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Bill Sheffield, Governor

Annual Performance Report for

LOWER COOK INLET ANGLER USE AND ASSESSMENT STUDIES AND ANCHOR RIVER STEELHEAD

by

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RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations of Alaska

Project: F-9-17

Study: G-I AFS-48 Study Title: INVENTORY AND CATALOGING

Job: G-I-C AFS-48-4 Job Title: Lower Cook Inlet Angler Use and Assessment Studies and Anchor River Steelhead Studies

Cooperator: D. Thomas Balland

Period Covered: July 1, 1984 to June 30, 1985

ABSTRACT

Minnow traps were used to capture juvenile steelhead trout, *Salmo gairdneri* Richardson, coho salmon, *Oncorhynchus kisutch* (Walbaum), chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), and Dolly Varden, *Salvelinus malma* (Walbaum), in Anchor River during the period from May 3 through August 10, 1984. Small inclined plane traps were used to capture emergent steelhead fry from July 5 through August 10, 1984. Relatively small numbers of steelhead smolts were captured during the season. The greatest catches occurred during mid-May. The earliest and greatest catches of emergent steelhead occurred during mid-July.

Ninety-four adult steelhead were tagged with Floy anchor tags. Based on the return of 10 tags during creel census, the 1984 estimated population was 1,361 fish.

A creel census was conducted on the Anchor River in 1984, and an estimated 7,610 angler-days of effort were spent during the period August 18 through November 4. During this fall fishery, it was estimated that anglers retained 39 % of the steelhead they caught for a total harvest of 305 steelhead. Anglers also caught an estimated 708 Dolly Varden and 1,060 coho salmon.

Samples from the adult run were composed of 14 separate age classes. First-spawning fish consisted of five age classes and repeat spawners consisted of nine separate age classes. The majority of first- spawning

females and males were Age Class 3.2. Repeat spawners comprised nearly 23% of the fish sampled.

Bacterial kidney disease, caused by *Renibacterium salmoninarum*, and Furunculosis, caused by *Aermonas salmonicida*, were detected in adult chinook and coho salmon from the Anchor River.

KEY WORDS

Steelhead trout, inclined-plane trap, tagging, minnow traps, steelhead smolt, Anchor River, spawning, sport fishing effort, harvest, population estimate, bacterial kidney disease, furunculosis.

BACKGROUND

A map showing the location of the study area is provided in Fig. 1 and a list of fish species is given in Table 1.

Anchor River has long been recognized as one of the most popular sport fishing streams on the Kenai Peninsula. The river supports good populations of Dolly Varden, chinook and coho salmon. It also has the largest steelhead trout population of the five Kenai Peninsula streams which produce this species.

Observations indicated a substantial increase in angler effort and harvest on the river and, during the period 1978-84, a creel census of the fall sport fishery was conducted to obtain data on harvest and population levels of Dolly Varden, coho salmon and steelhead trout.

Every year, 10,000-20,000 man-days of angling effort are spent on the Anchor River in the summer-fall period when steelhead are caught. Dolly Varden, coho salmon, and steelhead are all caught during this period, and it is not feasible to assign fishing effort to any one species. Total harvest of Anchor River steelhead has ranged from about 300 to 1,700 annually during the past 8 years. This catch has accounted for about 26 to 40% of the total combined harvest of steelhead in the state.

Steelhead stocks in all streams on the Kenai Peninsula are similar to those termed "summer run" throughout the Pacific Northwest. Adults enter the streams throughout the summer and fall, spend the winter in fresh water, then spawn the following spring and migrate back to sea.

Some aspects of Anchor River steelhead life history and population characteristics have been investigated periodically since the mid-1950's, but the studies have been intermittent and of limited scope. Total run size, adult migration, and spawning characteristics, areas and timing of juvenile rearing and migration and the potential for supplemental production are a few important aspects which had not been studied adequately prior to this study.

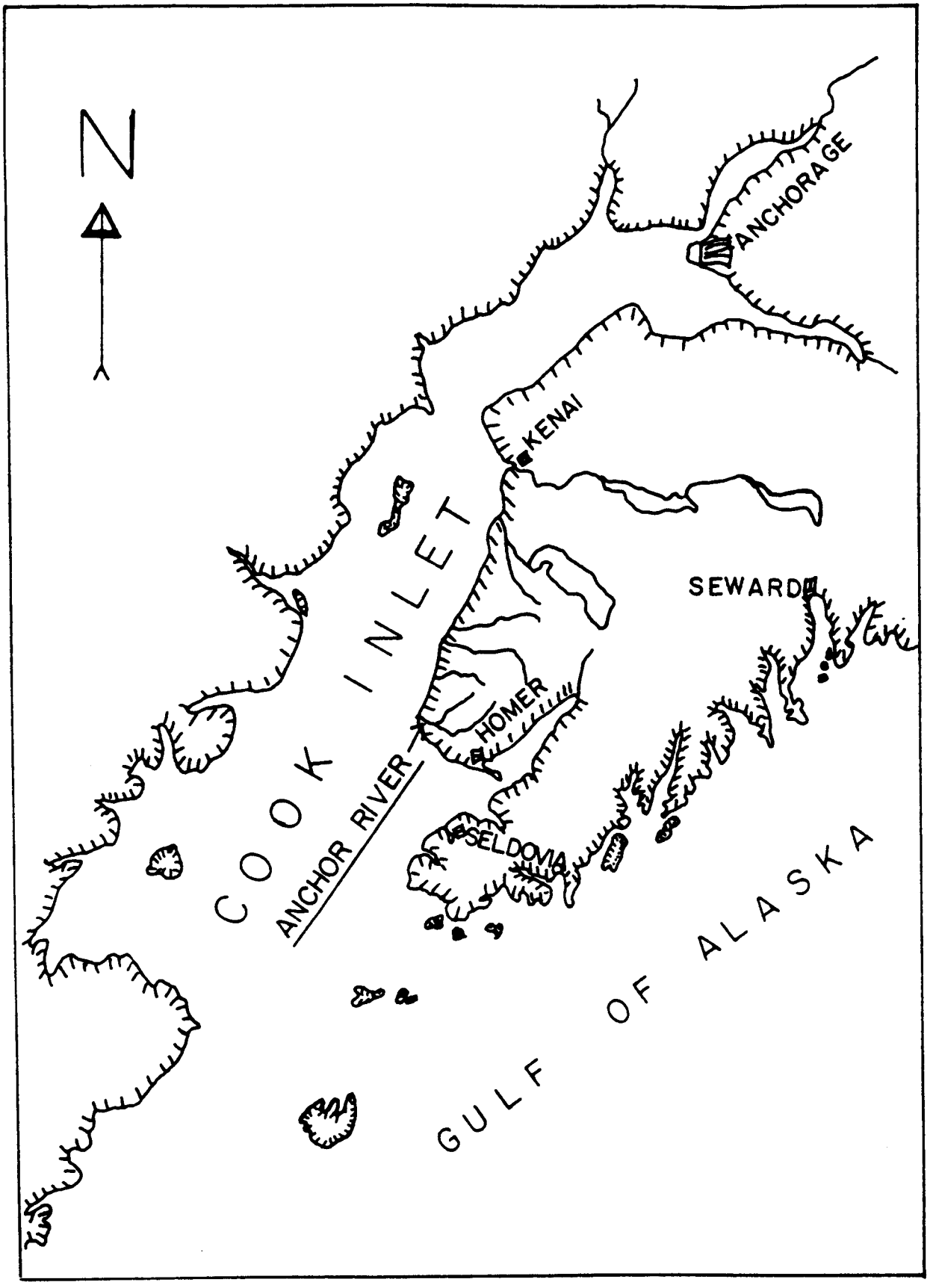

Figure 1. Location of the study area.

