Volume 13 Report No. G-II-I

RESEARCH PROJECT SEGMENT

State: Alaska

Project No.: F-9-4 *Name:* Sport Fish Investigations of Alaska.

Study No.: G-II *Study Title:* Sport Fish Studies.

Job No.: G-II-I *Job Title:* **A Study of Steelhead-Cutthroat Trout in Alaska.**

Period Covered: July 1, 1971 to June 30, 1972.

ABSTRACT

This report covers the first year's operation of a project on Petersburg Creek designed to study the life history of the sea-run cutthroat trout, Salmo clarki, and the steelhead trout, S. gairdneri, in a typical Southeast Alaska lake-stream system.

An estimated 806 steelhead migrated upstream past the Petersburg Creek weir between April 22 and June 21, 1971, with the peak of migration occurring in early May. Age composition of the adult steelhead migration was determined from scale samples collected at the weir traps. The steelhead run contained 23 age classes, with 43% of the migration spawning for the second time.

The cutthroat seaward migration began in early May and a total of 202 were enumerated by early August. The in-migration of cutthroat to Petersburg Creek began in late August with a total of 505 passing upstream by the end of October.

Studies of rearing steelhead and cutthroat in the Petersburg Creek system showed that the rearing steelhead were found in many different habitat types, but preferred the swift water areas over a substrate of large stones. Rearing cutthroat were restricted in their distribution to the slough-like areas above and below Petersburg Lake.

RECOMMENDATIONS

1. Construct an adequate weir in 1972 to accurately determine the number of the sea-run cutthroat and steelhead entering and leaving Petersburg Creek.

2. Investigate the migratory habits of Petersburg Creek cutthroat, once they have passed downstream through the weir.

3. Locate the spawning grounds for steelhead and cutthroat in the Petersburg Creek system. Foot surveys during the spawning season on all major tributaries to the Petersburg Creek system should be conducted in 1972.

4. Study the freshwater rearing habitat requirements and food habits, with emphasis on the sea-run cutthroat.

5. Investigate other steelhead populations in Southeast Alaska.

OBJECTIVES

1. To determine the numbers and timing of anadromous cutthroat and steelhead in a selected stream system.

2. To determine the length, weight, sex, and age of anadromous cutthroat and steelhead in a selected stream system.

3. To determine the maturity composition of andromous cutthroat leaving and entering a selected stream system.

4. To determine the food of steelhead smolts and out-migrant cutthroat smolts and adults in a selected system.

5. To determine the distribution of spawning cutthroat and steelhead in a selected stream system.

6. To determine the distribution of rearing cutthroat and steelhead in a selected stream system.

7. To determine the numbers and timing of other salmonids in a selected stream system.

8. To compile an annotated bibliography of selected references on cutthroat and steelhead.

TECHNIQUES USED

Background information from prior studies conducted by the Alaska Department of Fish and Game and other agencies was reviewed.

A weir with upstream and downstream trapping facilities was completed in the upper intertidal area of Petersburg Creek on April 22, 1971. The weir was 165 feet long and 3 feet high. During extreme high tides, an additional 4 vertical feet of screens were added to prevent fish passage. The weir was of a vertical screen panel type using 2.54 cm and/or 1.58 cm hardware cloth to halt fish passage. One downstream trap and two upstream traps were placed at points determined to be most attractive to migrating fish.

All in-migrant steelhead captured at the weir were anesthetized with tricaine methanesulfonate (MS-222), weighed, measured, and marked by punching a hole in the left opercular cover. The fish were then transferred to a freshwater tank to recover. All out-migrant steelhead captured were anesthetized and examined for marks. Those not marked were weighed, measured, and marked with the same mark as used for in-migrants. Scale collections for age determinations were collected from all steelhead.

All out-migrant cutthroat were anesthetized with MS-222, measured, and marked by punching a hole in the upper lobe of the caudal fin. All in-migrant cutthroat were anesthetized, measured, and examined for marks. All in-migrant cutthroat were marked by punching a hole in the lower lobe of the caudal fin.

