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A STUDY OF CUTTHROAT-STEELHEAD IN ALASKA

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ABSTRACT

The Situk River, located south and east of Yakutat, has the largest known run of steelhead, *Salmo gairdneri* Richardson, in southeast Alaska. The Situk River receives two runs of steelhead each year. The fall-run provides for a sport fishery from September through December. The spring-run begins in March and provides a fishery until mid-June. This dual run of steelhead is not unique in Southeast.

Studies to determine the number of spring and fall-run steelhead to the Situk River in 1981-1982 were begun in early April with the hook and line capture, tagging, and release of both fall and spring-run fish. After May 15, steelhead samples were collected as the steelhead moved through the weir located at "9-Mile bridge."

A total of 90 spring-run steelhead were tagged. Recaptures of tagged steelhead were used to calculate the 1981-1982 Situk River run of steelhead upstream of the 9-mile bridge using a marked:unmarked ratio estimate. The total run was estimated at approximately 5,000 steelhead. Estimates of the number of fall and spring-run fish were not possible.

Length-sex relationships were collected from 38 fall-run steelhead and 228 spring-run steelhead. Fall-run steelhead averaged 73.0 cm (28.7 inches) while spring-run steelhead averaged 74.8 cm (29.4 inches).

Age-sex relationships for the 1982 Situk River steelhead run were obtained from 248 scale samples. Twenty-two age classes (ages 2.2 to 5.3S1S1) were found. During 1981-1982, 75.3% of the Situk River steelhead run was comprised of initial spawners and 24.7% were repeat spawners. Of all age classes, 54.6% were of age 3.2 and 3.3. Sex ratios were approximately 1:1, with females slightly more numerous than males.

A formal creel census was supposed to have been conducted concurrently with the population study; however, insufficient useable data were collected to generate an estimate of the steelhead harvest.

KEYWORDS

Steelhead, Salmo gairdneri Richardson, Yakutat, Southeast, Alaska, Situk River, population estimate.

BACKGROUND

The Situk River (Figure 1) is one of most important steelhead systems in northern Southeast Alaska. Despite the many censuses that have been conducted, relatively little is known about the steelhead runs in the Situk. The Situk River has two races or "runs" of steelhead. A fall-run of fish enter as early as August, peaks in November, and are present throughout the winter. A spring-run begins to enter the Situk River in April, peaks in May, and normally is complete by mid-June.

In recent years, when the mid-May visual boat survey was conducted under ideal weather conditions, it was felt that at least 90% of the steelhead present in the river below the 9-mile bridge were enumerated. During the 3-week interim between the boat survey and the sockeye salmon enumeration weir installation in mid-June, unknown numbers of steelhead pass both upstream and downstream. Past surveys yielded only minimum escapement numbers. The spring-fall components could not be separated and the relative importance of the upper river-lower river spawning areas could not be determined. Without good annual data on the steelhead run size to the Situk, management has been to protect the runs by imposing conservative bag and possession limits. Determining the relative contribution of each segment of the steelhead habitat for both overwintering and spawning value is increasingly urgent for more effective management of this steelhead fishery.

The upper Situk River has been proposed for the Wild River classification and Scenic River classification has been proposed for the lower Situk.

Fishing pressure on the Situk River steelhead run was mostly local residents until the mid-1970's when media exposure and oil exploration in the area brought the steelhead run to the attention of anglers throughout the State and the Pacific Northwest.

Yakutat is accessible by daily jets from both the north and south. Access to the river is via two roads, one that reaches the lower river and one that crosses the river at the 9-mile bridge, i.e., approximately 14 miles upstream of the river mouth. In addition, a light aircraft landing strip provides access to the middle river.

Fishing pressure has increased annually. Periodic creel censuses have been conducted in the past, however, these censuses provide an indication of the effort and harvest of steelhead. To properly manage the fishery, census data on an annual or semi-annual basis will be necessary.

