

Fishery Data Series Number 95-3

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United States Department of the Interior  
Fish and Wildlife Service  
Region 7  
Fishery Resources

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## Distribution of Radio-tagged Fall Chum Salmon in the South Fork Koyukuk River, 1990

Jeffery L. Melegari and Kenneth D. Troyer

**Abstract**—During September 1990, in conjunction with a project that estimated escapement using sonar, 18 fall chum salmon *Oncorhynchus keta* were radio-tagged on the South Fork Koyukuk River. These fish were tracked upriver to locate spawning areas. Radio-tagged fish traveled as far as 55.9 km upriver from the capture site. The majority of the fish were located between 29 and 47 km from the capture site. This area corresponds with previous documentation of spawning chum salmon in the South Fork Koyukuk River.

### Introduction

Important commercial and subsistence fisheries exist in the Yukon River drainage. Due to the size of the Yukon River and remoteness of many of its tributaries, detailed data on spawning distribution and escapement counts are limited. The Koyukuk River, which flows through Kanuti National Wildlife Refuge (NWR), is a major tributary to the Yukon River. Salmon *Oncorhynchus* spp. originating in the Koyukuk River contribute to the fisheries in the lower Yukon River as well as subsistence fisheries in the Koyukuk drainage. Chinook salmon *O. tshawytscha* and summer and fall chum salmon *O. keta* are known to spawn in the South Fork Koyukuk River (Barton 1984; Troyer 1993).

During September, 1990 fall chum salmon from the South Fork Koyukuk River were radio tagged then tracked upriver to locate spawning areas. Radio tagging and tracking took place in conjunction with a sonar project that estimated total spawning escapement of fall chum salmon (Troyer 1993). One of the long-range goals of the sonar project was to develop a predictive relationship between sonar and aerial counts, and determine the feasibility of using aerial counts to estimate escapement in lieu of sonar. Radio telemetry was used to locate primary spawning grounds for maximizing aerial survey accuracy.

### Study Area

The South Fork Koyukuk River originates in the foothills of the Brooks Range and flows southwest 435 km to the Koyukuk River. The river is clear but stained from leachates, and substrate of the middle and lower reaches is gravel (Troyer 1993). Climate of the region is continental subarctic with temperature extremes of -57 to 34°C. Rivers in the region generally freeze during October. The capture site was located within the boundaries of Kanuti NWR, approximately 32 km upstream from the mouth of the South Fork Koyukuk river and 0.8 km above the confluence of Fish Creek (Figure 1). This site was below previously identified chum salmon spawning areas (Barton 1984; Troyer 1993).

