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INTRODUCTION

The Skagit River (Figure 1) is the largest river in the Puget Sound Basin (Figure 2). The Skagit River originates in British Columbia, flows in a southwesterly direction, and enters Ross Lake near the Canadian border. Ross Lake is formed by Ross Dam, the uppermost of three Seattle City Light Company hydroelectric dams on the mainstem Skagit River. Below Ross Dam the Skagit River flows through the reservoirs of Diablo and Gorge Dams. The free-flowing Skagit continues below the Gorge powerhouse at Newhalem, a distance of 94 river miles (RM) from its point of entry into Skagit Bay. Major tributaries entering the Skagit River below the Gorge powerhouse include the Cascade River at Marblemount, the Sauk River below Rockport, and the Baker River at Concrete. Puget Sound Power & Light Company operates two hydroelectric dams on the Baker River--Upper and Lower Baker dams. Lesser tributary streams of varying size enter the Skagit throughout its length.

All five species of Pacific Salmon (coho, Onorchynchus kisutch; chinook, O. tshawytscha; chum, O. keta; pink, O. gorbushca; sockeye, O. nerka) utilize the Skagit system for spawning and rearing and contribute to the catch. There are three distinct races of chinook--spring, summer, and fall. Chinook spawn in the 71-mile section of the mainstem Sauk River between Sedro Woolley and the Gorge powerhouse, in 40 miles of the Sauk River, and in 21 miles of the Cascade River. Additional chinook spawning occurs in larger tributary streams throughout the drainage. Pink salmon spawn in the mainstem Skagit, Sauk and Cascade Rivers and tributary streams. Coho salmon utilize nearly every accessible tributary stream, and also spawn in the mainstem Skagit, Sauk, and Cascade Rivers. Chum salmon utilize the mainstem Skagit and lower sections of the Sauk and Cascade Rivers and tributary streams. Sockeye salmon production is largely dependent on artificial spawning beaches located on the Baker River, though spawning also occurs in the lake and its tributaries when the run exceeds the capacity of the artificial beaches.

Spring Chinook

The Skagit River spring chinook run begins in April, peaks in mid-May, and ends during mid-June. Spring chinook migrate into the upper Sauk, Suiattle, and Cascade Rivers as much as 3 or 4 months prior to spawning. This race utilizes spawning grounds distinct from summer and fall chinook. Spring chinook spawn in the Sauk River from RM 21 to a falls at RM 41 on the North Fork and also utilize about 2 miles of the South Fork below another barrier to upstream migration. The

miles of the main Skagit River from Sedro Woolley to Gorge powerhouse, the Sauk River from its mouth to RM 21 at Darrington, and the lower 3 miles of the Cascade River. Spawning also occurs in larger tributary streams, including the Baker River, Illabot, Diobsud, Bacon, Falls, and Goodell Creeks. Summer chinook begin spawning in mid-August and continue until early October.

Fall Chinook

Fall chinook begin to enter Skagit Bay and the Skagit River in late July, overlapping with summer chinook. Migration into the river continues through August and September, with spawning beginning in late September and continuing through October. It appears that fall chinook spawning in the mainstem Skagit River is at least partially a result of juvenile chinook releases from Skagit Hatchery. Large numbers of fall chinook, originating from Green River Hatchery stock, have been released from Skagit Hatchery into the Skagit River since 1957 (Table 1). Furthermore, low hatchery returns suggest that straying occurs (Table 2).

Age Composition

Biological data (scales, length measurements, and sex determination) have been collected from chinook harvested in the Skagit Bay commercial fishery and carcasses recovered on the spawning grounds. Scales from spawning ground carcasses are used to determine freshwater age; because of absorption, however, these scales cannot be used to determine saltwater age. Therefore, age data from the commercial catch is used primarily to reflect age composition.

Four-year-old chinook are the major contributor to the gill net catch, and from 1965 to 1972 represented 73.4% (Table 3, Figure 3). The second largest year class was 5-year-olds (16.0%), followed by 3-year-olds (9.6%). Six-year-old fish comprised only 1.1% of the catch. Because of the large-mesh gill nets used for chinook, 2- and 3-year-old chinook are not harvested at a rate proportionate to numbers returning. Length frequency data obtained from seining near Hamilton showed that 27% of the chinook caught were less than 60 cm in length, the minimum size harvested by gill nets.

Chinook age cannot be determined by length. As shown by Figure 3, there is almost complete overlap between all age classes.

August 1 when hatchery fall chinook begin entering Skagit Bay. The timing of the catch from 1935 to 1958 is typified by a bimodal curve with a depression near mid-August. Based on Samish-Bellingham Bay catches, hatchery fall chinook enter the fishery in the first week of August, the run peaks in mid-August, and is through the fishery by the second week of September. Catch distribution prior to 1958 shows that Skagit wild chinook stocks (summer) were in the Skagit Bay catch from May to mid-September and, furthermore, a substantial number were being caught after August 1, the period during which fall chinook would enter the catch.

Four-year-old fall chinook of hatchery origin first returned in 1961, and have continued through 1972. The period 1959-1966 thus includes 6 years of hatchery fall chinook returns and illustrates the impact of hatchery releases on Skagit Bay catches. During the period 1959-1966, the depression in the catch during mid-August was eliminated, probably because of catches of these hatchery fall chinook. The percentage return of hatchery fall chinook probably was not great in view of the large numbers released and the total chinook catch.

Skagit summer chinook first enter Skagit Bay in mid-June and continue through the bay until mid-September. That portion of the run entering the bay after August 1 overlaps the timing for hatchery fall chinook. Thus the summer run contains a segment which would enter the river during the same period of time as hatchery fall chinook.

OBJECTIVES

The 1973 Skagit Chinook Race Differentiation Study was comprised of two phases: adult and juvenile. Objectives of the adult study were to determine spawning distribution, abundance, and timing for summer and fall chinook, develop a method to provide separate escapement estimates for these races, and determine the impact of naturally spawning hatchery fall chinook on wild stocks. Spring chinook spawning grounds are distinctly separate from summer and fall chinook and already adequately surveyed. Therefore, more intensive surveys of spring chinook spawning grounds were not necessary. Objectives of the juvenile study were to determine spects of freshwater life history, growth and survival rates, effect of river flow fluctuations caused by releases from the dams, and fisheries contribution. Wild chinook fry were to have been coded-wire tagged to determine marine survival, migration patterns, and rate of contribution to the various fisheries.

miles per hour depending on redd density. Air speed of the fixed-wing aircraft was relatively constant, varying from 70 to 80 miles per hour, depending on direction and speed of wind. In sections of high redd density it was necessary to circle to obtain an accurate redd count.

Skagit River chinook redd counts in the 27-mile section from the mouth of the Sauk to the Gorge powerhouse were separated into two sections during the surveys on September 1, 8, and 20. During these surveys, redds were counted in the Sauk to Cascade and Cascade to Gorge powerhouse sections. Redd counts were made in five sections of the Skagit River during surveys made on October 1 and 18. The five sections were the Sauk River to Cascade River, Cascade River to Diobsud Creek, Diobsud Creek to Bacon Creek, Bacon Creek to County Line Ponds, and County Line Ponds to the Gorge powerhouse. Sauk River redd counts were made in the 7.8-mile section between the mouth of the Suiattle River and the bridge at Darrington.

