THE LIFE HISTORY OF STEELHEAD TROUT (Salmo gairdneri) IN THE CHEHALIS RIVER - BASED ON SCALE SAMPLES COLLECTED BETWEEN 1948 AND 1959

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Abstract

About 140 scale samples were examined from winter run steelhead caught by anglers in the Chehalis River between 1948 and 1959. Rough data was broken down into age class structure, sex ratio and timing of the run.

The most common age for Chehalis steelhead was 3.2 (36%) with 40 fish, followed by 3.3 (31.5%) with 35 fish. The presence of two dominant age classes should help sustain the runs through any natural or unnatural disaster affecting only one years spawning run. The most common freshwater age group was 3. (68.3%) with 84 fish, followed by 4. (15.5%) with 19 fish. In addition, the presence of small no.'s of fish in the age group 2+. and 3+. indicates the existence of a small, late smolt outmigration. The most common saltwater age was .2 (58.2%) with 71 fish, followed by .3 (41.8%) with 51 fish. The sex ratio of the larger .3 fish was 4.7:1, highly favoring females. Repeat spawners made up 10.3% of the total sample. The most common age was 3.1S1. Females outnumbered males 3.7:1.

The overall sex ratio was 2:1 in favour of females. Monthly variation in sex ratio indicated an extremely high catch of females in March with an average ratio of 6.5:1. Anglers appear to select females in the Chehalis River. This represents a significant loss to the spawning escapement, especially the larger .3 females.

The peak month for steelhead in the Chehalis River appears to be February (31.9%) with 44 fish. The best week was February S-14 with 19 fish (14.5%). Peak catches roughly coincided with medium to high average winter flows in the Chehalis.

Introduction

The Chehalis River drains Chehalis Lake and the Statlu Creek watershed, flowing for 12 miles into the Harrison River about 5 miles above the Harrison's confluence with the Fraser. The Chehalis River supports a run of winter steelhead. Little is known of this run as the Chehalis has not been as intensively fished or studied as have many other Lower Mainland streams. But the Steelhead Harvest Analysis results have indicated a significant decline in the annual catch over the past ten years (Fig. 2). This decline may be a result of clearcut logging operations years ago in the Chehalis watershed.

In the future, enhancement of the natural stocks of steelhead may increase the run to its former abundance. The purpose of this report is to provide some baseline life history information on the Chehalis steelhead. The results are based on scale samples collected by anglers between 1948 and 1959. The rough data is broken down into age class structure, sex ratio and timing of the run. This information should prove useful in the planning of future enhancement projects.

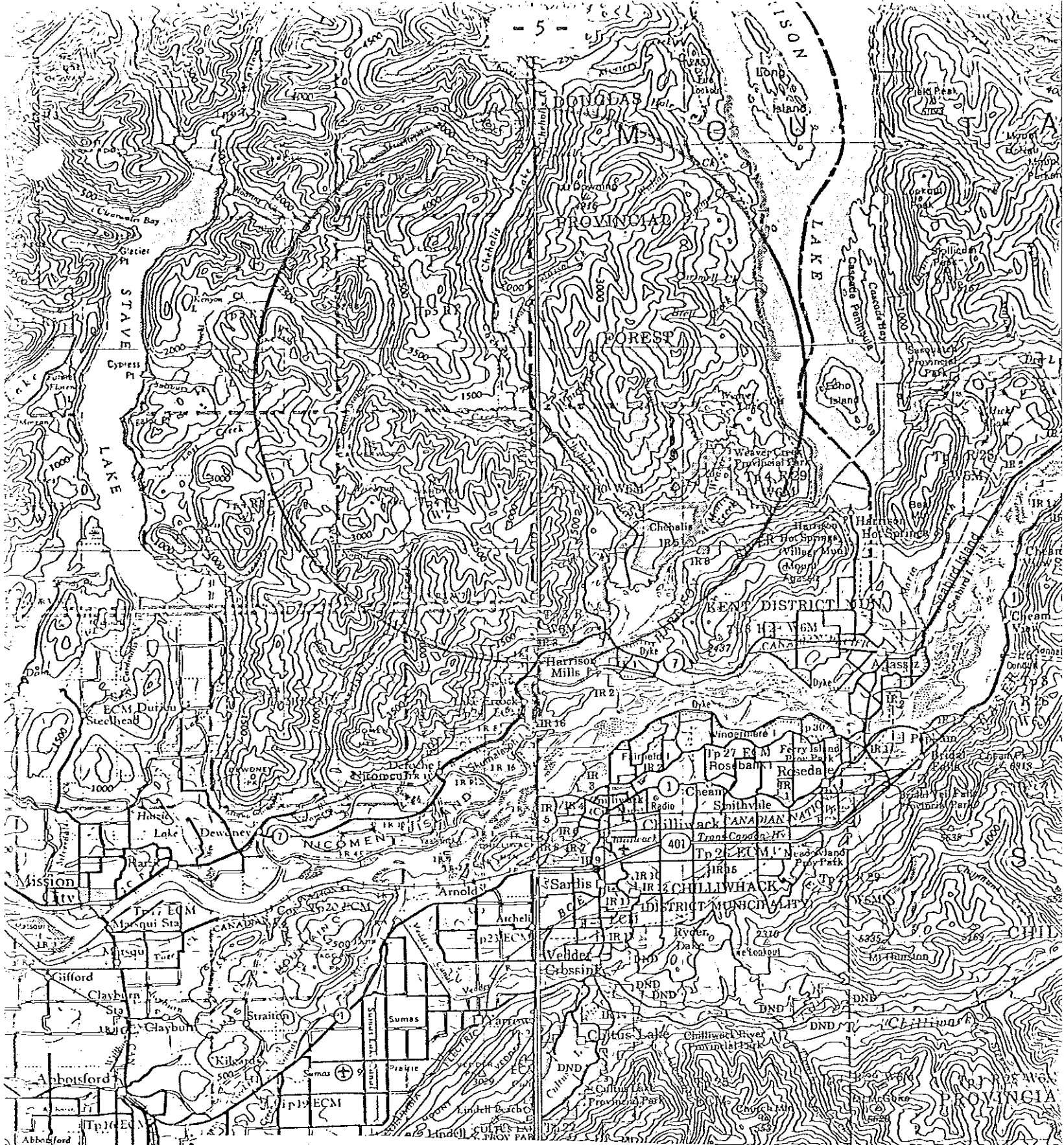
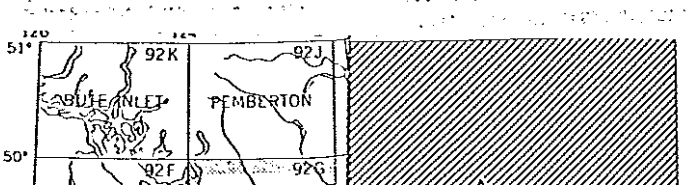


Fig. 1 Location map of the Chehalis River.

North Scale: 1: 250,000



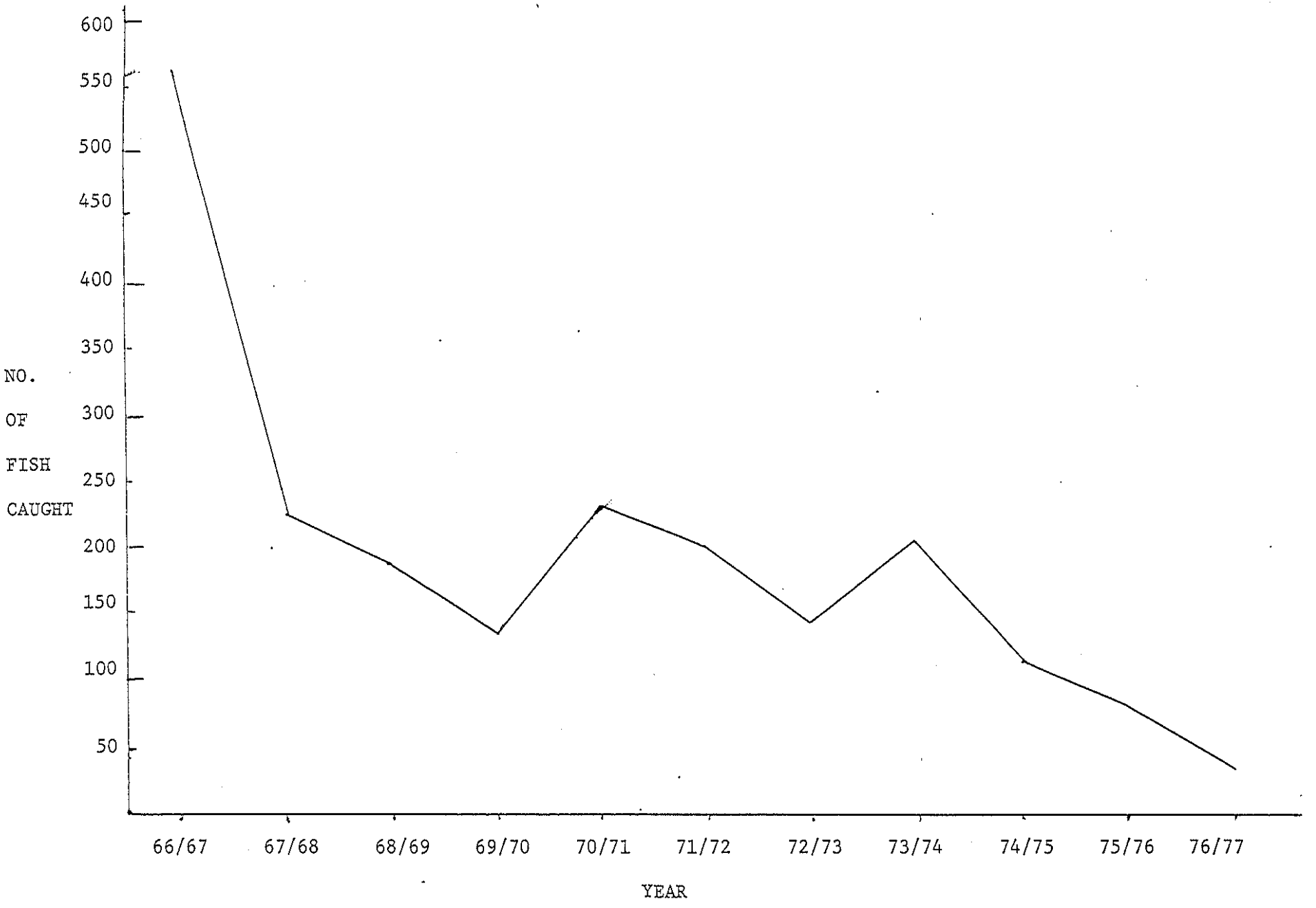


FIG. 2 STEELHEAD CATCH FOR 1967-1977, SUMMARY OF RESULTS FOR THE CHEHALIS RIVER
(FROM STEELHEAD HARVEST ANALYSIS - 1966/67 to 1976/77, FISH AND WILDLIFE BRANCH, VICTORIA)

Materials and Methods

The materials and methods in this report are virtually the same as those outlined by Caverly (1977), reports I and II. One difference is that none of the scale samples were photomicrographed.