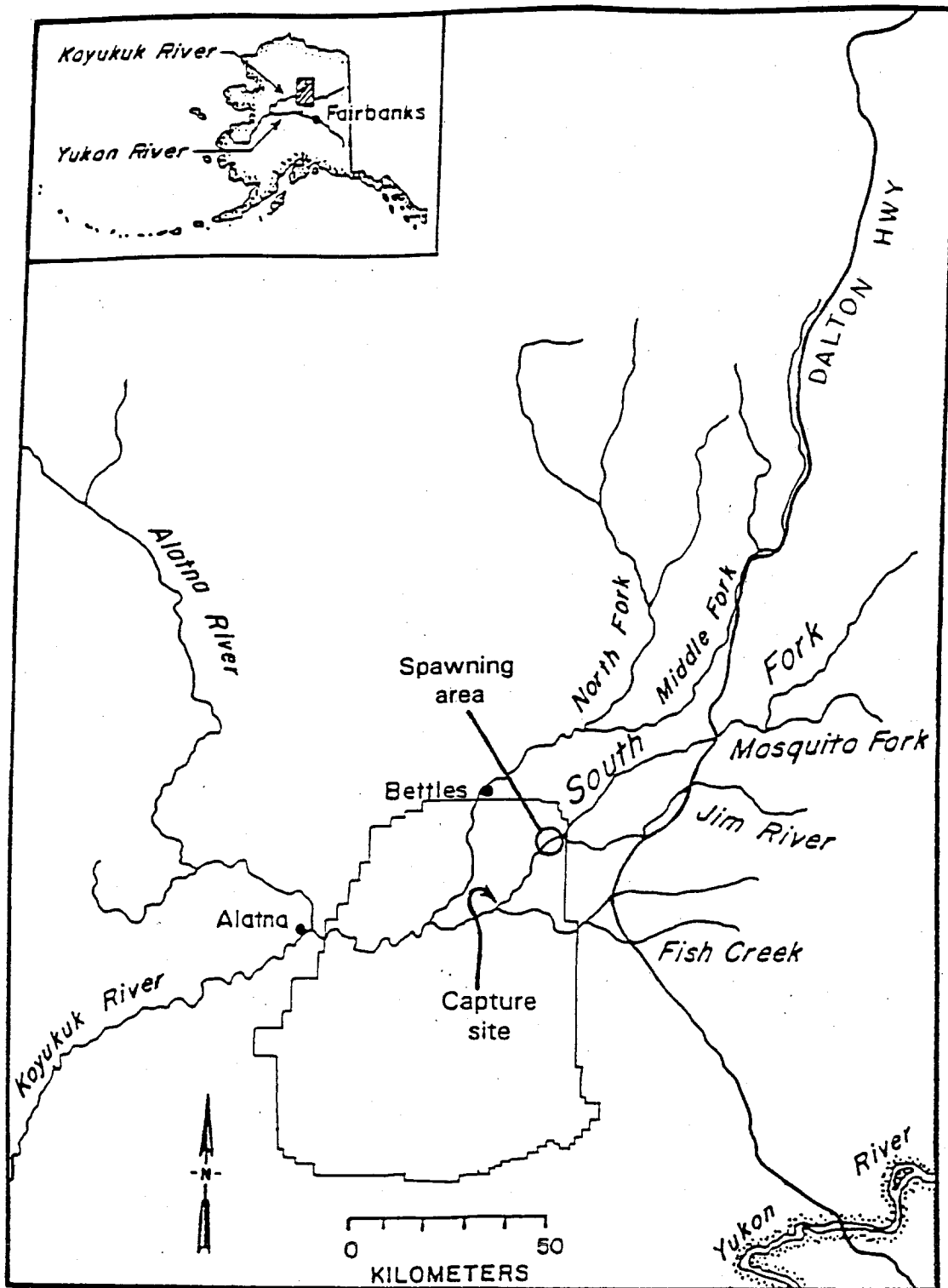


FIGURE 1. — Map of upper Koyukuk River drainage showing location of the capture site on the South Fork Koyukuk River, primary spawning area determined from transmitter relocations, and Kanuti NWR boundary (adapted from Troyer, 1993).

## Materials and Methods

Fall chum salmon were captured with 15.2 x 3.0 m multifilament gill nets with 7.5 cm bar mesh. A total of 18 radio transmitters, 15 manufactured by Advanced Telemetry Systems (ATS) (153.101 to 153.352 MHz) and three by Telonics (151.143 to 151.319 MHz), were implanted by esophageal insertion. Fish were tracked by fixed wing aircraft (Piper Supercub) and, on one occasion by helicopter. An "H" type antenna was mounted vertically (perpendicular to the ground surface), and pointing forward, on the aircraft. Locations of fish were determined using the brief silence or "null signal" that occurs when flying directly over a transmitter. After the initial location of a transmitter repetitive passes, usually two or three, were made over the area until the transmitter was pinpointed at the same location at least twice. Earlier test flights in the Tanana River using this configuration allowed the location of previously set transmitters to be determined to within 50 yards of their actual location (D. Daum, U.S. Fish and Wildlife service, Fairbanks, personal communication). Fish locations were plotted on USGS 1:63,360 series topographic maps, and distances traveled from the capture site were determined with a map measurer.

## Results and Discussion

A total of 18 fall chum salmon (8 males and 10 females) were radio-tagged from September 12 - 24, 1990. From September 16 to November 1, 1990 four tracking flights were flown, and all fish were located at least once. Success of locating all tagged fish during a single flight ranged from 44% to 100% (Table 1). The helicopter flight, which had the lowest success, was flown in conjunction with an aerial survey. During this flight repetitive passes to verify transmitter locations were not conducted.