Spawning ground surveys were made on the Skagit and its tributaries to collect tags and obtain biological data. All chinook carcasses which could be recovered were sexed, measured for length, and scale sampled. Females were further examined to determine egg retention.

Results

Survey method comparison

Helicopter and fixed-wing surveys were made during 1973 to determine which method produces the most accurate redd counts. Fixed-wing surveys were required for comparison with fixed-wing surveys for 1952-1972. Three surveys were made on nearly the same date, and the redd counts can be used to determine the difference between helicopter and fixed-wing counts. Because surveys were not made on identical dates, a curve was drawn showing the daily number of redds. visibile by helicopter. Fixed-wing aircraft counts for September 5, 18, and 28 were 68% of the estimated number of redds which would have been counted by helicopter (Table 5). Surveys by fixed-wing aircraft on the Sauk River on September 5 and by helicopter on September 1 and 8 showed a similar discrepancy. The fixed-wing count for September 8 (325) was 41% of the estimated helicopter count (790).

Large numbers of pink salmon spawn in the Skagit River during odd-numbered years and utilize the same river sections used by chinook. Although pink salmon prefer a somewhat different spawning habitat, generally mass spawn, and construct smaller redds, in areas where spawning overlaps it is necessary during observations to differentiate between redds of the two species. A distinct advantage of

chinook may spend as many as 5 days of pre-spawning redd construction activity. Based on this observation, the two peaks of spawning in the Sauk to Cascade section occurred on September 13 and October 2.

Redd counts for the Cascade to Gorge powerhouse section indicated timing similar to the Sauk to Cascade section (August 15 to October 30)(Figure 8, Table 9). Daily redd construction estimates show a bimodal distribution with peaks occurring on September 14 and October 6 (Figure 8). Based on Burner's observation, the two dates of peak spawning occurred on September 19 and October 11.

Sauk River timing of spawning

Aerial counts of chinook in the Sauk River from Suiattle to Darrington began on September 1 and ended on October 18 (Table 6). Based on these surveys, it was estimated that redds would have first been visible on August 16 and the last redds visible on October 19. The number of redds constructed daily (Figure 10, Table 9) was determined by the same technique used for the Skagit. Redd construction data for the Sauk River show a bimodal distribution with a major peak occurring on September 3 and a minor peak on September 25 (Figure 11). Based on Burner's observations, the two peaks of spawning occurred on September 8 and 30. The major portion of spawning occurred during the segment which peaked on September 8 and occurred primarily prior to September 21. Abundance of redds in early October was relatively minor, the Sauk River primarily serving as a spawning area for the early segment of the summer chinook run.

Sex ratio

Spawning ground surveys were made by foot and boat on the Skagit River and tributary streams to recover tagged chinook and determine the ratio of females to males. Additional sex ratio data were obtained during chinook tagging near Hamilton. The sex ratio obtained from spawning ground surveys diverged greatly from that observed during tagging. Carcasses recovered during surveys included 155 females and 102 males, a ratio of 1.51 females per male. On the other hand, during tagging, 139 males and 64 females were observed, a ratio of 1 female to 2.17 males. This is explained by examination of length frequencies for both sexes from chinook recovered during surveys and tagging. Spawning ground carcass length frequencies show an almost complete absence of males less than 70 cm whereas they were abundant in the tagging study (Figure 12). Carcasses of small males are more difficult to observe and more easily preyed upon. The sex ratio observed during tagging is assumed to be the most accurate data.

the last on October 12. Hatchery fall chinook spawning coincides with the last segment of the bimodal curve (Figure 13).

Tagging study

The number of chinook tagged at Hamilton (204) and the small number of recoveries (12) can only be used to show timing of wild and hatchery chinook stocks as they pass through this section of the Skagit (Table 13). A total of 120 chinook was tagged between August 20 and September 7, and four tags (3.3%) were recovered, all from the main river. Between September 10 and 13, a total of 84 chinook was tagged and 8 (9.5%) were recovered, five at Skagit Hatchery, one in Bacon Creek, one in Day Creek Slough, and one from the Baker River trap. It appears that hatchery and wild chinook are mixed as they pass through the lower Skagit.

Escapement enumeration

Foot surveys of spring chinook spawning grounds have been made annually since 1959. Counts of live and dead chinook are made on four Suiattle River tributaries: Big, Buck, Tenas, and Sulphur Creeks (Table 14). In addition, the 7.8-mile section of the Sauk River between the forks and the mouth of the Whitechuck River is surveyed by boat and by foot (Table 15). Each index stream is surveyed several times annually to obtain a count at or near peak of spawning. Surveys of Suiattle River index streams begin as early as the last week of July and continue into early September. Spawning in the upper Sauk River index area is later and surveys begin in late August. Two or three surveys are usually made by late September. Peak fish-per-mile counts from index streams are used to determine annual escapement levels. Counts from 1959 to 1972 show that spring chinook escapement have fluctuated, with the greatest fluctuation occurring in the upper Sauk River. Counts in Suiattle River tributaries have been relatively consistent.

Aerial redd counts have been made since 1952 to determine annual Skagit River summer chinook escapement levels. Counts have been made by fixed-wing aircraft in a 27-mile section between the Gorge powerhouse and the mouth of the Sauk River. Surveys are made near mid-day when light conditions are optimum and visibility is good. Observers count redds as the airplane flies along the river at a slow rate of speed (70 mph). When the redd density is low, redds may be counted individually. When densities are high, however, the number of redds must

spawning occurs in these river sections, but the timing and abundance of chinook cannot be determined for the 1973 brood year.

Results of female chinook egg retention sampling showed 97.0% retained less than 99 eggs. Egg retention was not considered significant during 1973.

Chinook spawning density, based on the number of redds per mile, was about equal between the two sections of the Skagit River above the Sauk River. Within the Cascade to Gorge section, the number of redds per mile varied for each of four sections. Redd counts were highest in the two sections between the Cascade River and Bacon Creek. The lowest redd count was in the Bacon Creek to County Line section, which included a gorge area not suitable for spawning. Chinook spawned in all suitable areas above the Sauk River during 1975, though redd density varied between individual spawning areas.

Time of spawning of hatchery fall chinook coincided with spawning of the late segment of wild chinook. There appears to be a potential for mixing of spawners from these stocks; the low rate of returns to the hatchery suggests the number of hatchery fall chinook spawning naturally in the Skagit River would be small in comparison to wild stocks. Naturally spawning hatchery chinook would be expected to spawn in the Marblemount area of the Skagit River and the lower Cascade River. Spawning ground surveys in 1974 should include river sections that would show distribution and abundance of the late segment of the run in these areas.

The small number of chinook tagged (20) and low number of recoveries (12) preclude all but the general conclusion that hatchery and wild stocks are mixed as they pass the Hamilton area during late August and early September.

JUVENILE STUDIES

Methods and Materials

Juvenile chinook sampling began on March 4 and continued until May 22 in the Skagit, Sauk, and Suiattle Rivers. During the 81-day period, a total of 21 days was spent collecting juvenile chinook from RM 0 to 87.5 on the Skagit, RM 0 to 32 on the Sauk, and at RM 8.0 on the Suiattle (Figure 2).

