

1966 ANNUAL REPORT  
ARCTIC-YUKON-KUSKOKWIM AREA

S E C T I O N I

M A N A G E M E N T

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DIVISION OF COMMERCIAL FISHERIES

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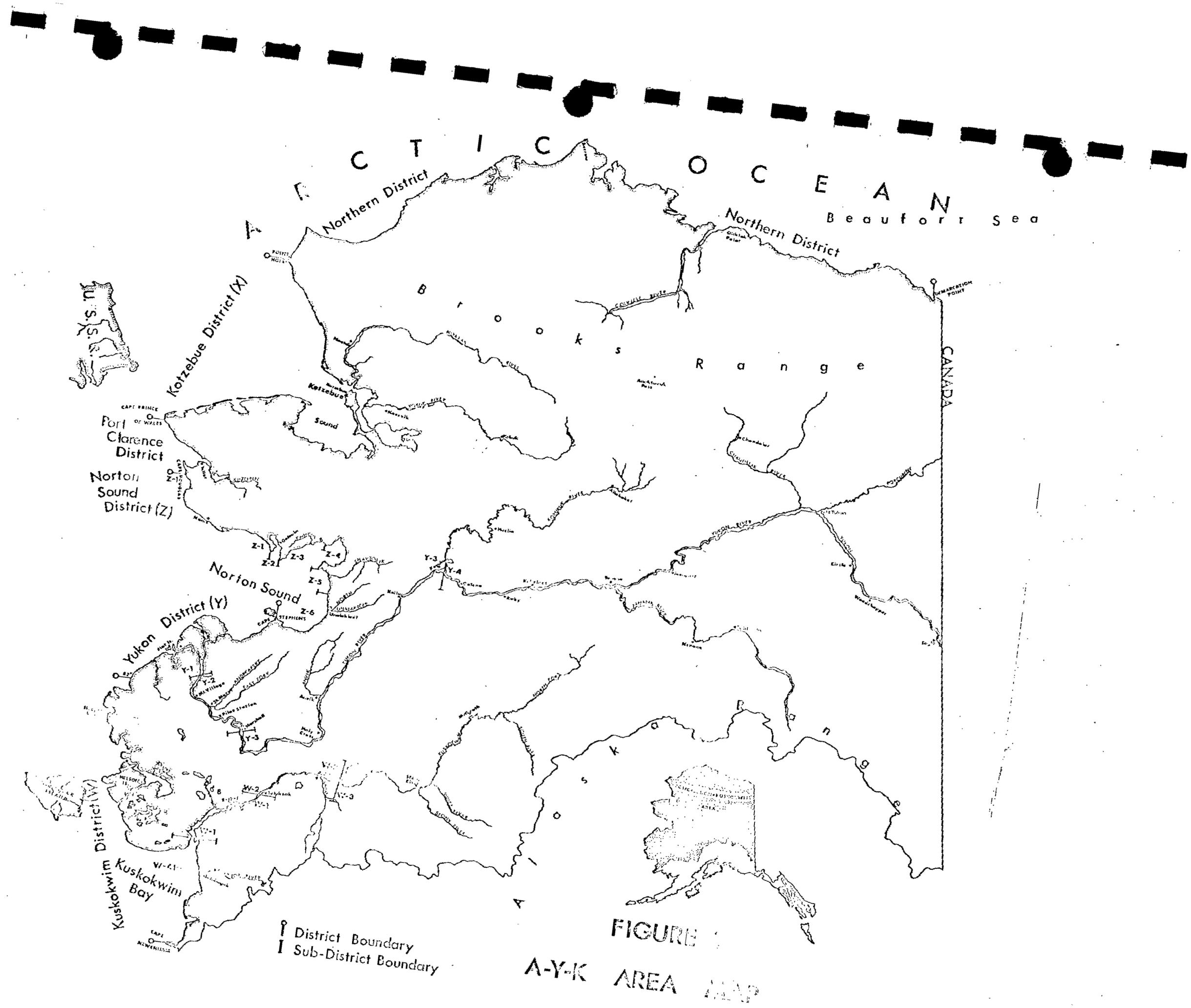
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## I N T R O D U C T I O N

The Arctic-Yukon-Kuskokwim area, as shown in Figure 1, is that portion of the State north of the Alaska Range and the Bristol Bay drainage. This is the largest management area in the State and is equal to the combined areas of California, Oregon, Washington, and Idaho.

