

## RESEARCH PROJECT SEGMENT

*State:* Alaska

*Project No.:* F-9-3

*Name:* Sport Fish Investigations of Alaska.

*Study No.:* G-11

*Study Title:* Sport Fish Studies.

*Job No.:* G-11-D

*Job Title:* Salmonid Rearing and Migration  
Study: Ship Creek System.

*Period Covered:* July 1, 1970 to June 30, 1971.

## ABSTRACT

The 1970 run of king salmon, Oncorhynchus tshawytscha, was the highest number (estimated 1,746) observed in Ship Creek since population enumeration began in 1961.

King salmon eggs (approximately 260,000) were taken from 32 females trapped at the Chugach Dam fish ladder and Ship Creek weir during July. Fry from these eggs are currently being reared at the Fort Richardson Cooling Pond and the resultant smolts are scheduled for release into Ship Creek during May, 1971.

A total of 177,200 silver salmon, O. kisutch, and 45,700 king salmon reared to smolt size at the Fort Richardson Cooling Pond were marked with an adipose fin clip and released into Ship Creek during May, 1970.

A total of 105 marked adult king salmon returned to Ship Creek during 1970. All these fish represented four consecutive annual releases (1966-69). A total of 247 returning king salmon were captured at the Chugach ladder, of which 16.6% were "jacks".

Five hundred forty-three silver salmon marked and released during the spring, 1970, were captured at the Chugach Dam facility, returning as "jacks" during the fall, 1970. In addition to the "jacks" 204 adult silver salmon were enumerated.

## RECOMMENDATIONS

1. Retain the present objectives of the studies.
2. Modify the Chugach fish ladder to provide adequate fish passage facilities for returning adult salmon, and to allow more precise evaluation of run timing and magnitude.

## OBJECTIVES

1. To evaluate king and silver salmon production at the Fort Richardson Cooling Pond in attempting to increase the stocks of the anadromous fishes to Ship Creek.
2. To investigate Ship Creek as a source for the procurement of king salmon eggs for experimental hatching and rearing.
3. To evaluate the contribution of marked king and silver salmon from Ship Creek to the overall Cook Inlet commercial salmon catch.
4. To provide recommendation for the management of king and silver salmon in these waters and direct the course of future studies.

## TECHNIQUES USED

King and silver salmon smolts were anesthetized with tricaine methane-sulphonate (MS-222), the adipose fin clipped, and released into Ship Creek.

Adult king salmon were captured at the Chugach diversion dam fish ladder and at the Ship Creek weir for the procurement of eggs. Eggs obtained were transferred to the Fire Lake Hatchery for incubation.

Returning adult king and silver salmon were enumerated at the Chugach City Dam live trap, weir, and by foot surveys. All were checked for fin clips.

Sport Fish personnel monitored portions of the commercial fish harvest in Upper Cook Inlet (northern district) by checking a local cannery (Whitney-Fidalgo Seafoods) for marked adult returns of king and silver salmon.

## FINDINGS

Past information collected on this project are presented in Dingell-Johnson Reports by Gretz (1963) and Kubik (1964 through 1969).

### Fort Richardson Cooling Pond

A description of the Cooling Pond is presented in D-J Annual Report of Progress, Volume 4, Job No. 8-C-4, 1962-1963.

King salmon, Oncorhynchus tshawytscha, have been reared at the Fort Richardson Cooling Pond, marked and released into Ship Creek since 1963 in an effort to enhance the anadromous stocks in that creek. The silver salmon, O. kisutch, program, with the same objective, began in 1968.

A total of 45,700 king salmon fingerling from local Ship Creek stocks, averaging 29.0 per pound, were released from the Cooling Pond into Ship Creek in May, 1970. Fingerling silver salmon (177,200) of Bear Creek, Alaska, origin at 10 - 11 per pound were also planted in Ship Creek during the same month.

Approximately 930,000 king and 410,000 silver salmon have been marked and released into Ship Creek during the past eight years (1963-70). Returns from these releases have been small and somewhat disappointing when compared with the accomplishments of other states. It would, however, be premature at this time to make an overall evaluation of the program for the following reasons:

1. A problem has been the inconsistency in numbers of king salmon smolts released into Ship Creek since 1964 (Table I). Releases have ranged as low as 428 kings in 1964 to a high of 548,368 in 1967. From 1968 through 1970 the average release has numbered approximately 74,302 king salmon smolts. Tentatively, plans have been developed for an estimated 200,000 king salmon smolt to be released in 1971.
2. The unknown contribution of adult marked king and silver salmon from Ship Creek to the Cook Inlet commercial salmon catch has not been resolved.