To estimate the total in-migration of adult steelhead, a marked-to-unmarked ratio of the out-migrants (Petersen estimate) was used to estimate the total number of steelhead that entered Petersburg Creek in 1971.

Every tenth in- and out-migrant cutthroat captured at the weir was killed, measured, weighed, and sexed. Otoliths and scale samples were collected from these fish for age determination. Reproductive maturity and the presence of residual eggs were noted. Stomach contents were examined and classified.

Foot surveys, electroshocking, baited minnow traps, and dip nets were used to determine the distribution of rearing steelhead and cutthroat in the Petersburg Creek system.

The upstream migrations of Dolly Varden and various salmon species were enumerated by removing them from the weir traps with a dip net or by removing a weir screen and counting as they crossed a flash board.

FINDINGS

Steelhead

Numbers and Timing:

An estimated 806 steelhead, Salmo gairdneri, entered Petersburg Creek in 1971. This migration began in late March, peaked in mid-May, and was terminated in late June.

The estimated in-migration of adult steelhead was calculated using Bailey's modification of Petersen's formula (Ricker, 1958) as follows:

$$\hat{N} = \frac{M\ (C + 1)}{R + 1} = \frac{87\ (241)}{26} = 806$$

where

M = 87 marked fish
C = 240 fish sampled
R = 25 marked fish recaptured

The majority of the in-migrant steelhead entered the trap during rising water levels at night. Schools of fish were often observed during the day below the weir, but few steelhead entered the trap during the day. Water temperatures in Petersburg Creek averaged 3°C during the peak of steelhead in-migration with a range of 2° - 6°C.

Many steelhead returned to sea shortly after spawning. The out-migration of spent steelhead started in June, peaked on June 22, and terminated in August (Table 1).

TABLE 1 Steelhead Migration by Month, Petersburg Creek, 1971.

Month	Direction of Migration	
	Upstream	Downstream
April	9	---
May	62	---
June	16	232
July	--	4
August	--	4
Total	87	240

Age-Sex Relationships:

To determine the age-sex relationships of the Petersburg Creek steelhead, scale samples were obtained and sex determined from all steelhead trapped at the weir during the in- and out-migrations. Eighty-seven scales were obtained for in-migrant steelhead and 240 were collected from spent fish on their out-migration. A total of 280 scales from the combined in- and out-migrant fish were readable for total age determinations. No difference in total age was apparent in the two groups and all scales were combined for final analysis.

Twenty-three age classes (ages 2.2 - 4.3S) were present in the Petersburg Creek steelhead population (Table 2). Age classes are presented using the aging method described by Narver, et al. (1971). Repeat spawning steelhead are listed with an "S" after the ocean age. This "S" represents a spawning run and is added to the total to determine the overall total age of repeat spawners. Initial spawners are those steelhead without an "S" in their total age.

The fish sampled had spent two (27.5%), three (56.8%), and four (15.7%) winters in fresh water. The numbers of winters spent in salt water by the sampled fish were two (34.6%), three (40.1%), four (16.8%), five (6.0%), six (2.1%), and seven (0.4%). The most frequently occurring of the female steelhead were age 3.3, while the most frequently occurring males were age 3.2. The high number of age classes in the population is due to the variable age of smolt migration and to the high occurrence of repeat spawners (43%) in the total run.

TABLE 2 Age Classes, Petersburg Creek Steelhead, 1971.

Age Class	No. SH	No. Females	No. Males	% Total
2.2	18	4	14	6.4
2.2S	13	2	11	4.6
2.2SS	3	2	1	1.1
2.2SSS	2	1	1	0.7
2.3	22	14	8	7.9
2.3S	8	4	4	2.9
2.3SS	7	4	3	2.5
2.3SSS	2	2	-	0.7
2.3SSSS	1	1	-	0.4
2.4	1	1	-	0.4
3.2	44	16	28	15.7
3.2S	33	14	19	11.8
3.2SS	12	7	5	4.3
3.2SSS	2	2	-	0.7

TABLE 2 (Cont.) Age Classes, Petersburg Creek Steelhead, 1971.