Scale samples were collected from angler caught steelhead captured between the years of 1948 and 1959. Sample size was about 130, for winter run fish. All the samples were examined to find two scales with clearly defined freshwater zones. These scales were pressed onto sheets of cellulose acetate for a permanent plastic impression. Scale samples are in the scale file under Chehalis River. All rough data is recorded on scale sample record sheets, copies of which are included in the report appendix, scale file and master reference report.

The age designation used in this report is similiar to the designation used by Caverly (1977) reports I and II, but has been reversed for summer and winter steelhead. A fish previously aged at 3.1+ is now aged at 3.2. This means that this steelhead has spent three winters in freshwater as a juvenile before smolting and moving to sea. The steelhead then spent an additional two summers and at least part of a second winter in saltwater before returning to the stream. An S designation indicates a spawning check and one complete annulus. A fish aged 3.2+ in reports I to VI is now aged at 3.3. This change was suggested by Narver (pers. comm.) in order to standardize a province wide age designation for steelhead.

Results

Total Age (Table I) (Fig. 3)

A total of 9 different age groups were represented in a sample size of 111 Chehalis River winter steelhead. The most common age class was 3.2 (36%) with 40 fish. Also very common were fish in the age class 3.3 (31.5%), 35 in total. The third most common age class was 4.2 (11.7%) with only 13 fish.

Freshwater Age (Table II) (Fig. 4)

A total of 123 samples were examined for freshwater age. Five different age groups were found. The most common was 3. (68.3%) with 84 fish followed by 4. (15.5%) with 19 fish.

Saltwater Age (Table III) (Fig. 4)

A total of 122 samples were examined for saltwater age. Only two age groups were found, .2 (58.2%) with 71 fish and .3 (41.8%) with 51 fish. The .2 fish had a sex ratio of 1.3:1 favoring females. The .3 fish had a female to male ratio of 4.7:1.

Repeat Spawners (Table IV)

Repeat spawners made up 10.3% of the total sample size (136). The female to male ratio for the 14 repeat spawners was 3.7:1. The most common age was 3.1S1 with 9 fish.

Sex Ratio - Yearly (Table V) (Fig. 5)

The overall female male ratio for 136 Chehalis River winter steelhead was 2:1. Yearly variation was from 0.25:1 to 7:1.

Sex Ratio - Monthly (Table VI) (Fig. 6)

Monthly variation in sex ratio was from 1:1 in December to 6.5:1 in March favoring females.

Timing of the Run - Monthly (Table VII) (Fig. 7)

Catches of steelhead in the Chehalis River occured from October to April. The peak month was February (31.9%) with 44 fish, followed by January (30.4%) with 42 fish. Sample size was 138.

Timing of the Run - Weekly (Table VIII) (Fig. 8)

The weekly breakdown of the steelhead catch indicated the best week to be February 8-14 (14.5%) with 19 fish. This was followed by January 8-14 (11.5%) with 15 fish and February 15-21 (10.7%) with 14 fish.

Table I - Age class structure of winter steelhead in the Chehalis River

		Age Class									
Year	Sex	2.2	2+.2	2.3	3.2	3+.2	3.3	3+.3	4.2	4.3	Total
1950	M	1	-	-	1	-	1	-	1	-	
	F	-	-	-	-	-	-	-	-	-	
	Total	1	-	-	1	-	1	-	1	-	4
1951	M	-	-	-	2	-	-	-	-	1	
	F	-	-	1	2	1	1	-	1	1	
	Total	-	-	1	4	1	1	-	1	2	10
1952	M	-	-	-	5	-	1	-	1	1	
	F	1	-	-	5	-	18	-	3	2	
	Total	1	-	-	10	-	19	-	4	3	37
1953	M	-	-	-	1	3	3	-	1 (1?)	-	
	F	1	-	-	2	-	2	-	1	-	
	Total	1	-	-	3	3	5	-	3	-	15
1954	M	2	-	-	3 (1?)	-	-	-	1	-	
	F	-	-	1	3	-	6	1	1	1	
	Total	2	-	1	7	-	6	1	2	1	20
1955	M	-	-	1	1	-	-	-	-	-	
	F	-	-	-	-	-	1	-	-	-	
	Total	-	-	1	1	-	1	-	-	-	3
1956	M	-	-	-	-	-	-	-	-	-	
	F	-	-	-	1	-	-	-	-	-	
	Total	-	-	-	1	-	-	-	-	-	1
1958	M	-	1	-	-	-	-	-	-	-	
	F	-	-	-	2	-	-	-	-	-	
	Total	-	1	-	2	-	-	-	-	-	3
1959	M	-	-	-	-	-	-	-	-	-	
	F	-	-	1	-	-	-	-	-	-	
	Total	-	-	1	-	-	-	-	-	-	1
Unknown	M	-	-	-	1	-	-	-	1	-	
	F	1	1	-	10	-	2	-	1	-	
	Total	1	1	-	11	-	2	-	2	-	17
Total	M	3	1	1	14 (1?)	3	5	-	5 (1?)	2	
	F	3	1	3	25	1	30	1	7	4	
	Total	6	2	4	40	4	35	1	13	6	111
	%	5.4%	1.8%	3.6%	36%	3.6%	31.5%	0.9%	11.7%	5.4%	

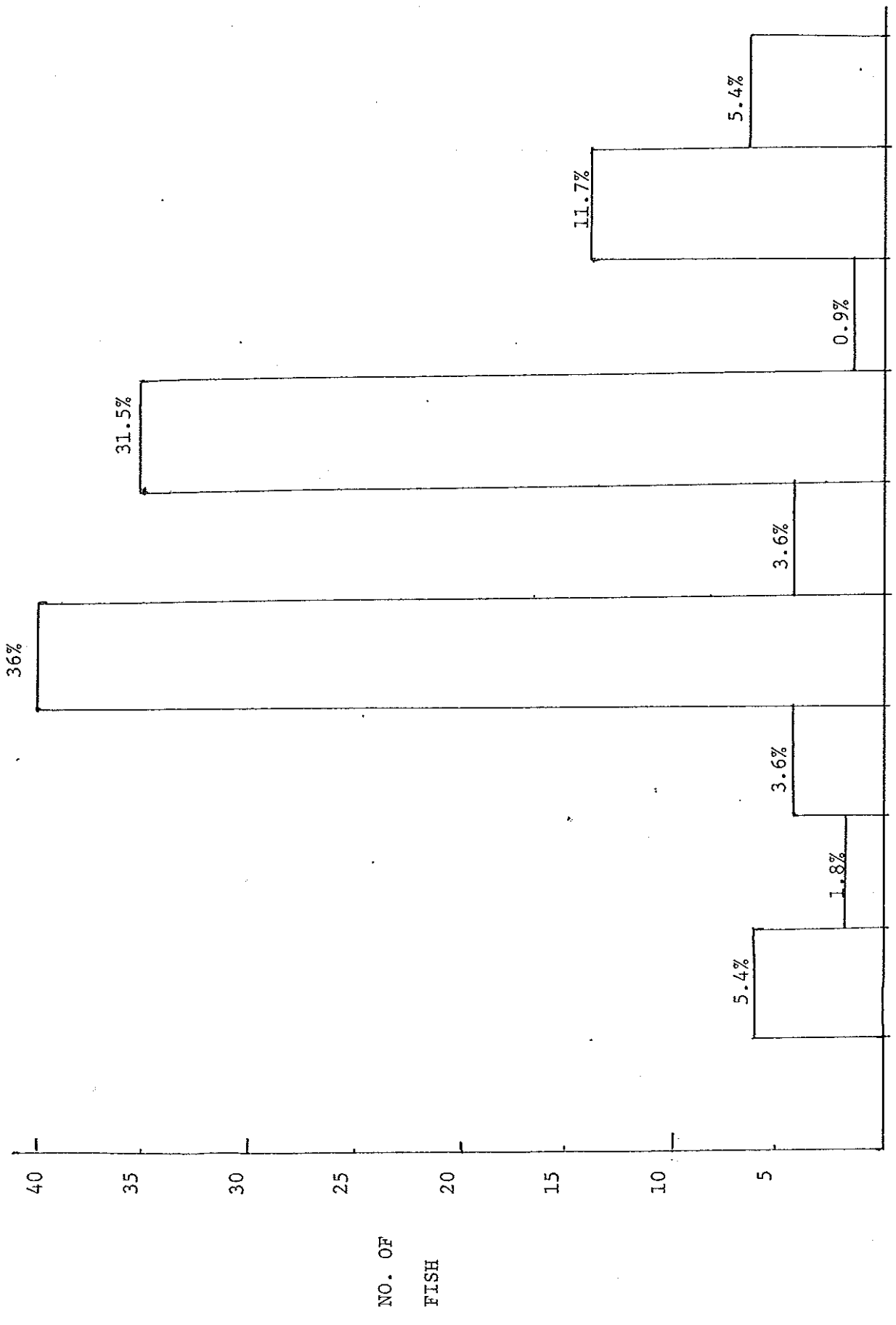


FIG. 3 AGE CLASS STRUCTURE OF CHEHALIS RIVER WINTER STEELHEAD

Table II - Freshwater ages of Chehalis River winter steelhead

		Freshwater Age					
Year	Sex	2.	2+.	3.	3+.	4.	Total
1949	M	-	-	1	-	-	
	F	-	-	-	-	-	
	Total	-	-	1	-	-	1
1950	M	1	-	2	-	1	
	F	-	-	1	-	-	
	Total	1	-	3	-	1	5
1951	M	-	-	3	-	1	
	F	1	-	5	1	2	
	Total	1	-	8	1	3	13
1952	M	-	-	6	-	2	
	F	1	-	22	-	5	
	Total	1	-	28	-	7	36
1953	M	-	-	4	3	1(1?)	
	F	1	-	6	-	1	
	Total	1	-	10	3	3	17
1954	M	2	-	3(1?)	-	1	
	F	1	-	9	1	2	
	Total	3	-	13	1	3	20
1955	M	1	-	1	-	-	
	F	-	-	1	-	-	
	Total	1	-	2	-	1	4
1956	M	-	-	-	-	-	
	F	-	-	1	-	-	
	Total	-	-	1	-	-	1
1957	M	-	-	-	-	-	
	F	1	-	-	-	-	
	Total	1	-	-	-	-	1
1958	M	-	1	-	-	-	
	F	-	-	2	-	-	
	Total	-	1	2	-	-	3
1959	M	-	-	-	-	-	
	F	1	-	-	-	-	
	Total	1	-	-	-	-	1
Unknown	M	-	-	1	-	1	
	F	2	2	15	-	1	
	Total	2	2	16	-	2	22
Total	M	4	1	21(1?)	3	7(1?)	36(2?)
	F	8	2	62	2	11	85
	Total	12	3	84	5	19	123
	%	9.6%	2.4%	68.3%	4.1%	15.5%	

