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STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

A STUDY OF CHINOOK SALMON IN SOUTHEAST ALASKA

by

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ABSTRACT

The Taku Inlet chinook salmon, Oncorhynchus tshawytscha, stock is presently at a low level. Over-harvest of the mature segment of the run occurred during the 1950's when an average of 50 gillnetters and in some years 50 power trollers fished from 3.0 to 5.5 days per week in the vicinity of Taku Inlet. Milling of chinook in this area averaged 8.6 days and subjected over 60 percent of the chinook to two fishing periods.

The harvest of maturing Taku River chinook salmon in Area III by gillnetters and sport and commercial trollers during 1974 was less than 500 as the area was closed from May 12 to June 15 to protect the weak spawning return.

Escapement of chinook salmon into the major clearwater spawning tributaries of the Taku River was low. Escapement/return relationships suggest that the Nakina River should receive about 3,500 female chinook annually for maximum production.

Length frequency data collected during the past two years at the Nakina carcass weir indicates that the 1970 brood year was weak. Since escapement of Age* 1.3 chinook in 1974 was low, indicating weakness in the 1969 brood year, it appears that there will also be a weak return of Age 1.4 chinook in 1975.

Harvest of immature chinook of Alaska origin in the Juneau area was 914 by the Taku River gillnetters, 2,242 by the Juneau area sport fishery and 4,994 by commercial trollers.

Escapement of chinook salmon in other spawning tributaries of southeast was also low in most cases.

* Ages are designated according to the European system--a 1.3 fish has one freshwater annulus and 3 ocean annuli; it is, therefore, in its fifth year of life, having gone to sea in its second.

RECOMMENDATIONS

Research

1. Monitor the Taku River gillnet fishery to determine age, sex, and size of maturing chinook harvested.

2. Continue to monitor the Taku River gillnet fishery after mid-June to determine the number, size, area and origin of immature chinook harvested.

3. Determine if gillnets of 5 3/8" or 6 3/8" stretched measure will capture a high percent of the male chinook present and allow the escapement of the majority of the females.

4. Enumerate the escapement of chinook salmon into the Taku River by aerial and ground surveys and construction of a carcass weir. The surveys should be conducted in the established areas during the peak of chinook spawning.

5. Monitor rearing areas of the Taku River to attempt to determine habitat preference, species composition and number of rearing chinook salmon which can be captured in minnow traps for possible future tagging and population dynamics studies.

6. Attempt to determine the effect of a partial barrier to migration on the Dudidontu River.

7. Monitor the escapement of chinook salmon in other important spawning tributaries of southeast. Helicopter surveys should be conducted in early August on major spawning tributaries of the Stikine, Unuk, Chickamin, Keta and Wilson rivers. Ground surveys should be conducted on the Chilkat, Situk and King Salmon rivers.

8. Determine the age, maturity, timing, area of harvest, flesh color, average weight and origin of chinook caught in Area III.

Management

1. Catch and escapement data indicate that the Taku chinook stock is at a low level and, therefore, fishing mortality should be reduced at all stages of their life history by:

   a. Closure of Area III to commercial trolling through mid-July.

   b. Reduction of the sport fishing bag limit to one chinook per day.

   c. A minimum size limit of 26" total length.

   d. Closure of all salmon fishing between a line drawn between Barlow Point and Outer Point southeast to a line drawn between Marmion Island and Point Arden to protect small chinook.

e. Reduction of the harvest of female chinook in the gillnet fishery by mesh size change or if significant catches of females still occur, do not open the fishery until June 15.

OBJECTIVES

1. Determine the current status of the Taku River chinook salmon stock.

2. Determine the escapement of chinook salmon in important spawning tributaries of Southeast Alaska.

3. Determine the characteristics of the troll harvest of chinook in Area III.

TECHNIQUES USED

Chinook salmon scales, lengths and weights were collected from various sport and commercial fisheries throughout Southeast Alaska. Known origin spring chinook scales were collected from the Alsek, Chilkat, Taku and Stikine rivers in Southeast Alaska and compared with scales previously collected in the Nass, Skeena, Fraser, Bella Coola, Cheakamus and Kitimat rivers in British Columbia and the Columbia River in Washington. Scales were taken in the preferred area, two rows above the lateral line and slightly posterior to the insertion of the dorsal fin. Because of the high occurrence of regeneration in chinook scales, five extra scales were taken from each side of an individual near the preferred area and placed in a numbered coin envelope.

Scales were later examined under a binocular microscope and the first complete scale was soaked in detergent, cleaned and mounted on a numbered gum card. They were pressed in cellulose acetate and analyzed under an Eberback micro-projector at a magnification of 80X.

Circulus counts and measurements were made along the 20° dorsoradial line of the scale. The following procedure was used to count and measure circuli:

1. Determine the last freshwater circulus before the annulus.

2. Count the circuli from the focus to the last freshwater circulus before the annulus.

Since only minor variations in freshwater scale pattern occur by brood year and sex in Southeast Alaska (Kissner, 1973) and Washington chinook systems (Bohn and Jensen, 1971), the data was combined during analysis.

The sample size was weighted in each river during catch simulation to approximate the population magnitude of spring chinook salmon in each system. Since escapement and catches of individual stocks in distant areas were lacking for most systems, the weighing factor was based on the average commercial harvest over a six year period in the vicinity of each river.

Difficulties in obtaining reproductive tracts to determine maturity were encountered after mid-June in the Taku gillnet fishery and throughout the season in the sport fishery. The criterion used to determine maturity was based on scale absorption. As a chinook salmon matures, the scales become tightly set and scales deteriorate starting at the outside edge. In all cases where gonads and scales were examined together, the proper choice of maturity could have been made by examination of scales alone.