Age Class	No. SH	No. Females	No. Males	% Total
3.3	40	27	13	14.3
3.3S	18	13	5	6.4
3.3SS	6	5	1	2.1
3.3SSS	4	4	-	1.4
4.2	34	19	15	12.1
4.2S	5	3	2	1.8
4.2SS	2	-	2	0.7
4.3	1	-	1	0.4
4.3S	2	2	-	0.7
Total	280	148	132	100.0

Frequency of Spawning:

During the Petersburg Creek weir operation in 1971, 57% of the steelhead sampled were spawning for the first time and 43% spawned two or more times. The number of years the sampled steelhead have spawned is presented in Table 3.

TABLE 3 Steelhead Spawning Frequency, Petersburg Creek, 1971.

Sex	Number of Spawning Runs					Total
	One	Two	Three	Four	Five	
Male	78	41	12	1	0	132
Female	82	38	18	9	1	148
Total	160	79	30	10	1	280

Initial Spawners:

Steelhead spawning for the first time were from seven age classes. The mode for initial female spawners was age 3.3, while that for males was 3.2 (Table 4).

TABLE 4 Age Classes of Initial Steelhead Spawners by Sex, Petersburg Creek Weir, 1971.

Age Class	No. SH	No. Females	No. Males	% Total
2.2	18	4	14	11.3
2.3	22	14	8	13.8
2.4	1	1	--	0.6
3.2	44	16	28	27.5
3.3	40	27	13	25.0
4.2	34	19	15	21.3
4.3	1	1	--	0.6
Total	160	82	78	100.1

Repeat Spawners:

The high occurrence of repeat spawners (43%) in the Petersburg Creek steelhead population was not expected. Samples of the Situk River steelhead population at Yakutat in 1970 and 1971 showed that 35% were repeat spawners (McHugh, et al., 1971). It was thought the Situk River population was unique in containing a high number of repeat spawners, but it now appears that Petersburg Creek contains a steelhead run with an even higher percent of repeat spawners.

A breakdown of repeat spawners by sex shows females outnumber males by 1.2:1. Sixteen age classes were represented among the repeat spawners. The mode for both female and male repeat spawners was age 3.2S (Table 5).

Examination of the 66 female repeat spawners revealed 38 (58%) were spawning for the second time, 18 (27%) for the third time, 9 (14%) for the fourth time, and 1 (2%) was spawning for the fifth time. On examination of the 54 male repeat spawners, 41 (76%) were spawning for the second time, 12 (22%) for the third time, and 1 (2%) for the fourth time.

TABLE 5 Age Classes of Steelhead Repeat Spawners by Sex, Petersburg Creek, 1971.

Age Classes	No. SH	No. Females	No. Males	% Total
2.2S	13	2	11	10.8
2.2SS	3	2	1	2.5
2.2SSS	2	1	1	1.7
2.3S	8	4	4	6.7
2.3SS	7	4	3	5.8
2.3SSS	2	2	-	1.7
2.3SSSS	1	1	-	0.8
3.2S	33	14	19	27.5
3.2SS	12	7	5	10.0
3.2SSS	2	2	-	1.7
3.3S	18	13	5	15.0
3.3SS	6	5	1	5.0
3.3SSS	4	4	-	3.3
4.2S	5	3	2	4.2
4.2SS	2	-	2	1.7
4.3S	2	2	-	1.7
Total	120	66	54	100.0

Length-Weight Relationships:

Length-weight data were collected from 280 steelhead trapped at the Petersburg Creek weir in 1971. The average length and weight of females and males for all age groups were almost identical. Examining the average length and weight of initial and repeat spawners, it is apparent that the older repeat spawners are almost all "trophy size" (5.4 kg) fish. Table 6 presents the length-weight relationship of Petersburg Creek steelhead in 1971. The reputation of Petersburg Creek as a trophy steelhead stream rests almost entirely on the large numbers of repeat spawners in the total population.