A total of 1,013 licensed commercial fishermen harvested 120,692 king, 1,137 red, 47,994 coho, 13,177 pink and 186,016 chum salmon during the 1966 season. In addition, 1,275 subsistence fishermen were surveyed by the Department and a resultant catch of 63,576 king, 1,000 red, 3,106 coho, 15,563 pink and 454,257 chum salmon was recorded. Table 1, shows the 1966 commercial and subsistence catches by district.

During 1966 approximately \$612,000 was paid to fishermen in the Arctic-Yukon-Kuskokwim Area for salmon sold commercially. Wages earned by cannery workers, tender boat operators, etc. are not known but add considerably to the economic importance of the commercial fishery. In this area of low industrialization, such income is of major significance.

The State received approximately \$52,000 in processing taxes and license revenues as a result of the 1966 commercial fishery. The first wholesale value of the A-Y-K salmon pack (all products) is estimated to be about \$2,000,000.

A minimum total of 537,492 salmon were taken for subsistence purposes during the 1966 season. In terms of money required to purchase a similar quantity of meat substitute, the subsistence catch is of equal or greater importance than the commercial catch. Because of its importance, the Arctic-Yukon-Kuskokwim area subsistence fishery influences management to a great extent.

Table 2 lists the A-Y-K Area buyers, processors, and associated data and Table 3 shows the 1966 pack for each species.

TABLE I

ARCTIC-YUKON-KUSKOKWIM AREA TOTAL SALMON CATCH BY DISTRICT 1966 1/

	Kings	Reds	Cohos	Pinks	Chums
<b>KUSKOKWIM:</b>					
Commercial	25,545	-	22,985	-	-
Subsistence	<u>49,280</u>	-	<u>-</u>	-	<u>180,054</u> <u>2/</u>
SUB-TOTAL	74,825		22,985		180,054 <u>2/</u>
<b>KANEKTOK:</b>					
Commercial	<b>278</b>	<b>1,030</b>	-	268	2,610
Subsistence	<u>-</u>	<u>-</u>	-	<u>-</u>	<u>-</u>
SUB-TOTAL	278	1,030		268	2,610
<b>YUKON:</b>					
Commercial	93,315	-	19,254	-	71,405
Subsistence	<u>14,017</u>	-	<u>-</u>	<u>369</u>	<u>213,867</u> <u>2/</u>
SUB-TOTAL	107,332		19,254	369	285,272
<b>NORTON SOUND:</b>					
Commercial	1,553	14	5,755	12,778	80,245
Subsistence	<u>269</u>	<u>-</u>	<u>2,210</u>	<u>14,335</u>	<u>21,873</u>
SUB-TOTAL	1,822	14	7,965	27,113	102,118
<b>PORT CLARENCE:</b>					
Commercial	-	93	-	131	992
Subsistence	<u>10</u>	<u>1,000</u>	<u>896</u>	<u>859</u>	<u>2,875</u>
SUB-TOTAL	10	1,093	896	990	3,867

TABLE 1 (continued)

	Kings	Reds	Cohos	Pinks	Chums
<b>KOTZEBUE:</b>					
Commercial	1	-	-	-	30,764
Subsistence	-	-	-	-	35,588
	<hr/>				<hr/>
SUB-TOTAL	1				66,352
<b>GRAND TOTAL FOR A-Y-K AREA</b>					
1966	184,268	2,137	51,100	28,740	640,273
1965	189,888	3,690	20,452	21,464	875,830