Mid-eye to fork of tail measurements were made in the gillnet fisheries and on the spawning grounds, and total length measurements were made in the troll fisheries.

Commercial chinook salmon harvest data was taken from statistical runs which are compiled from individual fish tickets made on landing.

Dockside sampling was conducted to determine biological characteristics of the sport harvest.

During August 1974, a weir was operated on the Nakina River approximately 25 yards upriver from the old weir site. Chinook, spawning above the weir, were enumerated after they could no longer maintain station in the river and floated against the weir face. The structure was cleaned of carcasses at 10:00 a.m. and 7:00 p.m. daily. All species were enumerated and flesh color, length and scale samples were collected from the chinook.

Upriver surveys of both banks of the river were made every other day to enumerate and sample spawned-out chinook which had not floated downriver to the weir. The survey area extended approximately 1.5 miles above the weir.

FINDINGS

Taku Inlet

Commercial gillnetting for maturing chinook salmon has been occurring in Taku Inlet since the late 1800's. The fishery commences in late April or early May and extends through the second week of June. During this time, gillnets may not be deeper than 40 meshes and most fishermen use 150 fathoms of eight to nine inch stretched mesh nylon gillnet. From mid-June (week 25) on, the mesh size is reduced and the fishing area is greatly expanded. With this change in mesh size and the expansion of area, the catch of immature chinook increases.

Present Status

The Taku River chinook salmon stock is presently at a low level. By combining all available catch and escapement data (Table 1), it appears that the stock was over-harvested during the 1950's as the maturing adults approached Taku Inlet. In this schooling area an average of over

Table 1. Minimum Total Run of Chinook Salmon in the Taku River, 1944-1974.

	Gillnet Caught Chinook Through Mid-June	Commercial Troll Harvest Through Mid-June	Nakina Escapement	Minimum Total Run
1944	3,610	---	---	3,610
1945	4,109	---	---	4,109
1946	6,704	---	---	6,704
1947	3,564	---	---	3,564
1948	5,317	---	---	5,317
1949	6,001	---	---	6,001
1950	7,342	---	---	7,342
1951	9,059	*5,750	5,000	19,809
1952	10,161	No Fishery	9,000	19,161
1953	15,192	*9,020	7,500	31,712
1954	13,668	*7,502	6,000	27,170
1955	9,573	*3,250	3,000	16,003
1956	9,963	---	1,380	11,343
1957	6,920	---	[a]1,500	8,420
1958	12,847	---	[a]2,000	14,847
1959	15,312	---	[a]4,000	19,312
1960	7,756	---	Poor	7,756
1961	6,480	---	Poor	6,480
1962	3,488	---	---	3,488
1963	796	---	---	796
1964	1,217	---	---	1,217
1965	2,378	---	---	2,378
1966	1,394	893	---	2,287
1967	3,471	599	---	4,070
1968	3,242	1,185	---	4,427
1969	2,363	772	---	3,135
1970	914	274	---	1,188
1971	2,313	223	---	2,536
1972	2,197	29	1,000	2,226
1973	3,160	206	2,000	5,366
1974	353	Almost None	1,800	2,153

* Mature Catch Only.
a Total Nakina River Escapement Expanded From Index Area Enumeration.

50 drift gillnetters and nearly the same number of power trollers fished from 3.0 to 5.5 days per week and harvested in certain years in excess of 24,000 maturing chinook salmon.

A regulatory change in 1953 also appears to have played an important part in the decline of this stock. Before that year, fishing was permitted from May 1 to May 31 and a three week closure was in effect during June to provide for escapement. Starting in 1953, fishing periods were reduced 1.5 days per week and fishing was permitted throughout the season. This had a drastic effect on the stock, as recent analysis indicates, that the average milling time for Taku River chinook in the vicinity of Taku Inlet was 8.6 days. Therefore, the reduction in fishing time per week actually had little effect on the escapement, and the gillnetters and trollers were permitted to fish a segment of the run which had been protected in the past.

The stock is presently at such a low level, that between the harvest of immature feeders and maturing spawners, the stock is probably incapable of returning to its former magnitude without strict curtailment of fishing mortality.

Milling in Taku Inlet

A tagging study conducted in 1951 (Parker and Kirkness, unpublished), which was designed to determine population strength and racial origin, has given valuable insight into the question of how long maturing Taku River chinook salmon remain vulnerable to trollers and gillnetters in the immediate vicinity of Taku Inlet.

Chinook salmon were captured and tagged from April 24 to May 29 in the immediate vicinity of Taku Inlet by trollers. Recoveries were made in the drift gillnet fishery and on the spawning grounds (Table 2).

Average time between tagging and recapture in the drift gillnet fishery was 8.6 days. Over 64 percent of the chinook recovered in the gillnet fishery were available for two fishing periods and 13.3 percent were available for three fishing periods.

All of the recoveries made on the spawning grounds were from chinook tagged after May 22. These fish were available to the gillnet and troll fishery for just over one week as the fishery was closed during the first three weeks of June. This suggests that the majority of the escapement came from chinook entering near the end of the fishery and the chinook that returned earlier were mostly harvested.

Several biases may affect the results of this study. The average milling time would be underestimated because: The fish is in the area for an unknown period before tagging; a fish that is recaptured could have milled longer if not recaptured; the fishery was closed during the first

Table 2. Recovery of Chinook Tagged by Trollers in the Vicinity of Taku Inlet.

