

YUKON RIVER SALMON TAGGING STUDIES

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YUKON RIVER ANADROMOUS FISH INVESTIGATIONS, 1969

INTRODUCTION

The Yukon River studies were initiated in 1961 to obtain information regarding life histories, population sizes and escapements, destination, movements and timing of anadromous fish run segments or races along with obtaining estimates of their utilization by the subsistence fishery.

Early phases of the program were designed to evaluate chum and king salmon runs. Initial tag and recovery efforts conducted at the mouth of the river provided much of the basic information but accurate population estimates were lacking. Location of the study area within an intensive commercial fishery and the influence of coastal storms, which often seriously affected fishing effort, were deemed responsible for the lack of sufficient population data. The tag and recovery project was, therefore, reestablished above the commercial fishery at Ohogamiut (mile 185) in 1968. A test fishing site was maintained at the river mouth to determine run timing and abundance indices of king and chum salmon entering the fishery.

Exploratory work during the 1968 season indicated that some method of capturing salmon other than with gill nets would be desirable. Previous gill net operations required far too much effort for the number of fish captured. The mortality rate of gill netted fish was greater than half the catch with delayed mortality of tagged fish impossible to determine. Resulting efforts were applied toward the construction and operation of a fishwheel in conjunction with a tag-recovery and catch sampling program based at Ohogamiut during the 1969 field season. Salmon spawning escapement surveys and comprehensive subsistence fishery surveys were also conducted throughout the district. Limited sheefish investigations were continued in the Yukon River.

## OBJECTIVES

1. Determine population sizes and escapements of anadromous fish passing through the Ohogamiut area.
2. Determine migration routes of anadromous fish in the study area.
3. Determine migration rates and timing of anadromous fish passing through the lower Yukon area, specifically between the mouth and the tagging site and various upriver recovery sites.
4. Determine life histories of anadromous fish in the Yukon River.
5. Determine subsistence utilization of anadromous fish populations.

## Secondary objectives:

- a. Construct and evaluate the effectiveness of a fishwheel as a piece of sampling gear.
- b. Evaluate short term tag-recovery values of the Floy FD-67 anchor tags on king and summer chum salmon.

## METHODS AND MATERIALS

Set gill nets of 5-1/2 and 3-1/2 inch stretch mesh nylon webbing with standard floats and weighted with a lead line were used to capture salmon and sheefish. Each net was approximately 25 fathoms long by 3-1/2 fathoms deep.

A fishwheel constructed of native spruce logs and cut lumber, was fished on an experimental basis. Three baskets, each 12 feet long and 11 feet wide with a 6 foot deep scoop, were covered with heavy gauge 2 inch square mesh wire netting which was later replaced by 2 inch square mesh nylon seine webbing. Panels of surplus canvas, 11 feet by 3 feet, were attached to the bottom outside

