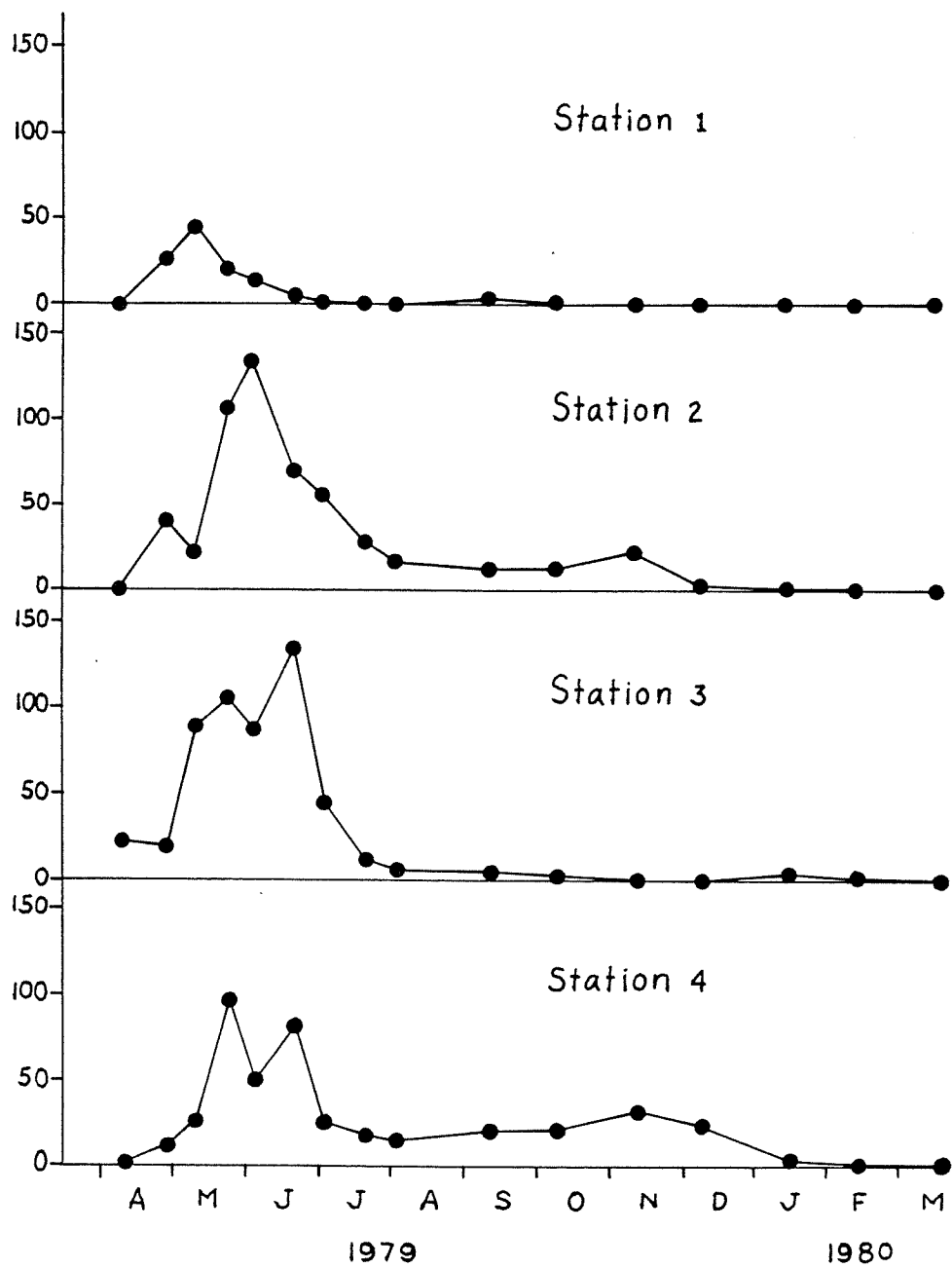


Fig. 5. Seasonal occurrence of age 0 coho in shoreline habitat, by sampling station.

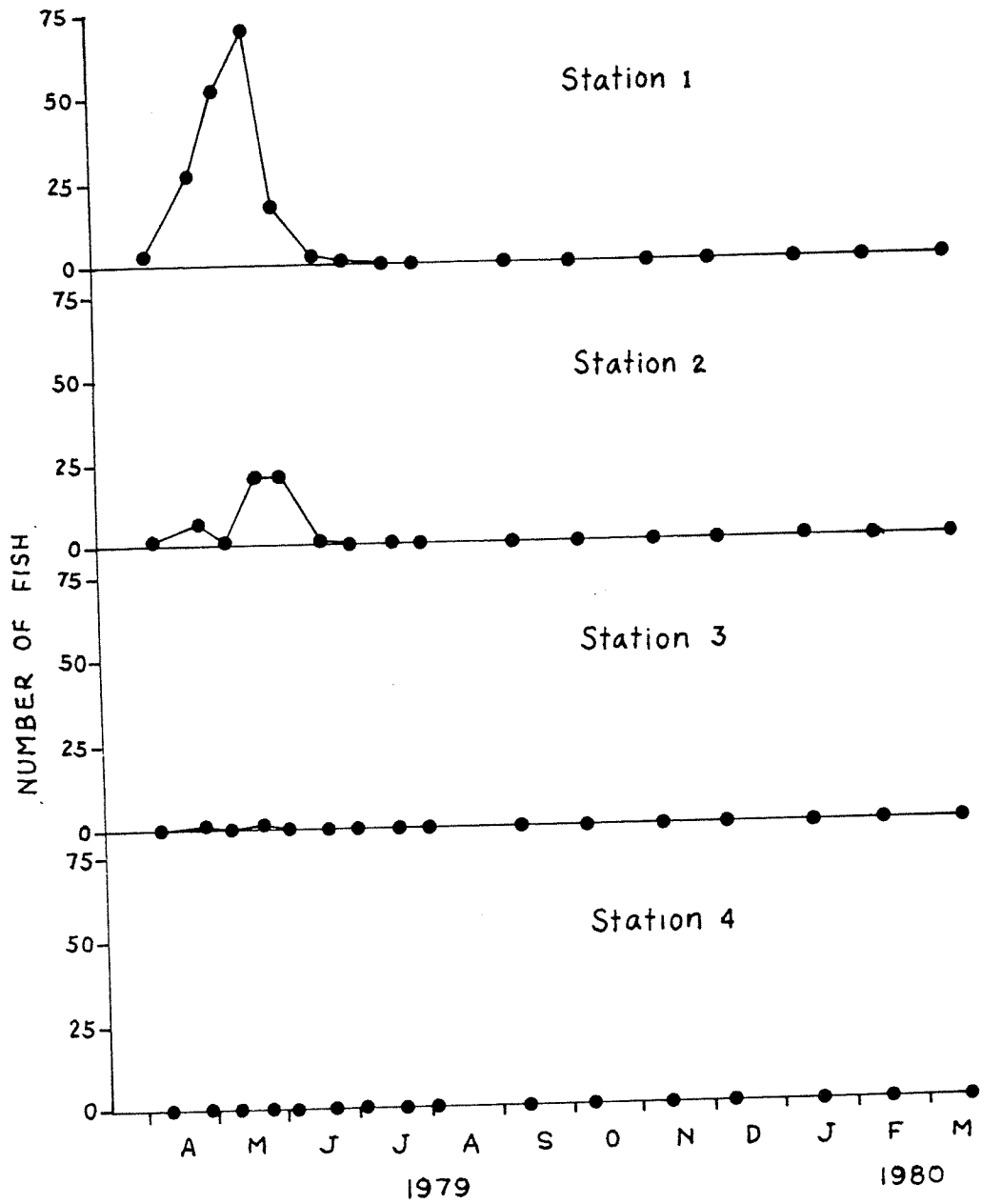


Fig. 6. Seasonal occurrence of age 0 chum in shoreline habitat, by sampling station.