Gillnet Recoveries

Tagged	Recovered	Days Out	Tagged	Recovered	Days Out
4/24	5/22	29	5/17	5/26	9
5/01	5/10	9	5/18	5/25	7
5/01	5/22	21	5/19	5/28	9
5/03	5/07	4	5/19	5/24	5
5/07	5/19	12	5/19	5/21	2
5/07	5/26	19	5/19	5/26	7
5/08	5/23	15	5/20	5/26	6
5/09	5/22	13	5/20	6/25	36
5/09	5/21	12	5/22	5/26	4
5/10	5/21	11	5/22	After May 31	9
5/12	5/18	6	5/22	5/23	1
5/12	5/23	11	5/22	5/26	4
5/13	5/21	8	5/22	5/26	4
5/15	5/28	13	5/23	5/30	7
5/15	5/20-26	8	5/23	5/31	8
5/15	5/29	14	5/23	5/28	5
5/15	5/23	8	5/23	5/28	5
5/15	5/24	9	5/24	5/31	7
5/16	5/21	5	5/24	5/29	5
5/16	5/23	7	5/24	5/29	5
5/17	5/22	5	5/26	6/03	8
5/17	5/24	7			
5/17	5/26	9			
5/17	5/26	9			

Spawning Ground Recoveries

Tagged	Recovered
5/23	7/19
5/23	8/11
5/23	8/11
5/23	8/14
5/23	----
5/26	8/11
5/27	8/11

three weeks of June so fish tagged later in May would not have the same exploitation rate or chance to mill before being recaptured as fish tagged earlier in May. Average milling time could be overestimated because of injuries associated with initial capture and tagging.

Taku Inlet Harvest

Catch per unit of effort, during late April and early May in the Taku Inlet drift gillnet fishery, was among the lowest on record (Table 3). Commercial drift gillnetting was thus closed in the Juneau area from May 12 through June 15 to protect the weak returning run of maturing Taku chinook salmon.

Comparative age analysis data of the limited gillnet harvest is presented in Tables 4 and 5.

The drift gillnet fishery was reopened on June 16 and from that point, the percentage of immature chinook harvested increased weekly. These feeders are taken incidentally to the much more numerous harvest of the other four species of salmon. Calculation of mature and immature chinook harvested in the Taku Inlet drift gillnet fishery is presented in Table 6. As in 1973, about 70 percent of the feeders were either 1.2 or 0.3 years old. In contrast to the large 1973 catch of 5,860 immatures, the 1974 harvest was only 1,408. Analysis of the freshwater growth zone of samples collected from these immature chinook indicated that 64.9 percent were of Alaskan origin. Based on past tagging studies, most would be of Taku and Stikine rivers origin.

The harvest of these immature chinook after mid-June in the gillnet fishery has increased greatly since 1960. Before that time, fishing was restricted to Taku Inlet; beginning in 1960, the fishing area was extended south into Stephens Passage and the southern terminus became the latitude of Midway Island light.

Taku River Escapement

The 1974 escapement of chinook salmon into the Taku River drainage was again low. In the Nakina River, which is the major clearwater chinook salmon spawning tributary, only 1,800 chinook salmon were enumerated. Nakina River escapements during 1972-1974 have averaged only 1,600 chinook salmon; while during the period 1951 to 1955 when the last series of ground counts were conducted, the escapements varied between 3,000 and 9,000 and averaged 6,100 (Table 7). Escapements were probably below average even then as during that time the largest harvests in the history of maturing Taku River chinook salmon occurred in the vicinity of Taku Inlet.

As during the summers of 1956 through 1959 and 1973, a carcass collection weir was operated about 100 yards above the junction of the Silver Salmon River to be utilized as an index of chinook escapement and to

Table 3. Chinook Salmon Catch Per Boat Per 24 Hour Period, Taku Inlet Gillnet Fishery, 1962-1974.

	Week 18	Week 19	Week 20	Week 21	Week 22	Week 23	Week 24	Ave.
1962	17.7	9.6	20.6	16.2	17.9	23.5	10.9	16.5
1963	4.5	6.9	5.8	5.2	closed	closed	closed	5.6
1964	8.0	10.4	14.6	7.4	4.0	6.8	14.9	9.9
1965	9.0	28.0	11.1	15.0	23.5	20.7	24.7	18.6
1966	7.0	2.4	14.2	14.6	13.4	13.1	17.3	13.3
1967	14.3	28.6	20.2	17.1	17.2	16.9	22.0	19.9
1968	9.4	11.3	16.7	11.1	15.9	14.2	16.2	14.0
1969	6.5	10.0	9.6	13.1	closed	45.4	11.8	16.0
1970	7.0	7.0	5.5	closed	closed	9.1	closed	8.3
1971	closed	17.0	21.7	14.7	9.6	9.5	5.7	12.9
1972	closed	8.0	7.5	12.0	12.4	10.6	22.8	12.6
1973	8.0	12.0	7.0	24.0	14.0	16.0	5.7	13.4
1974	6.5	6.3	closed	closed	closed	closed	closed	6.4
Average	8.9	12.1	12.9	13.7	14.2	16.9	15.2	13.4

Table 4. *Total Age of Gillnet Caught Maturing Salmon in Taku Inlet by Percent Through Statistical Week 24 (Mid-June).

Year	III	IV	V	VI	VII	Catch
1951	---	.1	17.2	80.6	2.1	9,790
1952	---	9.0	38.7	49.8	2.6	12,940
1953	---	2.9	49.3	45.2	2.6	16,780
1954	.8	10.0	22.3	64.9	2.1	14,335
1955	---	7.6	40.6	48.7	3.1	10,685
1956	.5	12.9	44.4	40.2	1.9	11,250
1957	---	6.6	45.4	46.3	1.8	8,482
1958	.4	12.3	52.8	33.3	1.2	15,343
1972	---	2.1	64.3	30.3	3.4	2,197
1973	---	5.3	15.3	75.3	4.0	3,160
1974	---	---	24.4	70.3	5.5	353

* Total age refers to the combined freshwater and ocean age. Over 95 percent of the Taku River chinook spend one year of rearing in freshwater after emergence. The remainder spend two years. Thus, a chinook designated in this table as total Age V would have spent one year rearing in freshwater and three years in the ocean or two years rearing in freshwater and two years in the ocean.