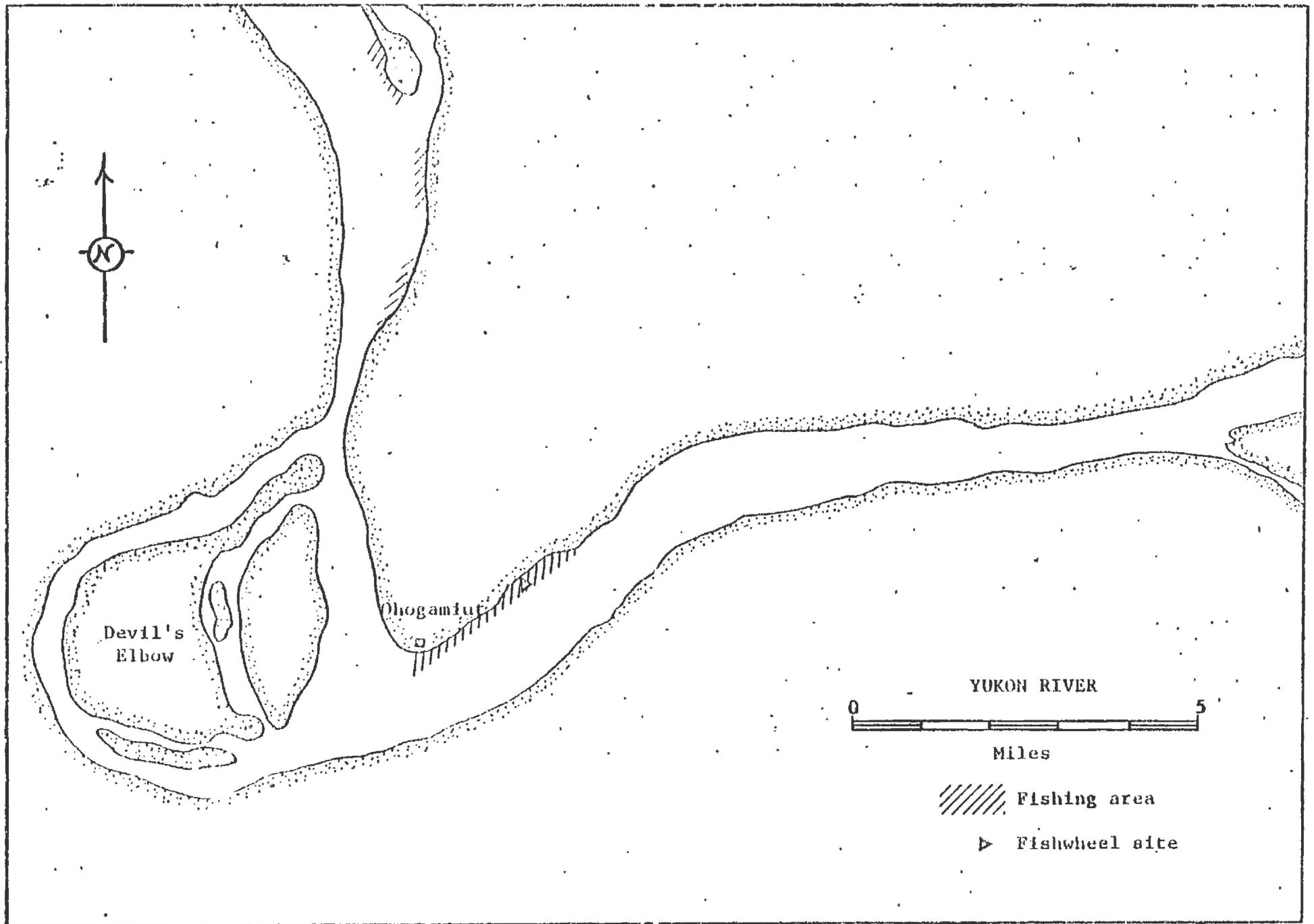
edge of each basket as a means of increasing water resistance to speed up rotation of the wheel. Adjustable axle supports allowed fishing depth to be increased or decreased. The fishwheel was anchored to shore with a single 1/2 inch diameter wire rope. Two boom logs held the fishwheel offshore in the current. A lead was installed from the mid-section of the fishwheel platform to shore. The lead extended from the river bottom to just above the surface of the water.

The Yukon River tagging operations began May 30. All fish<sup>ing</sup> was conducted in an area within three miles upstream and ten miles downstream of Ohogamiut (Figure 2). Set gill nets were usually fished for 24 hour periods at several locations restricted to the presence of eddies. All nets were checked approximately every 2 hours to decrease fish mortality. Not more than three nets were fished at any one period of time. Test fishing gill nets were fished near the north shore of the south mouth channel in the vicinity of Flat Island (Figure 1). The gear was operated continuously from June 4 to July 7.

Fishwheel construction began June 5. The apparatus was placed in operation June 21, approximately one mile upstream of Ohogamiut. Rotation speed of the wheel equaled three revolutions per minute. Basket depth was adjusted to fish approximately one foot above the river bottom. Captured fish were deposited into a live box where they were held until tagged and released.

Salmon tagging was initiated with Floy FD-67 international orange anchor tags and modified tagging gun. Yellow and white spaghetti tags of flexible 1/16 inch diameter plastic tubing in 13 inch lengths affixed to stainless steel needle applicators were also used on salmon and sheefish. Each tag was inscribed with a number and the legend - REWARD ADFG ANCHORAGE.

Figure 2 . . Map of the Yukon River, Ohogamiut, Alaska.



All fish were tagged just below and at the posterior end of the dorsal fin. Floy tags were self-anchoring when inserted with the tagging gun. Spaghetti tags were inserted with a tagging needle through <sup>both sides of the fish.</sup> the skin and flesh posterior to dorsal-fin. After insertion, the needle was removed and the two free ends of the tag were tied tightly with an overhand knot. Adipose fins of all tagged fish were excised as a check against tag loss.