A list of common names, scientific names, and abbreviations of all species mentioned in this report is found in Table 1.

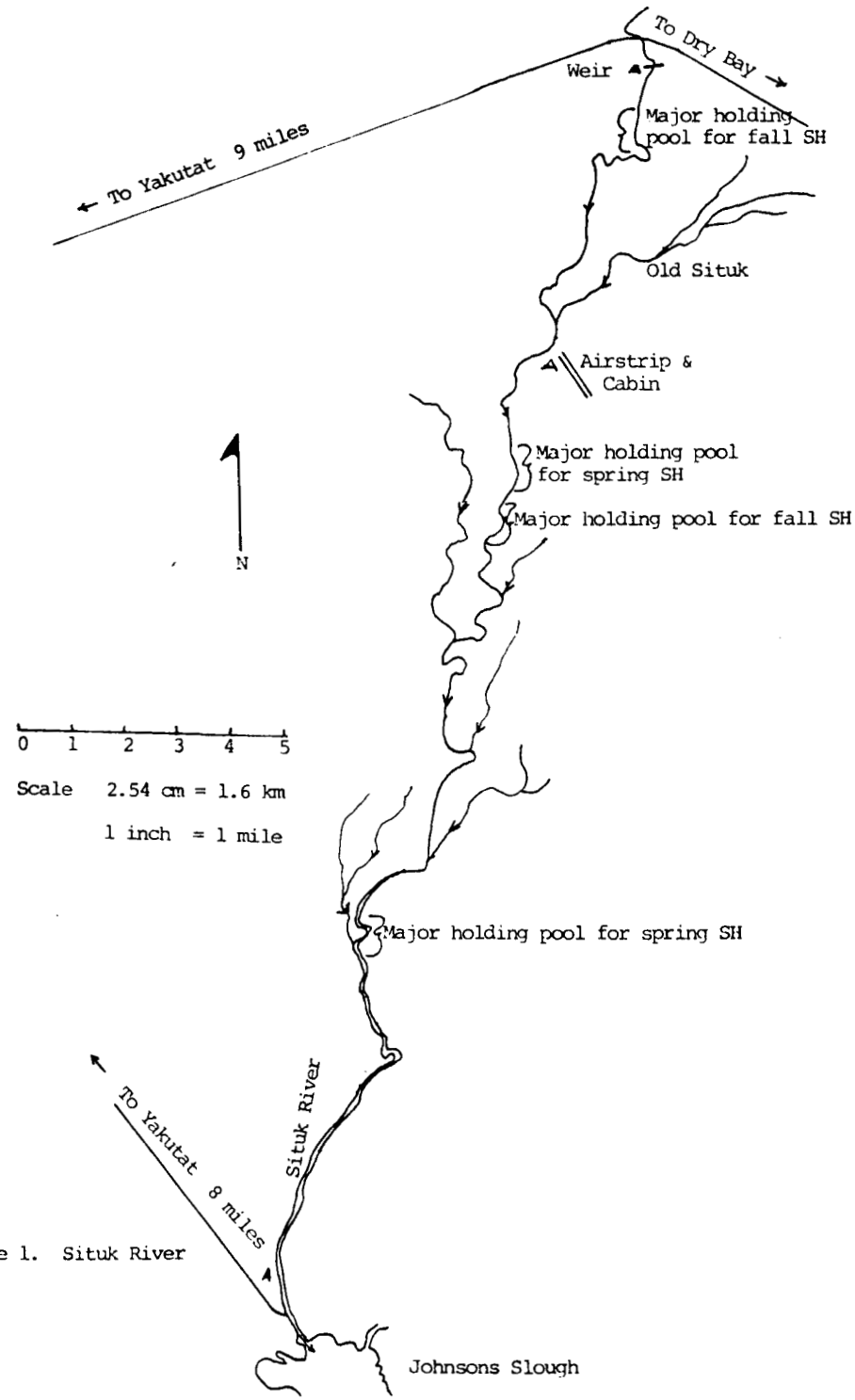

Figure 1. Situk River

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

Common Name	Scientific Names & Authors	Abbreviations
Steelhead	*Salmo gairdneri* Richardson	SH
Sockeye Salmon	*Oncorhychus nerka* (Walbaum)	RS