Samples were collected with a 100- x 6-ft beach seine (1/4-inch mesh) which was set by a 16-ft Valco river boat powered by a 70-hp jet-pump outboard engine. Also used was a backpack, battery-powered, Smith-Root Mark V electrofishing unit. During March, samples were collected primarily with the electrofishing unit because juvenile chinook are found in locations not suitable for seining during this period.

growth rate difficult. The growth curve shown by Figure 15 indicates a slow growth rate and a trend towards movement of larger fry into the lower river. Within the non-spawning area of the lower river, chinook reached the 50-mm minimum length for micro-tagging about May 10, whereas in non-spawning areas, mean length was less than 46 mm on May 20.

Electrofishing gear was most successful for collecting fry in the upper Skagit, Sauk, and Suiattle Rivers. The number of fish caught per day and the small size precluded tagging. Seining was relatively unsuccessful in the upper river, the fry inhabiting protected areas not suitable for seining. The river section below Hamilton offers many ideal seining sites, and catches were substantially higher in this area. Catches in the North and South Forks were good, but seining was difficult because of limited seine sites, reduced fishing time caused by tidal fluctuation, and problems associated with seining over a sandy river bottom.

A portable microtagging station had been set up prior to sampling for tagging at various locations on the Skagit, Sauk, and Suiattle Rivers. Though large numbers of fish were caught, the number of fish over 50 mm in length was insufficient to justify tagging. Microtagging head molds for chinook less than 50 mm will have to be developed before a successful tagging program can be conducted. This study shows that when equipment is developed so smaller fish can be tagged, the most suitable river section for fish collection is the lower Skagit below Hamilton.

Condition factor analysis of variance for chinook fry collected at five sites on the Skagit, Sauk, and Suiattle Rivers showed the following:

1. CF differs between size groups and classes.
2. There is no significant difference in CF based on sampling locations.
3. It appears that time and location interaction, with the May sample included, contribute to significant differences in CF values. This is likely a result of growth and environmental conditions.

LITERATURE CITED

Burner, Clifford J.
1951. Characteristics of spawning nests of Columbia River salmon. U.S. Fish & Wildl. Serv., Bull. No.

A P P E N D I X I

(Tables 1 through 21)
(Pages 17 through 36)

Table 4. Skagit Bay commercial chinook salmon catch, 1935-1974, all gear combined.

Year	No. of fish caught
1935	38,206
1936	51,748
1937	32,085
1938	26,407
1939	25,554
1940	38,328
1941	39,284
1942	15,881
1943	22,527
1944	25,985
Average	31,601
1945	36,029
1946	22,673
1947	16,672
1948	16,648
1949	15,688
1950	22,600
1951	16,104
1953	23,059
1953	18,005
1954	23,083
Average	21,056
1955	19,119
1956	11,750
1957	10,112
1958	12,183
1959	12,136
1960	17,055
1961	24,102
1962	12,243
1963	18,076
1964	18,238
Average	15,501
1965	27,278
1966	19,180
1967	8,874
1968	10,816
1969	8,162
1970	7,797
1971	4,984
1972	8,113
Average	11,900

Table 7. Estimated daily number of redds visible and redds constructed in the Skagit River (Sauk to Cascade) in 1973 based on helicopter surveys.

Date		No. redds visible	Cumulative total redds	New redds
August	15	0	0	0
	16	12	12	12
	17	25	25	13
	18	35	35	10
	19	45	45	10
	20	55	55	10
	21	65	65	10
	22	80	80	15
	23	90	90	10
	24	100	100	10
	25	115	115	15
	26	130	130	15
	27	145	145	15
	28	155	155	10
	29	170	170	15
	30	185	185	15
	31	205	205	15
September	1	225	225	20
	2	250	250	25
	3	280	280	30
	4	320	320	40
	5	365	365	45
	6	395	407	42
	7	440	465	58
	8	520	555	90
	9	575	620	65
	10	635	690	70
	11	680	745	55
	12	720	800	55
	13	760	850	50
	14	800	900	50
	15	835	950	50
	16	880	1,010	60
	17	900	1,045	35
	18	920	1,075	30
	19	940	1,110	35
	20	955	1,140	30
	21	970	1,175	35
	22	980	1,205	30
	23	990	1,240	35
	24	995	1,275	35
	25	1,000	1,320	45
	26	1,005	1,370	50
	27	1,005	1,412	42
	28	1,005	1,470	58
	29	1,005	1,560	90
	30	1,005	1,625	65
Oct.	1	1,000	1,690	65
	2	980	1,725	35
	3	965	1,765	40
	4	945	1,795	30
	5	905	1,805	10
	6	870	1,820	15
	7	830	1,840	45
	8	790	1,835	0
	9	750	1,825	0
	10	710	1,820	0

Table 9. Estimated daily number of redds visible and redds constructed in the Sauk River (Sciattle to Darrington) in 1973 based on helicopter surveys.

Date		No. redds visible	Cumulative total redds	No. redds
August	15	0	0	0
	16	15	15	15
	17	30	30	15
	18	45	45	15
	19	67	67	22
	20	90	90	23
	21	115	115	25
	22	140	140	25
	23	172	172	32
	24	210	210	38
	25	245	245	35
	26	280	280	35
	27	315	315	35
	28	355	355	40
	29	395	395	40
	30	435	435	40
	31	482	482	47
September	1	545	545	63
	2	635	635	90
	3	737	737	102
	4	805	805	68
	5	867	867	62
	6	915	915	48
	7	955	970	55
	8	973	1,003	33
	9	980	1,025	22
	10	987	1,054	29
	11	992	1,082	28
	12	995	1,110	28
	13	995	1,135	25
	14	993	1,165	30
	15	982	1,192	27
	16	975	1,220	28
	17	960	1,240	20
	18	945	1,260	20
	19	923	1,278	18
	20	895	1,290	12
	21	855	1,290	0
	22	812	1,294	4
	23	765	1,310	16
	24	715	1,350	40
	25	663	1,400	50
	26	620	1,425	25
	27	580	1,447	22
	28	540	1,455	8
	29	503	1,473	23
	30	470	1,473	0
October	1	440	1,473	0
	2	420	1,474	1
	3	395	1,477	3
	4	375	1,485	8
	5	350	1,485	0
	6	327	1,492	7
	7	305	1,497	5
	8	280	1,500	3
	9	267	1,507	7
	10	235	1,495	0
	11	207	1,485	0
	12	180	1,470	0
	13	175	1,465	0
	14	150	1,464	0
	15	125	1,435	0
	16	72	1,422	0
	17	45	1,445	0
	18	25	1,450	0
	19	15	1,462	0

Table 11. Counts of chinook redds from five sections between the Sauk and Gorge powerhouse.

Section	Miles surveyed	October 1		October 18	
		No. of redds	Redds per mile	No. of redds	Redds per mile
Sauk to Cascade	10.8	997	92.3	343	31.8
Cascade to Diobsud	3.2	357	111.6	131	40.9
Diobsud to Bacon	1.7	220	129.4	102	60.0
Bacon to County Line	7.1	219	30.8	101	14.2
County Line to Newhalem	4.2	279	66.4	51	12.4
Total	27.0	2,072	76.7	728	27.0

Table 13. Skagit River chinook salmon tagging and recovery data, 1973.