The maximum distance any fish was located from the capture site was 55.9 km. During the last two tracking flights combined (October 11 and November 1) 17 of the 18 fish were located. Of these, 82% (N=14) were located between 29 and 47 km above the capture site (Table 2). Of the 13 fish located more than once during the surveys, 10 were ultimately located either downstream from or near (<2 km) their previous locations. Movement of fish during the last two flights was less than during earlier flights. The decreased upstream movement and the high percentage of locations in the area from 29 to 47 km above the capture site indicate that this area is a primary spawning area for fall chum salmon in the South Fork Koyukuk River. This area is located just downstream of the confluence of the Jim River (Figure 1), which is 49.6 km above the capture site. Spawning concentrated in this area concurs with Barton (1984) who reported that large numbers of chum salmon were observed spawning below the Jim River confluence.

An increased sample size tagged over a longer time period and ground surveys to confirm spawning activity in areas where fish are located should be incorporated into future projects of this type.

The sonar project was discontinued after 1990. The Service is in the process of developing a weir project on the South Fork Koyukuk River. The weir project should be operational in 1996 and the goal of predicting the accuracy and feasibility of estimating escapement from aerial surveys will be incorporated into this project.

TABLE 1. — Success of locating tagged fish during tracking flights. (expressed as number of fish and percent of fish at large)

| Date  | Aircraft       | Fish at large | Number located | Percent located |
|-------|----------------|---------------|----------------|-----------------|
| 9/16  | Piper supercub | 7             | 7              | 100%            |
| 9/26  | Helicopter     | 18            | 8              | 44%             |
| 10/11 | Piper supercub | 18            | 15             | 83%             |
| 11/1  | Piper supercub | 18            | 9              | 50%             |

TABLE 2. — Locations of radio-tagged fall chum salmon, measured as distance from capture site, on the South Fork Koyukuk River, 1990.

| Date tagged | Frequency | Sex | Distance (km from capture site) |      |       |      |
|-------------|-----------|-----|---------------------------------|------|-------|------|
|             |           |     | Flight date                     |      |       |      |
|             |           |     | 9/16                            | 9/26 | 10/11 | 11/1 |
| 9/12        | 153.101   | M   | 11.9                            | 14.2 | 3.2   |      |
| 9/12        | 153.111   | F   | 27.2                            | 55.9 | 45.6  | 46.5 |
| 9/13        | 153.121   | M   | 32.7                            |      | 44.6  | 42.5 |
| 9/13        | 153.131   | M   | 32.0                            | 24.8 | 32.2  |      |
| 9/13        | 153.142   | M   | 22.9                            |      |       |      |
| 9/15        | 153.162   | F   | 2.5                             | 38.2 | 35.4  |      |
| 9/15        | 153.182   | F   | 1.3                             |      |       | 33.5 |
| 9/17        | 153.192   | M   |                                 |      | 34.6  |      |
| 9/17        | 153.202   | F   |                                 | 28.5 | 31.6  | 31.1 |
| 9/17        | 153.212   | F   |                                 | 8.3  | 12.5  | 11.5 |
| 9/17        | 153.222   | F   |                                 | 18.5 | 10.3  |      |
| 9/19        | 153.253   | F   |                                 |      | 46.0  |      |
| 9/21        | 153.262   | F   |                                 |      | 31.2  | 32.8 |
| 9/21        | 153.321   | F   |                                 | 23.6 | 29.3  |      |
| 9/21        | 153.352   | M   |                                 |      | 31.9  | 33.2 |
| 9/24        | 151.143   | F   |                                 |      | 30.3  | 29.1 |
| 9/24        | 151.160   | M   |                                 |      | 43.0  |      |
| 9/24        | 151.319   | M   |                                 |      |       | 37.0 |

## References

- Barton, L.H. 1984. A catalog of Yukon River salmon spawning escapement surveys. Alaska Department of Fish and Game, Technical Data Report 121, Juneau, Alaska.
- Troyer, K.D. 1993. Sonar enumeration of chum salmon in the South Fork Koyukuk River, 1990. U. S. Fish and Wildlife Service, Fishery Assistance Office, Alaska Fisheries Technical Report Number 19, Fairbanks, Alaska.