TABLE III. SALTWATER AGES OF WINTER STEELHEAD IN THE CHEHALIS RIVER

Year	Sex	Saltwater Age .2	Saltwater Age .3	Total
1949	M	–	–	
	F	1	–	
	Total	1	–	1
1950	M	3	1	
	F	–	–	
	Total	3	1	4
1951	M	5	1	
	F	4	3	
	Total	9	4	13
1952	M	6	2	
	F	9	22	
	Total	15	24	39
1953	M	5	2	
	F	4(1?)	3	
	Total	10	5	15
1954	M	6	–	
	F	4(1?)	10	
	Total	11	10	21
1955	M	1	1	
	F	–	1	
	Total	1	2	3
1956	M	–	1	
	F	1	–	
	Total	1	1	2
1957	M	–	1	
	F	–	–	
	Total	–	1	1
1958	M	1	–	
	F	2	–	
	Total	3	–	3
1959	M	–	–	
	F	–	1	
	Total	–	1	1
Unknown	M	3	–	
	F	14	2	
	Total	17	2	19
TOTAL	M	30	9	39
	F	39(2?)	42	82(2?)
	Total	71	51	122
	%	58.2%	41.8%	

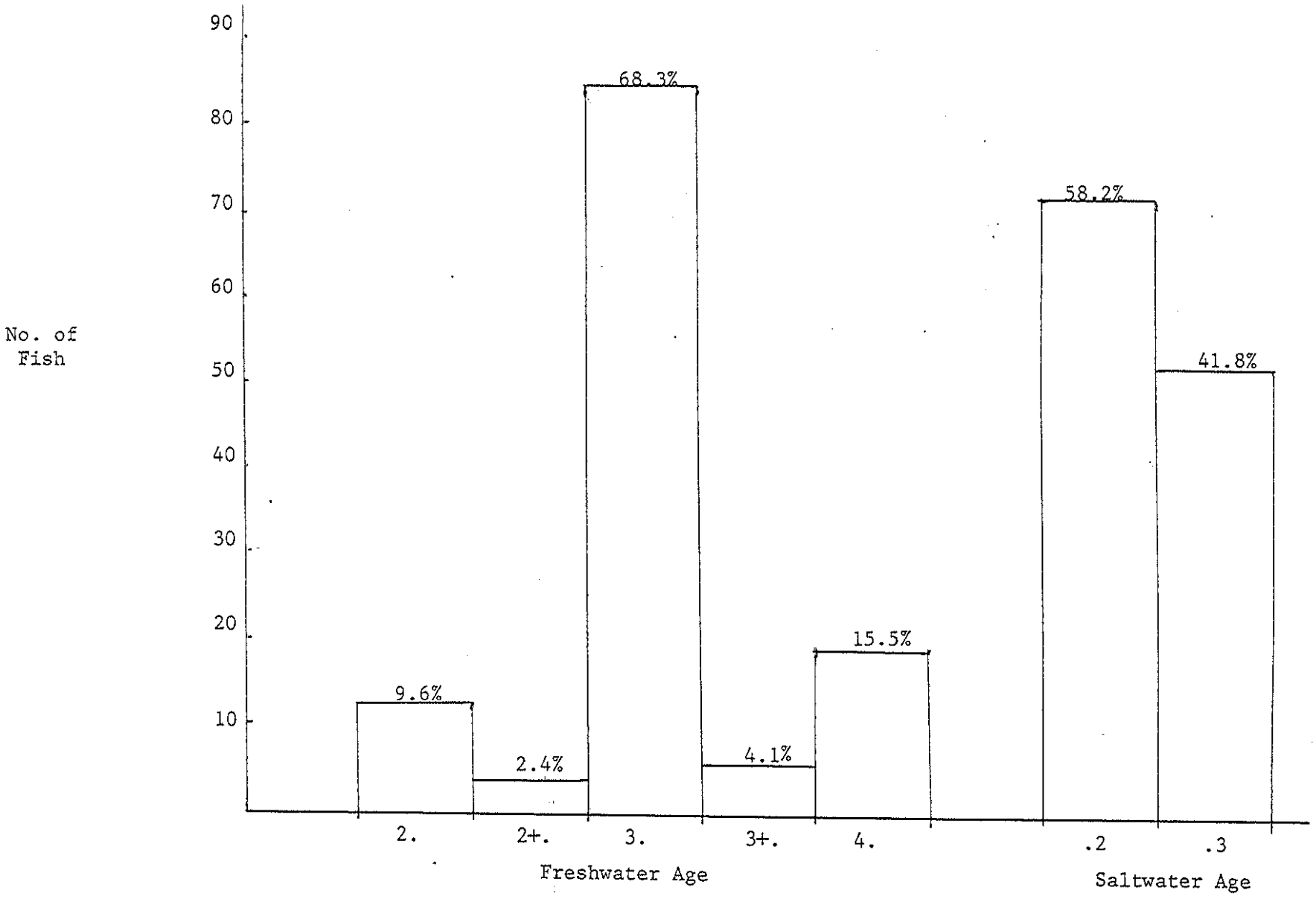


Fig. 4 - FRESHWATER AND SALTWATER AGES OF CHEHALIS RIVER WINTER STEELHEAD.

TABLE IV. AGE CLASS STRUCTURE OF REPEAT SPAWNING WINTER STEELHEAD

		Age Class						
Year	Sex	2.1S1	2+.1S1	2.2S1	3.1S1	3.2S1	R.S1	Total
1948	M	-	-	-	-	-	1	
	F	-	-	-	-	-	-	
	Total	-	-	-	-	-	1	1
1949	M	-	-	-	1	-	-	
	F	-	-	-	-	-	-	
	Total	-	-	-	1	-	-	1
1950	M	-	-	-	-	-	-	
	F	-	-	-	1	-	-	
	Total	-	-	-	1	-	-	1
1951	M	-	-	-	1	-	-	
	F	-	-	-	2	-	-	
	Total	-	-	-	3	-	-	3
1953	M	-	-	-	-	-	-	
	F	-	-	-	1	1	-	
	Total	-	-	-	1	1	-	2
1957	M	-	-	-	-	-	-	
	F	1	-	-	-	-	-	
	Total	1	-	-	-	-	-	1
Not Known	M	-	-	-	-	-	-	
	F	-	1	1	3	-	-	
	Total	-	1	1	3	-	-	4
TOTAL	M	-	-	-	2	-	1	3
	F	1	1	1	7	1	-	11
	Total	1	1	1	9	1	1	14
	F:M Ratio							3.7:1

- Repeat spawners made up 10.3% of the total sample size (140)

TABLE V. SEX RÁTIO OF CHEHALIS RIVER STEELHEAD - yearly

YEARS	FEMALE	MALE	F:M RATIO
1948	-	1	-
1949	1	1	1:1
1950	1	4	0.25:1
1951	9	7	1.3:1
1952	31	8	3.9:1
1953	8	8	1:1
1954	14	7	2:1
1955	1	2	0.5:1
1956	1	2	0.5:1
1957	1	1	1:1
1958	2	1	2:1
1959	1	-	-
UNKNOWN	21	3	7:1
TOTAL	91	45	2:1