Dates tagged	Tag streamer color	No. of fish tagged	No. recovered	Recoveries	
				Date	Location
August 20	red-green	13	1	Oct. 11	Skagit, Marblemount
August 27, 28, 31	yellow-yellow	35	None		
Sept. 4, 5, 6, 7	white-white	72	1	Oct. 7	Skagit, Concrete
			1	Oct. 8	Skagit, Concrete
			1	Oct. 22	Illabot Creek
Sept. 10, 11	green-white	32	1	Oct. 9	Bacon Creek
			2	Oct. 10	Skagit Hatchery
Sept. 11, 12, 13	green-yellow	52	1	Sept. 24	Baker River
			1	Oct. 6	Day Creek Slough
			3	Oct. 10	Skagit Hatchery
Total tagged		204			
Total recoveries			12 (5.88%)		

Table 15. Skagit[1/] and Sauk[2/] River peak chinook counts, 1952-1972.

Year	Skagit No. of fish/mile	Sauk total redds
1952	289	NS[3/]
1953	350	NS
1954	186	NS
1955	181	NS
1956	201	113
1957	167	35
1958	312	129
1959	313	NS
1960	628	322
1961	402	186
1962	244	NS
1963	173	202
1964	158	0
1965	272	119
1966	242	241
1967	124	NS
1968	260	113
1969	97	257
1970	251	491
1971	203	266
1972	270	439

1/ Sauk to Gorge powerhouse.
2/ Suiattle to Darrington.
3/ Not surveyed.

Table 17. 1974 Skagit juvenile chinook mean lengths, spawning and non-spawning areas.

Sampling date	Location (weekly grouping)	Days between groups	Average length		
			Total river	Spawning area	Non-spawning area
March 4	Marblemount-Rockport		40.93	40.93	
		6			
March 11	Marblemount-Rockport		41.36	41.36	
		6			
March 18	Marblemount-Rockport		40.74	40.74	
		8.5			
March 27	County Line-Hamilton		41.78	41.78	
March 8	Sauk-Suiattle				
		9			
April 5	South Fork		42.97		42.35
April 8	Illabot-Lower Sauk-Sedro Woolley			43.74	
		8.5			
April 16	Sauk River		41.99	41.99	
		6.0			
April 22	Sauk River		41.96	41.78	
April 23	Bacon Creek-Suiattle				43.21
April 26	South Fork-Mt. Vernon				
		6.5			
April 29	Lyman		45.77	42.69	
May 3	North Fork				46.75
		4.5			
May 6	North and South Forks		44.20	43.42	
May 9	Bacon Creek-Lyman				
May 13	Lower Skagit		48.01	45.30	51.71
		6.5			
May 20	Sauk-Suiattle		47.56	45.85	
May 21	Bacon Creek-Sauk				
May 22	North and South Forks				51.89

Table 19A. 1973 Skagit River juvenile salmon catch data.

Electro fishing data							
		Number of fish					
		Chinook		Coho			
Location	Date	0	1's	0's	1's	Chum	Pink
Skagit River							
Marblemount	3/4	43	0	0	0	0	0
Rockport	3/4	35	0	0	0	0	0
Sutter Creek	3/4	10	0	0	0	0	1
Marblemount	3/11	211	0	0	0	0	1
Sutter Creek	3/11	94	0	0	0	0	0
Rockport	3/11	39	0	0	0	0	0
Marblemount	3/18	23	0	1	0	0	1
Sutter Creek	3/18	112	0	2	0	0	0
Rockport	3/18	33	0	0	0	0	5
County Line	3/27	64	0	0	0	0	0
Hamilton	3/27	78	0	0	0	0	0
Sauk River							
Clear Creek	3/28	66	0	0	0	0	0
Suiattle River	3/28	63	0	0	0	0	0
Sauk River							
Below Suiattle	3/28	104	0	0	0	0	0
Skagit River							
Hamilton	4/18	115	0	0	0	13	2
Sauk River							
Whitechuck	4/22	54	0	0	0	0	0
Clear Creek	4/22	149	0	0	0	0	0
Suiattle River	4/23	163	0	5	2	0	0
Skagit River							
County Line	4/23	117	0	0	0	0	5
South Fork	4/26	29	0	0	0	5	5
Mt. Vernon	4/26	38	0	2	1	13	2
Bacon Creek	5/9	55	0	3	0	4	0
Marblemount	5/9	83	1	6	0	3	0
Rockport	5/9	78	0	3	0	13	0
Total		1,856	1	22	3	51	22

Table 20. Skagit juvenile chinook condition factors, 1974.

Date	Location	Condition factor		
		36-40 (mm)	41-45 (mm)	46-50 (mm)
March 27	County Line	9.70	8.75	9.42
	Hamilton	8.59	7.93	8.45
	Sedro Woolley	7.53	7.27	7.93
	Suiattle River	6.19	9.23	9.95
	Sauk River	6.17	9.02	10.17
April 18	County Line	6.70	8.79	10.20
	Hamilton	5.31	8.47	9.33
	Sedro Woolley	7.68	8.03	8.67
	Suiattle River	7.95	9.74	10.80
	Sauk River	7.98	8.40	10.40
May 20	County Line	8.71	9.45	10.73
	Sedro Woolley	8.32	9.19	9.95
	Suiattle River	8.78	9.51	10.24
	Sauk River	10.31	10.98	11.75

A P P E N D I X II

(Figures 1 through 16)
(Pages 38 through 53)