Table 1. List of common names, scientific names, and abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Chinook salmon	*Oncorhynchus tshawytscha* (Walbaum)	KS
Coho salmon	*Oncorhynchus kisutch* (Walbaum)	SS
Dolly Varden	*Salvelinus malma* (Walbaum)	DV
Rainbow trout	*Salmo gairdneri* Richardson	RT
Steelhead trout	*Salmo gairdneri* Richardson	SH

A life history study of steelhead in the Anchor River was initiated in 1980. Its goal is to gather biological information upon which to base management programs, formulate regulatory guidelines, and evaluate the need and potential for supplemental enhancement of these stocks. During the course of the life history study, juvenile salmonids of all species were captured, thereby providing an opportunity to obtain basic life history data for other species in addition to steelhead. These data will provide a better understanding of fish stocks and ultimately lead to better management techniques.

During the course of this investigation we compiled data which give us a far better understanding of the status of steelhead stocks in Anchor River and the instream movements of both juveniles and adults. However, there are two areas where our techniques are deficient:

1. The method of estimating total population of adult steelhead is of marginal value. We have been able to estimate total population in only 4 of the 7 years of the study, and confidence intervals of those estimates are great.

2. Methods of capturing steelhead smolts have been unsatisfactory, resulting in an incomplete assessment of the time of smolt migration and the size of smolts. The most useful data we have on these fish have come from scale analysis of adult steelhead.

RECOMMENDATIONS

1. The present objectives of this study should be retained and the study should be continued. Added emphasis should be placed upon collection of life history data for coho and chinook salmon and Dolly Varden in the Anchor River.

2. The study should be expanded to include steelhead population characteristics in other lower Kenai Peninsula streams.

OBJECTIVES*

1. To conduct a creel census from August 15 through October on the Anchor River to determine angler effort and harvest during the coho salmon, Dolly Varden, and steelhead fishery.

2. To determine juvenile salmonid rearing requirements, abundance, and distribution in the Anchor River from May through October.

3. To determine adult steelhead migration, holding and spawning behavior in the Anchor River from August through June.

* Objective 1 is for study number G-I and Objectives 2 and 3 relate to study number AFS-48.

TECHNIQUES USED

Techniques reported by Wallis and Balland (1983) were used during the 1984 field season to record water temperatures and obtain water flow data.

Juvenile salmonids were captured at nine locations in the Anchor River. For the sake of consistency, the locations were numbered as reported by Wallis and Balland (1984). New stations were assigned unused location numbers. Locations of all trapping stations are noted in Fig. 2.

Minnow traps, as described by Wallis and Balland (1983), were operated during the period May 3 to August 10. Four stations were established and trapped during the season. From May 21 until July 22, a trap-day began between the hours of 10 p.m. and midnight. Each station was trapped using a different timetable in an attempt to establish time of steelhead smolt migration. For the periods May 6 to May 20 and July 23 to August 10, a trap-day began at 8 a.m. and continued for 24 hours.

Length measurements were taken to the nearest millimeter from all juvenile salmonids that were captured. Scale and weight samples were collected from a representative sample of steelhead juveniles using techniques employed in previous years.

Inclined plane traps, as described by Wallis and Balland (1984), were used to capture emergent steelhead at four locations during the period July 5 to August 10. Two stations had been successfully trapped in 1983 and two new stations were chosen for their location.

On May 24, a foot survey was conducted along the North Fork of the Anchor River to observe spawning steelhead. High and turbid water prevented observation of spawning steelhead during the remainder of the season.

Adult steelhead were captured during the fall upstream migration using techniques described by Wallis and Balland (1983). The steelhead were tagged with Floy anchor tags and released at point of capture.

Scales were collected from adult steelhead during creel census, tagging operations, and capture of fish for the hatchery. Techniques of collection, preparation, and interpretation were the same as previous years.

Individual adult steelhead were weighed on a hand-held Chatillon scale and weights were recorded to the nearest 100 g. Fish were measured to the nearest 5 mm.

Steelhead were captured from Anchor River by Alaska Department of Fish and Game (ADF&G) personnel for brood stock in a steelhead enhancement project. All fish were captured by gill net; otherwise techniques of capture and handling were the same as in 1982. Fish were transported to the Trail Lakes Hatchery for overwinter holding.