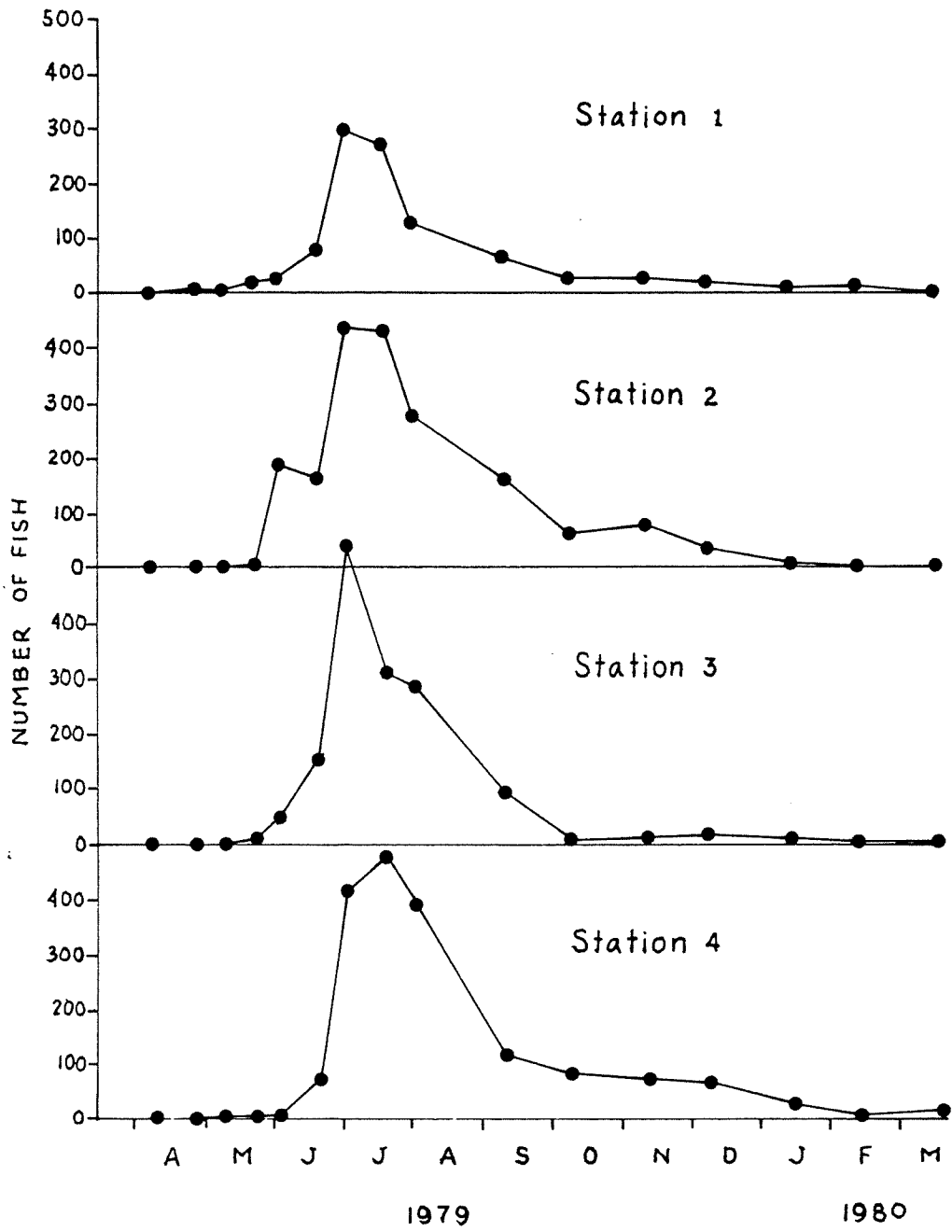


Fig. 7. Seasonal occurrence of age 0 rainbow-steelhead in shoreline habitat, by sampling station.

Table 3. Total and percent of total ( ) electrofisher catch of fry by species by station.

	Station				Total
	1	2	3	4	
Chinook	189 (18)	270 (25)	410 (38)	198 (19)	1067 (100)
Coho	111 (07)	508 (33)	519 (33)	418 (27)	1556 (100)
Chum	176 (75)	53 (23)	5 (02)	1 ( 0)	235 (100)
Rb-Sh	991 (16)	1844 (30)	1492 (25)	1752 (29)	6081 (100)

Table 4. Preference by season of age 0 chinook, coho, chum, and rainbow-steelhead for bank vs. bar habitat based on acceptance or rejection of the null hypothesis in analysis by Wilcoxin signed rank test of catches by electrofisher. Rejected = bank habitat preferred, accepted = no preference detected.

Species	April-June	July-September	October-December	January-March
Chinook	rejected Pr.01	*	*	*
Coho	rejected Pr.01	rejected Pr.01	*	*
Chum	accepted	*	*	*
Rainbow-steelhead	accepted Pr.05	accepted Pr.05	accepted Pr.05	rejected Pr.05

\* Sample size too small to be tested.

which would logically minimize the need for selection of specific habitat.

Rainbow-steelhead showed no significant preference for bank or bar habitat during April-December but during January-March strongly preferred bank habitat. The uniformity during most of the year is surprising in view of the preference shown by the two other rearing species, chinook and coho, for bank habitat. The move to bank habitat during January-March probably resulted from high water flows which increased the difficulty of residing in the main stream and forced rearing fishes to move to places of refuge along the banks.

The unequal distribution of chinook and coho between bank and bar habitat may have been more pronounced during the summer and fall had water turbidity been less, as in a nonglacial stream. The very high turbidity during summer and fall undoubtedly offered concealment from predators in areas lacking vegetation and may have enabled fry to range more widely. At times of highest turbidity, electroshocked salmonids were not visible more than three inches beneath the surface.

#### Period of Fry Emergence

The timing of fry emergence is assumed to coincide roughly with the period during which emergent-sized fry were present in the electrofisher catches. Estimates of emergence periods are thus inferred from the length-frequency data which are summarized in Appendix Tables 3-6 and graphed in Figs. 8-11. It is recognized that time is required for fry to grow the several mm necessary to be excluded from an emergent size category and therefore this time should be subtracted from the estimates of ending of emergence. The growth rate of fry in the Nisqually River is unknown but is assumed to be rapid during June and July. Lacking specific information on growth of emergent fry a lag period of one week is assumed and has been subtracted in most cases from the survey date on which emergent-size fry of each species were last observed.

Emergent-sized chinook (35-40 mm) were present during February-July 5. Although July 5 seems unusually late for emergent-sized chinook to occur, 36 percent of the catch was within this length group. Therefore, emergence is assumed to have continued at least until June 29. The high percentage of emergent-sized fry encountered during the July 3-5 survey is evidence for extending the estimate of emergence termination for perhaps another week. However, the catches of age 0 chinook had declined to low numbers by early July, and peak catches were made in April-May, indicating peak emergence was over by the end of May.

Emergent-sized coho (31-35 mm) were present during April-June 6. This emergence seems unusually late; however, 12 percent of the June 5-6 coho catch consisted of emergent-sized fry. Emergence is assumed