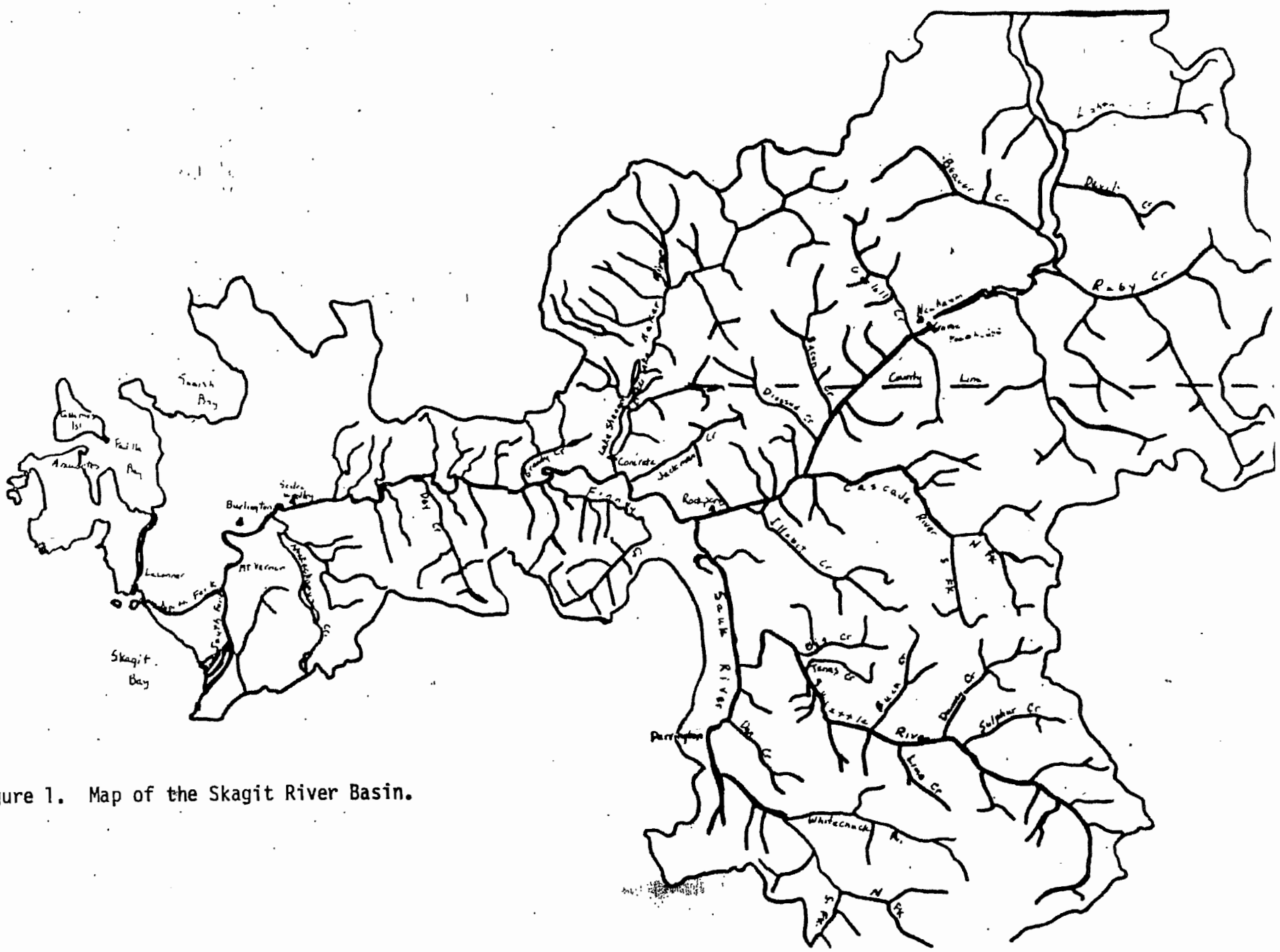


Figure 1. Map of the Skagit River Basin.

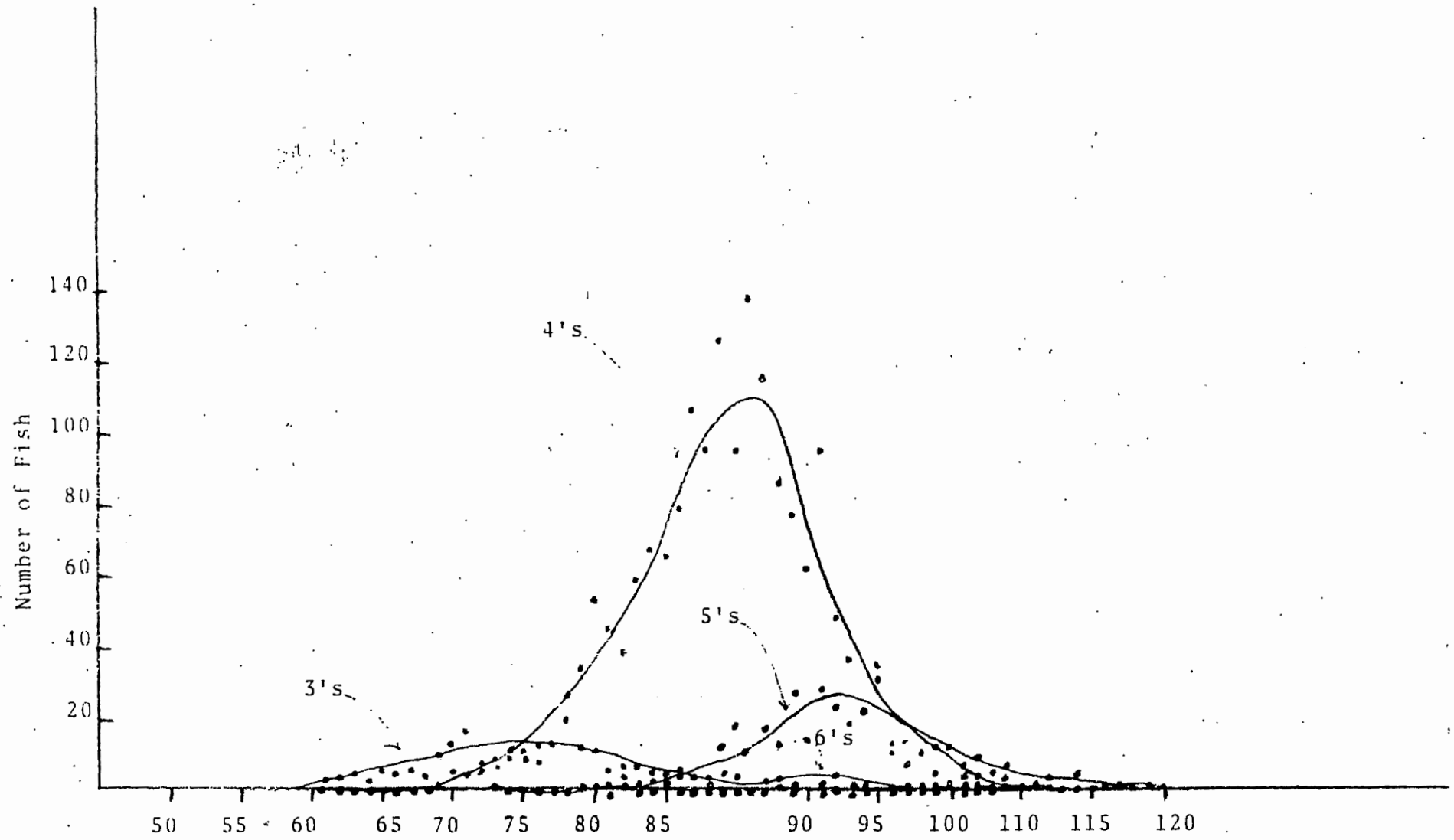


Figure 3. Skagit Bay adult chinook length frequencies by age class, 1967--1972.