The occurrence of marked Ship Creek fish in the Cook Inlet commercial fishery has been established through sampling catches at a local cannery, but the total numbers of commercially harvested fish may be too small for a reliable estimation of Ship Creek's contribution.

During 1970, 42 commercially harvested adult silver salmon from the 1969 Ship Creek release (1967 brood) were identified at the local cannery.

TABLE 1 King and Silver Salmon Smolt Releases - Ship Creek, 1964 - 1970.

| <u>Year</u> | <u>No. Kings</u> | <u>No. Silvers</u> | <u>Origin</u> | <u>Dates Released</u> | <u>Size</u> | <u>Mark</u>                 |
|-------------|------------------|--------------------|---------------|-----------------------|-------------|-----------------------------|
| 1970        | 45,690           |                    | Ship Creek    | 5/18 thru 5/27        | 29/lb       | Adipose                     |
|             |                  | 177,240            | Bear Creek    | 5/18 thru 5/27        | 10 to 11/lb | Adipose                     |
| 1969        | 95,900           |                    | Ship Creek    | 5/ 5 to 5/16          | 16.6/lb     | Adipose                     |
|             |                  | 101,300            | Eagle Creek*  | 5/ 5 to 5/16          | 13.7/lb     | Adipose                     |
| 1968        | 81,316           |                    | Ship Creek    | 5/23 thru 5/24        | 28.5/lb     | Adipose                     |
|             |                  | 129,318            | Big Creek*    | 4/15 thru 4/22        | 19.9/lb     | Adipose                     |
| 1967        | 474,516          |                    | Green River** | 5/22 thru 6/21        | 58.4/lb     | Adipose                     |
|             | 63,852           |                    | Ship Creek    | 5/ 8 thru 5/12        | 18.6/lb     | Adipose                     |
| 1966        | 166,870          |                    | Green River** | July                  | 98/lb       | Half-dorsal                 |
| 1965        | 8,432            |                    | Green River** | 8/ 6                  | 99 mm       | Left pectoral               |
|             | 352              |                    | Ship Creek    | 3/18                  | 76 mm       | Adipose                     |
| 1964        | 428              |                    | Ship Creek    | 6/ 3                  | 76 mm       | Right pelvic<br>and adipose |

\*Oregon  
\*\*Washington

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Approximately 100,000 adult silvers were processed at the cannery; about 10% were checked by Sport Fish Division personnel. None of the 1969 released silvers were observed at the Chugach ladder facility, weir, or during carcass count surveys of Ship Creek.

Approximately 3,000, or 37%, of 8,054 incidentally caught king salmon from the commercial fishery in Cook Inlet were spot checked at the Whitney-Fidalgo Cannery, with no marked adult king salmon observed in 1970. During the 1969 fishing season 12 marked king salmon were identified at the cannery.

Not all king salmon harvested in the commercial fishery are processed at the local cannery. Many of the freshly caught king salmon are utilized by the fishermen themselves; hence, the total incidental harvest is a minimum number and the sampling of these fish is less than the 37% indicated.

By monitoring the commercial fishery more closely during the 1971 fishing season, the difficulty of accurately assessing the commercial harvest of Ship Creek king and silver salmon stocks might be alleviated.

Other factors which may be significant in affecting low returns of marked fish to date are:

1. Loss of smolts at the time of the 1968 and 1969 releases due to extremely low water and high resultant mortality from gulls, terns, and ravens.
2. Improper screening at the intake structures of the Elmendorf and Chugach re-circulating ponds which potentially could trap thousands of downstream migrants.
3. Low quality of reared juveniles.
4. King salmon smolts smaller than the recommended size of 10 - 30 per pound for release.

### Escapement

#### King Salmon:

King salmon normally enter Ship Creek in early June, with spawning occurring in late July or early August.

Following the release of Green River fall-run king salmon stocks in 1966 and 1967, small numbers continued to enter the creek until late September and early October, with spawning occurring prior to December.

The 1970 king salmon run was the highest number (estimated 1,746) observed in Ship Creek since population enumeration began in 1962. King salmon escapement for Ship Creek is shown in Table 2.

TABLE 2 King Salmon Escapement Counts, Ship Creek, 1962-1970.

| <u>1970</u> | <u>1969</u> | <u>1968</u> | <u>1967</u> | <u>1966</u> | <u>1965</u> | <u>1964</u> | <u>1963</u> | <u>1962</u> |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1,746       | 710         | 500         | 200         | 50          | 207         | 94          | 119         | 58          |

An estimated 10% of the total run were marked fish originating from four releases into Ship Creek (1966-69).