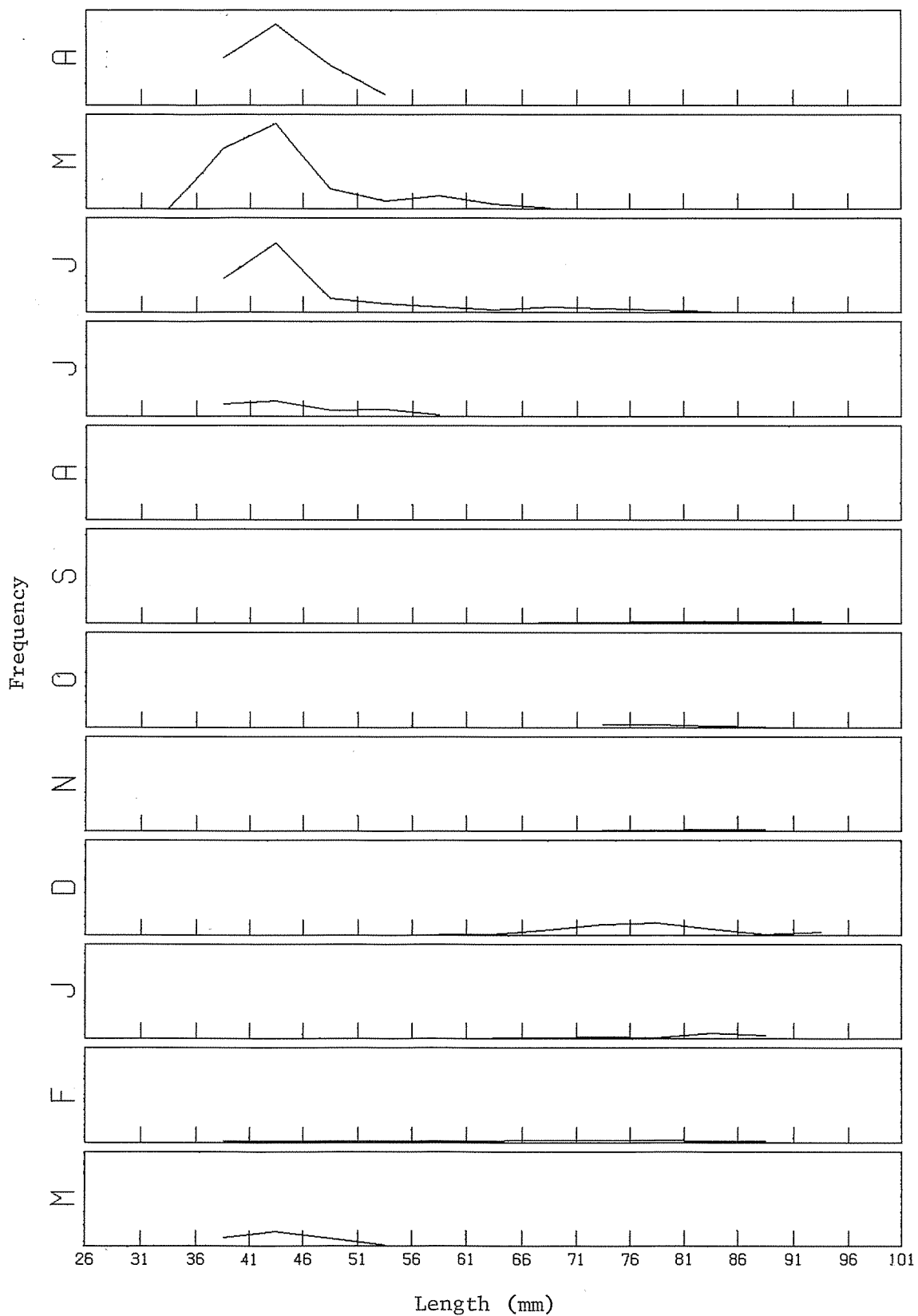


Figure 8. Length frequency of age 0 chinook fry.

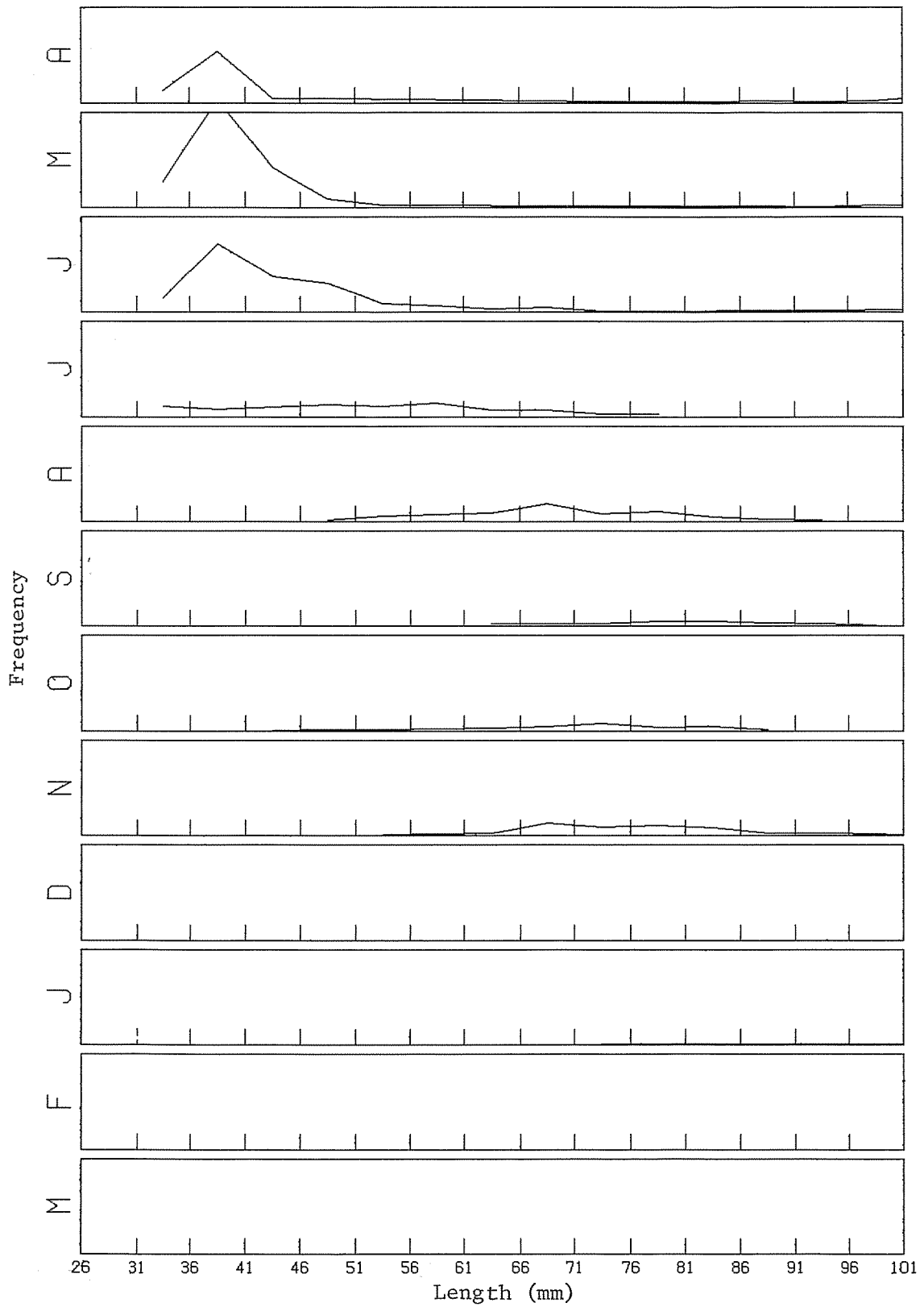


Figure 9. Length frequency of age 0 coho fry.