Table 5. Age Analysis of Gillnet Caught Chinook in Taku Inlet by Percent, 1972-1974.

	1.2	1.3	1.4	1.5	2.2	2.3	2.4	n
1972	2.1	64.3	26.5	1.7	-0-	3.8	1.7	238
1973	2.8	14.9	78.0	3.5	-0-	-0-	.7	141
1974	-0-	23.0	68.9	4.1	1.4	1.4	1.4	74

Table 6. Calculation of Harvest of Mature and Immature Chinook in Taku Inlet, 1974.

Week	Total Chinook Catch	Mature Chinook	Immature Chinook	Percentage Mature	Percentage Immature
18	153	145	8	95.0	5.0
19	200	190	10	95.0	5.0
20	closed	*	*	*	*
21	closed	*	*	*	*
22	closed	*	*	*	*
23	closed	*	*	*	*
24	closed	*	*	*	*
25	1,317	832	485	63.2	36.8
26	326	123	203	37.7	62.3
27	283	67	216	23.7	76.3
28	243	-0-	243	0.0	100.0
29	33	-0-	33	0.0	100.0
30	closed	*	*	*	*
31	closed	*	*	*	*
32	22	-0-	22	0.0	100.0
33	20	-0-	20	0.0	100.0
34	68	-0-	68	0.0	100.0
35	39	-0-	39	0.0	100.0
36	28	-0-	28	0.0	100.0
37	23	-0-	23	0.0	100.0
38	6	-0-	6	0.0	100.0
39	4	-0-	4	0.0	100.0
40	closed	*	*	*	*
TOTAL		1,357	1,408	49.1	50.9

Table 7. Escapement Counts of Chinook Salmon in the Nakina River.

Year	Total Count Nakina River Excludes Jacks
1951	5,000 (foot)
1952	9,000 (foot)
1953	7,500 (foot)
1954	6,000 (foot)
1955	3,000 (foot)
1956	1,380 (foot)
1957-1971	No Data
1972	1,000 (foot)
1973	2,000 (foot and air)
1974	1,800 (foot and air)

collect biological information which may give an indication of future year class strength. The area above the weir contains the most concentrated chinook spawning in the drainage.

The combined weir and upriver carcass count of 2,262 chinook salmon is the lowest on record. Of the carcasses enumerated at the weir and upstream only 11.7 percent were females while 62.9 percent were precocious males less than the minimum commercial size of 660 mm total length. During aerial and ground enumeration, the small males are extremely difficult to observe and, therefore, are not counted. These small, precocious three and four-year-old males annually escape through the eight to nine inch stretched measure nylon gillnets. The nets are highly selective to chinook from 660 to 900 mm (mid-eye to fork length). This subjects nearly 99 percent of the female segment of the population to the gillnet fishery but only about 16.6 percent of the males. Selective breeding experiments have shown that chinook that mature at a younger age have a tendency to pass the trait to their progeny (Ellis and Noble, 1961). Therefore, by annually allowing the escapement of these small males, the age, size and reproductive potential of the run will be decreased.

In an effort to alleviate this problem, mesh studies will be conducted in the spring of 1975 to determine if a reduction in mesh size will allow the escapement of the majority of the females but harvest the majority of the small males.

Comparison of total chinook salmon enumerated at the carcass weir and total enumerated escapement into the Nakina River indicated that during an average year about 50 percent of the Nakina River escapement spawns in the index area. Therefore, the carcass weir is an excellent annual indicator of chinook escapement.

Optimum Escapement

Analysis of data collected during the 1950's suggests a relationship between female escapement into the Nakina and return to the fishery and spawning grounds five and six years hence (Table 8). It appears that the Nakina River spawning grounds should have at least 3,500 females annually. When escapements in the Nakina dropped below 2,000 female chinook, the returns to the fishery and spawning grounds from these brood years were unsatisfactory and this led to the strict curtailment of commercial fishing time in 1962.

During the past three years the number of spawning females on the Nakina River has averaged only 733 and never exceeded 1,200.

Nakina River chinook salmon length frequency data by sex, which was collected at the carcass weir from 1956 through 1959 and 1973, 1974, is presented in Tables 9 and 10. The data was expanded to cover total enumerated by sex and divided into age classes (Table 11).

Table 8. Taku River Chinook Salmon Escapement vs. Return to the Fishery and Nakina River.

1951 Escapement of 5,000 Produced

Return	1956	1957	Total
Number	4,888	3,489	8,377
Age	1.3	1.4	

1952 Escapement of 9,000 Produced (2,322 Females)

Return	1957	1958	Total
Number	3,518	4,534	8,052
Age	1.3	1.4	

1953 Escapement of 7,000 Produced (3,488 Females)

Return	1958	1959	Total
Number	7,338	8,474	15,812
Age	1.3	1.4	

1954 Escapement of 6,000 Produced (3,384 Females)

Return	1959	1960	Total
Number	8,727	3,878	12,605
Age	1.3	1.4	

1955 Escapement of 3,000 Produced (1,533 Females)

Return	1960	1961
Number	Poor CPUE	Poor CPUE
Age	1.3	1.4

1956 Escapement of 1,380 Produced (741 Females)

Return	1961	1962
CPUE	Poor CPUE	Reg. Change
Age	1.3	1.4

Table 9. Length Frequency of Female Sampled at the Nakina Carcass Weir.