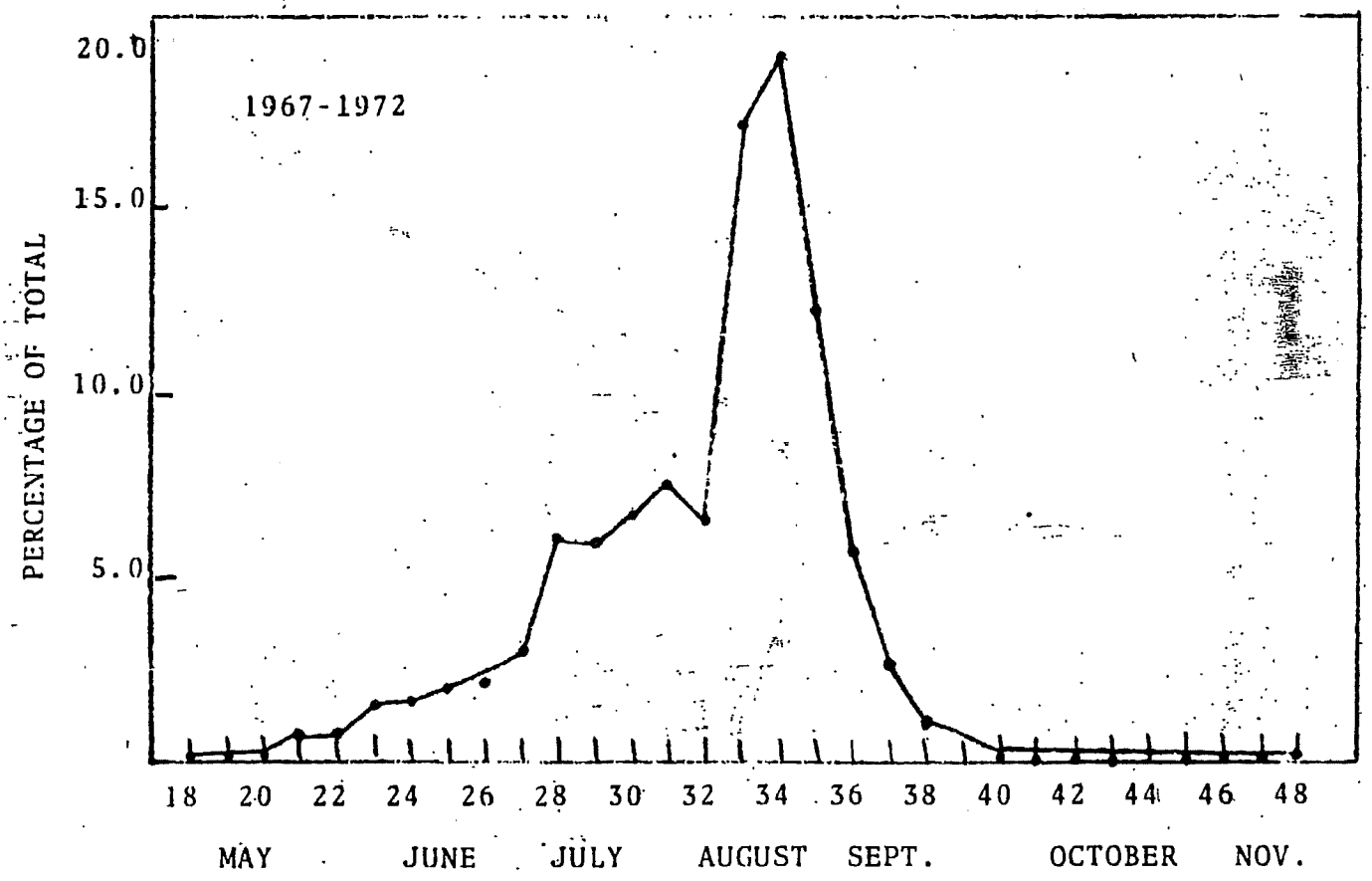


Figure 5. Average percentage of total commercial chinook catch by 7-day periods, Skagit Bay.

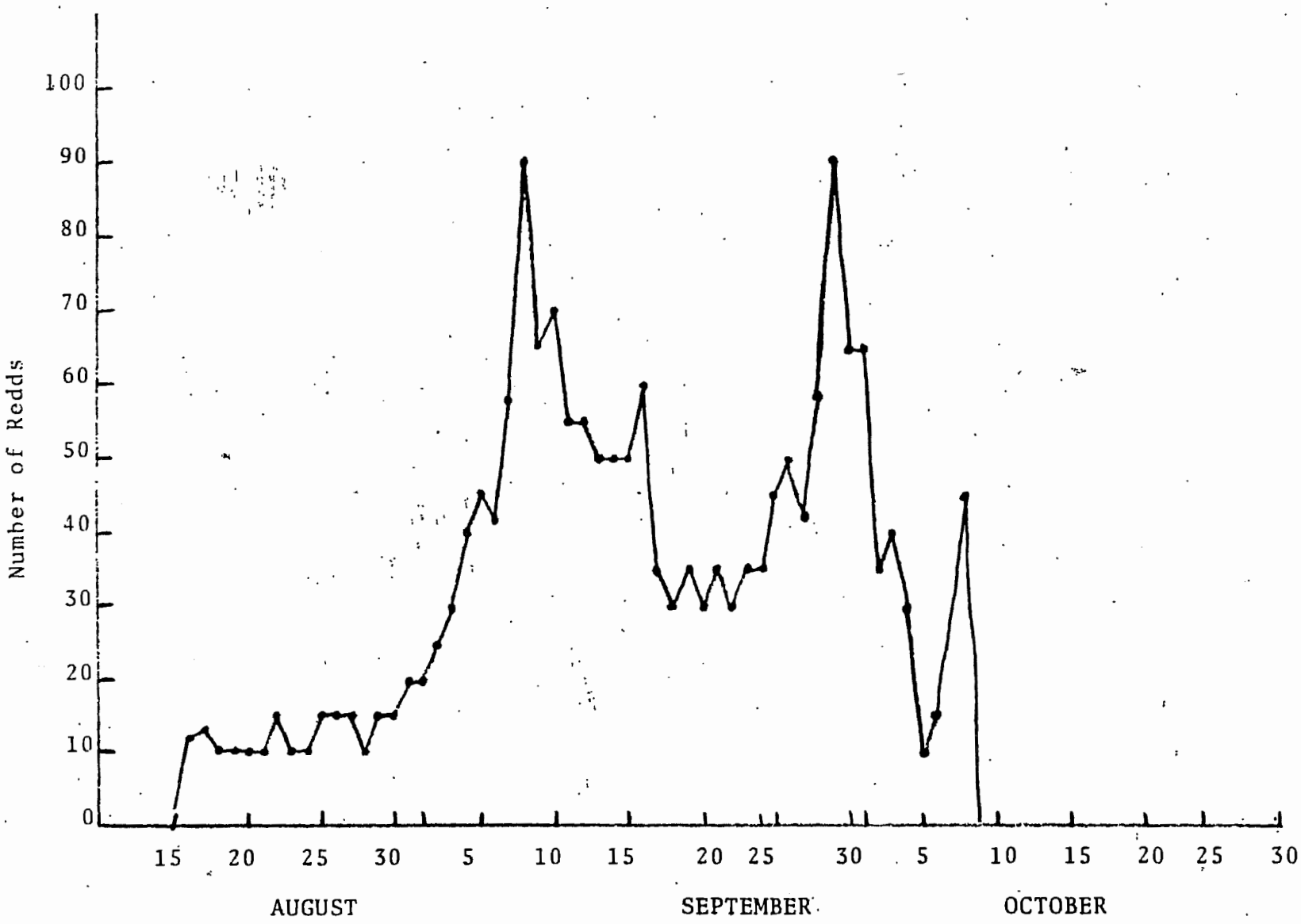
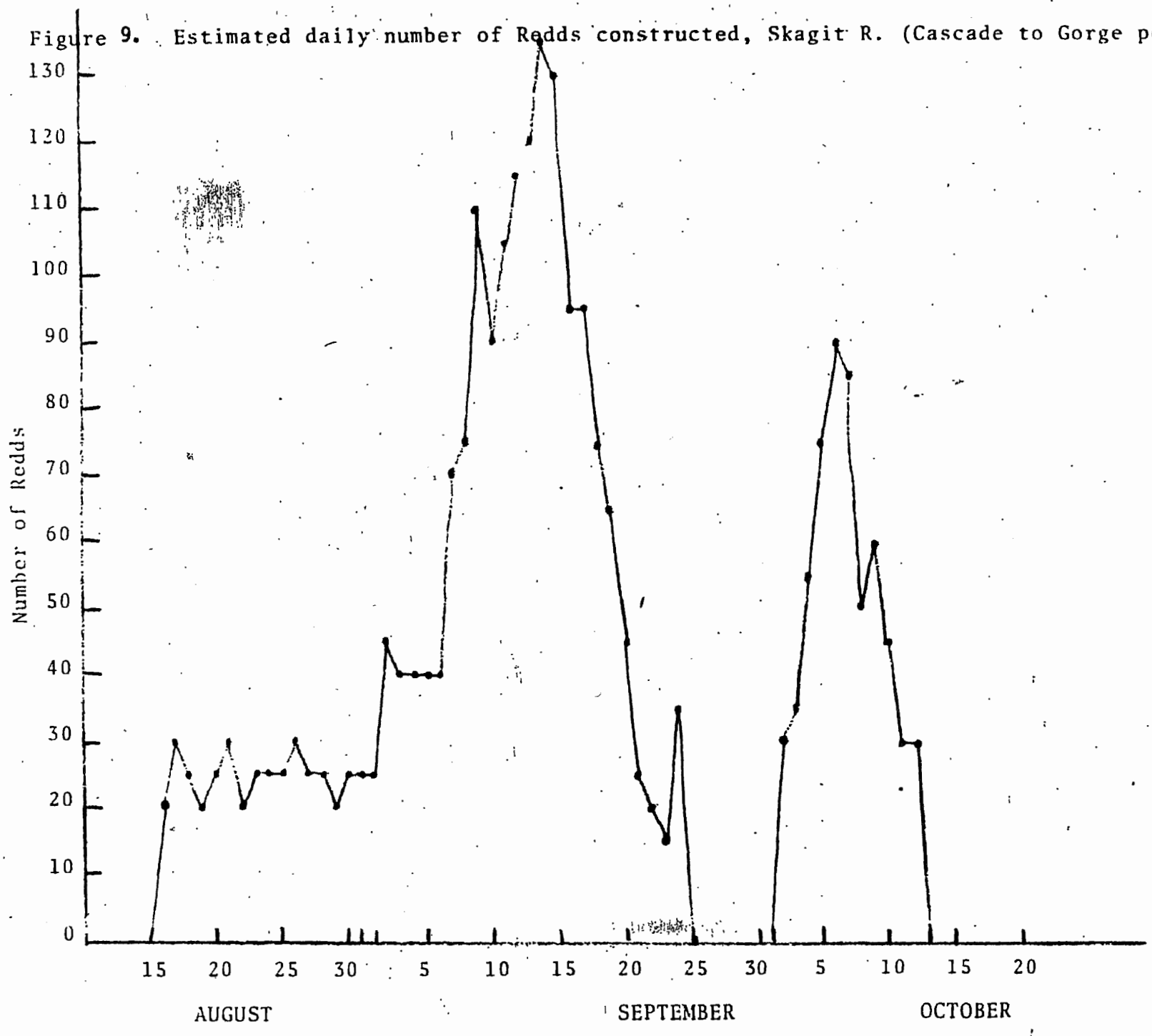