1/ The Kanektok Subdistrict is shown separately

2/ Chums, Reds & Cohos combined

3/ 1965 & 1966 subsistence catches not documented in Kanektok Subdistrict

TABLE 2

## 1966 ARCTIC-YUKON-KUSKOKWIM AREA PROCESSORS AND ASSOCIATED DATA

Commercial Operator	Product	Fish Per Case	Average Price Paid to Fishermen	District
Peninsula Fish Kotzebue, Alaska	Fresh Salmon Chums		\$ .08 Per lb.	Kotzebue
Rotman Seafoods Kotzebue, Alaska	Fresh Salmon Chums		.10 Per lb.	Kotzebue
AYK Industries 428 Fourth Avenue Anchorage, Alaska	Fresh Salmon Chums Pinks Cohos Kings		.08 Per lb. .08 Per lb. .15 Per lb. .24 Per lb.	Norton Sound
Alcan Fisheries Box 138 Anchorage, Alaska	Fresh Salmon Chums Pinks Kings Reds		.08 Per lb. .08 Per lb. 4.00 Per Fish .13 Per lb.	Norton Sound and Port Clarence
C. J. Phillips Nome, Alaska	Fresh Salmon Chums Pinks Kings		.08 Per lb. .20 Per Fish 2.00 Per Fish	Norton Sound
Far North Fishing Co. Unalakleet, Alaska	Fresh Salmon Chums Pinks Kings		.08 Per lb. .08 Per lb. .24 Per lb.	Norton Sound

TABLE 2 (cont.)

Commercial Operator	Product	Fish per Case	Average Price Paid to Fishermen	District
F. P. Phillips Unalakleet, Alaska	Fresh Salmon			Norton Sound
	Kings		\$ .24 Per lb.	
	Chums		.08 Per lb.	
	Cohos		.15 Per lb.	
Northern Commercial Co. Nome, Alaska	Fresh Salmon			Norton Sound
	Kings		.30 Per lb.	
	Chums		1.00 Per Fish	
	Cohos		1.00 Per Fish	
U.S. Mercantile Co. Nome, Alaska	Fresh Salmon			Norton Sound
	Chums		1.00 Per Fish	
Bruce Crow Bethel, Alaska	Fresh Salmon			Kuskokwim
	Kings		3.50 Per Fish	
	Cohos		.35 Per Fish	
Kuskokwim Packing Co. 1844 Westlake Ave. North. Seattle, Washington	Mild Cured Salmon			Kuskokwim
	Kings		2.50 Per Fish	
	Fresh Salmon			
	Cohos		.40 Per Fish	
	Kings		2.50 Per Fish	
George Schenk 2408 Peabody Street Bellingham, Washington	Fresh Salmon			Kuskokwim
	Kings		2.00 Per Fish	
	Reds		.50 Per Fish	
	Cohos		.40 Per Fish	
	Chums & Pinks		.10 Per Fish	

TABLE 2 (cont.)

Commercial Operator	Product	Fish Per Case	Average Price Paid to Fishermen	District
Swanson Brothers Bethel, Alaska	Frozen Salmon Kings Cohos		\$3.50 Per Fish .40 Per Fish	Kuskokwim
Bethel Trading Company Bethel, Alaska	Fresh Salmon Kings		3.50 Per Fish	Kuskokwim
Northern Commercial Co. Bethel, Alaska	Fresh Salmon Kings		3.50 Per Fish	Kuskokwim
Clark Fishing Enterprises Aniak, Alaska	Fresh Salmon Kings Cohos & Chums		3.50 - 5.00 Per Fish .50 Per Fish	Kuskokwim and Yukon
Northern Commercial Co. 419 Colman Building Seattle, Washington	Mild Cured, Hard Salt & Frozen Kings		4.50 Per Fish	Yukon
Yukon Fishing and Transportation Co. Box 487 Nenana, Alaska	Mild Cured Salmon Kings Frozen Salmon Cohos Chums		4.50 Per Fish .50 Per Fish .35 Per Fish	Yukon
John Amukon Scammon Bay, Alaska	Mild Cured and Hard Salt Kings		3.75 Per Fish	Yukon

TABLE 2 (cont.)