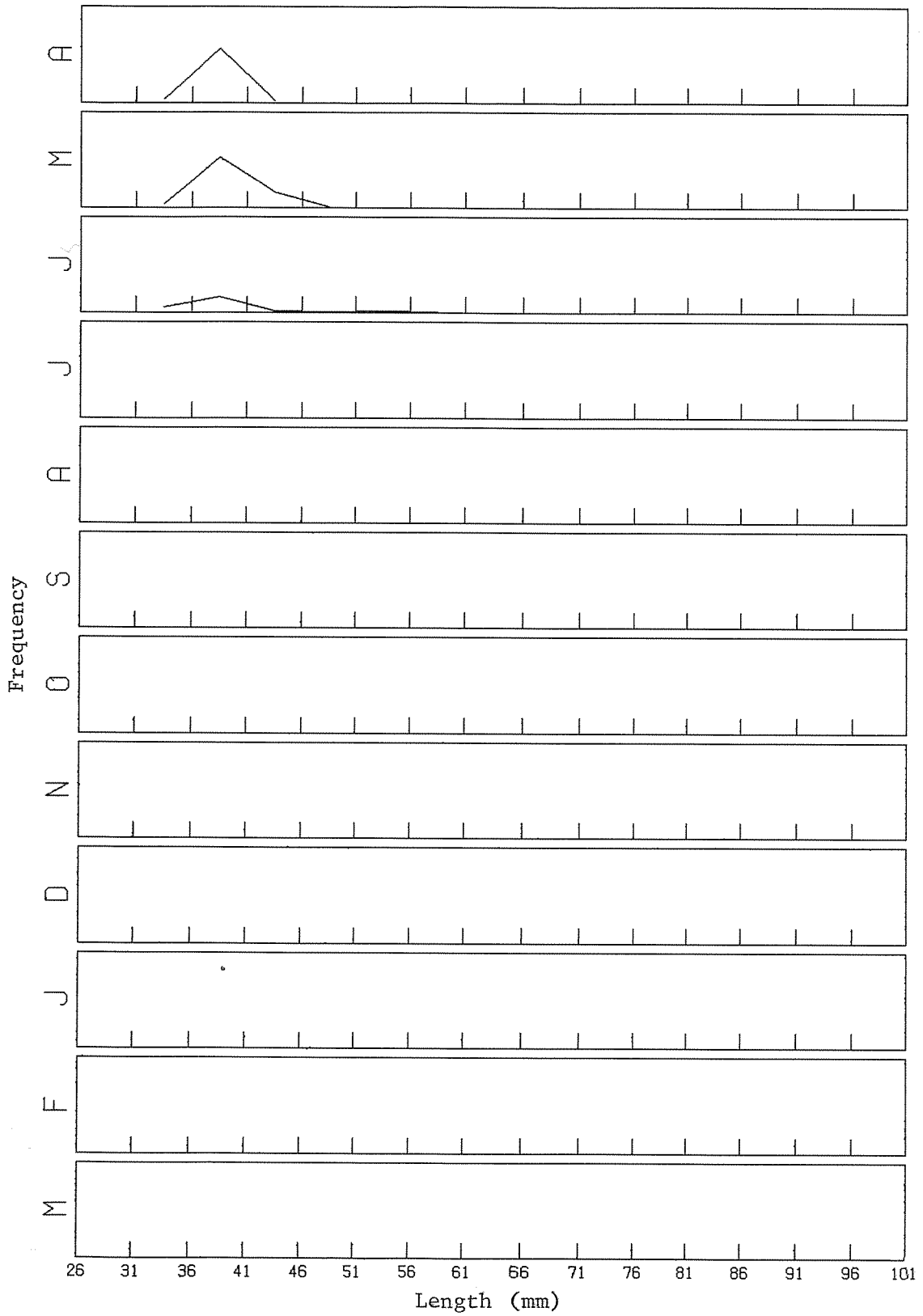


Figure 10. Length frequency of age 0 chum fry.

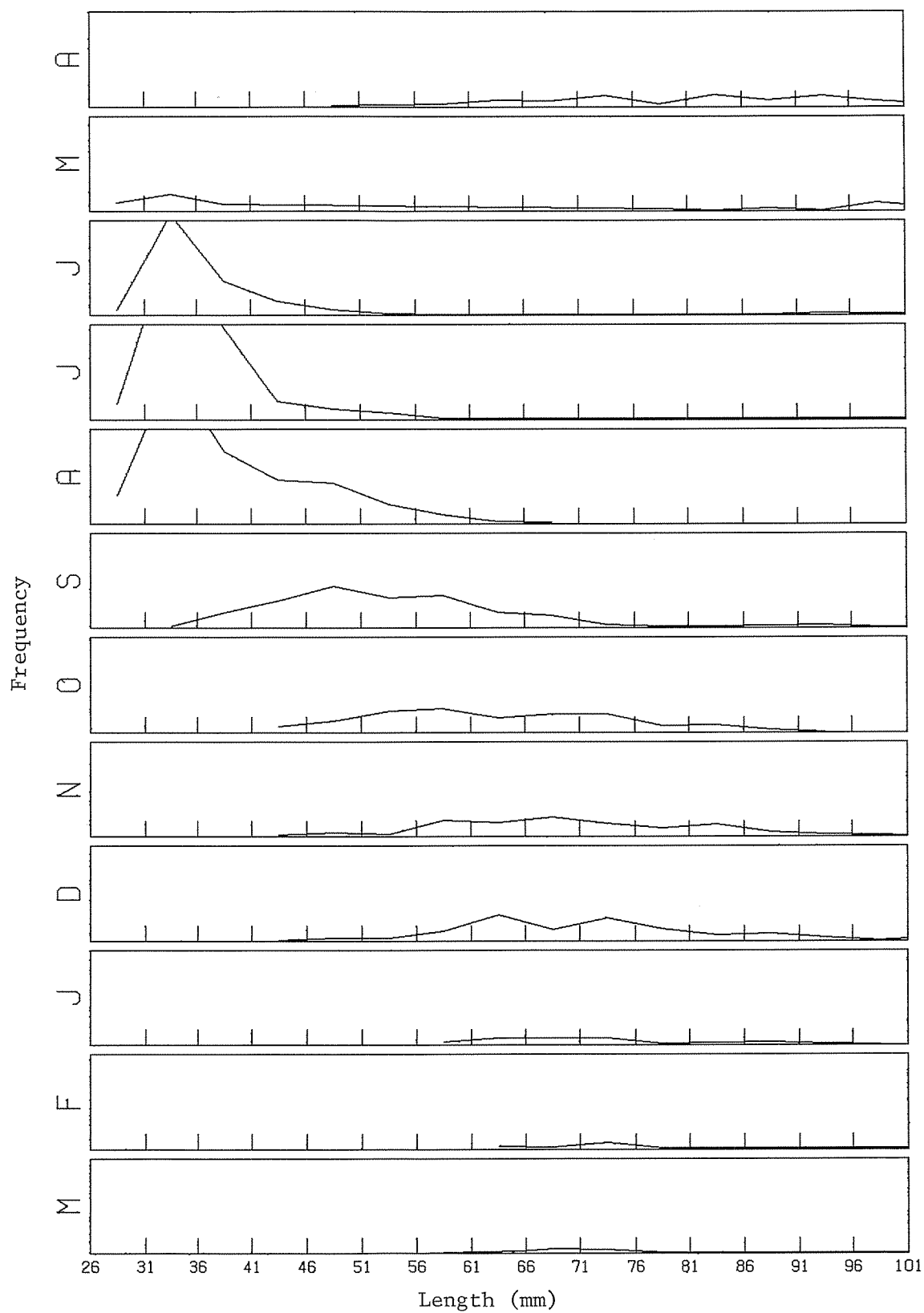


Figure 11. Length frequency of age 0 rainbow-steelhead fry.

to have continued until about May 30. The catch data are difficult to interpret because of the possible presence of hatchery-reared fish.

Emergent-sized chum (31-35 mm) were present during April-June 21. Four of the seven chum fry caught on June 20-21 were emergent size including one with a visible yolk sac. The emergence of chum therefore continued until about June 21, although catches in the latter half of June were very small.

Emergent-sized rainbow-steelhead (26-30 mm) were present during May-August 16. Five percent of the August 14-16 rainbow steelhead catch consisted of emergent-sized fry. The emergence of rainbow-steelhead is assumed to have terminated about August 9. Catches peaked in July, indicating a buildup of emerging fry.

#### Growth of Fry

Growth rates are not discernable in the length frequencies of the electrofisher catches because emergent fry of each species were recruited continuously into the catch during the extensive emergence periods while larger individuals tended to move away from the shoreline or out of the main stem. The length frequencies in Figs. 8-11, reflect these effects in varying degrees for all species. The pattern of size increment for rainbow-steelhead was more regular than for the other species. Once the emergence of rainbow-steelhead was completed the monthly frequency modes showed a steady size increment through the fall and little or no increment during the winter, which suggests that the composition of the population sampled was relatively stable during this period.

#### SUMMARY AND CONCLUSIONS

A study was conducted from April 1979, through March 1980 in the 41-mile reach of the Nisqually River below the LaGrande power dam to provide information on the distribution, habitat preference, relative abundance, emergence period, and period of residence of juvenile chinook, coho, chum, and rainbow-steelhead. Of particular interest was the 13.6 mile section from which water is diverted (Yelm River) between river miles 26.2 and 12.6. The salmonids populations were sampled at 2 sites in the Yelm Reach and at one site each above and below the Yelm Reach by means of backpack electrofisher. Beach seine sampling was conducted at sites 1 and 4 from August-December and in March.

Chinook began emerging in February, earliest of the four species, and reached peak abundance along the shoreline during early May. Emergent-sized chinook were present as late as July 5. Fry began leaving the shoreline after mid-May and moved into pools at midstream where they remained in abundance until high winter flows eliminated the pools. The period of dependence on shoreline habitat appeared to end after July. Chinook fry occurred in greater numbers inside the Yelm Reach.

Coho fry of hatchery or wild origin were present at the shoreline during April-December. Peak abundance occurred during mid to late May. Emergence apparently continued until about May 30. Coho, like chinook, tended to move offshore into pool habitat during August and September. After September coho left the main stem and probably moved into lateral streams. Coho reappeared in the main stem as age I smolts during April-June. Recently emerged coho fry were most abundant inside the Yelm Reach. Coho strongly preferred bank habitat to bar habitat during their residence in the main stem.

Chum fry were present from April 10-July 5 and reached peak abundance on May 20. Chum fry were distributed primarily at station 1 (75%), secondarily at station 2 (23%), in very small numbers at station 3 (2%) and not at all at station 4. This distribution reflects the distribution of spawning which occurs largely below the Yelm Reach. Chums showed little preference in selection of bank vs. bar habitat, which is logical in view of their relatively direct migration downstream.

Rainbow-steelhead began emerging in May, reached peak abundance along the shoreline during July, and thereafter declined slowly. Emergence may have continued until about August 9. During the summer and fall the fry showed no preference for either bank or bar habitat but during winter when high flows forced the remaining fry to the shoreline they occurred along the banks.