Figure 7. Estimated daily number of Redds constructed, Skagit River (Sauk to Cascade) 1973

Figure 9. Estimated daily number of Redds constructed, Skagit R. (Cascade to Gorge powerhouse 1973



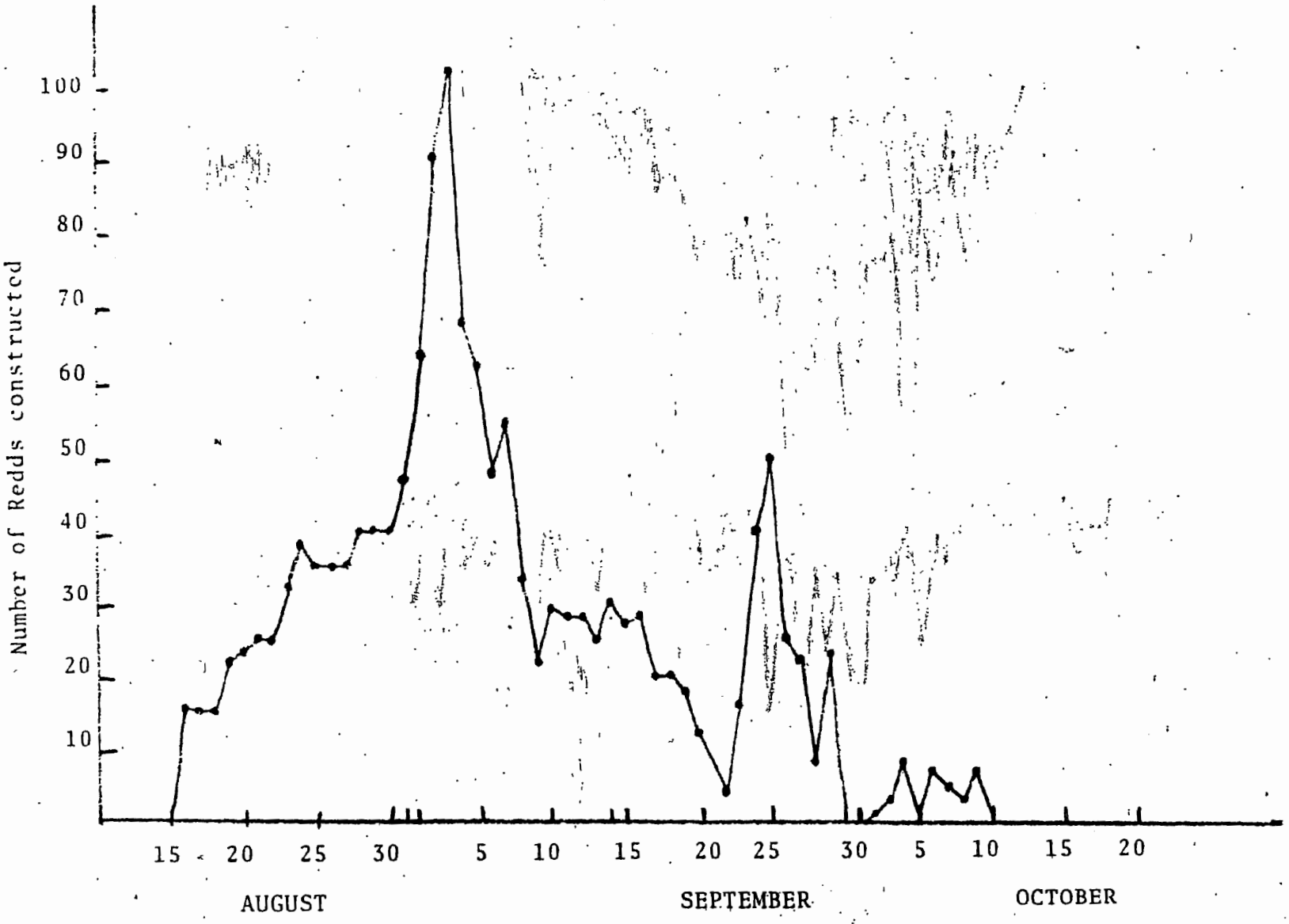
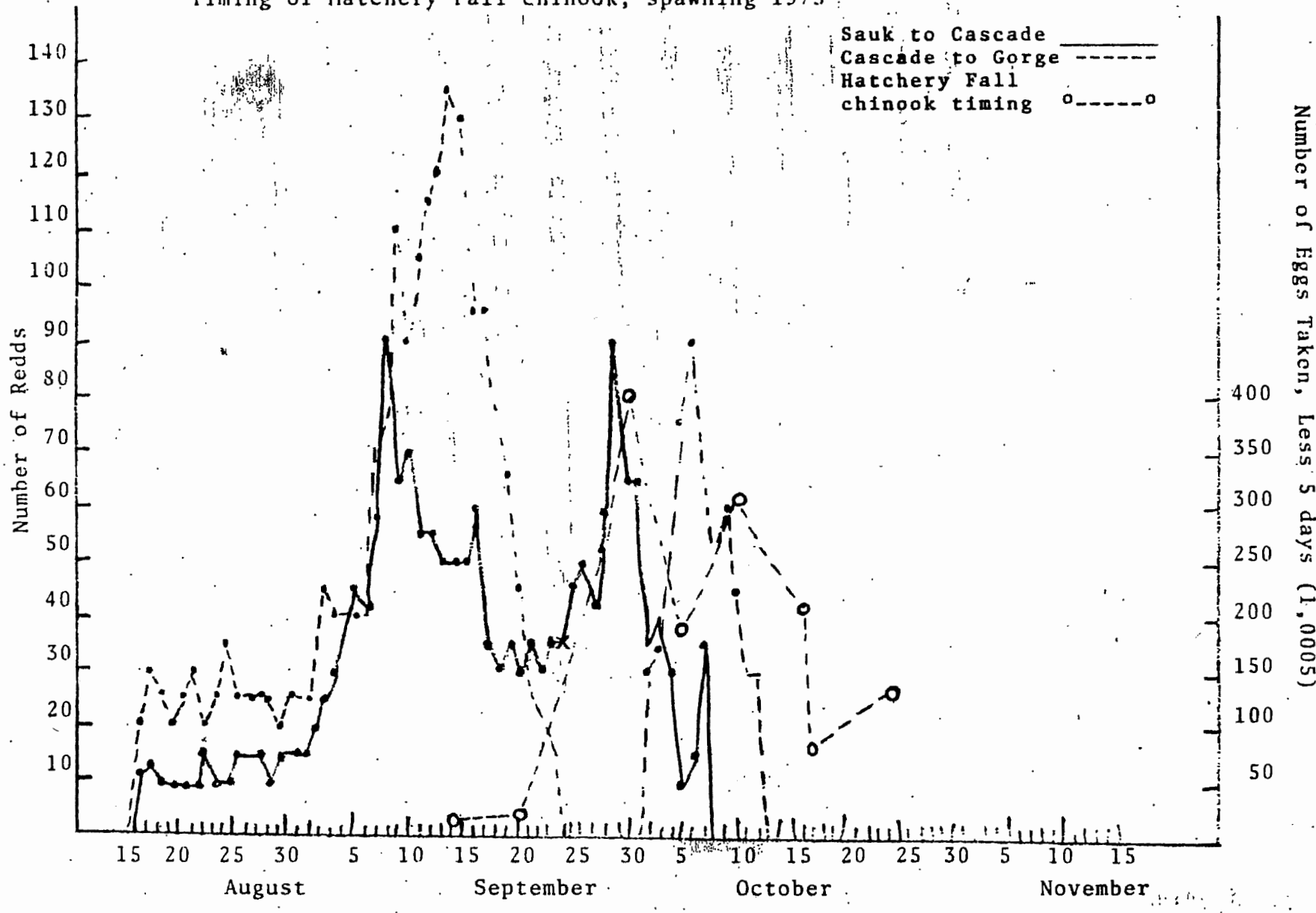