RECOMMENDATIONS

Management

1. Consider less restrictive bag and possession limits, except during the spawning time and in spawning areas.

   Annual steelhead runs (fall and spring) to the Situk River are large enough to support more liberal bag and possession limits. If these regulations are adopted, time and area closures should be put in place to protect the spawning areas.

2. Continue the spring drift count as an index to run strength.

   The annual spring drift count has provided the only annual index of the run for some years. This tool should be continued until a more accurate method of enumerating the steelhead run is in use.

3. Discontinue the use of Peterson disc tags on steelhead.

   The use of brightly colored Peterson disc tags has led to excessive mortalities from in-stream predators. The use of Floy anchor tags of a dull color is recommended if tagging of adult steelhead is required.

4. Conduct another intensive project in 3 to 5 years.

   Management data on the Situk River steelhead runs will be required periodically to ensure that present or new regulations are meeting their goals for this population of steelhead.

OBJECTIVES

1. Obtain population estimates of the Situk River steelhead run and determine the magnitude of the fall and spring-run components.

2. Determine the run timing of the Situk River steelhead and collect biological data from the fish sampled.

3. Obtain an estimate of the recreational harvest of Situk River steelhead.

TECHNIQUES USED

1. The population of the 1982 run was calculated from data obtained by the following:

   a) Steelhead that appeared to be fall-run were obtained by hook and line and at the weir. These fish were tagged with a numbered yellow Floy tag and released. (Fall-run steelhead were determined to be those fish that entered the river

between August and January. Fall-run steelhead were identified by the presence of "clubbed" gill filaments.)

b) Steelhead that appeared to be spring-run* were obtained by hook and line and by weir. These fish were tagged with a numbered orange Floy tag and released. (* Spring-run steelhead were determined to be those fish that entered the Situk River between January and June. Spring-run steelhead were identified by the lack of "clubbed" gill filaments.)

c) A fish weir was installed in early May adjacent to the 9-mile bridge, which is approximately 14 river miles above tide water. The ratio of tagged to untagged steelhead was obtained as they passed both upstream and downstream through the weir.

d) In late May, a boat drift of the lower 14 miles of the Situk was made to count the number of fish. The ratio of tagged and untagged fish was noted, but not used for a population estimate.

e) A Peterson estimate of the steelhead run upstream of the 9-mile bridge was obtained using a marked:unmarked ratio.

2. Run timing of the 1982 Situk River steelhead run was obtained from floats of the lower river prior to May 13 (when the weir was installed). All steelhead captured were measured for length (fork length), sexed, and scale samples were collected for age determination.

3. An estimate of the angler harvest of steelhead was to have been obtained from creel census information. One week day and 1 weekend day was spent on a float of the lower river (14 miles) to contact anglers. In addition, information was obtained from the sole all-terrain vehicle (ATV) and boat rental operator in the area. This operator supplies transportation for approximately 80% of the anglers on the Situk River until the roads are free of snow. Insufficient useable data were gathered to generate an estimate of the steelhead harvest.

FINDINGS

Adult Steelhead - Numbers

The Situk River has the largest known run of steelhead in southeast Alaska. Because of the dual run of steelhead, a sport fishery exists from September through June each year. This situation is not unique in Southeast Alaska, however, the number of steelhead in the Situk River is considerably larger than in other Southeast systems.

A research project to study the Situk River steelhead was undertaken in spring 1982. Adult steelhead were captured throughout the river by hook

and line from April 10 to May 15. After May 15, samples were collected as they moved through the weir located at the 9-mile bridge.