Mid-Eye to Fork (mm)	1956	1957	1958	1959	1973	1974
575	7	1	0	3	0	0
600	3	1	2	6	0	0
625	6	5	9	10	0	2
650	16	13	13	17	2	2
675	29	22	38	42	3	1
700	44	30	66	93	10	22
725	46	51	55	142	17	21
750	69	65	76	192	43	53
775	66	67	67	197	59	52
800	50	78	87	238	112	90
825	37	41	36	156	108	64
850	28	18	21	71	150	70
875	15	2	5	18	77	28
900	4	1	2	5	22	11
925	3	1	0	1	6	4
950	0	0	1	0	3	0
975	1	0	0	0	2	0
TOTAL	424	396	478	1,191	614	420

Table 10. Length Frequency of Male Chinook Sampled at the Nakina Carcass Weir.

Mid-Eye to Fork (mm)	1956	1957	1958	1959	1973	1974
200	1	2	0	0	0	0
225	3	14	3	3	1	0
250	34	107	46	20	7	10
275	141	211	162	132	24	100
300	235	182	289	328	114	274
325	237	89	301	275	108	254
350	125	71	262	120	97	143
375	82	118	192	41	68	41
400	57	155	202	61	71	56
425	83	193	215	98	99	68
450	129	204	207	111	120	110
475	155	169	271	132	94	107
500	175	159	262	170	100	94
525	146	113	202	148	91	68
550	140	81	145	182	93	55
575	183	57	86	99	78	44
600	58	46	70	100	49	49
625	46	40	68	71	38	31
650	64	43	89	90	39	36
675	28	30	69	86	27	25
700	22	28	67	87	35	42
725	17	21	35	68	34	37
750	44	24	29	66	37	45
775	67	17	29	62	28	21
800	24	25	27	58	27	23
825	19	32	22	81	28	21
850	19	29	29	66	35	16
875	11	26	12	68	39	21
900	4	10	9	37	49	17
925	3	4	3	14	35	16
950	1	0	2	4	24	8
975	0	0	0	1	22	11
TOTAL	2,353	2,300	3,405	2,879	1,711	1,843

Table 11. Age Analysis by Length Frequency Comparison of Chinook Sampled at the Nakina Carcass Weir.

MALE

Age	Mid-Eye Fork (mm)	1956	1957	1958	1959	1973	1974
1.1	200-400	915	949	1,457	980	490	878
1.2	450-575	928	783	1,173	842	576	478
1.3	675-775	178	120	229	369	161	170
1.4	800-1,000	81	126	104	329	259	133

FEMALE

1.3		286	255	326	702	134	153
1.4		138	141	152	489	480	267

COMBINED

Age	1956	1957	1958	1959	1973	1974
1.1	915	949	1,457	980	490	878
1.2	928	783	1,173	842	576	478
1.3	464	375	555	1,071	295	323
1.4	219	267	256	818	739	400

It appears that valuable information on present and future year class strength can be determined from length frequency data collected at the carcass weir and in the gillnet fishery. For instance, the total harvest and escapement of five-year-old chinook in 1958 was an indication of the success of the 1953 brood year and it would suggest a strong return of six-year-olds in 1959. Since samples from the 1959 gillnet fishery have been lost, it is impossible to determine the contribution of six-year-old chinook to the fishery, but the total catch that year was the highest on record and the carcass weir count contained more six-year-old chinook than in any other year.

It appears from age data collected at the weir in 1973 and 1974 that the 1970 brood year was extremely weak as returns of Age 1.1 chinook in 1973 and 1.2 chinook in 1974 to the Nakina index area were both the lowest on record. This suggests a low return of 1.3 aged chinook to the Taku River during 1975.

Since the escapement of Age 1.3 chinook in 1974 was also low, it appears that there will also be a low return of Age 1.4 chinook in 1975.

Inklin Drainage

Aerial enumeration of the index areas (Kissner, 1973) in the Nahlin and Dudidontu rivers was conducted by Alloutte III helicopter on July 29-30. Survey conditions were excellent and it appeared to be the peak of spawning as all chinook observed were actively spawning and very few carcasses were noted. The Nahlin River contained 900 spawning chinook but the Dudidontu River, which is an important spawning tributary of the Nahlin, must have been blocked as no chinook were observed. A low level flight was made through the canyon, but no definite blocks were detected although several potential problem areas were seen. It is felt that most of the Dudidontu River run probably ascended the Nahlin River to spawn.

The annual survey by fixed wing aircraft was made several weeks later for comparative purposes and only 153 chinook were enumerated in the Nahlin. This is one of the lowest counts on record. During this survey, 20 chinook were observed in the Dudidontu River which indicates that only a partial barrier to migration exists in the canyon.

In Table 12 is a summary of annual escapement enumeration in various tributaries of the Inklin drainage.

ESCAPEMENT IN OTHER AREAS OF SOUTHEAST

The following are chinook salmon surveys conducted in various other stream systems of Southeast Alaska.

Table 12. Escapement of Chinook Salmon into the Inklin Drainage of the Taku River.

	Kowatua	Tatsameni	Dudidontu	Tseta	Nahlin
1951	*	*	400	100	1,000
1958	*	*	4,500	*	2,500
1962	*	*	25	81	216
1965	200 P	50 P	100	18	37
1966	14 P	150 P	267	150	300
1967	250 P	*	600	350	300
1968	1,100 E	800 E	640	230	450
1969	3,300 E	800 E	*	*	*
1970	1,200 E	530 E	10	25	26
1971	1,400 E	320 E	165	0	473
1972	130 P	170 P	103	80	280
1973	100 P	200 P	200	0	280
1974	235 P	120 P	20	4	153

P = Water Glacial

E = Water Clear

King Salmon River (Admiralty Island)

This is a unique chinook stock in that it is the only population of chinook in southeast that has adapted to an island watershed. It appears that this stock enters the river in a nearly ripe condition and spends only a short period of time in the river before spawning. Peak spawning occurs between July 25 and August 1. The counts in this river have all been by foot survey and are minimum estimates as the chum salmon, Oncorhynchus keta, which utilize this system are very large and often difficult to distinguish from the chinook (Table 13).