TABLE 6 Steelhead Length-Weight Relationships, Petersburg Creek, 1971.

	No. in Sample	Length (cm) Range	Length (cm) Avg.	Weight (kg) Range	Weight (kg) Avg.
Initial Spawners	158	60.9 - 102.8	74.6	2.2 - 8.4	4.3
Repeat Spawners	122	68.6 - 102.8	85.3	4.1 - 10.7	6.2

Cutthroat Out-Migration:

The seaward migration of cutthroat, S. clarki, in Petersburg Creek began in early May, peaked in June, and was nearly complete by mid-July. Weir screen panels were of 2.54 cm mesh during this period and only the larger smolts were captured. The majority of the cutthroat trapped were spent adults over 200 mm in length (Table 7). Water temperatures during the out-migration ranged from 3° - 6°C, with the peak of migration occurring at temperatures above 4°C. Petersburg Creek cutthroat migrated at a later date and at lower water temperatures than those observed at Lake Eva, Alaska, where water temperatures averaged 6°C during the peak of out-migration (Armstrong, 1971). Spring, 1971, was unusually late and probably accounted for the late migration timing. Nearly all of the out-migrant cutthroat entered the trap during the hours of darkness on rising stream flows.

The average lengths of out-migrant cutthroat are somewhat biased upward as the smaller initial out-migrants passed through the large mesh weir screens unsampled. Also, total out-migrants trapped is low due to the many hours the weir was inoperative during flood conditions.

TABLE 7 Numbers and Lengths of Out-Migrant Cutthroat by Month, Petersburg Creek Weir, 1971.

Month	No. of Fish	Length (mm) Range	Length (mm) Avg.	% Total
May	36	144 - 360	257	17.8
June	161	166 - 480	217	79.7
July	4	216 - 394	265	2.0
August	1	273	---	0.5
Totals	202	144 - 480	246	100.0

In-Migration:

A total of 505 in-migrant cutthroat were enumerated at the Petersburg Creek weir during 1971. A small number of mature cutthroat passed upstrem in May. These fish were in advanced spawning condition, and their origin is uncertain as the weir is in the intertidal area; it was assumed that no cutthroat were overwintering below the weir site. Small numbers of cutthroat also passed the weir in June and July. These fish did not have the appearance of having spent any

time at sea and are believed to be part of the out-migration that remained in Petersburg Creek below the weir. The sea-run in-migration began in August, peaked in mid- to late-September, and was complete by the end of October (Table 8). This pattern closely parallels that of the in-migration at Lake Eva, Alaska, in 1962-1964 (Armstrong, 1971). Petersburg Creek cutthroat migrated at night, but good numbers also migrated during high water periods during daylight hours. Water temperatures were 12°C at the start of in-migration, averaged 10°C during the peak, and dropped to 4°C at the end.

TABLE 8 Numbers and Lengths of In-Migrant Cutthroat by Month, Petersburg Creek Weir, 1971.

Month	No. of Fish	Length (mm) Range	Avg.	% Total
May	6	255 - 430	342	1.2
June	8	254 - 433	332	1.6
July	7	217 - 430	303	1.4
August	12	178 - 470	293	2.4
September	330	140 - 513	258	65.3
October	142	171 - 440	305	28.1
Total	505	140 - 513	306	100.1

Exact numbers of cutthroat migrating into Petersburg Creek in 1971 were not determined. There were several long periods during the peak of in-migration when the weir was removed due to flood conditions. The number of marked cutthroat recaptured (2.6% of the total in-migration) was too small to be used for a valid analysis using the Petersen formula. As the weir was not a barrier to migration during approximately 50% of the peak of in-migration, the 500 cutthroat trapped may represent approximately 50% of the total 1971 in-migration. It is estimated, therefore, that the total 1971 Petersburg Creek in-migration was 1,000 cutthroat.