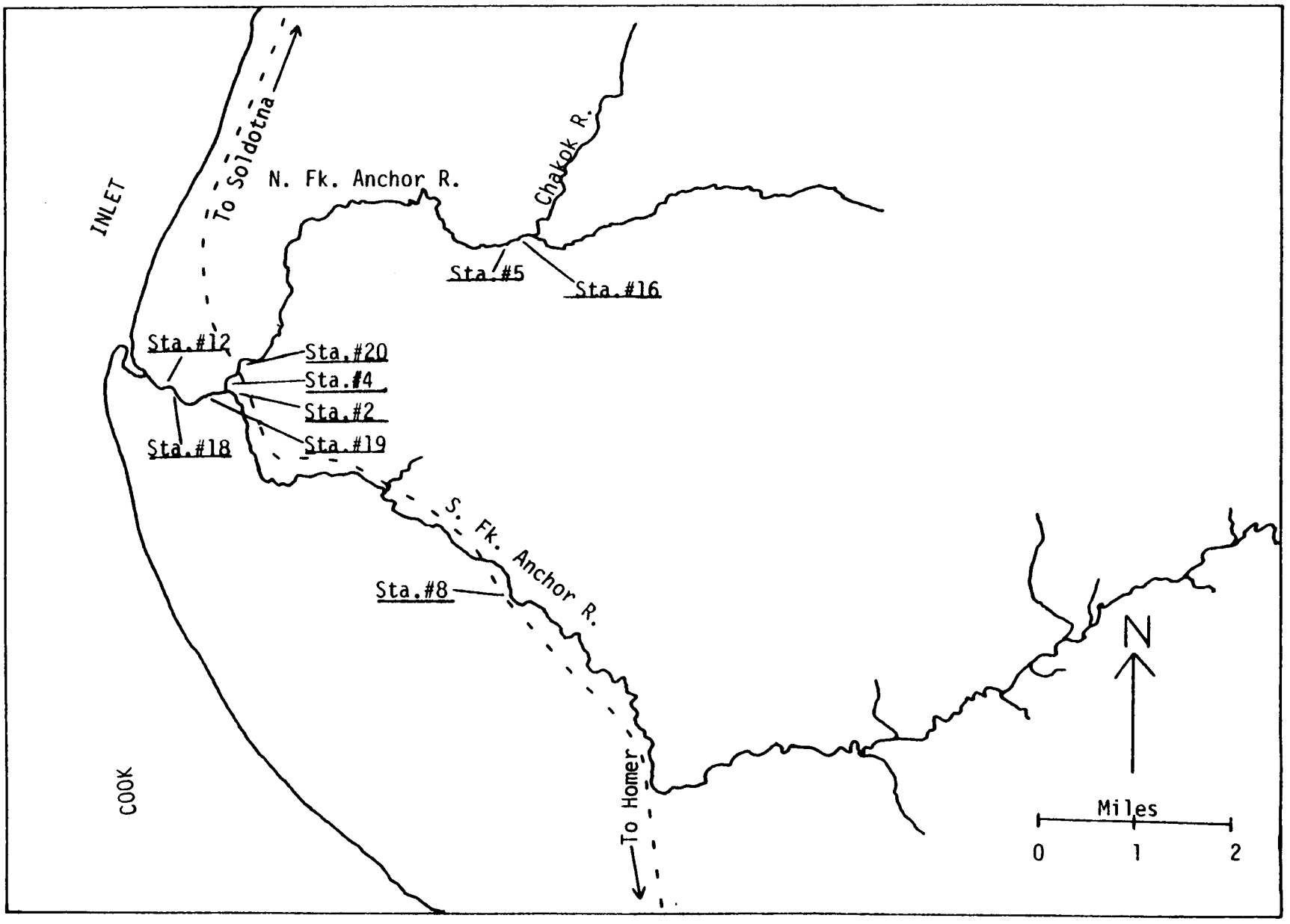

Figure 2. Map of Anchor River showing location of juvenile trapping stations, 1984.

A creel census was conducted from August 18 to November 4. The method employed was a modification of that described by Neuhold and Lu (1957) and was described in detail by Wallis and Balland (1981). Creel census interviews were conducted in Area 1 during two randomly selected time periods of 2.5 hr. each. A vehicle count was made in Area 2 once a day, at randomly selected times, on those days a creel census was conducted in Area 1. The estimated harvest in Area 2 was based on comparative effort between Areas 1 and 2.

Kidney and hindgut samples were collected from adult chinook, coho, and steelhead for pathological examination. The samples were collected from fish harvested by sport fishermen. They were frozen and later shipped to the pathology laboratory in Anchorage and were examined for the presence of bacterial kidney disease or furunculosis.

FINDINGS

Water Temperature and Flow

Daily maximum and minimum temperatures recorded in the South Fork of Anchor River are listed in Table 2.

Mean monthly waterflow rates in Anchor River for water years 1965-1982 inclusive and 1984 are depicted in Fig. 3.

Juvenile Data

Juveniles Trapped:

Specific locations of the various trapping stations are shown in Fig. 2. Numbers of juvenile salmonids trapped are summarized in Table 3.

Trapping at Station 18 was discontinued after the third week when it was determined greater numbers of juvenile salmonids could be trapped at other stations.

Size distributions of juvenile steelhead captured at Stations 2, 4, 12, and 19 are given in Tables 4, 5, 6, and 7, respectively.

Minnow traps at Stations 2 and 4 were operated on a 24-hr. basis during the entire season. During the period May 21 to July 22, the minnow traps were checked at periodic intervals during a 24-hr. trap-day. All of the fish were counted and steelhead were measured. The fish were returned to their respective traps until the end of the 24 hour period when they were again enumerated and all were measured. Data collected indicated fish readily escaped from the minnow traps after short periods of time and in many instances a greater number of fish were counted for a 2-or 3-hr. period than for a 24-hr. period. Data in Tables 3, 4, and 5 reflect the greatest number of fish counted.

Table 2. Minimum and maximum water temperatures recorded in the Anchor River, 1984, °C.

	April		May		June		July		August		September	
Day	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1	...	...	2	5	6	11	9	10	12	14	7	9
2	...	...	2	5	7	12	9	11	13	14	7	9
3	...	...	2	3	8	12	9	14	13	16	7	9
4	...	...	2	3	9	13	11	16	12	18	7	9
5	...	...	2	4	9	12	12	16	14	17	7	9
6	...	...	2	4	8	10	13	16	14	16	7	9
7	...	...	1	6	8	9	12	17	13	17	7	8
8	...	...	2	6	7	9	13	15	13	17	8	9
9	...	...	2	6	7	9	12	14	14	18	8	10
10	...	...	2	6	7	10	11	13	13	17	8	10
11	...	...	2	6	8	12	11	12	13	16	7	9
12	...	...	2	6	9	13	10	...	12	16	7	9
13	...	...	2	5	9	11	...	12	11	16	8	8
14	...	...	3	4	8	10	10	12	11	16	8	8
15	...	...	3	4	8	9	10	13	12	17	7	8
16	...	...	3	5	7	8	11	13	13	17	7	9
17	...	...	3	5	7	9	11	11	13	16	7	9
18	...	...	3	5	7	12	10	11	13	14	8	8
19	...	...	3	6	8	13	10	11	9	13	7	8
20	...	...	3	7	10	14	10	11	11	12	5	6
21	0	2	4	6	4	6	10	14	11	11	4	6
22	0	3	4	6	4	6	12	14	11	12	5	6
23	0	4	4	6	4	6	11	13	11	12	5	6
24	1	5	4	8	4	8	10	13	11	12	...	...
25	1	5	5	7	5	7	11	14	11	12	...	...
26	2	3	4	7	4	7	12	14	9	11	...	...
27	2	3	5	6	5	6	12	14	8	10	...	...
28	1	4	5	8	5	8	10	13	7	9	...	...
29	1	3	5	9	5	9	11	12	7	8	...	...
30	2	3	6	9	6	9	11	13	6	9	...	...
31	...	...	5	9	5	9	11	13	6	8	...	...