Unuk, Chickamin, Wilson-Blossom, Chilkat and Situk Rivers

Peak estimates of chinook salmon escapements in 1974 and data from previous surveys is presented in Table 13.

TROLL HARVEST--AREA III

Sport and commercial trolling for chinook salmon was restricted north of a line from Station Point to the south entrance of Limestone Inlet to a line from Piling Point to the beacon on the north end of Portland Island to Point Louise, including Taku Inlet, Gastineau Channel and Auke Bay from May 12 through June 15 to protect the weak spawning return of Taku River chinook salmon. This closed area has been shown by past tagging and maturity studies to be the major schooling area for maturing chinook salmon of Taku River origin. In addition, commercial trolling was closed and the sport bag limit was reduced to one chinook salmon per day or in possession in the remainder of District 11, District 12 north of the latitude of Point Couverden and in Section 15C.

On June 16, all sport and commercial restrictions made to protect the Taku spawning run were rescinded as the majority of the run had entered the river. From this time on, the majority of the troll catch is composed of immature chinook one or more years from maturity. Past tagging (Anonymous, unpublished) and recent racial studies (Kissner, 1973, 1974) have shown that Areas 111 and 115 are important rearing areas for immature chinook of Taku, Stikine and Chilkat rivers origin.

Analysis and computer comparison of known origin chinook scales with chinook scales collected during 1974 in Areas 111 and 115 indicate that approximately 72.1 percent of the chinook salmon harvested were of Taku, Chilkat and Stikine rivers origin. This means that the sport harvest of Alaskan chinook in this area was 2,242 and the commercial troll harvest was 4,994. Harvest of these immature feeders should be reduced in Areas 111 and 115 to help rebuild the Taku chinook stock.

Length frequency information collected in the Juneau area sport fishery between 1960 and 1973 indicates that the waters of Stephens Passage south and west of Douglas Island contain many small chinook less than the minimum commercial size of 26" total length (Table 14). Because of high mortality rates associated with hooking and releasing of these small chinook and because of the current low population of Taku River chinook salmon, it is recommended that this area be closed to all salmon fishing.

The Juneau area commercial troll chinook catch per week from 1963-1973 is presented in Table 15. Catch statistics collected in Area 111 before this time are unreliable. A downward trend in harvest is apparent during the last five years in spite of an increased number of landings.

Results of racial analysis studies conducted in the past (Kissner, 1972, 1973) cannot be applied to years other than when completed, but it is probable that the Taku, Stikine and Chilkat rivers contributed heavily to the chinook stocks available in this area in past years. It is suggested that the declining troll harvest in Area 111 is associated with declining native stocks.

Table 13. Peak Escapement Counts of Chinook Salmon in Southeast Alaska.

King Salmon River (Admiralty Island)

Year	Number	Method
1961	117	Foot
1971	94	Foot
1972	90	Foot
1973	211	Foot
1974	104	Foot

Unuk River (Eulachon Creek)

Year	Number	Method
1950	1,100	Air
1951	200	Air
1952	244	Air
1953	510	Air
1954	---	---
1955	600	Air
1956	200	Air
1957	500	Air
1961	270	Foot
1973	64	Helicopter
1974	68	Helicopter

Chickamin River (King Salmon Creek)

Year	Number	Method
1951	22	Air
1952	88	Air
1953	---	---
1954	---	---
1955	500*	Air
1956	3,000*	Air
1957	5,000*	Air
1961	48	Ground
1973	1	Helicopter
1974	11	Helicopter

* Probably Chum Salmon

Chickamin River (South Fork)

Year	Number	Method
1963	350	Air
1972	350	Air
1974	144	Helicopter

(continued)

Wilson-Blossom River

Year	Number	Method
1963	825	Air
1972	500	Air
1974	166	Helicopter

Chilkat River (Big Boulder Creek)

Year	Number	Method
1960	316	Foot
1966	330	Foot
1967	150	Foot
1968	259	Foot
1970	176	Foot
1974	0	Foot

Situk River

Year	Number	Method
1928	1,224	Weir
1929	3,559	Weir
1930	1,455	Weir
1931	2,967	Weir
1932	1,978	Weir
1933	---	---
1934	1,486	Weir
1935	638*	Weir
1936	816	Weir
1937	1,290*	Weir
1938	2,668*	Weir
1939	2,117	Weir
1940	903	Weir
1941	2,594	Weir
1942	2,543	Weir
1943	3,546*	Weir
1944	2,906	Weir
1945	1,458	Weir
1946	4,284	Weir
1947	5,077	Weir
1948	3,744	Weir
1949	1,978	Weir
1950	2,011	Weir
1951	2,780	Weir
1952	1,459	Weir
1953	1,040	Weir
1954	2,101	Weir
1955	1,571	Weir
1971	964	Weir
1972	400	Float
1973	510	Float
1974	702	Float

* Weir out part of the time

Table 14. Length Frequency by Area of Chinook Salmon Sampled in the Juneau Sport Fishery, 1960-1973.