Age-Length Relationships:

Twenty-one out-migrant cutthroat otoliths were read for total age. Four age groups were present in the sample with the youngest being age 3. Eighty-one percent of the out-migrant cutthroat showed four and five annuli on their otoliths (Table 9).

TABLE 9 Age-Length Relationships of Out-Migrant Cutthroat, Petersburg Creek Weir, 1971.

Fork Length (mm)	Age (No. of Annuli) 3	4	5	6	Total	% Total
141 - 160	1	-	-	-	1	4.8
161 - 180	-	-	-	-	0	0.0
181 - 200	1	-	-	-	1	4.8
201 - 220	-	1	1	-	2	9.5
221 - 240	-	4	3	-	7	33.3
241 - 260	-	1	1	-	2	9.5
261 - 280	-	-	5	1	6	28.6
281 - 300	-	-	1	-	1	4.8
301 - 320	-	-	-	1	1	4.8
Total	2	6	11	2	21	
% Total	9.5	28.6	52.4	9.5		100.0
Avg. Length (mm)	169	233	253	284		

Age-length data were collected from a random sample of 76 in-migrant cutthroat. These trout ranged from 3 - 8 years, with 73.8% showing four and five annuli on their otoliths (Table 10).

TABLE 10 Age-Length Relationships of In-Migrant Cutthroat, Petersburg Creek Weir, 1971.

Fork Length (mm)	Age (No. of Annuli) 3	4	5	6	7	8	Total	% Total
141 - 160	1	-	-	-	-	-	1	1.3
161 - 180	3	1	-	-	-	-	4	5.3
181 - 200	2	5	-	-	-	-	7	9.2
201 - 220	3	6	-	-	-	-	9	11.8
221 - 240	-	6	2	-	-	-	8	10.5
241 - 260	-	9	1	-	-	-	10	13.2
261 - 280	-	6	4	-	-	-	10	13.2
281 - 300	-	1	2	-	-	-	3	3.9
301 - 320	-	-	6	2	-	1	9	11.8
321 - 340	-	1	3	1	1	-	6	7.9

TABLE 10 (Cont.) Age-Length Relationships of In-Migrant Cutthroat, Petersburg Creek Weir, 1971.

Fork Length (mm)	Age (No. of Annuli) 3	4	5	6	7	8	Total	% Total
341 - 360	-	1	1	-	-	1	3	3.9
361 - 380	-	-	-	3	-	-	3	3.9
381 - 400	-	-	1	-	1	-	2	2.6
401 - 420	-	-	-	-	1	-	1	1.3
Total	9	36	20	6	3	2	76	
% Total	11.8	47.4	26.4	7.9	3.9	2.6		100.0
Avg. Length (mm)	187	242	289	342	365	318		

Reproductive maturity was noted for the cutthroat sampled during the out- and in-migrations. The out-migrant cutthroat were comprised almost entirely of spawned-out mature fish, with only 9% of the sample showing little gonadal development. This is probably biased as the majority of the cutthroat migrating to sea for the first time passed unchecked through the weir screens.

The in-migration was sampled more accurately as weir screens were of smaller mesh (1.6 cm) and captured all age groups in the migration. Fifty-six percent of the in-migrants were not sufficiently mature to spawn in the spring, 1972. This contrasts greatly with studies conducted on Sand Creek, Oregon, where nearly 95% of all in-migrant cutthroat were potential spawners (Sumner, 1962).

It is apparent that Petersburg Creek sea-run cutthroat spawning population is quite small, comprising less than 50% of the estimated 1,000 sea-run population.

Other Migrants

The Dolly Varden, Salvelinus malma, out-migration from Petersburg Lake to salt water was nearly completed when the Petersburg Creek weir became an effective barrier on April 22, 1971. This was confirmed by the large schools of Dolly Varden in Wrangell Narrows and the lower intertidal reaches of Petersburg Creek during weir construction. The few Dolly Varden trapped and released

downstream represented only the remainder of the out-migration. During August and September, it was almost impossible to operate the downstream trap due to the large numbers of dead salmon floating downstream. Table 11 presents the monthly downstream trap counts for the Petersburg Creek weir in 1971.