For each tagged fish, the following information was recorded: date, tagging site, gear, tag number, species and length. Sampling data were obtained from commercial, subsistence and Department test fishing and tagging site catches. Scale samples were removed from the area of the first or second scale row, above the lateral line, located on a diagonal line down from the insertion of the dorsal fin to the origin of the anal fin.

All fish scales were interpreted for age and data tabulated. Tag recovery data were analyzed by hand calculator. Remaining results are pending receipt of Department computer analysis.

For purposes of this report, a 42 salmon returning to spawn in 1969 would be the progeny of the 1965 run that migrated from freshwater to the ocean in the spring of 1967.

It has been impossible to determine whether a few king salmon scale samples (usually less than 10%) have one or two freshwater annuli. This cannot be resolved until adequate samples of smolt are obtained for age and size analysis.

Department biologist and a subsistence survey crew collected tag recoveries from fishermen within Alaska. In the Yukon Territory, Canadian Department of Fisheries and Royal Canadian Mounted Police personnel collected tag recoveries. Additional tags were returned by individuals through the mail.

A reward of \$1.00 was offered for each tag returned with the appropriate recovery information of date and recovery location.

Estimate of salmon escapements were determined by aerial surveys utilizing Cassna 180 or Piper PA-18 type aircraft.

Much of the subsistence fishery data <sup>were</sup> was obtained from personal interviews of fishermen and direct counts of salmon. Some catches were obtained from return of special catch forms or questionnaires that were distributed to fishermen prior to the fishing season.

Two-man crews, traveling by boat, surveyed the majority of the Yukon River fisheries, while the other subsistence fisheries were surveyed by biologists traveling in single engine aircraft. The Whitehorse office of the Canadian Department of Fisheries supplied catch information for the Canadian portion of the Yukon drainage.

## RESULTS

Several problems were encountered which resulted in comparatively small numbers of salmon being captured and tagged. Fluctuating low water conditions (10-15 feet below normal), fishwheel construction and difficulty in locating suitable fishing sites hampered operations. Since the determination of a reliable population estimate of king salmon passing through the Ohogamiut area did not appear feasible this year, emphasis was placed on obtaining additional information on migration rates, timing and distribution of run segments or races of king and summer chum salmon.

### King Salmon

Table 1 summarizes the king salmon tag-recovery data. Of 537 kings captured at the tagging site, 293 (54.6%) were tagged and released. Gill nets accounted for the largest catch (437) and mortality (53.5%), while the fishwheel accounted for 100 kings and a 10.0 percent mortality. The overall recovery rate of tagged fish was 26.3 percent. Nearly all recoveries were taken in 3-1/2 inch mesh gill nets of upriver fishermen. The daily numbers of king salmon captured, tagged and recovered by tagging date are presented in Appendix A. Tag-recovery data for recoveries (6) made by tagging site nets within 24 hours of the date of tagging are not included.

#### Distribution of recoveries by area

The number and percentage distribution of king salmon tag recoveries by recovery area are summarized in Table 2. The greatest percentage (93.5%) of recoveries occurred in the Alaskan portion of the main Yukon River, particularly in the Russian Mission to Holy Cross area where a large amount of fishing effort is located in relative close proximity to the tagging site. Remaining recoveries were made in the Yukon Territory. The furthest recovery occurred in the <sup>Pelly River</sup> Pelly Crossing, Yukon Territory, a distance of 1,580 miles upstream from the mouth of the Yukon. Tag and recovery data are presented in Appendix B.

#### Recovery rates by tagging period

King salmon upriver recovery rates by tagging period are summarized in Table 3. The largest percentage of recoveries (47.3%) occurred during June 1-15, the period of maximum gill net commercial fishing effort. Reduced effort and a change to a fishwheel chum salmon fishery during the subsequent two periods accounted for only 20.6 and 14.8 percent recoveries respectively. Data indicates a substantial harvest of the early portion of the king salmon run.

Table 1. King salmon tag-recovery summary, Ohogamiut, Yukon River, 1969.

Gear	Effort (days)	Number captured	Percent captured	Mortality		Tagged			Recovered		
				Number	Percent	Number	Percent	Percent total	Number	Percent	Percent total
Shovel	21	100	18.6	10	10.0	90	90.0	30.7	10	11.1	13.0
11 net	42	<u>437</u>	<u>81.4</u>	<u>234</u>	53.5	<u>203</u>	46.5	<u>69.3</u>	<u>67</u>	33.0	<u>87.0</u>
Total	<u>42<sup>1/2</sup></u>	537	100.0	244	45.4	293	54.6	100.0	77	26.3	100.0

Maximum number of days gear operated.