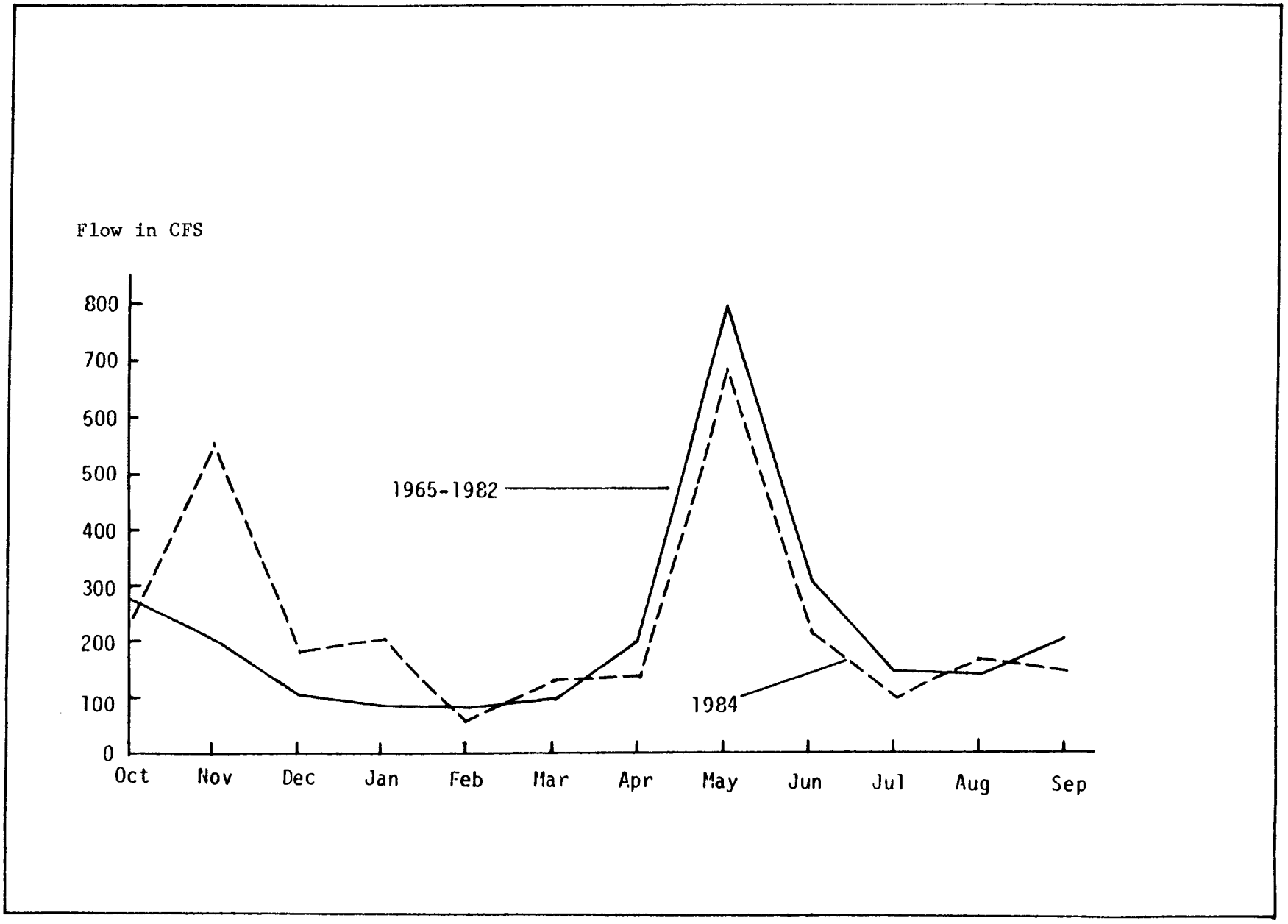

Figure 3. Mean monthly water flows in Anchor River, 1965-1982, 1984.

Table 3. Summary of numbers of juvenile salmonids captured at various trapping stations in Anchor River, 1984.

Station Number	Type of Trap	SH	DV	KS	SS
2	Minnow Trap	201	100	25	55
4	Minnow Trap	270	402	177	252
12	Minnow Trap	330	843	409	358
18	Minnow Trap	10	25	19	16
19	Minnow Trap	332	447	150	122
2, 8, 16, and 20	Inclined- Plane Fry Trap	108	0	0	3
	Total	1,251	1,817	780	806

Table 4. Numbers of juvenile steelhead trapped at Station 2 in Anchor River, by weekly period and length interval, 1984

Fork Length (mm)	Week Ending 5/06	5/13	5/20	5/27	6/03	6/10	6/17	6/24	7/01	7/08	7/15	7/22	7/29	8/05	8/12
40-44														1	
45-49															5
50-54		1		1	1										1
55-59			2	2	1			2							
60-64	1	3	4	4	5	2			1						
65-69	2	1	2	4	1		1	3	1						
70-74		1	1	1	2	1	1	2	2	2	3	1			
75-79				1	1	3	1	1	1	7	4				
80-84			1			1		1	2	5	1	1			
85-89				1			1	1	1	8	1	5	1	3	
90-94				1		1				3	2	2		1	
95-99			1	2	2					2	2	2		1	
100-104						2	1			4	1	1		2	
105-109			1		1					2	1	1		1	
110-114			1	2			1			1	2				
115-119		1								1		2			1
120-124					1					1			1		
125-129	1							1		3	1				
130-134							1								
135-139	2									2	1				
140-144				1						2					
145-149								1		1					
150-154															
155-159					1						1				
160-164										1					
165-169				1											
170-174						1									
175-179															
180-184															
185-189															
Total	6	7	13	21	16	11	7	12	8	45	20	15	2	9	7

Table 5. Numbers of juvenile steelhead trapped at Station 4 in Anchor River, by weekly period and length interval, 1984.

Fork Length (mm)	Week Ending 5/06	5/13	5/20	5/27	6/03	6/10	6/17	6/24	7/01	7/08	7/15	7/22	7/29	8/05	8/12
40-44						1									
45-49															3
50-54		2	6			1									
55-59	2	5	8			2									
60-64	1	3	8	3	2	3									
65-69	1	3	4	1	2			1							
70-74			2		1		1		1	1					
75-79		1			2		1			1	2	3			
80-84		2		1						2	2	2	1	1	1
84-89		5	1	1	2				1	1	1	7		2	
90-94		2		3	2					1	3	4		1	
95-99		9	7	1	4						2	2			
100-104		3		2	3	2	1	1		1	2				
105-109		5		2	2				1						
110-114		8		1	2	2	1		2		1				
115-119	1	6			2	2	1				1				
120-124		6		1	1	1	1			2	1				
125-129		2			1		2			1	1	1			
130-134		7				1		1							
135-139		3					1								
140-144		3		2							1				
145-149		4			1				1						
150-154		2													
155-159		2	1			1		1			2				
160-164		1		1											
165-169							1			1					
170-174						1									
175-179									1		1				
180-184										1					
185-189															
Total	5	84	37	19	27	17	10	4	7	12	20	19	1	4	4

Table 6. Numbers of juvenile steelhead trapped at Station 12 in Anchor River, by weekly period and length interval, 1984.