TABLE 11 Monthly Downstream Trap Counts, Petersburg Creek Weir, 1971.

Month	Fish Species		
	Cutthroat	Dolly Varden	Steelhead
April	---	179	---
May	36	1,465	2*
June	161	27	233
July	4	---	4
August	1	---	3
Total	202	1,671	242

*Steelhead smolts.

The upstream trap was completed on April 22 and the first adult steelhead was captured on April 23. As the steelhead in-migration increased in May, an additional upstream trap was constructed to handle the increasing numbers of fish. Only cutthroat and steelhead were captured during April and May. The Dolly Varden in-migration started in late June together with the first of the sockeye salmon, Oncorhynchus nerka, run. The monthly upstream trap counts for the Petersburg Creek weir are presented in Table 12.

Totals in Table 12 do not represent the entire run for the species listed. Many fish passed the weir uncounted during high water periods, and several thousand pink, O. gorbuscha, and chum, O. keta, salmon spawned in the intertidal area below the weir. The totals given are the actual counts during the 1971 weir operation.

TABLE 12 Number of Upstream Migrants Enumerated at the Petersburg Creek Weir, 1971.

Month	Fish Species*						
	SH	CT	DV	RS	PS	CS	SS
April	9	---	--	--	--	--	---
May	62	6	--	--	--	--	---
June	16	8	3	39	--	--	---
July	--	7	1,240	479	--	10	---
August	--	12	5,849	4,239	27,608	1,265	28
September	--	330	2,825	--	482	1	6
October	--	142	1,726	--	1	7	415
Total	87	505	11,643	4,757	28,091	1,283	449

*SH - Steelhead trout
CT - Cutthroat trout
DV - Dolly Varden
RS - Red salmon
PS - Pink salmon
CS - Chum salmon
SS - Silver salmon

Steelhead-Cutthroat Rearing Requirements

During July an attempt was mde to locate and classify the rearing habitat of steelhead and sea-run cutthroat in the Petersburg Creek system. Two capture methods were tested but only one proved successful.

A backpack electro shocker was tested in Petersburg Creek and one large tributary. Several problems developed and it was apparent that a better capture method would be needed.

Wire mesh minnow traps baited with cured salmon eggs were tested and worked well in all areas sampled. The minnow traps were also much easier to transport from site to site and allowed a greater coverage of the streams.

The Petersburg Creek system contains three major tributaries and numerous lesser tributaries (Figure 1). Rearing steelhead and/or cutthroat were found in all areas sampled.