Table 2. Distribution and migration rates of tagged king salmon, Yukon River, 1969.

Area of recovery	Miles from tagging site	Recoveries		Tagging dates (range)	Recovery dates (range)	Mean days out	Mean miles per day
		No.	%				
Below Ohogamiut	-	9	11.7	6/4-30	6/16-7/6	7.1	-
Russian Mission	28	4	5.2	6/3-27	6/7-7/5	3.5	8.0
Paimiut	66	6	7.8	6/3-24	6/6-27	4.3	15.3
Above Paimiut	76	10	12.9	6/1-24	6/11-7/2	10.2	7.4
Mouth, Innoko River	89	2	2.6	6/3-27	6/6-7/1	3.0	29.7
Holy Cross	98	13	16.9	6/2-25	6/6-7/26	9.9	9.9
Trayling	151	1	1.3	6/24	7/2	8.0	18.9
Altag	268	1	1.3	6/17	6/28	11.0	24.4
Ulato	299	2	2.6	6/11-12	6/28-7/2	18.5	16.2
Koyukuk	317	1	1.3	6/26	7/20	24.0	13.2
Mouth, Koyukuk R.	323	3	3.9	6/23-7/3	7/6-26	14.3	22.6
Okrimnes	423	3	3.9	6/23-7/4	7/15-20	16.7	25.3
Tanana	510	3	3.9	6/13-25	7/8-25	13.7	37.2
Above Tanana	540	4	5.2	6/3-23	6/26-7/5	19.8	27.2
Ampart	578	4	5.2	6/15-29	7/1-15	15.8	36.6
Chenana (Tanana R.)	675	4	5.2	6/22-27	7/13-23	25.8	26.2
Mouth of Chenana R. (Tanana R.)	727	1	1.3	6/24	7/20	26.0	28.0
Port Yukon	817	1	1.3	6/27	7/20	23.0	35.5
Mid Crow (Porcupine R.), Y.T.	1,074	1	1.3	6/15	7/13	28.0	38.4
Armaks, Y.T.	1,366	2	2.6	6/18-27	7/28-8/17	45.5	30.0
Pelly Crossing (Pelly R.) Y.T.	1,395	2	2.6	6/12-28	7/26-8/17	42.0	33.2

Table 3. King salmon recovery rates by tagging period, Yukon River, 1969.

Tagging period	<u>Tagged</u>		Number	<u>Recovered</u>	
	Number	Percent		Percent	Percent total
6/1-15	67	22.9	32	47.8	41.6
6/16-30	199	67.9	41	20.6	53.2
7/1-12	<u>27</u>	<u>9.2</u>	<u>4</u>	14.8	<u>5.2</u>
Total	293	100.0	77	26.3	100.0

### Migration rates

Migration rates of Yukon River king salmon recovered at various locations are summarized in Table 2. The maximum rate recorded was 38.4 miles per day while the average rate was 24.2 miles per day. In general, migration rates increased as the distance traveled upstream increased. These migration rates should not be considered as the actual rate of travel due to the following inherent tag and recovery limitations: (1) tagged fish were usually in an initially weakened or disoriented condition as a result of handling and tagging, (2) comparatively few fish were tagged and recovered and (3) reported recovery dates may be inaccurate. Based on peak catches in the Flat Island and Ohogamiut areas, the migration rate of untagged fish was approximately 46 miles per day (Figure 3).

### General run timing

The daily catches of king salmon are listed in Appendix A. The first king salmon was captured June 1. One notable peak of abundance occurred during June 23-24 in the Ohogamiut area. Smaller run peaks occurred approximately four days apart between <sup>the Flat Island and Ohogamiut</sup> both fishing sites.

King salmon catches made at Ohogamiut and Flat Island are compared in Figure 3. Differences in the magnitude of the catches between the two sites reflect the influence of the intensive downriver commercial fishery on the salmon migrations.

During the first two and one-half weeks of the season, the majority of the king salmon run entered the river by the south mouth. As indicated by commercial and Flat Island catches, the peak in the south mouth run occurred between June 7-11 (Table 4).