An undetermined number of fall steelhead entered the Situk River throughout the winter. Spring weather in 1982 was late in arriving. The water was murky, making observations of steelhead in pools difficult. The cold weather also delayed the entry of the spring run.

Between April 10 and April 23, 38 fall-run fish were captured, tagged with yellow Floy tags, and released (Table 2).

On May 13, the Situk River weir was installed and began fishing. The weir was fished for steelhead until June 23. A total of 138 spring-run steelhead were tagged with red Peterson disc tags and released upstream. A total of 907 fish passed upstream.

Recaptures of tagged steelhead at the weir were used to calculate that portion of the run upstream of the 9-mile bridge. Data collected by other methods (hook and line) were not considered to be useful for the determination of the total population. In the past few years, 1,000 to 1,500 steelhead have been observed below the 9-mile bridge. It appears reasonable to assume that 1,000 steelhead were present again this year.

A total of 138 steelhead were tagged and released as they moved upstream through the weir. A total of 1,581 steelhead were passed downstream during the weir operation. Of this total, 55 were tagged with red disc tags.

The steelhead population upstream of the 9-mile bridge was computed using a marked/unmarked ratio:

N = Total steelhead run in 1982
M = 138 marked steelhead passed upstream
D = 1,581 steelhead passed downstream
R = 55 recaptures of marked steelhead

$$N = \frac{(138 + 1)\ (1{,}581 + 1)}{55 + 1} = 3{,}927$$

This estimate includes only the portion of the steelhead run that migrated past the weir at the 9-mile bridge. Adding the 1,000 steelhead estimated to be below the 9-mile bridge, the 1981-82 run was approximately 5,000 steelhead.

Examination of hook and line caught steelhead showed that 29% of those captured were from the fall-run population and 71% were spring-run. However, due to the methodology of the hook and line sampling, these percentages cannot be applied to the overall population to estimate the proportions of fall and spring-run steelhead.

Steelhead Length - Sex Relationship

Length - sex relationships were collected from 38 fall-run steelhead and 228 spring-run steelhead. Very little differences could be found between

Table 2. Daily In-migrant Steelhead Counts, Sitkoh Creek Weir, 1982.

Date	No. Males	No. Females	Total	No. Legal Size*
4/15	0	0	0	0
4/16	0	0	0	0
4/17	0	0	0	0
4/18	0	0	0	0
4/19	0	0	0	0
4/20	0	0	0	0
4/21	10	0	10	0
4/22	7	0	7	0
4/23	1	1	2	0
4/24	4	4	8	5
4/25	0	1	1	0
4/26	0	0	0	0
4/27	16	1	17	0
4/28	8	3	11	0
4/29	0	0	0	0
4/30	2	2	4	0
5/01	7	5	12	4
5/02	5	1	6	1
5/03	7	5	12	3
5/04	8	4	12	2
5/05	10	14	24	5
5/06	51	33	84	17
5/07	54	43	97	11
5/08	33	23	56	12
5/09	16	9	25	12
5/10	4	7	11	6
5/11	24	21	45	13
5/12	6	15	21	4
5/13	5	5	10	2
5/14	4	6	10	3
5/15	2	1	3	0
5/16	3	2	5	1
5/17	10	16	26	7
5/18	3	10	13	3
5/19	8	26	34	6
5/20	11	22	33	11
5/21	5	8	13	4
5/22	5	11	16	2
5/23	3	10	13	2
5/24	1	10	11	3
5/25	2	5	7	0
5/26	3	4	7	0
5/27	4	6	10	1
5/28	0	0	0	0
5/29	4	4	8	1
5/30	0	0	0	0
5/31	1	5	6	2
TOTAL	690	347	343	145

*Steelhead 33 inches or more in length.

the two runs (Table 3). On the average, spring-run fish were 10-20 mm longer than fall-run fish. The ocean feeding during the fall and winter most likely accounted for the size difference.