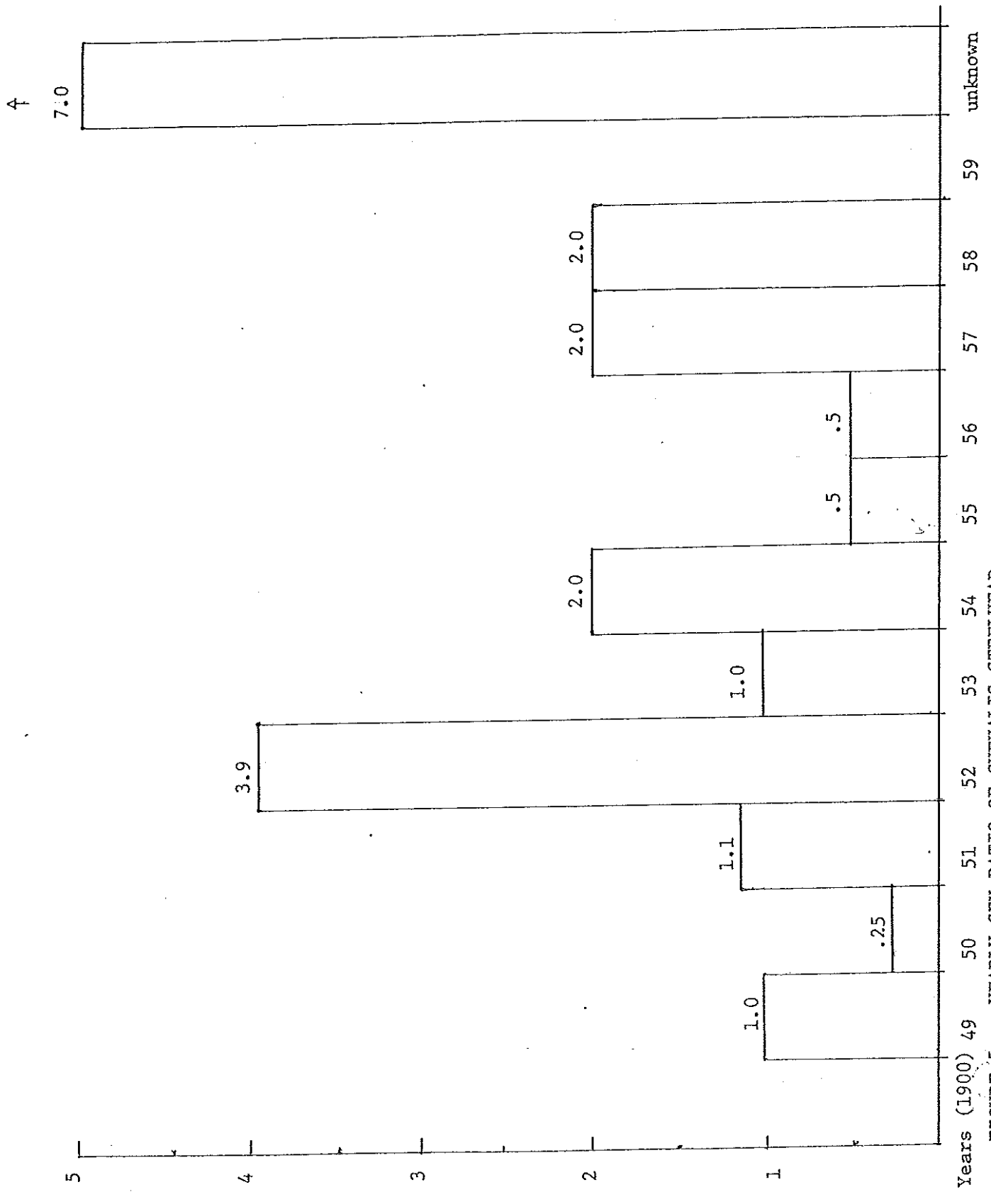
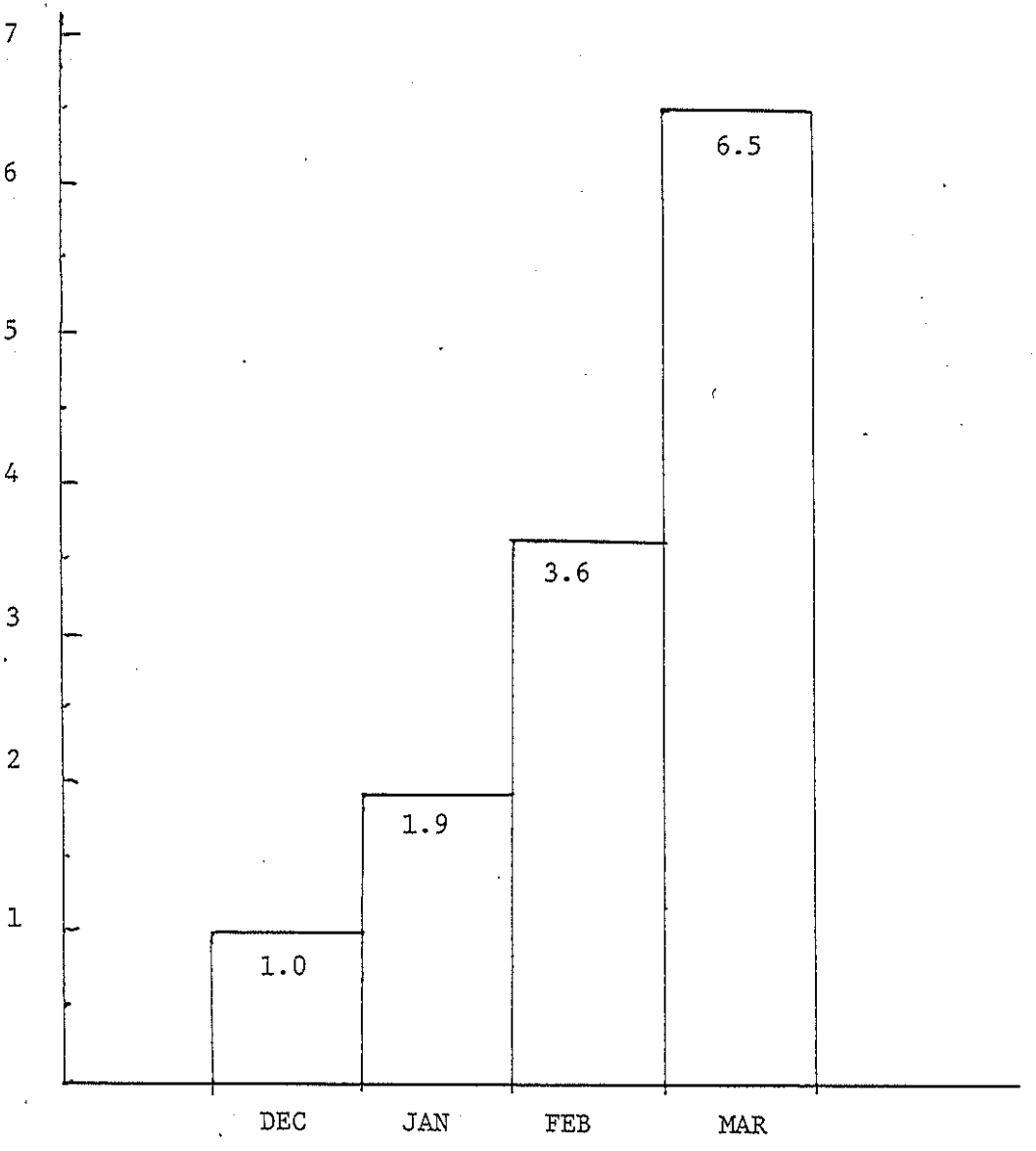


FIGURE 5. YEARLY SEX RATIO OF CHEHALIS STEELHEAD.

	NOV			DEC			JAN			FEB			MAR			APR		
YEAR	M	F	F:M RATIO	M	F	F:M RATIO	M	F	F:M RATIO	M	F	F:M RATIO	M	F	F:M RATIO	M	F	F:M RATIO
1948	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1949	-	-	-	-	-	-	1	1	1:1	-	-	-	-	-	-	-	-	-
1950	-	-	-	4	1	0.25:1	-	-	-	-	-	-	-	-	-	-	-	-
1951	-	-	-	1	-	-	4	5	1.3:1	2	4	2:1	-	-	-	-	-	-
1952	-	-	-	2	5	-	-	-	-	4	17	4.3:1	1	8	8:1	-	-	-
1953	-	-	-	4	3	0.75:1	4	3	0.75:1	-	2	-	-	-	-	-	-	-
1954	-	-	-	2	5	2.5:1	2	6	3:1	1	3	3:1	-	1	-	-	-	-
1955	1	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
1956	-	-	-	1	-	-	1	-	-	-	1	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-
1958	-	-	-	1	-	-	-	1	-	-	-	-	-	1	-	-	-	-
1959	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
UNKN.	-	-	-	-	1	-	1	10	10:1	2	4	2:1	-	3	-	-	2	-
TOTAL	1	-	-	16	16	1:1	14	27	1.9:1	9	32	3.6:1	2	13	6.5:1	-	2	-

TABLE VI. SEX RATIO BY MONTH FOR CHEHALIS RIVER WINTER STEELHEAD



FEMALE / MALE RATIO

FIG. 6 AVERAGE MONTHLY SEX RATIO FOR CHEHALIS STEELHEAD

	MONTH												
YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	-	-	-	-	-	-	-	-	-	-	-	1	1
1949	2	-	-	-	-	-	-	-	-	-	-	-	2
1950	-	-	-	-	-	-	-	-	-	-	-	5	5
1951	9	6	-	-	-	-	-	-	-	-	-	1	16
1952	-	23	9	-	-	-	-	-	-	-	-	7	39
1953	7	3	-	-	-	-	-	-	-	-	-	8	18
1954	9	4	1	-	-	1	-	-	-	-	-	7	21
1955	1	-	-	-	-	-	-	-	-	1	1	1	4
1956	1	1	-	-	-	-	-	-	-	-	-	1	3
1957	-	1	1	-	-	-	-	-	-	-	-	-	2
1958	1	-	1	-	-	-	-	-	-	-	-	1	3
1959	1	-	-	-	-	-	-	-	-	-	-	-	1
Unknown	11	6	3	2	-	-	-	-	-	-	-	-	22
TOTAL	42	44	15	2	-	1	-	-	-	1	1	32	138
%	30.4%	31.9%	10.9%	1.5%	-	0.7%	-	-	-	0.7%	0.7%	23.2%	

TABLE VII. TIMING OF THE RUN - BASED ON ANGLER CATCH PER MONTH.