Figure 11. Estimated daily number of Redds constructed, Sauk River. (Suiattle to Darrington) 1973

Figure 13. Estimated daily number of Redds constructed, Skagit River (Saule to Cascade and Cascade to Gorge) and estimates

Timing of Hatchery Fall chinook, spawning 1973



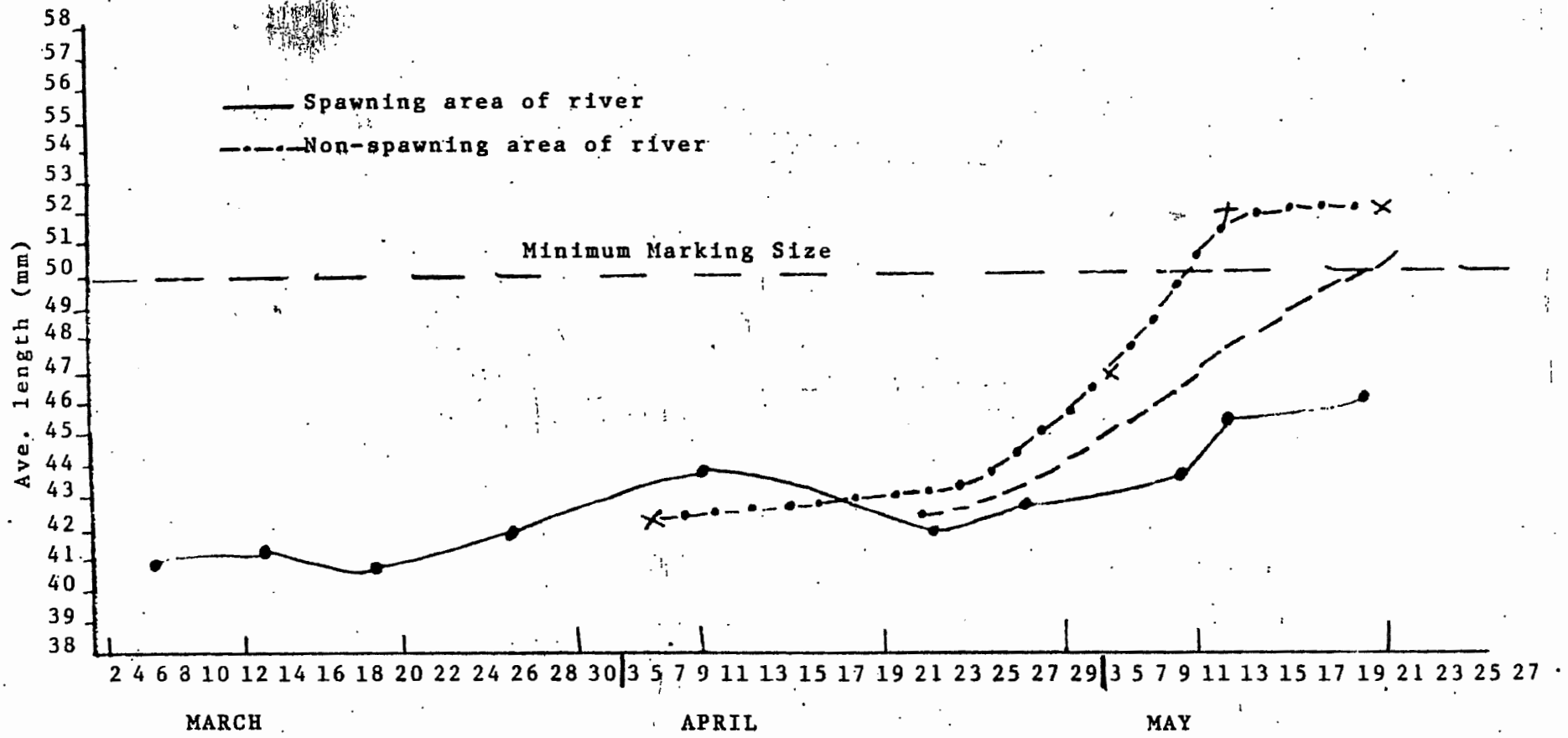


Figure 15. Mean chinook fry sample length, for spawning and non-spawning areas Skagit River, 1973.