Fork Length (mm)	Week Ending 5/06	5/13	5/20	5/27	6/03	6/10	6/17	6/24	7/01	7/08	7/15	7/22
40-44												
45-49												
50-54												
55-59			2									
60-64		6	4		1	6	1	2				
65-69		2	5	3	1	4	5	1	3			
70-74		1	1	1		2	4	6	3	1		
75-79			1	2		2	2	7	11	3		
80-84			1		1	1	2	8	9	9	2	
85-89						1		5	11	10	3	3
90-94				3		3	1	4	7	7	4	5
95-99			2	2		5		1	2	2	4	9
100-104			1	2		2		3	3	1	3	8
105-109		2			1			1	7		2	6
110-114			1	1				1	1		1	1
115-119									3	1	1	
120-124		1	1	1					2		1	
125-129			1	1						1	1	
130-134		1			2							1
135-139		1		2				1	1	1		
140-144		1				3	1	1	1	1	1	
145-149							1	1	1			
150-154					2		1	1				
155-159						1		2		1	1	
160-164												
165-169								1	1	1	1	
170-174								1	1	1	1	
175-179									1	1	1	
180-184									1	1		
185-189												
200+									1			
Total	0	15	20	18	8	30	18	47	70	42	27	33

Table 7. Numbers of juvenile steelhead trapped at Station 19 in Anchor River, by weekly period and length interval, 1984.

Fork Length (mm)	Week Ending 5/06	5/13	5/20	5/27	6/03	6/10	6/17	6/24	7/01	7/08	7/15	7/22
40-44												
45-49												
50-54												
55-59	2		1		2	1						
60-64	1		6	2	7	7						
65-69	1		10	1	2	8	1					
70-74	2		2	1	1	6	1	2	1			
75-79					2	2	4	7	4			
80-84				3		2		1	3	7	2	1
85-89		1	2	3	3	1	1	2	3	4	7	4
90-94			1	2	1	3	2	1	1	5	3	16
95-99	1	2	3		1	4	3		1	3	4	5
100-104	3			1	2	2	3	2			3	9
105-109				2		1	2	4	1	1	3	8
110-114				2		2	3	1				1
115-119		1		1	1	1		3	5	1	1	2
120-124	1			2				2	2		1	
125-129	1		2		2			1		1	1	5
130-134	1										2	1
135-139			1	1		1			1	1	2	2
140-144					1			1			1	4
145-149				1		1					2	1
150-154								2				
155-159			1									
160-164		1										1
165-169											2	
170-174												
175-179							1					
180-184								1	1		1	
185-189												
190-194								1				
195-199						1						
Total	13	5	29	22	25	43	21	31	23	23	35	60

Minnow traps at Stations 12 and 19 were operated on a 24-hr. basis from May 3 to May 20 and on two 3-hr. trap periods per 24-hr. trap-days from May 21 to July 22. Data collected at Stations 2, 4, 12, and 19 indicate that salmonid activity is greatest during periods of twilight and darkness.

Data presented in previous years indicate steelhead smolt are 130 mm or greater in length. Data in Tables 4-7 show there were comparatively few smolt-size fish captured. At Station 4 the greatest number of steelhead longer than 130 mm were caught during the week ending May 13. A similar peak was noted for Station 4 in 1982; however, it was not noted in 1983. Because trapping efforts did not start until the week ending May 13 in 1983, it is possible that a noteworthy movement of steelhead greater than 130 mm in length was missed. Catches of steelhead greater than 130 mm in length increased slightly at Station 12 for the period June 18 to July 8, at Station 2 for the period July 2 to July 14, and at Station 19 for the period July 9 to July 21. Similar elevated catches of steelhead greater than 130 mm were noted in 1981 for the same approximate time period. No other significant catches of steelhead greater than 130 mm in length were noted.

The length-weight relationship of selected steelhead juveniles captured in 1984 is presented in Fig. 4.

Emergent Fry Data:

Emergent steelhead fry were captured by miniature inclined-plane traps at four stations in the Anchor River. Because observations of adult spawning steelhead were prevented by high, turbid water, two stations were established at locations where emergent steelhead fry had been successfully captured in 1983. Two additional stations were established downstream near the junction of the North and South Forks of the Anchor River.

Numbers and sizes of emergent fry captured at each station are summarized in Table 8. The earliest catch of emergent steelhead occurred at all stations the week ending July 22. Peak catches of emergents at three stations also occurred the week ending July 22. The peak catch at the fourth station occurred the following week. The catch at Station 16 represented 88.5% of the total catch of emergent steelhead. Catches at the other stations were relatively small. Timing of emergence was similar to that reported in 1983.

Adult Data

Population Estimates:

From September 5 to October 5, 94 adult steelhead were tagged with serially numbered Floy anchor tags and released. The purpose of these tags was to provide data to estimate the steelhead population in the Anchor River.