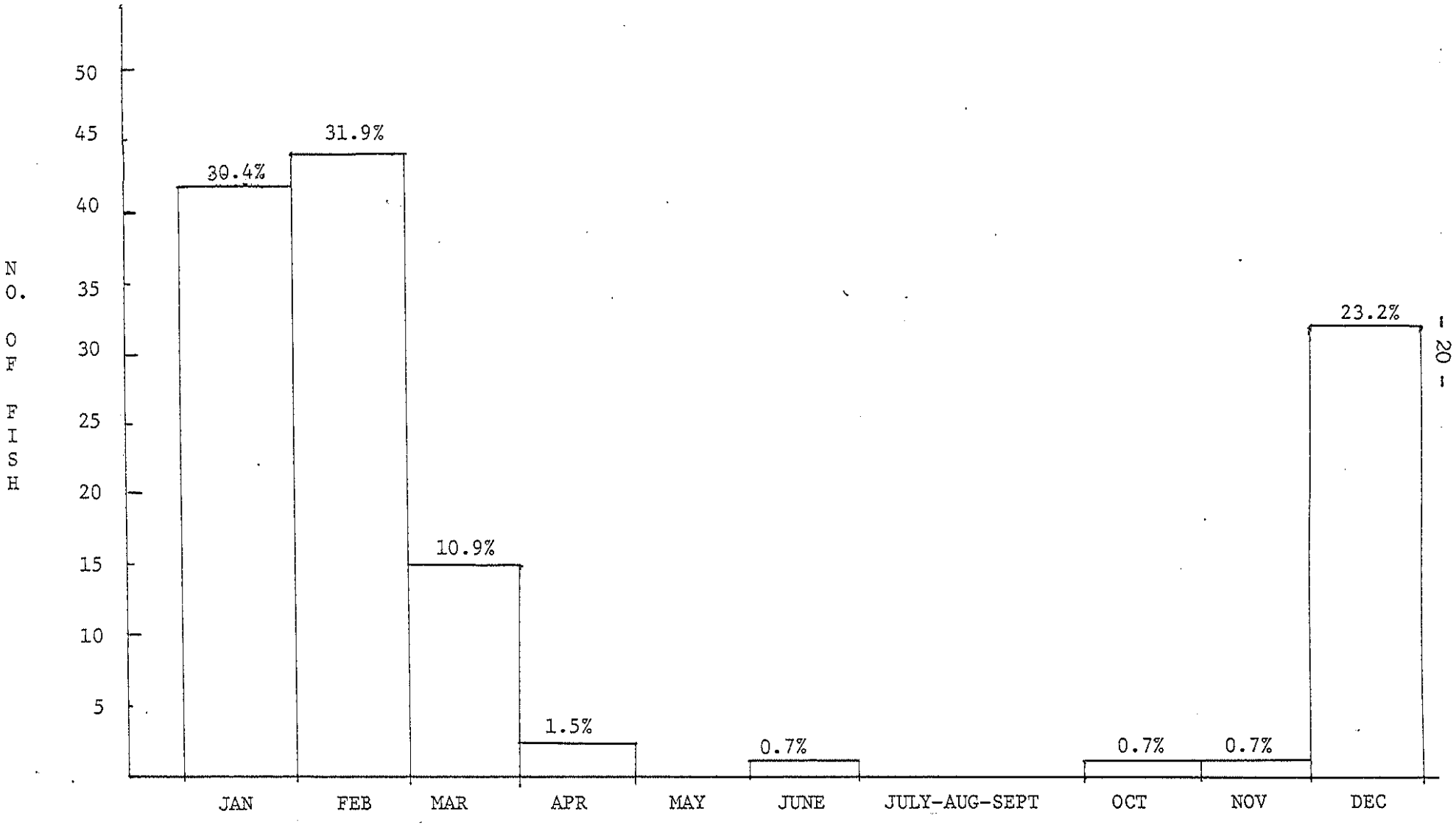


FIGURE 7. TIMING OF THE RUN - BASED ON ANGLER CATCH PER MONTH.

TABLE VIII. TIMING OF THE RUN-BASED ON ANGLER CATCH PER WEEK FOR CHEHALIS RIVER STEELHEAD

YEARS	DEC.				JAN.				FEB.				MAR.		TOTAL
	1-7	8-14	15-22	23-31	1-7	8-14	15-22	23-31	1-7	8-14	15-21	22-29	1-7	8-15	
1948	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1949	-	-	-	-	-	1	1	-	-	-	-	-	-	-	2
1950	-	-	-	5	-	-	-	-	-	-	-	-	-	-	5
1951	-	-	1	-	4	2	3	-	-	5	1	1	-	-	17
1952	-	3	3	1	-	-	-	-	6	9	8	-	3	5	38
1953	-	4	2	1	1	1	4	1	-	1	2	-	-	-	17
1954	3	2	-	2	3	6	-	-	-	2	2	-	-	-	20
1955	1	-	-	-	1	-	-	-	-	-	-	-	-	-	2
1956	-	-	1	-	-	-	-	1	-	1	-	-	-	-	3
1957	-	-	-	-	-	-	-	-	-	-	1	-	1	-	2
1958	-	-	-	1	1	-	-	-	-	-	-	-	1	-	3
1959	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
UNKNOWN	-	-	-	-	2	4	1	4	5	1	-	-	1	2	20
TOTAL	5	9	7	10	12	15	9	6	11	19	14	1	6	7	131
% OF TOTAL	3.8	6.9	5.3	7.6	9.2	11.5	6.9	4.6	8.4	14.5	10.7	.8	4.6	5.3	100.1

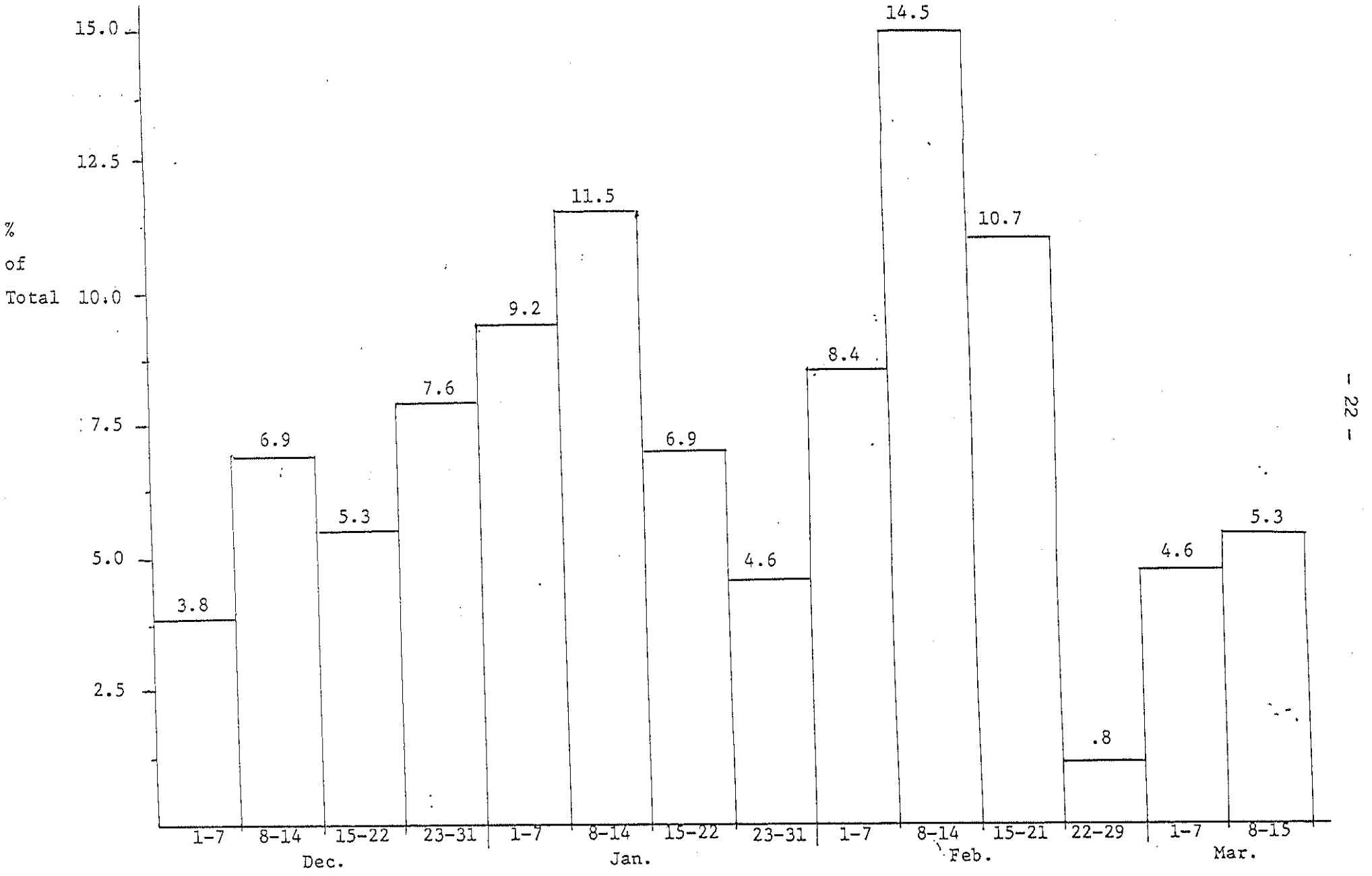


Fig. 8 - Timing of the Run - Based on Angler Catch per Week

Discussion

The results discussed in this report are based on scale samples collected from winter run steelhead caught by anglers in the Chehalis River between 1948 and 1959. The sample size is about 140. Results are broken down into age class structure, sex ratio, and timing of the run. Due to the fact that the fish were angler caught, their may be a bias of angling or gear selectivity.

(i) Age Class Structure

There were 9 different age groups represented in a sample size of 111. The most common age was 3.2 (36%) with 40 fish, followed by 3.3 (31.5%) with 35 fish. The results agree closely with those of Withler (1966). Withler found that 3/2 fish made up 33.3% and 3/3 fish 34.2%. The Chehalis steelhead run has a strong point in that it has two dominant age classes. Any natural or unnatural disaster that would affect the spawning run or egg incubation of any year class would be compensated for by the fact that only a portion of the returns from two year classes were destroyed. It would be assured that a 3.3 fish would spawn progeny destined to be both 3.2 and 3.3 adults and this overlap should help maintain the strength of the runs.

Five different freshwater age groups were found in a smaple size of 123. The most common age was 3. (68.3%) with 84 fish, followed by 4. (15.5%) with 19 fish. Although not too common, some fish were found in the 2+. and 3+. fresh-water age groups. This suggests that a portion of the smolt outmigration occurs later than the normal period from April to June. This was also found to occur on the Chilliwack by Caverly; Report V (1977) and on the Coquitlam by Caverly; Report VII (1978).

The most common saltwater age for 122 steelhead was .2 (58.2%) with 71 fish, followed by .3 (41.8%) with 51 fish. A significant difference appeared in the sex ratio of the two age groups. For .2 fish there were 39 females and 30 males for a ratio of 1.3:1. For the .3 group there were 42 females and 9 males with a ratio of 4.7:1. It appears that the larger .3 Chahalis steelhead are generally females.

Repeat spawners made up 10.3% of the total sample size. This is a higher figure than was reported by Withler (1966). Withler found that 6.4% of the total sample were second spawners. The most common age group for the 14 repeat spawners was 3.1 S1 (9 fish). No third spawners were found. The female to male ratio was 3.7:1. Females generally survive first spawning more often than males (Withler 1966), (Caverly 1977-78).

(ii) Sex Ratio

The overall female to male ratio for 136 Chehalis river winter steelhead was 2:1. There definitely appears to be angling selectivity for females in the Chehalis. This was also found in other Lower Mainland streams by Withler (1966) and Caverly (1977-78). Regulation by sex ratio should be considered to protect the diminishing runs. The saltwater age results demonstrate that many of the females are large fish and would make a significant difference if released to increase the size of the spawning escapement.

The monthly variation in sex ratio brought out another interesting fact. The variation in the female to male ratio was from 1:1 in December to 6.5:1 in March. The later in the season, the more females in the sport catch. A late season closure may be necessary on the Chehalis; or a catch and release fishery in February and March.

(iii) Timing of the Run

Steelhead are caught in the Chehalis River from October to April of the following year. The peak months for angler catch was Feburary with 44 fish (31.9%). January followed with 42 fish (30.4%). Peak catches appear to coincide with months having medium to high average flows (Fig.9).

The best week for steelhead catches was February 8 - 14 with 19 fish (14.5%). January 8 - 14 followed with 15 fish (11.5%).