APPENDICES

Appendix Table 1. Salmonids caught by electrofisher.

Date	Location	Timer	Age 0				Age I	
			Chin	Coho	Chum	Rb-Sh	Coho	Rb-Sh
4-10	1 bank bar	337	3		2			5
		413	14		1			
	2 bank bar	188	13		1			24
		599	78		1			6
4-11	3 bank bar	378	21	20				4
		333	29	3				
	4 bank bar	324	5					2
		374	2					1
4-26	1 bank bar	641	25	17	14	2		1
		396	19	9	14			1
	2 bank bar	693	46	40	2		6	29
		500	1		4			
4-24	3 bank bar	427	33	10	1			1
		164	3	7				
	4 bank bar	572	6	9			1	9
		229	7		1			3
5-10	1 bank bar	843	62	39	38	2		1
		354	13	4	15			
5-8	2 bank 3 bank bar	330	20	20	2		1	5
		476	68	84				
		167	3	4				
5-10	4 bank bar	382		10			2	4
		444	24	17		1		1
5-24	1 bank bar	957	16	19	69	20		1
		221	5		1	2		
	2 bank bar	583	39	101	9	1	3	23
		346	5	5	12	1		
5-22	3 bank bar	525	48	104				
		284	16	1	1	5		
	4 bank bar	658	16	68			1	3
		619	23	28		2		

Appendix Table 1. Salmonids caught by electrofisher - continued.

Date	Location	Timer	Age 0				Age I	
			Chin	Coho	Chum	Rb-Sh	Coho	Rb-Sh
6-5	1 bank bar	614	3	14	18	15		
		397	1	1		11		
	2 bank bar	680	20	134	6	59	3	10
		546	4		15	129		
6-6	3 bank bar	536	65	84		11		
		475	21			50		
	4 bank bar	710	24	42			1	
		621	6	8		2		
6-21	1 bank bar	828		4	3	65		
		328				14		
	2 bank bar	465	14	59		51		6
		241			1	110		
6-20	3 bank bar	720	71	134	3	58		
		471	5			96		
	4 bank bar	977	14	73		33		1
		801	12	6		42		
7-3	1 bank bar	1127				178		
		524			1	121		
7-5	2 bank bar	307				201		2
		577	3	55		104		
	3 bank bar	612	17	44		356		
		489				178		
7-3	4 bank bar	886	4	22		143		
		985	12	3		271		
7-19	1 bank bar	732				258		
		127				14		
	2 bank bar	482		30		286		
		245				144		
7-17	3 bank bar	514	4	11		229		
		-				76		

Appendix Table 1. Salmonids caught by electrofisher - continued.

Date	Location	Timer	Age 0				Age I	
			Chin	Coho	Chum	Rb-Sh	Coho	Rb-Sh
7-17	4 bank bar	717	2	16		222		
		850	1	1		257		
	4 bank bar	717	2	16		222		
		850	1	1		257		
8-1	1 bank bar	948				106		
		522				25		
	2 bank bar	590		16		175		
		232				102		
8-2	3 bank bar	559		6		232		
		336				52		
	4 bank bar	709		15		151		
		945				240		
9-11	1 bank bar	515	3	2		28		
		355	1			35		
	2 bank bar	665	1	12		97		
		467				66		
9-12	3 bank bar	301		2		33		
		687		1		61		
	4 bank bar	1077		21		34		
		816	5			85		
10-8	1 bank bar	262				13		
		175	1			15		
	2 bank bar	368	5	12		41		
		223		1		23		
	3 bank bar	91	1	1		9		
		185				2		
	4 bank bar	281	2	22		38		
		289	1			44		
11-13	1 bank bar	329				7		
		155	1			22		

Appendix Table 1. Salmonids caught by electrofisher - continued.

Date	Location	Timer	Age 0				Age I	
			Chin	Coho	Chum	Rb-Sh	Coho	Rb-Sh
11-13	2 bank	408	4	22		73		2
	bar	213				8		
	3 bank			2		8		
	bar	171				6		
	4 bank	448		32		60		
	bar		1			16		
12-10	1 bank	272	3			6		1
	bar	220	7			14		
	2 bank	300	10	1		36		1
	bar	157				2		1
	3 bank	118				10		2
	bar	235				9		
	4 bank	535	6	21		45		2
	bar	220	1	2		24		
1-15	1 bank	214				7		
	2 bank	136	4			3		
	3 bank	84		1		4		
	bar	150				2		
	4 bank	290	9	2		23		
	bar	193	1			4		
2-12	1 bank	245	2			10		
	bar	151	1					
	2 bank	160				2		
	3 bank	92	1			2		
	bar	111	1					
	4 bank	246	3			2		
	bar	130				1		

Appendix Table 1. Salmonids caught by electrofisher - continued.

Date	Location	Timer	Age 0				Age I	
			Chin	Coho	Chum	Rb-Sh	Coho	Rb-Sh
3-19	1 bank bar	297	2			1		
		215	7					
	2 bank	159	2					
	3 bank bar	96				3		
		162	3					
	4 bank bar	317	6			13		1
		171	5					

Appendix Table 2. Salmonids caught by beach seine.

Date	Location	Age 0			Age I	
		Chin	Coho	Rb-Sh	Rb-Sh	Chin
8-15	Site 1: Set 1	400	1	167	1	
	Set 2 <sup>a</sup>	31		71		
	Site 3 <sup>a</sup>	7		62		
	Site 4	89	38	31		
9-13	Site 1	299		67	6	
	Site 4	178	77	14		
10-9	Site 1	88		26	4	
	Site 4	189	18	22		
11-6	Site 1	55		40		
	Site 4	174	6	35		
12-7	Site 1	67		15	2	
	Site 3	121		14	1	
	Site 4	143		19	7	
3-10	Site 1	2				
	Site 4	12				1

<sup>a</sup>Not included in analysis.

Appendix Tables 3-6. Mean length, mean weight, and condition factor for age 0 chinook, coho, chum, and rainbow-steelhead. Samples grouped by month:  
Sample groups 1-3 = January-March 1980 samples.  
Sample groups 4-12 = April-December 1979 samples.  
Length groups are by 5-mm intervals: Length group 26 = 26-30 mm, length group 31 = 31-35 mm, etc.

Appendix Table 3. Mean length, mean weight, and condition factor of age 0 chinook by 5 mm length group.