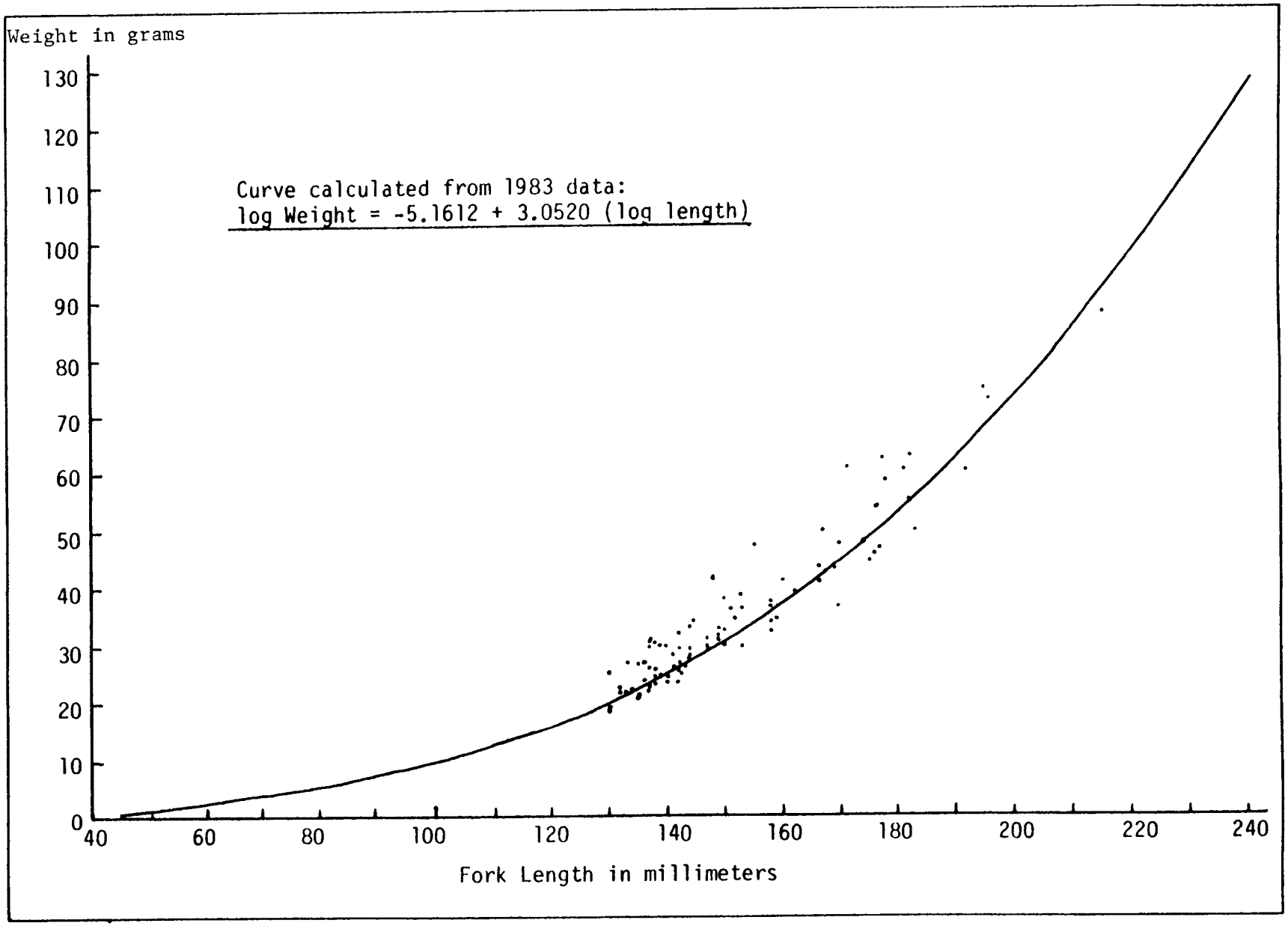

Figure 4. Length-weight relationship of juvenile steelhead in Anchor River, 1984.

Table 8. Numbers of emergent steelhead fry captured in inclined-plane screen traps in Anchor River, 1984.

Fork Length (mm)	Week Ending 7/08	7/15	7/22	7/29	8/05	8/12
Station 2. South Fork Anchor River						
25-29	0	0	0	0	0	0
30-34	0	0	5	1	0	0
35-39	0	0	0	0	0	0
Total	0	0	5	1	0	0
Station 8. South Fork Anchor River						
25-29	0	0	0	1	0	0
30-34	0	0	1	3	0	0
35-39	0	0	0	0	0	0
40-44	0	0	0	0	0	0
45-49	0	0	0	0	0	1
Total	0	0	1	4	0	1
Station 16. North Fork Anchor River						
25-29	0	0	4	1	0	0
30-34	0	0	57	23	3	0
35-39	0	0	0	0	0	0
Total	0	0	61	24	3	0
Station 18. North Fork Anchor River						
25-29	0	0	2	1	0	0
30-34	0	0	5	0	0	0
35-39	0	0	0	0	0	0
Total	0	0	7	1	0	0

Anglers reported 12 tagged fish were recaptured and ADF&G personnel recaptured 10 during gill-net operations. The tagged steelhead were recaptured from 0 to 30 days after tagging. One steelhead was recaptured twice after tagging; the remainder were recaptured once after tagging. Seven fish were recaptured at the same location where they had been tagged; other fish were recaptured both upstream and downstream from the tagging site. The greatest distance of movement from tagging site to recapture site was approximately 1-1/2 miles, 15 days after tagging.

Ten tagged fish were recovered during creel census and provide a basis for estimating the total population. Using the Peterson method as modified by Chapman (Ricker, 1975), it was estimated that the total Anchor River steelhead population in 1984 was 1,361 fish.

Creel Census:

A creel census of the summer-fall fishery was started on August 18 and terminated on November 4. A total of 2,845 anglers were interviewed, and completed anglers fished an average of 3.42 hr. per day. Total angler effort during this period was estimated to be 7,610 man-days.

Angler effort prior to September is concentrated on coho salmon and Dolly Varden. Effort during this time period was comparable to previous years with the exception of 1983 which showed reduced effort due to a lower return of coho salmon than most recent years. Angler effort during September and October was comparable to estimated effort in previous years. Estimates of effort and harvest during the fall fishery are listed in Table 9 and creel census data for past years are summarized in Table 10.

Prior to commencement of the creel census, numerous anglers reported catches of steelhead. Elevated estimated catches prior to September 1 indicate early run timing. The extent of this early harvest is unknown, but is believed to be only a small percentage of the total harvest.

It is estimated that anglers harvested 305 steelhead from the Anchor River during the 1984 fall fishery; the harvest is listed in Table 11 by weekly period and area. Angling effort, steelhead harvest, and available population estimates since 1954 are summarized in Table 12.

Information obtained during the 1984 creel census indicates that anglers kept 39% of the steelhead they caught. Creel census information during the years 1978-1981 indicated anglers kept 45 to 62% of the steelhead they caught, and interviews in 1982 and 1983 indicated they kept 36 and 40%, respectively. The 1984 estimated steelhead harvest is lower than the estimated harvest for 1979-1983. However, if the harvest is adjusted to reflect the lower percentage of fish kept, the number caught would closely approximate the steelhead catch in 1979.

Table 9. Estimated sport fishing effort and harvest from Anchor River by species and weekly intervals, August 18 to November 4, 1984.

Week Ending	Effort (Man-Hours)	Estimated Harvest		
		DV	SS	SH
8/19*	1,117	0	95	0
8/26	4,785	37	555	23
9/02	5,187	123	252	45
9/09	2,980	59	114	29
9/16	2,438	109	29	24
9/23	2,288	52	15	59
9/30	1,783	46	0	29
10/07	1,824	88	0	51
10/14	1,519	33	0	25
10/21	1,538	125	0	19
10/28	431	36	0	1
11/04	140	0	0	0
Total	26,027	708	1,060	305

* Effort and harvest estimates for the weekend only.

Table 10. Summary of creel census data from Anchor River for harvest of Dolly Varden, coho salmon, and steelhead trout.