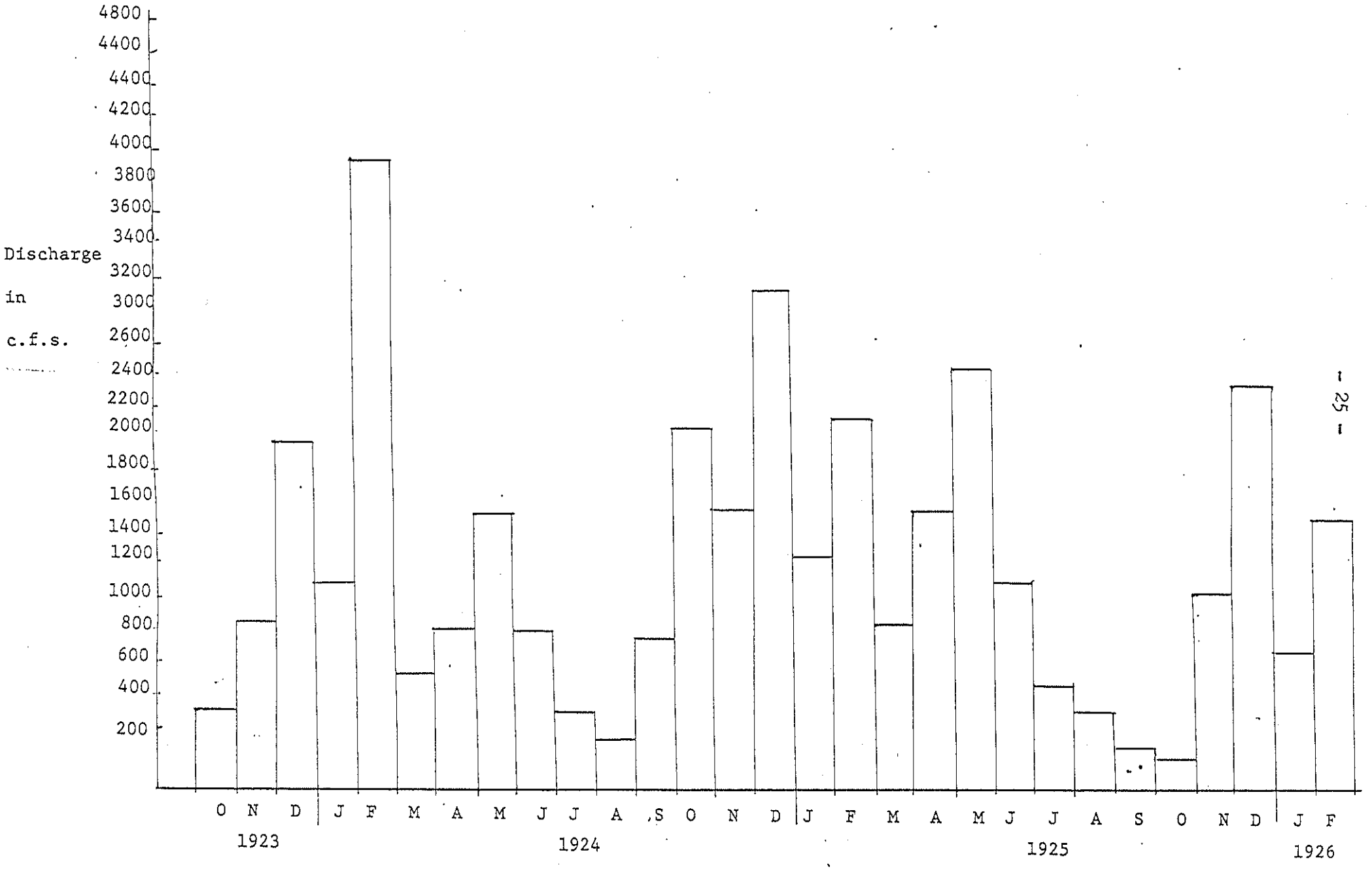


FIG. 9 MEAN MONTHLY DISCHARGE OF THE CHEHALIS RIVER.

Conclusions

1) Two dominant age groups are represented in the Chehalis River steelhead run. This run should be able to survive natural or unnatural disasters that affect only one year's spawning population.

2) The presence of 2+. and 3+. freshwater age groups suggests that a portion of the smolt outmigration occurs later than the normal period from April to June.

3) Larger .3 saltwater age Chehalis steelhead are generally females. Sex ratio results also indicate that two females are caught to every male.

4) During the later season on the Chehalis (March) as many as 6 females are taken for every male. These fish represent a significant loss to the spawning escapement.

5) Peak catches of steelhead in the Chehalis River coincide with the months having a medium to high average water flows.

Recommendations

1) The bias towards selection of females in the Chehalis River should justify a angling regulation by sex ratio (ie. release all females).

2) A late season closure may be advisable to prevent the high exploitation of females during late Feburary and March; if unacceptable catch and release should be mandatory.

List of References

1) Caverly, A.R.

Life History of Steelhead Trout (Salmo gairdneri) in the Coquihalla River. Based on Anglers Catches Between 1949 and 1975

Unpub. Rept. No. I F & W Br. 1977

2) Caverly, A.R.

Life History of Steelhead Trout (Salmo gairdneri) in the South Alouette River - Based on Nine Years of Angler's Catches

Unpub. Rept. No II F & W Br. 1977

3) Withler, I. L.

Life History of Steelhead Trout (Salmo gairdneri) Along the Pacific Coast of North America

Jour. Fish. Res. Bd., Canada, 23(3) 1966

4) Caverly, A.R.

Life History of Winter Steelhead (Salmo gairdneri) in the Vedder-Chilliwack River. Based on Scale Samples Collected Between 1948 and 1975.

Unpub. Rept. No. V F & W Br. 1978

5) Caverly, A.R.

The Life History of Winter Steelhead (Salmo gairdneri)) in the Coquitlam River Between 1958 and 1972

Unpub. Rept. No. VII F & W Br. 1978

Appendix 1. ADULT SCALE SAMPLE RECORD SHEET

SPECIES: STEELHEAD (Salmo gairdneri)

LOCATION: CHEHALIS RIVER, B.C.

INTERPRETER: AL FAVERLY

DATE: 1948-1951

DATE READ: JUNE/1978

REPORT: VIII

DATE D	M	Y	SCALE ENV. NO.	SCALE BOOK	SEEX	LENGTH	WEIGHT	TOTAL AGE	FRESH AGE	FRESH RADIUS cm.	MAG.	SALT AGE	SALT RAD. cm.	TOT. RAD. cm.
5	12	48	1	/	M	30	9.8	R.S1	R.	/	48×	.S1	/	/
9	1	49	2	/	F	28	8.5	R.2	R.	/	"	.2	/	/
16	1	49	3	/	M	30	9.5	3.1S1	3.	/	"	.1S1	/	/
26	12	50	4	/	F	29	/	3.1S1	3.	/	"	.1S1	/	/
27	12	50	5	/	M	29	10.1	4.2	4.	2.9	"	.2	10.5	15.0
28	12	50	6	/	M	34.5	16.5	3.3	3.	3.3	"	.3	12.0	23.0
29	12	50	7	/	M	26	8.0	2.2	2.	2.2	"	.2	9.0	13.4
29	12	50	8	/	M	28	9.2	3.2	3.	3.0	"	.2	9.5	14.2
1	1	51	9	/	F	30	8.0	3.1S1	3.	/	"	.1S1	/	/
4	1	51	10	/	F	35.5	13.0	4.3	4.	4.0	"	.3	10.2	20.4
7	1	51	11	/	F	29.1	8.0	3.1S1	3.	/	"	.1S1	/	/
7	1	51	12	/	F	26.5	7.0	3.2	3.	3.4	"	.2	10.0	13.5
14	1	51	13	/	M	36	18.0	4.3	4.	4.0	"	.3	9.7	18.2
14	1	51	14	/	M	28	7.0	3.2	3.	3.6	"	.2	10.0	16.0
16	1	51	15	/	F	31	12.0	2.3	2.	2.3	"	.3	9.2	21.0
16	1	51	16	/	M	30	10.0	3.2	3.	3.2	"	.2	10.5	17.5
21	1	51	17	/	M	27	6.7	3.1S1	3.	/	"	.1S1	/	/
8	2	51	18	/	M	27	7.0	R.2	R.	/	"	.2	/	/
9	2	51	19	/	M	27.5	7.5	R.2	R.	/	"	.2	/	/
9	2	51	20	/	F	27.5	8.5	3.2	3.	3.9	"	.2	13.0	18.5
9	2	51	21	/	F	31.5	11.0	3.3	3.	2.8	"	.3	11.2	20.0

ADULT SCALE SAMPLE RECORD SHEET

SPECIES: Steelhead

LOCATION: Chehalis R.

INTERPRETER: AL S.

DATE: 1951 - 1952

DATE READ: JUNE/78

REPORT: VIII

DATE D	DATE M	DATE Y	SCALE ENV. NO.	SCALE BOOK	SEX	LENGTH	WEIGHT	TOTAL AGE	FRESH AGE	FRESH RADIUS cm.	MAG.	SALT AGE	SALT RAD. cm.	TOT. RAD. cm.
9	2	51	22	✓	F	24.5	5.5	3+.2	3+.	3.7	48x	.2	11.0	18.5
18	2	51	23	✓	M	16.7	1.5	4+	RESIDENT RAINBOW					
24	2	51	24	✓	F	28	7.0	4.2	4.	4.4	"	.2	12.2	16.5
16	12	51	25	✓	M	✓	10.0	R.2	R.	✓	"	.2	✓	✓
1	2	52	26	✓	M	23.	7.1	4.2	4.	2.5	"	.2	10.2	13.1
2	2	52	27	✓	F	31	10.5	3.3	3.	3.4	"	.3	11.0	19.2
2	2	52	28	✓	M	32.5	12.0	4.3	4.	3.5	"	.3	10.1	18.5
2	2	52	29	✓	F	33	11.1	R.3	R.	✓	"	.3	✓	✓
5	2	52	30	✓	F	31	8.0	3.3	3.	✓	"	.3	✓	✓
7	2	52	31	✓	M	32	10.0	3.2	3.	3.6	"	.2	11.7	14.8
9	2	52	32	✓	F	25.5	6.0	3.2	3.	3.0	"	.2	10.5	13.6
9	2	52	33	✓	F	32	13.0	R.3	R.	✓	"	.3	✓	✓
9	2	52	34	✓	F	31.5	12.5	3.3	3.	3.0	"	.3	9.0	18.5
10	2	52	35	✓	F	31	11.0	3.3	3.	3.1	"	.3	10.5	18.3
10	2	52	36	✓	F	31	12.0	3.3	3.	3.1	"	.3	10.2	20.0
10	2	52	37	✓	F	31	12.0	3.3	3.	3.4	"	.3	10.8	18.3
13	2	52	38	✓	M	27	7.0	3.2	3.	3.1	"	.2	10.2	14.0
14	2	52	39	✓	F	31	13.0	3.3	3.	3.5	"	.3	10.5	20.5
14	2	52	40	✓	F	32	14.0	3.3	3.	3.5	"	.3	11.8	22.5
15	2	52	41	✓	F	26.5	7.5	3.2	3.	3.5	"	.2	9.5	17.0
15	2	52	42	✓	F	33	12.8	3.3	3.	✓	"	.3	✓	✓
15	2	52	43	✓	F	26.5	11.0	2.2	2.	3.2	"	.2	9.7	15.0
15	2	52	44	✓	M	26.5	7.0	3.2	3.	3.2		.2	12.8	17.3

ADULT SCALE SAMPLE RECORD SHEET

SPECIES: Steelhead

LOCATION: Chehalis R.