A total of 432 king salmon carcasses checked on Ship Creek ranged in size from 356 - 1,321 mm (Figure 1). Males averaged 907 mm while females averaged 958 mm. The carcass count consisted primarily of five- and six-year-old adults with a male:female sex ratio of 1.8:1. "Jacks" comprised approximately 3% of the total sample.

#### Silver Salmon:

A total of 2,243 silver salmon were estimated to have returned to the creek with about 70% being 1968 brood year silvers released from the Fort Richardson Cooling Pond in May, 1970.

The first adult silver salmon observed in Ship Creek was captured at the Chugach Dam trapping facility on July 13, and silvers continued to enter Ship Creek until the first week in October. No silver salmon were observed coming in after this date but it is possible that additional fish jumped the Chugach Dam during high tides.

Marked "jacks" began to enter the creek prior to mid-August, and the first one was captured in the ladder on August 19. The period of greatest movement of marked silvers through the trap was September 10 through September 14. After mid-September, silvers continued to enter the creek in smaller numbers until October 2, when all migration ceased.

During the entire month of September, numerous adipose-marked silvers from the 1970 release were taken in the sport fishery, ranging in length from 241 - 365 mm.

#### Chugach Dam Fish Trap

From June 8 through October 2, 1970, a total of 1,194 fish were captured at the trap; in addition to king and silver salmon, a number of Dolly Varden, Salvelinus malma; rainbow trout, Salmo gairdneri; pink salmon, O. gorbuscha; and chum salmon, O. keta, were enumerated (Table 3).