Year	Period Covered In Census	Effort (Man-Days)	Dolly Varden		Coho		Steelhead	
			Harvest	Total Run	Harvest	Total Run	Harvest	Total Run
1954	5/29-10/23	3,000	4,000	11,500	395	1,700	247	511
1957	5/01-10/15	5,800	573	7,000	90	801	50	600
1960	5/07-10/02	5,300*	3,300	...	1,000	...	400	...
1968	7/06-10/19	3,045	4,352	...	1,149	...	102	...
1977	Entire year**	31,515	9,222	...	1,339	...	1,072	...
1978	Entire year**	42,671	17,357	...	1,559	...	1,754	4,132
1979	Entire year**	44,220	21,364	...	2,870	5,307	782	...
1980	Entire year**	33,272	10,948	...	2,649	...	841	2,388
1981	Entire year**	34,257	15,271	...	2,949	...	777	...
1982	Entire year**	24,709	10,375	...	2,379	...	551	...
1983	Entire year**	28,881	17,277	...	1,395	...	1,101	1,762
1984***	8/18-11/04	7,610	708	...	1,060	...	305	1,361

* Effort incomplete; covers period 5/07-7/14 only.
** Effort and harvest data from statewide harvest survey.
*** Effort and harvest data incomplete; covers only period 8/18-11/04.

Table 11. Estimated sport fish effort and harvest of steelhead from Anchor River by weekly intervals and area, August 1 to November 4, 1984.

Week Ending	Effort (Man-Hours)	Harvest Area 1**	Harvest Area 2***	Total
8/19*	1114	0	0	0
8/26	4785	20	3	23
9/02	5187	38	7	45
9/09	2980	25	4	29
9/16	2438	22	2	24
9/23	2288	48	11	59
9/30	1783	20	9	29
10/07	1824	38	13	51
10/14	1519	17	8	25
10/21	1538	15	7	19
10/28	431	1	0	1
11/04	140	0	0	0
Total	26,027	244	61	305

* Estimates for weekend only.
** Anchor River below the forks.
*** South Fork Anchor River above confluence of the North Fork.

Table 12. Summary of angler effort, and estimates of harvest and total populations of steelhead on Anchor River.

Year	Period Covered in Census	Effort (Man-Days)	Steelhead Estimates Harvest	Steelhead Estimates Total Run	Source of Data
1954	5/29-10/23	3,000	247	511	Allin (1954)
1957	5/01-10/15	5,800	50	600	Allin (1957)
1960	5/07-10/02	5,300*	400	...	Dunn (1961)
1968	7/06-10/19	3,045	102	...	McHenry (1969)
1977	Entire year	31,515	1,072	...	Mills (1979)
1978	Entire year	42,761	1,754	4,162	Mills (1980); Wallis & Hammarstrom (1979)
1979	Entire year	44,220	782	...	Mills (1981a)
1980	Entire year	33,272	841	2,388	Mills (1981b); Wallis & Balland (1982)
1981	Entire year	34,257	777	...	Mills (1982)
1982	Entire year	24,709	551	...	Mills (1983) Wallis & Balland (1984)
1983	Entire year	28,881	1,101	1,682	Mills (1984)
1984**	May-June	...	50		Estimated Creel Census
	8/13-11/4	7,610	305		
	Total		355	1,361	

* Effort incomplete; covers period 5/07 to 7/14 only.
** Incomplete data, subject to revision.

Age-Weight-Length Data:

Scales and lengths were collected from 126 adult steelhead during creel census interviews, tagging operations, and the hatchery brood stock collection. Total age could be determined for 90 steelhead and marine history for 124. Age composition and length of the fish from all samples combined are summarized in Table 13.

Twenty-eight (22.6%) of the steelhead had spawned previously, 19 were returning for a second spawning, and 9 were returning to spawn a third time.

Previous percentages of repeat spawners in Anchor River have been: Allin (1954), 26%; Dunn (1961), 3.5%; Redick (1968), 24.3%; McHenry (1969), 16.2%; Wallis and Hammarstrom (1979), 17.7%; Wallis and Hammarstrom (1980), 17.5%; Wallis and Balland (1981), 19.7%; Wallis and Balland (1982), 11.1%; Wallis and Balland (1983), 33%; Wallis and Balland (1984), 25.2%.

Steelhead lengths collected during various activities are comparable in size (Table 14). It is expected that anglers select larger fish to keep, but captured, hatchery-bound fish were not selected for size. Samples collected during tagging operations were taken at random and sizes are comparable to the other samples.

Lengths and weights of 26 adult steelhead were recorded during the fall fishery. The length-weight relationship is illustrated in Fig. 5.

Spawning Observations:

On May 24, 1984, a foot survey was conducted along the North Fork of the Anchor River to observe spawning steelhead. The section of stream from Station 5 upstream approximately 1-1/2 miles to a point known as Station 6 in 1983 (Wallis and Balland, 1984) was visually surveyed. Viewing conditions were poor to good. Adult steelhead had been observed in this area in 1983; however, none were observed in 1984. High and turbid water prevented other opportunities to observe spawning steelhead.

Hatchery Brood Stock:

Twenty adult steelhead were captured and transported to the Trail Lakes Hatchery during the fall steelhead run (Table 15). They are to be held for spawning in the spring of 1985.

Pathology

Kidney and hindgut samples were collected from adult chinook, coho and steelhead that were harvested by anglers. The samples were sent to the pathology laboratory in Anchorage and examined for the presence of *Aeromonas salmonicida* and *Renibacterium salmoninarum*. Results are listed in Table 16.

Table 13. Summary of age composition and length of Anchor River steelhead trout; combined data from all samples taken during Fall 1984.

Age Class	Number	Fork Length (mm) Mean	Range	S.D.*
First-time Spawners				
Males				
3.1	9	584	520-730	62.4
4.1	2	605	580-630	35.4
2.2	3	710	655-715	52.7
3.2	15	693	560-770	57.4
4.2	3	717	695-740	22.5
R.1	3	570	525-625	50.7
R.2	12	713	515-800	78.1
R.3	1		690	
Total	48			
Females				
4.1	1		525	
2.2	4	658	645-680	15.5
3.2	30	658	610-705	25.0
4.2	2	651	630-645	16.6
R.1	2	528	520-535	10.6
R.2	8	648	540-715	55.9
R.3	1		740	
Total	48			
Repeat Spawners				
Males				
3.1s	1		795	
2.1s1	2	820	800-840	28.3
3.1s1	2	730	670-790	84.9
3.2s1	1		750	
4.2s1	2	768	745-790	31.9
3.1s1s1	1		825	
R.1s1	2	735	680-790	77.8
R.1s1s1	1		815	
Total	12			
Females				
2.1s1	1		735	
3.1s1	1		720	
2.2s1	1		760	
3.2s1	6	778	755-805	21.4
2.2s1s1	2	823	800-845	31.8
2.2s1s1	1		815	
R.2s1	4	733	745-805	29.6
Total	16			

* Standard Deviation

Table 14. Mean length of adult steelhead collected in different sampling programs on Anchor River, 1984.