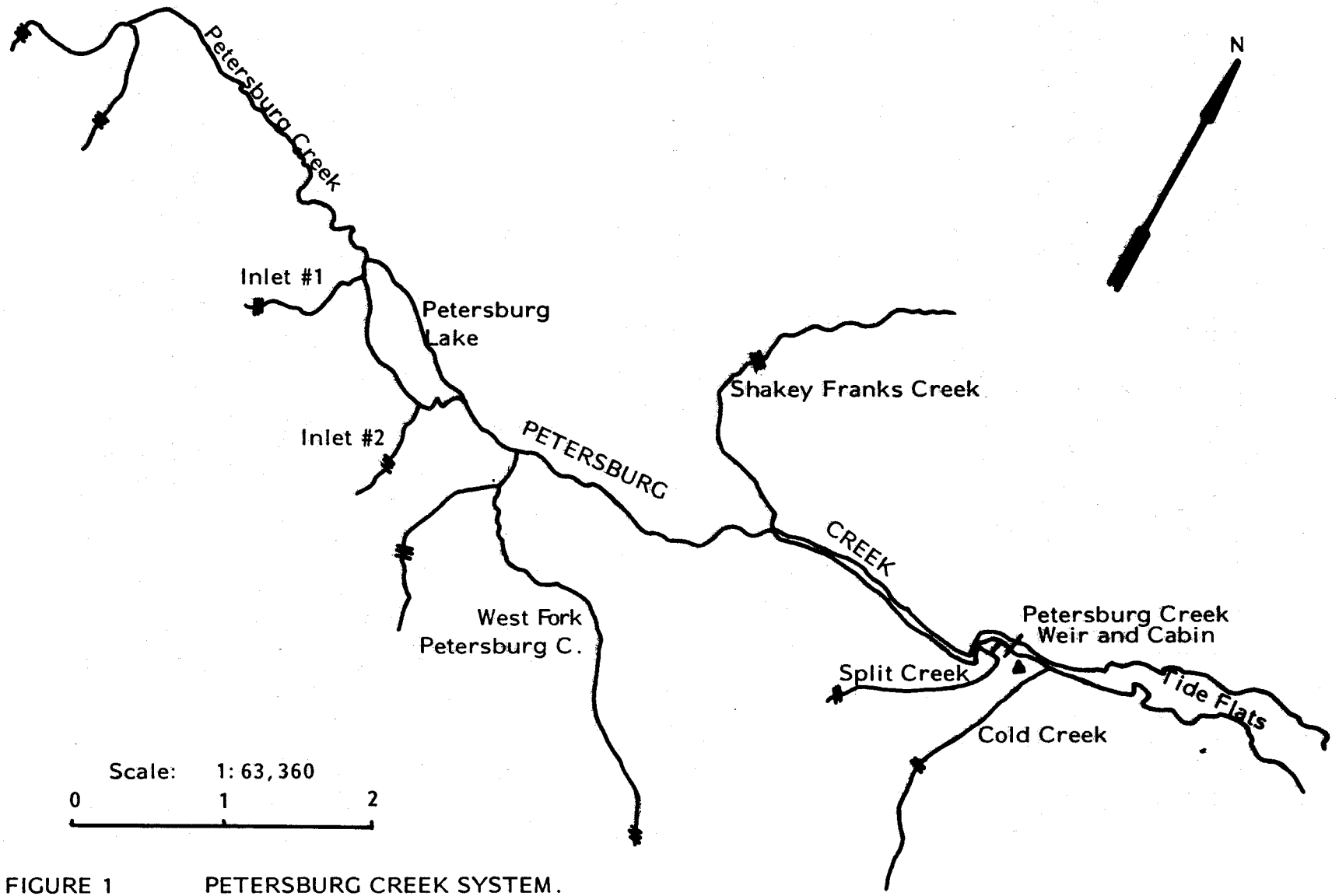

FIGURE 1 PETERSBURG CREEK SYSTEM.

Steelhead Habitat:

Rearing steelhead were found in still and moving water in all areas except Petersburg Lake proper. Steelhead were found in Cold, Split, Shakey Franks, West Fork of Petersburg Creek, and in Petersburg Creek. Rearing steelhead were most abundant in the fast water areas of the tributaries; however, good numbers were also present in the deep pool areas of Petersburg Creek. The most favored rearing habitat type for Petersburg Creek system steelhead is a stream section 15 - 60 cm deep, having moderate to fast flow over a substrate of large stones. Stream areas with overhanging vegetation and/or logs and undercut banks did not seem to be as favored as the more open fast water areas. Rearing steelhead were found throughout several small tributaries from their confluence with Petersburg Creek to the extreme upper limits of possible fish migration.

Cutthroat Habitat:

Rearing cutthroat were found in a more restrictive habitat type than that of steelhead. Rearing cutthroat in the Petersburg Creek system preferred the slough-like areas above and below Petersburg Lake and the shoreline areas of Petersburg Lake. Several beaver ponds along Petersburg Creek and adjacent to the inlet of Petersburg Lake were found to contain rearing cutthroat but not rearing steelhead. Rearing steelhead and cutthroat were found together only in the West Fork of Petersburg Creek. The cutthroat were found in the slow, deep pool areas and the steelhead in the moving water between pools.