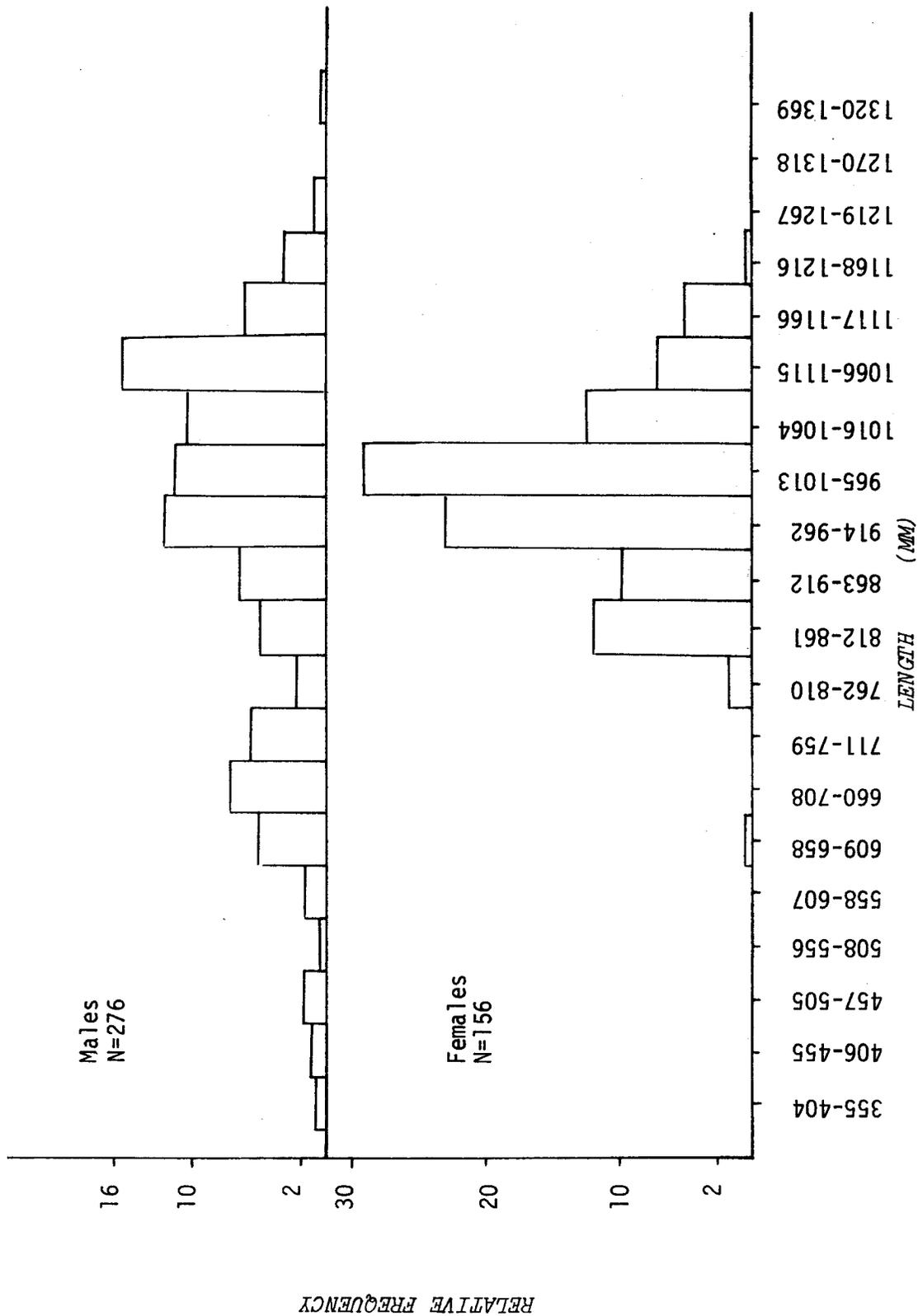


FIGURE 1 SIZE COMPOSITION OF KING SALMON CARCASSES FROM SHIP CREEK, 1970

TABLE 3 Chugach Dam Fish Ladder Capture Results, 1970.

| Fish Species |           |           |           |           |           |
|--------------|-----------|-----------|-----------|-----------|-----------|
| <u>KS</u>    | <u>SS</u> | <u>PS</u> | <u>CS</u> | <u>DV</u> | <u>RT</u> |
| 247          | 747       | 148       | 39        | 10        | 3         |

King salmon appeared at the mouth of Ship Creek in early June. The first adult king salmon was captured in the trap on June 11, 1970. Of the 47 king salmon checked at the fish ladder, 23.8% were marked fish. Most of the kings were past the Ship Creek fish ladder by the first of July. During 1970, the majority of the estimated 1,746 king salmon (86%) went over the Chugach Dam during high tides. Cook Inlet is renowned for its extreme high tides exceeding 30.0 feet, occurring both in the spring and fall.

In addition to the high tides, which may have accounted for most of the king salmon going "over the top", several problems occurred at the Chugach Dam fish ladder in 1970 which may have accounted for less adult kings using the facility than anticipated. They were:

1. Insufficient water flow to attract fish into the entrance of the fish ladder.
2. The one-foot vertical orifices are not designed to efficiently handle large king salmon.
3. Observers walking along the screened top of the ladder scare the fish to the extent they avoid the entrance to the live trap and move back downstream through the ladder.
4. Several instances of illegal removal of fish occurred at the entrance to the fish ladder and also in the trapping facility.

Seventy-three percent of the silvers checked at the trap were adipose clipped "jack" silvers from the spring, 1970, release. An estimated 0.3% return of the 1970 released silvers was noted at the trap and another 0.3% observed in the sport fishery.

#### Marked Returns

King Salmon:

During 1970, 105 marked kings from separate release years were recovered in Ship Creek (Table 4).

TABLE 4 Marked King Salmon Returns, Ship Creek, 1970.

| <u>Release Year</u> | <u>No. Return</u> | <u>Size Range<br/>(mm)</u> | <u>%</u> |
|---------------------|-------------------|----------------------------|----------|
| 1969                | 52                | 330 - 508                  | 50       |
| 1968                | 14                | 508 - 762                  | 13       |
| 1967                | 37                | 660 - 1,168                | 36       |
| 1966                | 2                 | 838 - 1,054                | 1        |

Silver Salmon:

Bear Lake origin silvers marked and released in the spring, 1970, returned to Ship Creek for the first time in the fall as "jacks". Of the 747 silver salmon examined at the Chugach trap facility, 73% (543) were hatchery marked fish ranging in size from 241 - 356 mm, averaging 330 mm.

King Salmon Egg Take

Approximately 260,000 king salmon eggs were obtained from 32 females captured in Ship Creek. Egg-take activities commenced on July 8 and terminated on July 24, 1970.

A total of 34 females and 16 male adult king salmon were held at the Elmendorf Air Force rearing ponds until maturation. At the time of spawning activities, two females were found to be green and the eggs (skeins) discarded. The females ranged in size from 876 - 1,158 mm, with a mean length of 1,006 mm; males averaged 1,017 mm, with a length range of 851 - 1,232 mm. These fish were primarily five- and six-year-old adults. Four females and two males, part of the total used for spawn, were adipose-clipped fish from the 1967 release.

The eggs were hatched at the Fire Lake Hatchery and the fry are presently being reared at the Fort Richardson Cooling Pond. Tentative releases into Ship Creek are scheduled for mid-May, 1971.

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