SAMPLE LENGTH GROUP	MEAN LENGTH			MEAN WEIGHT (G)			CONDITION FACTOR G.5/MM. <sup>3</sup>			SAMPLE LENGTH GROUP	MEAN LENGTH			MEAN WEIGHT (G)			CONDITION FACTOR G.5/MM. <sup>3</sup>			
	FREQ	LENGTH (MM)	FREQ	LENGTH (MM)	FREQ	WEIGHT (G)	FREQ	LENGTH (MM)	FREQ		LENGTH (MM)	FREQ	WEIGHT (G)	FREQ	LENGTH (MM)	FREQ	WEIGHT (G)	FREQ	LENGTH (MM)	FREQ
1	26	0	0	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0
	31	0	0	0	35.0	1	0	.93	31	0	0	0	0	0	0	0	0	0	0	0
	36	0	0	0	39.3	64	0	.48	36	0	0	0	0	0	0	0	0	0	0	0
	41	0	0	0	42.5	90	0	.65	41	0	0	0	0	0	0	0	0	0	0	0
	46	0	0	0	47.4	21	0	.85	46	0	0	0	0	0	0	0	0	0	0	0
	51	0	0	0	53.8	6	0	1.08	51	0	0	0	0	0	0	0	0	0	0	0
	56	0	0	0	57.9	14	0	1.05	56	0	0	0	0	0	0	0	0	0	0	0
	61	1	2.99	0	64.0	1	1.14	1.31	61	5	62.4	2.76	1.14	65	1	70.0	3.88	1.13	0	0
	66	1	3.10	0	67.0	1	1.03	1.31	66	1	70.0	4.51	1.31	71	0	0	0	0	0	0
	71	2	4.82	0	73.0	2	1.24	1.17	71	0	0	0	0	76	2	78.0	5.63	1.19	0	0
	76	1	5.41	0	76.0	1	1.23	1.17	76	0	0	0	0	81	2	82.0	6.47	1.17	0	0
	81	6	6.04	0	83.2	6	1.05	1.22	81	0	0	0	0	86	2	85.5	8.73	1.22	0	0
	86	3	7.44	0	88.7	3	1.07	1.22	86	0	0	0	0	91	2	93.5	9.54	1.22	0	0
	91	0	0	0	0	0	0	0	91	0	0	0	0	96	0	0	0	0	0	0
	96	0	0	0	0	0	0	0	96	0	0	0	0	0	0	0	0	0	0	0
2	26	0	0	0	0	0	0	0	26	0	0	0	0	26	0	0	0	0	0	0
	31	0	0	0	38.0	1	.73	.78	31	0	0	0	0	31	0	0	0	0	0	0
	36	1	.40	0	39.3	35	.48	.88	36	0	0	0	0	36	0	0	0	0	0	0
	41	1	.47	0	42.0	41	.69	1.03	41	0	0	0	0	41	0	0	0	0	0	0
	46	0	0	0	48.4	15	1.17	1.22	46	0	0	0	0	46	0	0	0	0	0	0
	51	0	0	0	53.2	9	1.83	1.22	51	0	0	0	0	51	0	0	0	0	0	0
	56	0	0	0	57.8	6	2.36	1.22	56	0	0	0	0	56	0	0	0	0	0	0
	61	0	0	0	63.7	3	3.33	1.29	61	0	0	0	0	61	0	0	0	0	0	0
	66	0	0	0	67.5	6	4.03	1.31	66	0	0	0	0	66	0	0	0	0	0	0
	71	2	3.82	0	73.5	71	0	0	71	0	0	0	0	71	3	71.7	3.90	1.06	0	0
	76	2	4.40	0	76.5	76	0	0	76	0	0	0	0	76	3	79.0	5.39	1.09	0	0
	81	1	5.47	0	81.0	81	1	1.03	81	0	0	0	0	81	2	83.5	6.83	1.17	0	0
	86	1	6.28	0	87.0	86	0	0	86	0	0	0	0	86	1	89.0	8.85	1.26	0	0
	91	0	0	0	0	0	0	0	91	0	0	0	0	91	0	0	0	0	0	0
	96	0	0	0	0	0	0	0	96	0	0	0	0	96	0	0	0	0	0	0
3	26	0	0	0	0	0	0	0	26	0	0	0	0	26	0	0	0	0	0	0
	31	0	0	0	35.3	9	.48	.82	31	0	0	0	0	31	0	0	0	0	0	0
	36	9	.59	0	42.1	15	.79	1.18	36	13	39.0	.49	.82	36	0	0	0	0	0	0
	41	0	0	0	47.8	4	1.21	1.08	41	16	43.2	.73	.51	41	0	0	0	0	0	0
	46	0	0	0	51.0	7	1.21	1.08	46	6	47.0	1.23	1.18	46	0	0	0	0	0	0
	51	1	1.21	0	57.0	1	1.79	.97	51	7	52.1	1.53	1.08	51	0	0	0	0	0	0
	56	0	0	0	0	0	0	0	56	1	57.0	1.79	.97	56	0	0	0	0	0	0
	61	0	0	0	0	0	0	0	61	0	0	0	0	61	0	0	0	0	0	0
	66	0	0	0	0	0	0	0	66	0	0	0	0	66	0	0	0	0	0	0
	71	0	0	0	0	0	0	0	71	0	0	0	0	71	1	73.0	4.20	1.08	0	0
	76	0	0	0	0	0	0	0	76	0	0	0	0	76	1	76.0	5.15	1.17	0	0
	81	0	0	0	0	0	0	0	81	0	0	0	0	81	2	82.0	6.23	1.13	0	0
	86	0	0	0	0	0	0	0	86	0	0	0	0	86	2	87.5	7.05	1.05	0	0
	91	0	0	0	0	0	0	0	91	0	0	0	0	91	0	0	0	0	0	0
	96	0	0	0	0	0	0	0	96	0	0	0	0	96	0	0	0	0	0	0
4	26	0	0	0	0	0	0	0	26	0	0	0	0	26	0	0	0	0	0	0
	31	0	0	0	39.0	50	.49	.83	31	0	0	0	0	31	0	0	0	0	0	0
	36	42	1.11	0	47.8	42	1.11	1.01	36	0	0	0	0	36	0	0	0	0	0	0
	41	11	1.55	0	52.6	11	1.55	1.06	41	0	0	0	0	41	0	0	0	0	0	0
	46	0	0	0	0	0	0	0	46	0	0	0	0	46	0	0	0	0	0	0
	51	0	0	0	0	0	0	0	51	0	0	0	0	51	0	0	0	0	0	0
	56	0	0	0	0	0	0	0	56	0	0	0	0	56	1	56.0	2.54	1.45	0	0
	61	0	0	0	0	0	0	0	61	0	0	0	0	61	1	62.0	2.95	1.24	0	0
	66	0	0	0	0	0	0	0	66	0	0	0	0	66	0	0	0	0	0	0
	71	0	0	0	0	0	0	0	71	0	0	0	0	71	11	72.6	4.31	1.12	0	0
	76	0	0	0	0	0	0	0	76	0	0	0	0	76	13	77.5	5.29	1.14	0	0
	81	0	0	0	0	0	0	0	81	0	0	0	0	81	6	82.0	6.21	1.13	0	0
	86	0	0	0	0	0	0	0	86	0	0	0	0	86	1	85.0	7.84	1.11	0	0
	91	0	0	0	0	0	0	0	91	0	0	0	0	91	0	0	0	0	0	0
	96	0	0	0	0	0	0	0	96	0	0	0	0	96	0	0	0	0	0	0

Appendix Table 4. Mean length, mean weight, and condition factor of age 0 coho by 5 mm length group.