Steelhead Age-Sex Relationships

To obtain the age-sex relationships, scale samples were collected and the sex was determined from 146 steelhead sampled by hook and line and from 138 trapped at the Situk River weir. A total of 284 weir and hook and line caught steelhead scales were found to be useable for age determination.

Twenty-two classes (ages 2.2 to 5.3S1S1) were found among the Situk River steelhead population in 1982 (Table 4).

Age classes are presented using the aging method described by Narver and Withler (1977). Repeat spawners are listed with an "S" after ocean age. This "S" is used to denote a successful spawning run and survival. Therefore, a steelhead with an age 3.3S1 is a total of 7 years old. Three years were spent in fresh water before smolt outmigration, then 3 years (winters) in saltwater, after which it returned to freshwater and spawned ("S"). This steelhead survived another year in saltwater (1) and has returned to freshwater on its second spawning run. Initial spawning steelhead are those fish without an "S" in their age.

Examination of the steelhead scale samples obtained during the investigations of the Situk River revealed that 75.3% of the run was composed of initial spawning steelhead and 24.7% of the run showed one or more spawning checks on their scales.

Steelhead spawning for the first time were from eight age classes (Table 5). Of all initial spawner's age classes, 71.6% were of age 3.2 or 3.3. The initial steelhead spawners contained 59.5% 2-ocean and 40.5% 3-ocean fish. The overall sex ratio of initial spawners was 1:1.06, with females only slightly more numerous than males.

The steelhead run to the Situk River in 1982 was comprised of 24.7% repeat spawners. Fourteen age classes were represented among the 70 fish aged (Table 6). Three age classes (ages 2.3S1, 3.2S1, and 3.3S1) comprised 61.3% of the overall total. Repeat spawners showed females to outnumber males by a ratio of 4:1.

The Situk River has two races of steelhead. These are the fall-run and the spring-run. The fall-run steelhead normally begin to enter the river as early as August and reach a peak in mid-November. Fall-run fish continue to enter the river throughout the winter as conditions permit. The spring-run usually enter the Situk as early as March, with a peak occurring in early May.

A total of 83 fall-run and 79 spring-run steelhead scales were read for age. The fall-run was comprised of fish in 20 age classes, with 45.0% in ages 3.2 and 3.3 (Table 7). The spring-run steelhead were from only 13 age classes, with ages 3.2, 3.3, and 4.2 comprising 77.2% of the total (Table 8).

Table 3. Steelhead length-sex relationships, Situk River, 1982.

Fall-Run	Length Range	Average Length	No. of Fish
Females	661-831 mm	741 mm	14
Males	595-880 mm	720 mm	28
Spring-Run			
Females	609-886 mm	769 mm	162
Males	595-862 mm	728 mm	66

Table 4. Steelhead age classes, Situk River, 1982.

Age Classes	No. of Steelhead	No. of Females	No. of Males	% of Total
2.2	6	2	4	2.1
2.2S1	2	1	1	0.7
2.2S1S1	2	2	...	0.7
2.3	6	3	3	2.1
2.3S1	8	7	1	2.8
3.2	92	38	54	32.4
3.2S1	13	9	4	4.6
3.2S1S1	7	5	2	2.5
3.2S1S1S1	5	5	...	1.8
3.3	63	44	19	22.2
3.3S1	20	18	2	7.0
3.3S1S1	2	2	...	0.7
3.3S1S1S1	2	2	...	0.7
4.2	25	8	17	8.8
4.2S1	3	1	2	1.1
4.2S1S1	1	1	...	0.4
4.3	13	6	7	4.6
4.3S1	3	2	1	1.1
5.2	6	3	3	2.1
5.2S1	1	...	1	0.4
5.3	3	2	1	1.1
5.3S1S1	1	1	...	0.4
TOTAL	284	162	122	100.0

Table 5. Age classes of initial steelhead spawners by sex, Situk River, 1982.