Area #	Name	Number Under 26"FL	Number Over 26"FL	Percent Under	Percent Over	Total Number
1	Juneau-Douglas	4	15	21.1	78.9	19
2						
3	Dupont	54	124	30.3	69.7	178
4	Pt. Salisbury	162	404	28.6	71.4	566
5	Pt. Bishop	28	102	21.5	78.5	130
6	Circle Pt.	0	2	0	100.0	2
7						
8	Doty's Cove	43	179	19.4	80.6	222
9	Pt. Arden	43	130	24.9	75.1	173
10	False Arden	29	66	30.5	69.5	95
11	Green Cove	8	16	33.3	66.7	24
12	Marmion Island	31	79	28.2	71.8	110
13	Icy Pt.	32	89	26.4	73.6	121
14	Icy-Hilda	12	17	41.4	58.6	29
15	Pt. Hilda	8	12	40.0	60.0	20
16	Whitemarker	50	142	26.0	74.0	192
17	Young Bay	6	8	42.9	57.1	14
18						
19	Horse & Colt Is.	22	26	47.8	54.2	48
20	Middle Pt.	13	37	26.0	74.0	50
21	Outer Pt.	50	161	23.7	76.3	211
22	Portland Is.	96	224	30.0	70.0	320
23	S. Shelter	107	274	28.1	71.9	381
24	Piling Pt.	26	48	35.1	64.9	74
25	Barlow Cove	15	84	15.2	84.8	99
26	Barlow Pt.	12	60	16.7	83.3	72
27	Pt. Retreat	8	63	11.3	88.7	71
28	Handtrollers' Cove	14	19	42.4	57.6	33
29	North Pass	40	113	26.1	73.9	153
30	North Shelter	33	117	22.0	78.0	150

(continued)

Table 14, cont. Length Frequency by Area of Chinook Salmon Sampled in the Juneau Sport Fishery, 1960-1973.

Area #	Name	Number Under 26"FL	Number Over 26"FL	Percent Under	Percent Over	Total Number
31	Lincoln	0	2	0	100.0	2
32	Little Is.	4	10	28.6	71.4	14
33	Bridget Cove	1	5	16.7	83.3	6
34	North Island	17	57	23.0	77.0	74
35	Benjamin Is.	3	7	30.0	70.0	10
36	Eagle River Bluffs	0	3	0	100.0	3
37	Eagle River	8	17	32.0	68.0	25
38	Pearl Harbor	0	1	0	100.0	1
39	Shrine Is.	6	28	17.6	82.4	34
40	Aaron Is.	67	228	22.7	77.3	295
41	Breadline	116	550	17.4	82.6	666
42	Steven's Pt.	77	405	16.0	84.0	482
43	Lena Pt.	71	175	28.9	71.1	246
44	Island Pt.	11	62	15.1	84.9	73
45	Coghlan Is.	28	112	20.0	80.0	140
46	Auke Bay	9	54	14.3	85.7	63
47	Sphun Is.	1	5	16.7	83.3	6
48	North Douglas Bluff	2	16	11.1	88.9	18
49	Favorite Reef	10	18	35.7	64.3	28
50	Berner's Bay	7	13	35.0	65.0	20
51	St. James Bay	4	3	57.1	42.9	7
52	Boat Harbor	1	4	20.0	80.0	5
53	Oliver's Inlet	0	4	0	100.0	4
54	Taku Harbor	2	20	9.1	90.0	22
55	S. Island	0	2	0	100.0	2
56	Echo Cove	0	5	0	100.0	5
TOTAL		1,391	4,417			5,808
Percent				23.9	76.1	100

Table 15. Commercial Troll Harvest of Chinook Salmon in Statistical Area III by Week, 1963 through 1974.

Week	1963	1964	1965	1966	1967	1968	1969 No.	1969 Average Weight
17	22	45	2	0	98	78	0	0
18	116	61	2	2	0	6	28	14.3
19	3	11	259	1	17	399	162	14.9
20	40	214	641	14	82	209	291	16.2
21	34	78	818	91	108	42	4	16.2
22	0	52	217	184	76	24	0	0
23	72	67	165	460	113	292	59	12.5
24	0	145	372	141	105	135	59	12.5
25	529	988	1,484	350	540	524	371	12.0
26	406	1,010	1,203	1,249	1,232	506	526	11.4
27	780	2,103	937	2,115	884	1,319	1,107	10.1
28	1,434	889	1,225	1,075	751	545	917	9.6
29	659	2,099	1,448	2,159	564	1,671	567	9.6
30	1,017	1,744	1,047	1,399	396	854	1,553	10.5
31	1,420	758	584	1,854	375	534	450	12.1
32	1,105	1,059	1,457	1,368	372	534	1,096	9.6
33	3,572	592	1,236	1,207	629	642	915	9.5
34	1,177	353	677	1,385	836	415	806	8.3
35	3,702	512	980	1,022	990	326	631	9.7
36	908	228	559	570	388	304	444	9.9
37	1,040	167	663	236	240	84	69	9.6
38	452	120	282	97	140	363	112	11.5
39	28	152	140	77	0	9	115	9.8
40	274	76	0	6	0	81	10	8.7
41 on	164	1,008	1,047	269	552	779	221	8.7
TOTAL	18,954	14,531	17,445	17,331	9,488	11,207	10,682	10.49 lb.

(continued)

Table 15, cont. Commercial Troll Harvest of Chinook Salmon in Statistical Area III by Week, 1963 through 1974.