1				4				5				6				7			
SAMPLE GROUP	LENGTH	FREQ	CONDIT	SAMPLE GROUP	LENGTH	FREQ	CONDIT	SAMPLE GROUP	LENGTH	FREQ	CONDIT	SAMPLE GROUP	LENGTH	FREQ	CONDIT	SAMPLE GROUP	LENGTH	FREQ	CONDIT
GROUP	(MM)		(G./MM. <sup>3</sup> )	GROUP	(MM)		(G./MM. <sup>3</sup> )	GROUP	(MM)		(G./MM. <sup>3</sup> )	GROUP	(MM)		(G./MM. <sup>3</sup> )	GROUP	(MM)		(G./MM. <sup>3</sup> )
26	0	0	0	26	0	0	0	26	0	0	0	26	0	0	0	26	0	0	0
31	0	0	0	31	0	0	0	31	0	0	0	31	0	0	0	31	0	0	0
36	0	0	0	36	0	0	0	36	0	0	0	36	0	0	0	36	0	0	0
41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0
46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0
51	0	0	0	51	0	0	0	51	0	0	0	51	0	0	0	51	0	0	0
56	3	55.3	2.54	56	3	59.3	.67	56	3	59.3	.67	56	3	59.3	.67	56	3	59.3	.67
61	7	62.6	2.64	61	7	64.6	2.08	61	7	64.6	2.08	61	7	64.6	2.08	61	7	64.6	2.08
66	7	67.6	3.62	66	6	67.3	2.31	66	6	67.3	2.31	66	6	67.3	2.31	66	6	67.3	2.31
71	7	73.4	4.36	71	12	73.9	1.71	71	12	73.9	1.71	71	12	73.9	1.71	71	12	73.9	1.71
76	2	77.5	5.68	76	3	78.0	2.07	76	3	78.0	2.07	76	3	78.0	2.07	76	3	78.0	2.07
81	0	0	0	81	13	83.1	1.54	81	13	83.1	1.54	81	13	83.1	1.54	81	13	83.1	1.54
86	3	89.7	6.08	86	7	87.7	2.58	86	7	87.7	2.58	86	7	87.7	2.58	86	7	87.7	2.58
91	2	93.5	8.39	91	12	93.5	1.51	91	12	93.5	1.51	91	12	93.5	1.51	91	12	93.5	1.51
96	1	98.0	9.82	96	6	97.8	1.84	96	6	97.8	1.84	96	6	97.8	1.84	96	6	97.8	1.84
101	0	0	0	101	3	102.3	0	101	3	102.3	0	101	3	102.3	0	101	3	102.3	0
106	0	0	0	106	4	106.7	2.29	106	4	106.7	2.29	106	4	106.7	2.29	106	4	106.7	2.29
111	0	0	0	111	4	113.8	7.80	111	4	113.8	7.80	111	4	113.8	7.80	111	4	113.8	7.80
116	0	0	0	116	2	120.0	0	116	2	120.0	0	116	2	120.0	0	116	2	120.0	0
121	0	0	0	121	1	123.0	0	121	1	123.0	0	121	1	123.0	0	121	1	123.0	0
126	0	0	0	126	0	0	0	126	0	0	0	126	0	0	0	126	0	0	0
131	0	0	0	131	1	132.0	0	131	1	132.0	0	131	1	132.0	0	131	1	132.0	0
136	0	0	0	136	1	139.0	0	136	1	139.0	0	136	1	139.0	0	136	1	139.0	0
141	0	0	0	141	1	143.0	0	141	1	143.0	0	141	1	143.0	0	141	1	143.0	0
146	0	0	0	146	2	148.0	0	146	2	148.0	0	146	2	148.0	0	146	2	148.0	0
151	3	62.7	2.32	151	0	0	0	151	0	0	0	151	0	0	0	151	0	0	0
156	2	67.5	3.26	156	0	0	0	156	0	0	0	156	0	0	0	156	0	0	0
161	7	72.6	3.58	161	0	0	0	161	0	0	0	161	0	0	0	161	0	0	0
166	1	76.0	3.95	166	0	0	0	166	0	0	0	166	0	0	0	166	0	0	0
171	1	82.0	4.92	171	1	173.0	0	171	1	173.0	0	171	1	173.0	0	171	1	173.0	0
176	1	95.0	7.22	176	1	177.0	0	176	1	177.0	0	176	1	177.0	0	176	1	177.0	0
181	0	0	0	181	0	0	0	181	0	0	0	181	0	0	0	181	0	0	0
186	0	0	0	186	0	0	0	186	0	0	0	186	0	0	0	186	0	0	0
191	0	0	0	191	0	0	0	191	0	0	0	191	0	0	0	191	0	0	0
196	0	0	0	196	0	0	0	196	0	0	0	196	0	0	0	196	0	0	0
201	0	0	0	201	0	0	0	201	0	0	0	201	0	0	0	201	0	0	0
206	0	0	0	206	0	0	0	206	0	0	0	206	0	0	0	206	0	0	0
211	0	0	0	211	0	0	0	211	0	0	0	211	0	0	0	211	0	0	0
216	0	0	0	216	0	0	0	216	0	0	0	216	0	0	0	216	0	0	0
221	0	0	0	221	0	0	0	221	0	0	0	221	0	0	0	221	0	0	0
226	0	0	0	226	0	0	0	226	0	0	0	226	0	0	0	226	0	0	0
231	0	0	0	231	0	0	0	231	0	0	0	231	0	0	0	231	0	0	0
236	0	0	0	236	0	0	0	236	0	0	0	236	0	0	0	236	0	0	0
241	0	0	0	241	0	0	0	241	0	0	0	241	0	0	0	241	0	0	0
246	0	0	0	246	0	0	0	246	0	0	0	246	0	0	0	246	0	0	0
251	0	0	0	251	0	0	0	251	0	0	0	251	0	0	0	251	0	0	0
256	1	60.0	2.00	256	3	85.0	0	256	3	85.0	0	256	3	85.0	0	256	3	85.0	0
261	2	62.0	2.48	261	1	91.0	0	261	1	91.0	0	261	1	91.0	0	261	1	91.0	0
266	5	67.2	3.30	266	9	98.3	0	266	9	98.3	0	266	9	98.3	0	266	9	98.3	0
271	4	72.0	4.07	271	4	102.0	0	271	4	102.0	0	271	4	102.0	0	271	4	102.0	0
276	1	84.0	5.56	276	1	107.0	0	276	1	107.0	0	276	1	107.0	0	276	1	107.0	0
281	0	0	0	281	3	112.3	0	281	3	112.3	0	281	3	112.3	0	281	3	112.3	0
286	0	0	0	286	4	116.6	0	286	4	116.6	0	286	4	116.6	0	286	4	116.6	0
291	1	92.0	8.79	291	1	122.0	0	291	1	122.0	0	291	1	122.0	0	291	1	122.0	0
296	0	0	0	296	0	0	0	296	0	0	0	296	0	0	0	296	0	0	0

Appendix Table 5. Mean length, mean weight, and condition factor of age 0 chum by 5 mm length group.

SAMPLE LENGTH GROUP	FREQ.	MEAN		MEAN CONDITION FACTOR	SAMPLE LENGTH GROUP	FREQ.	MEAN		MEAN CONDITION FACTOR
		LENGTH (MM)	WEIGHT (G)				LENGTH (MM)	WEIGHT (G)	
1	26	0	0	0	5	26	0	0	0
	31	0	0	0		31	27	34.4	.32
	36	0	0	0		36	113	37.9	.48
	41	0	0	0		41	42	42.3	.72
	46	0	0	0		46	9	47.7	1.23
	51	0	0	0		51	2	53.0	1.81
	56	0	0	0		56	0	0	0
	61	0	0	0		61	0	0	0
	66	0	0	0		66	0	0	0
	71	1	74.0	3.98		71	0	0	0
	76	0	0	0		76	0	0	0
	81	0	0	0		81	0	0	0
	86	1	87.0	7.21		86	0	0	0
	91	0	0	0		91	1	92.0	0
	96	0	0	0		96	2	97.5	0
	101	0	0	0		101	2	104.5	0
	106	1	108.0	10.27		106	2	107.0	0
	111	0	0	0		111	0	0	0
	116	0	0	0		116	0	0	0
2	26	0	0	0	6	26	0	0	0
	31	0	0	0		31	15	34.5	.33
	36	0	0	0		36	72	38.1	.48
	41	0	0	0		41	38	43.2	.89
	46	0	0	0		46	30	48.4	1.24
	51	0	0	0		51	9	52.7	1.77
	56	0	0	0		56	7	58.3	2.23
	61	0	0	0		61	4	62.8	3.29
	66	0	0	0		66	5	67.2	2.96
	71	0	0	0		71	1	71.0	4.09
	76	0	0	0		76	0	0	0
	81	0	0	0		81	0	0	0
	86	0	0	0		86	0	0	0
	91	0	0	0		91	0	0	0
	96	0	0	0		96	0	0	0
	101	0	0	0		101	0	0	0
	106	0	0	0		106	0	0	0
	111	0	0	0		111	0	0	0
	116	0	0	0		116	0	0	0
3	26	0	0	0	7	26	0	0	0
	31	0	0	0		31	11	33.5	.32
	36	0	0	0		36	6	38.9	.57
	41	0	0	0		41	10	42.9	.91
	46	0	0	0		46	13	47.8	1.45
	51	0	0	0		51	11	53.5	1.53
	56	0	0	0		56	14	57.5	2.39
	61	0	0	0		61	7	63.3	3.26
	66	0	0	0		66	7	69.0	4.33
	71	0	0	0		71	3	72.3	4.43
	76	0	0	0		76	3	78.7	5.93
	81	0	0	0		81	0	0	0
	86	0	0	0		86	0	0	0
	91	0	0	0		91	0	0	0
	96	0	0	0		96	0	0	0
	101	0	0	0		101	0	0	0
	106	0	0	0		106	0	0	0
	111	0	0	0		111	0	0	0
	116	0	0	0		116	0	0	0
4	26	0	0	0	7	26	0	0	0
	31	13	34.2	.33		31	11	33.5	.32
	36	54	37.9	.44		36	6	38.9	.57
	41	5	42.0	.73		41	10	42.9	.91
	46	0	0	0		46	13	47.8	1.45
	51	0	0	0		51	11	53.5	1.53
	56	0	0	0		56	14	57.5	2.39
	61	0	0	0		61	7	63.3	3.26
	66	0	0	0		66	7	69.0	4.33
	71	0	0	0		71	3	72.3	4.43
	76	0	0	0		76	3	78.7	5.93
	81	0	0	0		81	0	0	0
	86	0	0	0		86	0	0	0
	91	0	0	0		91	0	0	0
	96	0	0	0		96	0	0	0
	101	0	0	0		101	0	0	0
	106	0	0	0		106	0	0	0
	111	0	0	0		111	0	0	0
	116	0	0	0		116	0	0	0



Appendix Table 6. Mean length, mean weight, and condition factor of age 0 rainbow-steelhead by 5 mm length group.