Rearing Steelhead-Cutthroat Age-Length Relationships

A total of 120 young steelhead were examined for biological data. A representative sample was taken from each of the various tributaries and habitat types. The steelhead were measured and otoliths were taken for age determination. Four age groups (ages 1 - 4) ranging from 42 - 168 mm, were found rearing in the Petersburg Creek system (Table 13). Young steelhead in the four age groups found in all habitat types. The older steelhead were most abundant in the larger tributaries while the younger fish were concentrated in the smaller tributaries.

A total of 28 rearing cutthroat from all representative habitat types were sampled for age-length relationships. Only three age groups (ages 2 - 4) were present in the fish sampled (Table 14). The sampling gear was apparently either selective to the older age groups of cutthroat, or age 1 cutthroat were not rearing in the area sampled.

TABLE 13 Age-Length Relationships of Rearing Steelhead, Petersburg Creek System, 1971.

Fork Length (mm)	Age (No. of Annuli) 1	2	3	4	Total	% Total
41 - 50	1	-	-	-	1	0.8
51 - 60	5	-	-	-	5	4.2
61 - 70	6	4	-	-	10	8.3
71 - 80	7	7	-	-	14	11.7
81 - 90	1	12	1	-	14	11.7
91 - 100	-	15	-	-	15	12.5
101 - 110	-	9	7	-	16	13.3
111 - 120	-	1	10	-	11	9.2
121 - 130	-	1	14	1	16	13.3
131 - 140	-	-	4	1	5	4.2
141 - 150	-	-	2	8	10	8.3
151 - 160	-	-	-	2	2	1.7
161 - 170	-	-	-	1	1	0.8
Total	20	49	38	13	120	
% Total	16.7	40.8	31.7	10.8		100.0
Avg. Length (mm)	71	90	116	155		

TABLE 14 Age-Length Relationships of Rearing Cutthroat, Petersburg Creek System, 1971.

Fork Length (mm)	Age (No. of Annuli) 2	3	4	Total	% Total
71 - 80	2	-	-	2	7.1
81 - 90	2	-	-	2	7.1
91 - 100	3	2	-	5	17.9
101 - 110	4	-	-	4	14.3
111 - 120	-	1	-	1	3.6
121 - 130	-	4	2	6	21.4
131 - 140	-	1	-	1	3.6
141 - 150	-	4	-	4	14.3
151 - 160	-	2	-	2	7.1
161 - 170	-	-	1	1	3.6
Total	11	14	3	28	
% Total	39.3	50.0	10.7		100.0
Avg. Length (mm)	96	121	136		

LITERATURE CITED

Armstrong, Robert H. 1963. Investigations of Anadromous Dolly Varden Populations in the Lake Eva-Hanus Bay Drainages, Southeastern Alaska. Alaska Department of Fish and Game. Federal Aid In Fish Restoration, Annual Report of Progress, 1962-1963, Project F-5-R-4, 4: 78-122.

_____. 1971. Age, Food and Migration of Sea-Run Cutthroat Trout, Salmo clarki, at Eva Lake, Southeastern Alaska. Transactions of the American Fisheries Society, 100(2): 302-306.

McHugh, Michael J., Darwin E. Jones, and Robert T. Baade. 1971. Inventory and Cataloging of the Sport Fish and Sport Fish Waters in Southeast Alaska. Alaska Department of Fish and Game. Federal Aid In Fish Restoration, Annual Report of Progress, 1970-1971, Project F-9-3, 12(G-I): 1-27.

Narver, David W. and Fred C. Withler. 1971. 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.

Ricker, W. E. 1958. Handbook of Computations for Biological Statistics of Fish Populations. Fisheries Research Board of Canada, Bulletin No. 119, p. 84.

Sumner, Francis H. 1962. Migration and Growth of Coastal Cutthroat Trout in Tillamook County, Oregon. Transactions of the American Fisheries Society, 91(1): 77-83.

Prepared by:

Darwin E. Jones
Fishery Biologist

Approved by:

s/Howard E. Metsker
D-J Coordinator

Date: May 1, 1972.

s/Rupert E. Andrews, Director
Division of Sport Fish