Sample Origin	Number	Fork Length (mm)		
		Mean	Range	S.D.*
Creel Census				
Females	24	676	540-815	60.0
Males	27	694	515-840	90.8
Anchor Tagging				
Females	31	687	525-845	80.7
Males	23	690	525-800	73.9
Hatchery Take				
Females	10	689	520-800	79.8
Males	10	670	525-825	101.8

* Standard Deviation

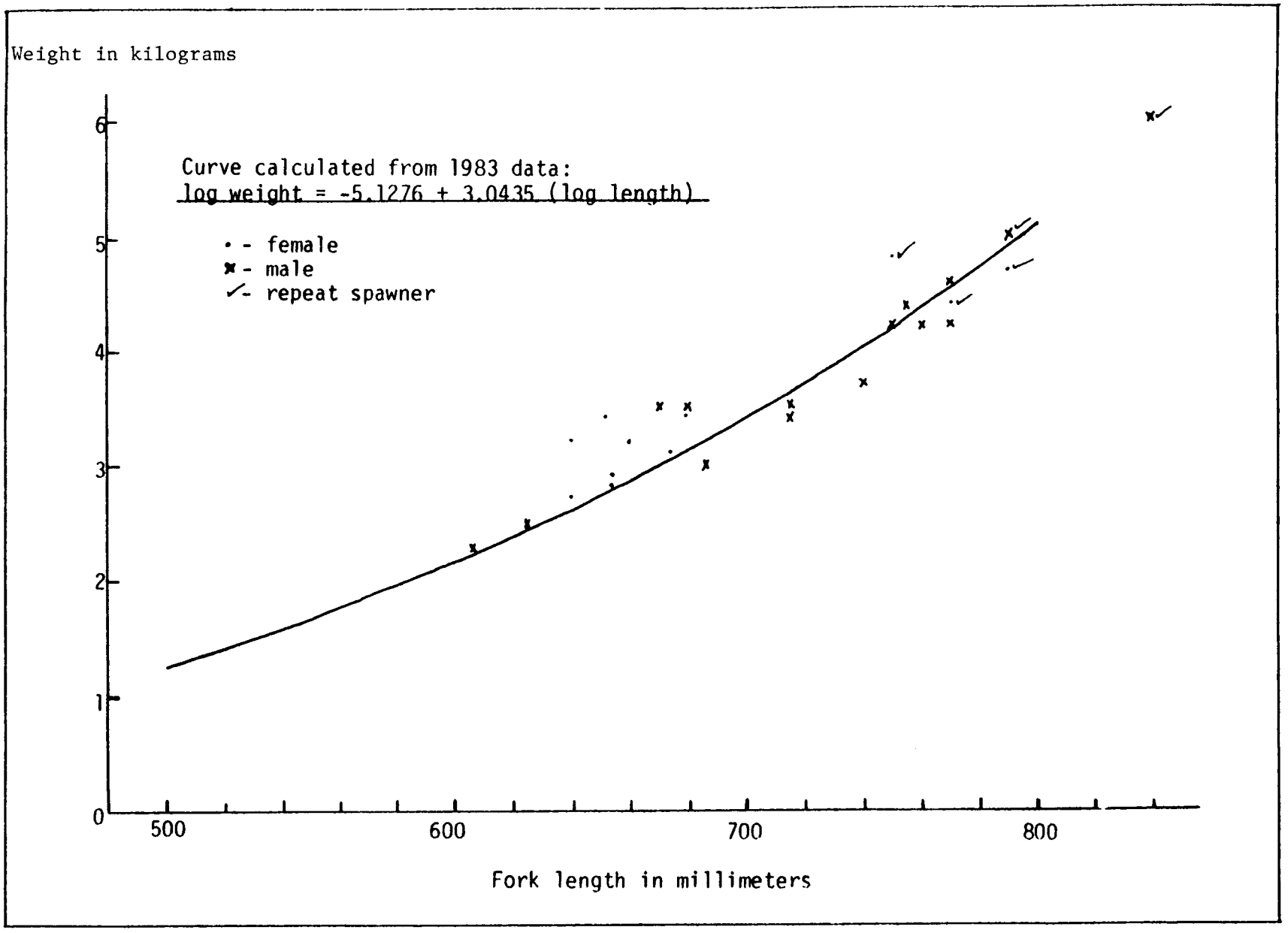

Figure 5. Length-weight relationship of adult steelhead in Anchor River, 1984.

Table 15. Numbers of adult steelhead captured in Anchor River and transported to Trail Lakes Hatchery, 1984.

Date	Females	Males	Total
10/02/84	6	1	7
10/08/84	2	5	7
10/15/84	2	4	6
Total	10	10	20

Table 16. Summary of salmonid examination results from Anchor River for presence of *A. salmonicida* and *R. salmoninarum*, 1984.

Species	Stage	Date	Number Sampled	Number Positive	
				A. salmonicida	R. salmoninarum
KS	Adult	May-June	41	0	1
SS	Adult	August	39	1	1

Samples taken from steelhead were inadvertently ruined in transit. Some chinook and coho samples were damaged during testing procedures. Tests on remaining samples detected *A. salmonicida* in 1/24 coho and 0/34 chinook. Tests for *R. salmoninarum* were positive for 1/34 coho and 1/33 chinook.

This is the first time *A. salmonicida* has been detected in any species of wild Anchor River fish. In 1983, *R. salmoninarum* was detected in adult steelhead (Wallis and Balland 1984); however, this is the first time it has been detected in chinook or coho.

Discussion

Efforts to catch steelhead smolts, since the inception of this study, have met with limited success. Sampling gear has included a fyke net, gill net, hand seine, inclined-plane screen trap, backpack electro-shocker, and various minnow traps. Additionally, various sampling timetables have been tried with varying degrees of success. Data gathered indicate that most fish activity occurs during twilight and darkness. Minnow traps have been the most successful means of capturing steelhead smolts except that fish readily escape standard-designed minnow traps.

It appears that if the timing of steelhead smolt out-migration is to be better determined it will be necessary to use a more efficient type of trap. The most effective trap would impede all downstream migration of smolt and include some mechanism of capture and collection. A weir is one type of structure that might be used. The North Fork of the Anchor River has large culverts where a spill-type structure might lend itself to capture of steelhead smolts. Minnow traps that prevent escape would be the most desirable capture method because of minimal environmental impact, portability, and cost effectiveness.

The estimated adult steelhead catch for 1984 was similar to that of 1979 but lower than all other recent (1978-1983) years. Three factors that may have contributed to the lower estimated catch are:

1. Early run timing and catch of steelhead before the commencement of creel census.

2. More restrictive bait regulation; i.e., artificial lures only after September 15.

3. A slight change in the calculations of estimates.

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