4			5			6			7			8					
SAMPLE GROUP	LENGTH (MM)	FREQ	MEAN LENGTH (MM)	MEAN WEIGHT (G)	CONDITION FACTOR G..5/MM..3	SAMPLE GROUP	LENGTH (MM)	FREQ	MEAN LENGTH (MM)	MEAN WEIGHT (G)	CONDITION FACTOR G..5/MM..3	SAMPLE GROUP	LENGTH (MM)	FREQ	MEAN LENGTH (MM)	MEAN WEIGHT (G)	CONDITION FACTOR G..5/MM..3
26	0	0	0	0	0	26	0	0	0	0	0	26	0	0	0	0	0
31	4	4	34.8	.29	.69	31	4	4	34.5	.26	.65	31	0	0	0	0	0
36	56	56	38.3	.40	.72	36	53	53	38.0	.38	.69	36	0	0	0	0	0
41	2	2	41.5	.49	.69	41	16	16	42.6	.65	.84	41	0	0	0	0	0
46	0	0	0	0	0	46	1	1	46.0	.76	.78	46	0	0	0	0	0
51	0	0	0	0	0	51	0	0	0	0	0	51	0	0	0	0	0
56	0	0	0	0	0	56	0	0	0	0	0	56	0	0	0	0	0
61	0	0	0	0	0	61	0	0	0	0	0	61	0	0	0	0	0
66	0	0	0	0	0	66	0	0	0	0	0	66	0	0	0	0	0
71	0	0	0	0	0	71	0	0	0	0	0	71	0	0	0	0	0
76	0	0	0	0	0	76	0	0	0	0	0	76	0	0	0	0	0
81	0	0	0	0	0	81	0	0	0	0	0	81	0	0	0	0	0
86	0	0	0	0	0	86	0	0	0	0	0	86	0	0	0	0	0
91	0	0	0	0	0	91	0	0	0	0	0	91	0	0	0	0	0
96	0	0	0	0	0	96	0	0	0	0	0	96	0	0	0	0	0
26	0	0	0	0	0	26	0	0	0	0	0	26	0	0	0	0	0
31	4	4	34.8	.29	.69	31	4	4	34.5	.26	.65	31	0	0	0	0	0
36	56	56	38.3	.40	.72	36	53	53	38.0	.38	.69	36	0	0	0	0	0
41	2	2	41.5	.49	.69	41	16	16	42.6	.65	.84	41	0	0	0	0	0
46	0	0	0	0	0	46	1	1	46.0	.76	.78	46	0	0	0	0	0
51	0	0	0	0	0	51	0	0	0	0	0	51	0	0	0	0	0
56	0	0	0	0	0	56	0	0	0	0	0	56	0	0	0	0	0
61	0	0	0	0	0	61	0	0	0	0	0	61	0	0	0	0	0
66	0	0	0	0	0	66	0	0	0	0	0	66	0	0	0	0	0
71	0	0	0	0	0	71	0	0	0	0	0	71	0	0	0	0	0
76	0	0	0	0	0	76	0	0	0	0	0	76	0	0	0	0	0
81	0	0	0	0	0	81	0	0	0	0	0	81	0	0	0	0	0
86	0	0	0	0	0	86	0	0	0	0	0	86	0	0	0	0	0
91	0	0	0	0	0	91	0	0	0	0	0	91	0	0	0	0	0
96	0	0	0	0	0	96	0	0	0	0	0	96	0	0	0	0	0
26	0	0	0	0	0	26	0	0	0	0	0	26	0	0	0	0	0
31	6	6	34.3	.27	.68	31	6	6	34.3	.27	.68	31	0	0	0	0	0
36	16	16	38.1	.27	.67	36	16	16	38.1	.27	.67	36	0	0	0	0	0
41	2	2	43.0	.58	.73	41	2	2	43.0	.58	.73	41	0	0	0	0	0
46	1	1	50.0	1.14	.91	46	1	1	50.0	1.14	.91	46	0	0	0	0	0
51	2	2	51.5	1.88	1.57	51	2	2	51.5	1.88	1.57	51	0	0	0	0	0
56	1	1	57.0	1.69	.91	56	1	1	57.0	1.69	.91	56	0	0	0	0	0
61	0	0	0	0	0	61	0	0	0	0	0	61	0	0	0	0	0
66	0	0	0	0	0	66	0	0	0	0	0	66	0	0	0	0	0
71	0	0	0	0	0	71	0	0	0	0	0	71	0	0	0	0	0
76	0	0	0	0	0	76	0	0	0	0	0	76	0	0	0	0	0
81	0	0	0	0	0	81	0	0	0	0	0	81	0	0	0	0	0
86	0	0	0	0	0	86	0	0	0	0	0	86	0	0	0	0	0
91	0	0	0	0	0	91	0	0	0	0	0	91	0	0	0	0	0
96	0	0	0	0	0	96	0	0	0	0	0	96	0	0	0	0	0

Appendix Table 6, continued

SAMPLE LENGTH GROUP		FREQ	MEAN LENGTH (MM)	MEAN WEIGHT (G)	CONDITION FACTOR
9					
26	0	0	0	0	0
31	2	33.5	.52	1.38	0
36	17	38.3	.45	.80	0
41	29	43.3	.78	.96	0
46	44	48.4	1.24	1.10	0
51	32	53.4	1.60	1.05	0
56	34	57.9	2.14	1.10	0
61	17	62.9	2.74	1.10	0
66	13	67.8	3.46	1.17	0
71	4	73.0	4.21	1.08	0
76	2	76.0	4.74	1.08	0
81	2	83.0	6.32	1.11	0
86	0	0	0	0	0
91	4	92.8	8.35	1.05	0
96	1	99.0	10.18	1.05	0
101	1	103.0	11.92	1.09	0
106	0	0	0	0	0
111	0	0	0	0	0
116	0	0	0	0	0
10					
26	0	0	0	0	0
31	0	0	0	0	0
36	0	0	0	0	0
41	6	43.7	1.03	1.24	0
46	12	48.3	1.28	1.23	0
51	23	53.4	1.84	1.20	0
56	25	58.2	2.39	1.21	0
61	15	62.9	2.98	1.20	0
66	19	67.8	3.68	1.18	0
71	19	73.2	4.57	1.17	0
76	7	78.6	5.90	1.22	0
81	8	83.0	6.76	1.18	0
86	3	87.3	7.44	1.12	0
91	1	93.0	8.86	1.10	0
96	0	0	0	0	0
11					
26	0	0	0	0	0
31	0	0	0	0	0
36	0	0	0	0	0
41	2	44.5	.98	1.11	0
46	4	49.8	1.38	1.12	0
51	3	52.3	1.61	1.12	0
56	17	58.3	2.34	1.13	0
61	15	63.3	2.71	1.07	0
66	20	68.2	3.54	1.12	0
71	14	72.8	4.11	1.07	0
76	9	77.7	4.50	1.05	0
81	13	82.0	5.82	1.05	0
86	5	87.2	6.87	1.04	0
91	3	92.0	8.99	1.15	0
96	2	98.0	9.99	1.06	0
101	1	103.0	11.19	1.02	0
106	0	0	0	0	0
12					
26	0	0	0	0	0
31	0	0	0	0	0
36	0	0	0	0	0
41	1	43.0	1.04	1.31	0
46	3	47.3	1.44	1.36	0
51	3	52.7	1.83	1.25	0
56	10	57.8	2.41	1.25	0
61	27	62.6	3.02	1.23	0
66	12	67.2	3.91	1.29	0
71	24	72.0	4.20	1.13	0
76	13	76.5	5.60	1.25	0
81	6	82.3	6.59	1.18	0
86	8	88.5	8.24	1.21	0
91	4	92.8	9.35	1.17	0
96	1	100.0	11.38	1.14	0
101	3	103.0	12.47	1.14	0
106	0	0	0	0	0
111	0	0	0	0	0
116	0	0	0	0	0
121	0	0	0	0	0
126	0	0	0	0	0
131	0	0	0	0	0
136	0	0	0	0	0
141	0	0	0	0	0
146	0	0	0	0	0
151	0	0	0	0	0
156	0	0	0	0	0
161	1	165.0	0	0	0
166	0	0	0	0	0
171	0	0	0	0	0
176	1	177.0	0	0	0
181	1	183.0	0	0	0
186	1	190.0	0	0	0
191	0	0	0	0	0
196	0	0	0	0	0
201	0	0	0	0	0
206	0	0	0	0	0
211	0	0	0	0	0
216	0	0	0	0	0
221	0	0	0	0	0
226	0	0	0	0	0
231	0	0	0	0	0
236	0	0	0	0	0
241	0	0	0	0	0
246	1	250.0	0	0	0
251	0	0	0	0	0