INTERPRETER: AL C.

DATE: 1952-53

DATE READ: JUNE/78

REPORT: VIII

DATE D	DATE M	DATE Y	SCALE ENV. NO.	SCALE BOOK	SEX	LENGTH	WEIGHT	TOTAL AGE	FRESH AGE	FRESH RADIUS cm.	MAG.	SALT AGE	SALT RAD. cm.	TOT. RAD. cm.
15	2	52	45	✓	F	32	14.0	4.3	4.	4.2	48x	.3	12.1	20.5
15	2	52	46	✓	F	31	12.0	3.3	3.	3.4	"	.3	12.0	20.0
15	2	52	47	✓	F	32	12.5	3.3	3.	3.5	"	.3	10.7	20.0
18	2	52	48	✓	F	31.5	13.5	3.3	3.	3.3	"	.3	10.0	17.5
2	3	52	49	✓	F	31.5	11.0	3.3	3.	3.4	"	.3	10.3	17.3
2	3	52	50	✓	F	✓	7.5	4.2	4.	3.2	"	.2	9.4	14.3
2	3	52	51	✓	M	33	13.0	3.3	3.	2.9	"	.3	11.0	22.0
11	3	52	52	✓	F	35	14.0	3.3	3.	3.7	"	.3	11.0	19.5
13	3	52	53	✓	F	31.5	12.0	4.3	4.	3.5	"	.3	12.0	18.3
13	3	52	54	✓	F	28	8.2	4.2	4.	4.3	"	.2	11.7	15.8
13	3	52	55	✓	F	30	7.0	3.2	3.	✓	"	.2	✓	✓
14	3	52	56	✓	F	✓	10.8	3.3	3.	3.1	"	.3	9.8	17.3
16	3	52	57	✓	F	31.5	15.0	3.3	3.	3.5	"	.3	12.0	22.0
13	12	52	58	✓	F	35	15.5	3.3	3.	3.1	"	.3	13.5	22.0
14	12	52	59	✓	F	25	7.0	4.2	4.	3.2	"	.2	8.2	11.2
14	12	52	60	✓	F	27.7	8.0	3.2	3.	2.6	"	.2	11.0	13.6
15	12	52	61	✓	M	30.5	10.0	3.2	3.	3.1	"	.2	12.7	16.8
19	12	52	62	✓	F	29	11.1	3.2	3.	3.4	"	.2	12.2	17.3
20	12	52	63	✓	M	28	7.5	3.2	3.	3.1	"	.2	12.4	18.3
31	12	52	64	✓	F	33.5	✓	R.3	R.	✓	"	.3	✓	✓
1	1	53	65	✓	M	29	11.5	3.2	3.	3.7	"	.2	11.7	15.7
11	1	53	66	✓	M	32	12.0	3+.2	3.	4.0	"	.2	12.1	16.0
17	1	53	67	✓	M	34	14.0	3.3	3.	✓	"	.3	✓	✓

ADULT SCALE SAMPLE RECORD SHEET

SPECIES: Steelhead

LOCATION: Chehalis R.

INTERPRETER: AL C.

DATE: 1953-1954

DATE READ: June/78

REPORT: VIII

DATE D	DATE M	DATE Y	SCALE ENV. NO.	SCALE BOOK	SEX	LENGTH	WEIGHT	TOTAL AGE	FRESH AGE	FRESH RADIUS cm.	MAG.	SALT AGE	SALT RAD. cm.	TOT. RAD. cm.
18	1	53	68	✓	F	31	10.0	3.3	3.	3.3	48x	.3	12.3	20.5
18	1	53	69	✓	F	27	6.5	3.2	3.	3.0	"	.2	12.6	17.5
18	1	53	70	✓	M	36.5	15.0	3.3	3.	3.2	"	.3	13.6	23.0
25	1	53	71	✓	F	27.2	7.0	4.2	4.	3.8	"	.2	12.0	15.8
8	2	53	72	✓	✓	27.[illegible]	6.5	4.2	4.	4.2	"	.2	12.6	17.0
21	2	53	73	✓	F	27.	8.0	3.2	3.	3.1	"	.2	10.0	14.0
21	2	53	74	✓	F	32.5	13.0	3.3	3.	2.9	"	.3	10.6	19.6
9	12	53	75	✓	M	35.5	15.5	3.3	3.	3.0	"	.3	9.5	17.0
9	12	53	76	✓	F	27.5	9.0	2.2	2.	2.7	"	.2	10.5	14.5
12	12	53	77	✓	M	30.5	10.0	4.2	4.	3.8	"	.2	11.5	16.8
12	12	53	78	✓	M	28	8.0	3+.2	3+.	3.6	"	.2	12.0	16.5
15	12	53	79	✓	M	28.5	9.5	3+.2	3+.	3.2	"	.2	8.4	12.8
16	12	53	80	✓	F	31	8.3	3.1S1	3.	✓	"	.1S1	✓	✓
24	12	53	81	✓	F	32.5	12.0	3.2S1	3.	✓	"	.2S1	✓	✓
1	1	54	82	Book 1-1 #1,2	F	31.5	11.5	3.3	3.	✓	"	.3	✓	✓
2	1	54	83	✓	F	32.2	13.5	3.3	3.	3.5	"	.3	11.5	18.5
3	1	54	84	✓	✓	29	9.0	3.2	3.	2.8	"	.2	10.0	14.5
9	1	54	85	✓	F	29	9.0	2.3	2.	✓	"	.3	✓	✓
10	1	54	86	✓	F	31.5	11.0	3+.3	3+.	4.5	"	.3	10.0	17.3
10	1	54	87	✓	F	32	11.5	3.3	3.	2.9	"	.3	10.0	18.0
13	1	54	88	✓	F	26	7.0	3.2	3.	3.8	"	.2	9.5	13.8
13	1	54	89	✓	M	27	6.5	3.2	3.	2.8	"	.2	9.1	12.5
13	1	54	90	✓	M	28	7.1	2.2	2.	3.2	"	.2	10.5	15.0

ADULT SCALE SAMPLE RECORD SHEET

SPECIES: Steelhead

LOCATION: Chehalis R.

INTERPRETER: AL C.

DATE: 1954 - 1957

DATE READ: JUNE / 78

REPORT: VIII

DATE D	M	Y	SCALE ENV. NO.	SCALE BOOK	SEEX	LENGTH	WEIGHT	TOTAL AGE	FRESH AGE	FRESH RADIUS cm.	MAG.	SALT AGE	SALT RAD. cm.	TOT. RAD. cm.
10	2	54	91	✓	M	29.5	8.5	3.2	3.	3.0	48x	.2	10.0	18.0
10	2	54	92	✓	M	27.5	7.5	2.2	2.	1.8	"	.2	7.5	11.2
21	2	54	93	✓	M	27.5	6.1	4.2	4.	4.0	"	.2	12.5	17.8
21	2	54	94	✓	F	25	6.5	3.2	3.	3.5	"	.2	11.0	15.0
28	3	54	95	✓	F	33	13.0	3.3	3.	4.0	"	.3	11.5	17.6
5	6	54	96	✓	F	17.5	2.4	3.2	3.	3.0	"	.2	7.0	9.5
4	12	54	97	✓	F	26	6.5	4.2	4.	3.7	"	.2	8.7	12.5
5	12	54	98	✓	F	34	14.1	R.3	R.	✓	"	.3	✓	✓
5	12	54	99	✓	F	30	11.0	3.3	3.	3.0	"	.3	11.0	18.5
11	12	54	100	✓	M	26	7.5	3.2	3.	3.4	"	.2	12.0	16.0
13	12	54	101	✓	F	30	13.0	4.3	4.	4.5	"	.3	11.2	17.0
23	12	54	102	✓	F	29.5	10.0	3.3	3.	3.0	"	.3	10.8	16.5
26	12	54	103	✓	M	34.5	16.0	✓	✓	✓	"	✓	✓	✓
4	1	55	104	✓	M		10.5	3.2	3.	4.0	"	.2	11.2	15.5
26	11	55	105	✓	M	31	14.0	2.3	2.	2.7	"	.3	11.0	18.3
2	12	55	106	✓	F	32	12.7	3.3	3.	3.5	"	.3	10.0	15.5
28	1	56	107	✓	M	35.5	16.5	R.3	R.	✓	"	.3	✓	✓
9	2	56	108	✓	F	26	7.0	3.2	3.	3.0	"	.2	10.0	13.5
22	12	56	109	Book 1-1 #34	M	23.2	5.0	R	R	✓	"	✓	✓	✓
16	2	57	110	✓	F	29	8.5	2.1S1	2.	✓	"	.1S1	✓	✓
2	3	57	111	✓	M	33	14.2	R.3	R.	✓	"	.3	✓	✓

ADULT SCALE SAMPLE RECORD SHEET

SPECIES: ST

LOCATION: CHEHALIS R.