Age Class	No. of Steelhead	No. of Females	No. of Males	% of Total
2.2	6	2	4	2.8
2.3	9	4	5	4.2
3.2	91	41	50	42.3
3.3	63	44	19	24.3
4.2	25	9	16	11.6
4.3	13	7	6	6.1
5.2	6	3	3	2.8
5.3	2	1	1	0.9
TOTAL	215	111	104	100.0

Table 6. Age classes of repeat steelhead spawners by sex, Situk River, 1982.

Age Class	No. of Steelhead	No. of Females	No. of Males	% of Total
2.2S1	1	...	1	1.4
2.2S1S1	2	2	...	2.9
2.3S1	9	7	2	12.9
3.2S1	12	9	3	17.1
3.2S1S1	7	5	2	10.0
3.2S1S1S1	5	5	...	7.1
3.3S1	22	20	2	31.4
3.3S1S1	2	2	...	2.9
3.3S1S1S1	2	2	...	2.9
4.2S1	3	1	2	4.3
4.2S1S1	1	1	...	1.4
4.3S1	2	1	1	2.9
5.3S1	1	...	1	1.4
5.3S1S1	1	1	...	1.4
TOTAL	70	56	14	100.0

Table 7. Age classes of fall-run steelhead, Situk River, 1982.

Age Class	No. of Steelhead	% of Total
2.2S1	1	1.2
2.3	2	2.4
2.3S1	2	2.4
3.2	15	18.1
3.2S1	6	7.2
3.2S1S1	3	3.6
3.2S1S1S1	2	2.4
3.3	23	27.7
3.3S1	4	4.8
3.3S1S1	2	2.4
3.3S1S1S1	1	1.2
4.2	6	7.2
4.2S1	2	2.4
4.2S1S1	1	1.2
4.3	4	4.8
4.3S1	2	2.4
5.2	3	3.6
5.2S1	1	1.2
5.3	2	2.4
5.3S1S1	1	1.2
TOTAL	83	99.8

Table 8. Age classes of spring-run steelhead, Situk River, 1982.

Age Class	No. of Steelhead	% of Total
2.2	2	2.5
2.3	1	1.3
2.3S1	2	2.5
2.3S1S1	1	1.3
3.2	41	51.9
3.2S1	2	2.5
3.2S1S1S1	1	1.3
3.3	8	10.1
3.3S1	5	6.3
4.2	12	15.2
4.2S1	1	1.3
4.3	2	2.5
5.2	1	1.3
TOTAL	79	100.0

Overall, no large difference in the ages of initial spawning of fall and spring-run steelhead was found. Both samples were comprised of fish from seven age classes, with ages 3.2, 3.3, and 4.2 comprising the majority of the run.

The most obvious difference between fall and spring-run steelhead was the percentage of repeat spawners in each run. The fall-run contained 34% repeat spawners, while the spring-run contained only 15% repeat spawners. It was expected that there would be a higher percentage of repeat spawners in the spring-run due to their shorter stream residency, but this was not the case.

Creel Census of Steelhead Anglers

A creel census of steelhead fishermen was initiated on April 6, 1982. However, an estimate of the number of steelhead harvest was not possible due to an insufficient quantity of useable creel census data.

The investigation of the Situk River steelhead confirmed that the 1981-1982 steelhead run of 5,000 fish was considerably more than the one time float counts would indicate.

An examination of these two races does not show enough difference in size or age to enable the manager to accurately determine which run is contributing most to the recreational fishery.

The Situk River has been recommended for Wild and Scenic River designation. Just how this will affect the steelhead population will require evaluation during the next 2 or 3 years.

LITERATURE CITED

Narver, R. A. and Withler, F. C. 1977. Age and size of steelhead trout, *Salmo gairdneri*, in anglers catches from Vancouver Island, British Columbia streams. Fisheries Research Board of Canada, Circular 91:1-26.

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