Week	1970 No.	1970 Average Weight	1971 No.	1971 Average Weight	1972 No.	1972 Average Weight	1973 No.	1973 Average Weight	1974 No.	1974 Average Weight
17	0	0	4	20.3	0	0	5	7.2	0	0
18	3	19.3	1	14.0	0	0	0	0	0	0
19	16	21.3	3	14.0	0	0	24	14.5	26	18.4
20	116	15.4	6	20.5	4	24.3	25	9.9	0	0
21	0	0	3	28.3	4	21.3	18	22.8	0	0
22	0	0	59	18.7	3	18.0	24	15.6	0	0
23	133	18.7	71	15.8	15	13.3	8	17.6	0	0
24	6	14.0	76	15.4	2	11.0	86	11.2	5	11.2
25	618	13.7	272	15.4	13	15.4	329	10.7	495	11.5
26	624	12.7	145	15.3	72	11.7	411	11.3	365	10.6
27	568	11.4	312	12.5	140	10.8	773	9.6	517	10.2
28	450	12.2	307	10.8	431	9.8	1,099	9.2	1,066	10.2
29	855	11.5	312	12.5	140	10.8	1,499	10.5	822	10.1
30	642	10.8	910	10.8	669	9.4	654	10.8	486	10.2
31	1,410	12.0	840	10.5	1,306	9.4	463	9.3	782	11.6
32	894	11.0	642	10.7	1,261	10.2	492	9.9	758	9.8
33	860	10.2	688	9.7	1,515	10.3	457	9.6	323	10.4
34	464	11.4	565	9.7	1,586	10.8	400	11.0	720	9.9
35	190	11.4	483	10.0	1,317	11.0	347	10.3	260	10.4
36	134	11.6	443	10.1	483	10.0	147	12.7	108	10.5
37	234	12.5	189	12.2	107	9.6	70	10.4	142	11.6
38	140	13.0	309	11.4	112	11.9	102	10.6	33	12.0
39	10	14.0	119	10.8	121	10.1	0	0	5	21.0
40	0	0	66	11.3	0	0	5	10.6	0	0
41 on	64	0	33	13.4	0	0	20	0	14	10.6
TOTAL	8,431	11.9	6,952	11.1	9,763	10.2	7,472	10.3	6,927	10.5

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RESEARCH PROJECT SEGMENT

State: Alaska

Project No.: F-9-7 Name: Sport Fish Investigations of Alaska

Study No.: AFS 41 Study Title: A STUDY OF CHINOOK SALMON IN SOUTHEAST ALASKA

Job No.: AFS 41-3 Job Title: Development of a Chinook Salmon Enhancement Program

Period Covered: July 1, 1974 to June 30, 1975.

ABSTRACT

Chinook enhancement programs conducted by the Alaska Department of Fish and Game were reviewed.

During 1974, over 413,000 chinook salmon, Oncorhynchus tshawytscha, which were supplied by the Carson National Fish Hatchery and reared in various locations in Southeast Alaska, were released. Survival from egg to out-migrant averaged 27.6 percent.

Attempts to establish a native brood stock have been unsuccessful because almost all southeast chinook populations are at a low level.

RECOMMENDATIONS

Research

1. The number of females spawned from individual stocks for development of a chinook salmon brood should be based on escapement magnitude.
2. Development of a chinook salmon brood stock program should continue annually for a minimum of six years.
3. Evaluate individual stocks of chinooks separately.
4. Delayed release of out-migrants should be attempted.

OBJECTIVES

Develop techniques of enhancing the chinook salmon stocks in inside waters of Southeast Alaska.

FINDINGS

Over 1.5 million spring chinook salmon eggs from the Carson National Fish Hatchery were supplied to the Department of Fish and Game in 1972. This stock was developed by capturing chinook at Bonneville Dam during upstream migration and, therefore, is of mixed genetic origin. Little information is available on relocation of this stock as only in recent years has the facility furnished eggs to other areas. The early migration timing of young and adults of this stock indicated the possibility that it may not be suitable for Southeast Alaska.

The 1972 brood chinook salmon were hatched at the Crystal Lake Hatchery, reared in three locations and released during May 1974. Survival from egg to out-migration averaged 27.6 percent. Data associated with individual lots of fish is presented in Table 1.

Attempts have been made, since the Department's ban on importation of stocks of fish from outside Alaska in 1973, to develop a brood from stocks native to Southeast Alaska. Difficulties have been experienced in development because of the small numbers of chinook available. Only nine river systems in southeast consistantly support populations of over 100 females in the total escapement. Escapement information from these nine river systems indicates chinook salmon populations are at an extremely low level.

During June 1974, permission was obtained from Environment Canada to utilize a maximum of 50 female chinook salmon from the Nakina River, a clearwater tributary of the Taku River, to establish a brood stock. Subsequent escapement surveys of this drainage indicated an extremely weak spawning run and it was, therefore, decided that an egg take could possibly place several year classes in jeopardy and, therefore, no Taku spawn was taken.

Permission has again been received in 1975 to capture chinook from the Taku River to attempt to help rebuild this depleted stock. The number of females spawned from the Taku drainage will be based upon the magnitude of the escapement (Table 2). In addition, chinook from King Salmon River (Admiralty Island) will be spawned in an attempt to develop a stock that enters freshwater in a nearly mature condition. Number of females removed will also be based on number of chinook present (Table 2).

Table 1. Data Associated with the 1972 Brood Wind River Chinook Salmon Released in Southeast Alaska.

Release Site	Number Per Pound At Plant	Number Per Pound At Release	Number Stocked	Number Released	Survival	Remarks
Mendenhall Ponds	30.0	28.7	155,078	93,129	60.1%	39,560 marked adipose only.
Mendenhall River	16.9	16.9	*	124,309	*	Overwintered at Crystal Lake Hatchery. All marked half dorsal.
Starrigavan Salt-water Rearing Facility	147	22.7	103,632	62,373	60.2%	10,000 marked adipose plus coded wire tag.
Crystal Creek	Swim-up Fry	15.8	*	134,000	*	

TOTAL RELEASE: 413,811

Table 2. Schedule of Female Chinook Salmon Removal Based on Escapement, 1975

Nakina River		Nahlin River	
Escapement Large Chinook	Female Removal	Escapement Large Chinook	Female Removal
1,000	15	500	15
2,000	30	1,000	30
3,000	45	1,500	45
4,000	60	2,000	60
5,000	75	2,500	75

King Salmon (Admiralty Island)

Escapement Large Chinook	Female Removal
25	0
50	5
75	7
100	10
125	12
150	15
175	17
200	20
225	22
250	25