INTERPRETER: AL C.,

DATE : 1957 - 1959

DATE READ : JUNE/78

REPORT: VIII

DATE D	DATE M	DATE Y	SCALE ENV. NO.	SCALE BOOK	SEEX	LENGTH	WEIGHT	TOTAL AGE	FRESH AGE	FRESH RADIUS cm.	MAG.	SALT AGE	SALT RAD. cm.	TOT. RAD. cm.
15	6	57	112	/	F	15.7	1.3	5+	RESIDENT		RAINBOW			
5	1	58	113	/	F		5.0	3.2	3.	3.0	48x	.2	10.1	13.7
2	3	58	114	/	F		7.2	3.2	3.	4.0	"	.2	11.3	15.0
26	12	58	115	/	M		7.0	2+.2	2+	2.3	"	.2	8.8	13.2
11	1	59	116	/	F	31	10.3	2.3	2.	2.4	"	.3	8.0	15.3

ADULT SCALE SAMPLE RECORD SHEET

SPECIES: Steelhead (Salmo gairdneri)

LOCATION: ~~Coquitlam River~~ Chehalis River INTERPRETER: A. C.

DATE: UNKNOWN DATE READ: JUNE/78

REPORT: VIII

DATE D	DATE M	DATE Y	SCALE ENV. NO.	SCALE BOOK	SEX	in. LENGTH	lb. WEIGHT	TOTAL AGE	FRESH AGE	cm. FRESH RADIUS	MAG.	SALT AGE	cm. SALT RAD.	cm. TOT. RAD.
06	01	✓		✓	F	29.0	8.5	4.2	4.	4.6	48x	.2	12.8	17.6
07	01	✓		✓	F	28.0	8.0	R.2	R.	✓	"	.2	✓	✓
08	01	✓		✓	F	28.5	10.0	3.1S1	3.	✓	"	.1S1	✓	✓
10	01	✓		✓	F	24.0	5.1	3.2	3.	4.0	"	.2	12.0	15.0
10	01	✓		✓	M	30.0.	12.5	4.2	4.	4.0	"	.2	12.7	17.2
13	01	✓		✓	F	27.5	7.0	3.2	3.	2.5	"	.2	8.5	12.5
20	01	✓		✓	F	31.5	11.0	3.2	3.	3.4	"	.2	12.0	17.0
29	01	✓		✓	F	34.0	11.5	3.1S1	3.	✓	"	.1S1	✓	✓
30	01	✓		✓	F	29.0	8.5	3.2	3.	3.0	"	.2	10.0	14.5
31	01	✓		✓	F	28.5	8.0	3.2	3.	3.8	"	.2	9.3	13.8
31	01	✓		✓	F	27.0	6.75	3.2	3.	3.7	"	.2	10.0	14.7
01	02	✓		✓	F	35.5	14.0	4.1S1	4.	✓	"	.1S1	✓	✓
01	02	✓		✓	M	31.5	11.0	R.2	R.	✓	"	.2	✓	✓
01	02	✓		✓	F	35.5	17.0	2.2S1	2.	✓	"	.2S1	✓	✓
02	02	✓		✓	F	32.5	13.0	3.3	3.	3.4	"	.3	11.2	20.5
06	02	✓		✓	F	29.5	8.2	3.2	3.	3.1	"	.2	9.0	11.5
14	02	✓		✓	M	25.0	6.1	3.2	3.	2.9	"	.2	11.0	13.5
01	03	✓		✓	F	27.5	8.0	3.2	3.	3.5	"	.2	15.0	22.0
15	03	✓		✓	F	27.0	6.5	3.2	3.	3.0	"	.2	10.0	15.0
15	03	✓		✓	F	31.8	8.0	3.3	3.	3.4	"	.3	9.5	15.0
02	04	✓		✓	F	26.3	6.1	3.2	3.	3.7	"	.2	8.5	12.0
02	04	✓		✓	F	27.0	7.2	2.2	2.	2.5	"	.2	10.5	15.5
✓	10	55		✓	F	29.5	9.5	3.1S1	3.	✓	"	.1S1	✓	✓
	12	53		✓	F	26.5	6.5	2+.2	2+.	3.0	"	.2	11.0	14.5

MISC. SCALE SAMPLES - NO CATCH DATE

Appendix 2. Discharge records for the Chehalis River.

CHEHALIS RIVER NEAR HARRISON MILLS - STATION NO. 08MG001

MONTHLY AND ANNUAL MEAN DISCHARGES IN CUBIC FEET PER SECOND FOR THE PERIOD OF RECORD

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1911	---	---	---	---	---	---	---	---	---	---	2170	1600	---
1912	---	---	---	425	904	760	386	311	391	631	2130	999	---
1913	551	1350	1080	1470	2460	1690	916	441	1010	1770	3300	1610	1470
1914	4230	1570	3800	3610	1980	1130	689	271	989	2040	4480	731	2130
1915	1040	931	1380	1810	901	---	---	---	---	---	---	---	---
1923	---	---	579	1430	1850	1320	594	267	303	479	1010	2170	---
1924	1260	3910	705	1000	1680	971	431	288	937	2220	1760	3110	1510
1925	1440	2280	1010	1680	2620	1240	617	488	257	195	1250	2500	1290
1926	838	1650	1060	1040	1240	701	---	---	---	---	---	---	---
1957	---	---	---	---	---	---	---	---	349	418	---	---	---
MEAN	1560	1950	1370	1560	1700	1120	606	344	605	1110	2300	1820	1600

CHEHALIS RIVER NEAR HARRISON MILLS - STATION NO. 08MG001

ANNUAL EXTREMES OF DISCHARGE IN CFS AND ANNUAL TOTAL DISCHARGE IN AC-FT

YEAR	MAXIMUM INSTANTANEOUS DISCHARGE	MAXIMUM DAILY DISCHARGE	MINIMUM DAILY DISCHARGE	YEAR	TOTAL DISCHARGE
1911	---	---	---	1911	---
1912	---	---	---	1912	---
1913	---	15000 CFS ON NOV 24	230 CFS ON AUG 31	1913	1060000 AC-FT
1914	---	22000 CFS ON JAN 6	120 CFS ON SEP 6	1914	1540000 AC-FT
1915	---	---	---	1915	---
1923	---	---	---	1923	---
1924	---	14000 CFS ON DEC 12	240 CFS ON SEP 17	1924	1100000 AC-FT
1925	---	9020 CFS ON FEB 3	134 CFS ON OCT 18	1925	936000 AC-FT
1926	---	---	---	1926	---
1957	---	---	---	1957	---
EXTREMES OF DISCHARGE FOR THE PERIOD OF RECORD				MEAN	1160000 AC-FT

MAX. INST. DISCHARGE IS ---
MAX. DAILY DISCHARGE IS 22000 CFS ON JAN 6 1914
MIN. DAILY DISCHARGE IS 120 CFS ON SEP 6 1914

CHEHAINUS RIVER NEAR WESTHOLME - STATION NO. 08HA001

MONTHLY AND ANNUAL MEAN DISCHARGES IN CUBIC FEET PER SECOND FOR THE PERIOD OF RECORD

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1914	---	---	---	---	---	203	76.6	24.9	108	1330	2200	435	---
1915	915	713	840	932	253	148	57.5	24.0	15.0	794	897	1810	617
1916	277	1370	1400	1300	1180	970	343	54.5	20.1	61.4	477	431	653
1917	673	605	324	---	---	---	---	---	---	---	---	---	---
1952	---	---	---	---	---	---	---	---	---	---	---	989	---
1953	2610	1120	567	654	595	233	82.7	27.7	120	525	1660	1770	830
1954	1410	2690	1240	---	---	---	338	61.6	230	409	2030	1370	---
1955	712	518	371	881	668	387	170	95.6	24.9	639	1170	824	538
1956	858	197	719	1060	1100	748	146	22.5	63.3	732	494	1400	631
1957	702	833	1290	680	321	85.7	98.8	149	91.0	182	223	899	461
1958	1510	1290	619	842	261	99.0	23.4	12.1	66.7	433	936	2480	713
1959	1880	484	658	1360	606	204	80.9	48.6	119	346	1040	1060	659
1960	870	1320	619	1100	581	227	48.8	26.8	30.7	357	948	1100	599
1961	2170	2320	1240	625	579	148	43.0	14.5	38.6	486	905	1450	827
1962	1290	518	378	950	553	244	59.7	76.9	46.0	678	2230	2230	772
1963	652	1340	752	678	408	64.7	52.2	23.9	13.0	862	1230	1290	609
1964	1450	858	670	686	556	421	142	56.8	77.4	261	487	653	526
1965	697	1380	524	553	374	94.4	24.7	16.6	13.4	663	1120	1610	585
1966	1470	883	1220	997	528	218	95.5	24.1	28.0	346	1180	2560	797
1967	1920	1050	1020	563	664	252	39.2	12.4	13.9	794	820	1640	733
1968	3500	1770	1190	479	364	174	49.9	45.4	160	953	1130	940	897
1969	457	424	829	1400	993	284	59.2	38.3	185	245	643	1580	595
1970	915	939	826	822	311	99.0	26.8	7.8	28.8	306	637	1490	532
MEAN	1280	1080	824	872	573	265	98.0	41.1	71.1	543	1070	1360	662

Appendix 3.

SUBJECT: Use of Master Reference Report

The scale sample master record sheets contain all the raw data obtained from scale envelopes and scale samples that have been discussed in reports on Lower Mainland streams. All the samples are arranged chronologically by day whenever possible. Scale samples are stored in the filecabinet for scales at the Region II office. Photomicrographs are in the watershed file, numbered by scale envelope no.

Different formats are used for adult scale samples and juvenile samples. Copies of both are in the scale file. Copies of the adult record sheets are also in the report appendix for each watershed.

Description of Record Sheet Format and Terminology

(i) Adult Samples: Record sheets also included in report appendix

At the top of the record sheet is the following:

Location: River, nearby town

Species: Common name (latin name)

Report No. Roman numeral and report title

Interpreter: Name of person(s) reading scales

Date: Date the scales are read (month/year)

- The rest of the sheet is scale envelope and sample information
- All radii measurements are in centimerters on the dorsal-ventral axis.

Date: Date of sampling

Day Mo. Yr.

Scale Envelope: This number corresponds to the number at the upper right hand corner of the scale envelope

Scale Book: Book number - page number (NA - not applicable) # square no.

Sex: Self-explanatory

Length: Length of fish in inches

Weight: Weight of fish in pounds

...2

Total Age: Freshwater winters. Saltwater winters; This would also include second or third spawnings.

Freshwater age: Number of winters in freshwater

Freshwater Radius: The radius of the freshwater growth zone, measured from the focus to the outer freshwater annulus.

Mag: The magnification used for all scale radii measurements

Saltwater Age: Number of winters of saltwater growth; includes repeat spawning

Saltwater Radius: Measured from the focus to the outer ring of the first saltwater annulus.

Total Radius: Measured from the focus to the outer scale edge.