Commercial Operator	Product	Fish Per Case	Average Price Paid to Fishermen	District
Mountain Village Fish Co. Mountain Village, Alaska	Canned 1/2# Flats Kings	3.4	4.50 Per Fish	Yukon
Point Adams Packing Co. Hammond, Oregon	Canned 1# Ovals and Canned 1/2# Flats Kings	3.3	\$4.50 Per Fish	Yukon
Yukon Packers 1032 Eighth Avenue Fairbanks, Alaska	Canned 1/2# Flats Kings	3.6	4.50 Per Fish	Yukon
Weisner Trading Co. Rampart, Alaska	Canned 1# Flats and Talls, Canned 1/2# Flats Kings	7.0	4.50 Per Fish	Yukon
Pitkas Point Packing Co. 1844 Westlake Ave. North Seattle, Washington	Canned 1# Flats and Miled Cured Kings	?	4.50 Per Fish	Yukon
Polar Fisheries 1500 Westlake Ave. North Seattle, Washington	Frozen Salmon Kings		4.50 Per Fish	Yukon
Bering Sea Fisheries Inc. 611 Lowman Bldg. Seattle, Washington	Canned 1# Talls Chums Cobos	10.2 11.5	.35 Per Fish .50 Per Fish	Yukon

TABLE 2 (cont.)

Commercial Operator	Product	Fish Per Case	Average Price Paid to Fishermen	District
Peterson Navigation Co. Inc. P. O. Box 1833 Fairbanks, Alaska	Frozen Salmon Kings Chums Cohos		\$5.00 Per Fish .35 Per Fish .50 Per Fish	Yukon
Yukon Pacific Fisheries Inc. 216 Lavery Building Fairbanks, Alaska	Frozen Salmon Kings Cohos		4.50 Per Fish .50 Per Fish	Yukon
Miles M. Davie P. O. Box 75 Tanana, Alaska	Fresh Salmon Kings		?	Yukon
Peter E. Merry c/o Wien Airlines Fairbanks, Alaska	Fresh Salmon Kings		?	Yukon
Bill Carlo (Bills Fish Wagon) 2111 Southern Aurora Subdivision Fairbanks, Alaska	Fresh Salmon Kings		?	Yukon

TABLE 3

ARCTIC-YUKON-KUSKOKWIM AREA  
PACK BY SPECIES, 1966

Species	Cases (48# Case)	Mild Cure and Hard Salt		Numbers of Fresh or Frozen Fish
		Full Tierces	Half Tierces	
King Salmon	14,026	638	60	30,843
Chum Salmon	2,812	-	-	158,244
Red Salmon	-	-	-	107
Coho Salmon	836	-	-	36,554
Pink Salmon	-	-	-	13,168

## YUKON DISTRICT

### INTRODUCTION

This district includes all waters of the Yukon River and its tributaries and all coastal waters including Stuart Island from Cape Stephens southward to 62° North latitude. Commercial fishing for salmon is permitted upstream from the mouths of the Yukon and Black Rivers.

During 1966 a total of 93,315 king salmon, 19,254 coho salmon and 71,405 chum salmon was harvested commercially. As shown in Table 18 a record total of 577 fishermen, 516 fishing vessels, 10,325 fathoms of drift gill net and 46,170 fathoms of set gill net were licensed. Also 17 fishwheels were registered in subdistrict #4. Yukon District commercial fishermen, nearly all resident Eskimos and Indians, received a total of \$454,537 for their catch and the State received approximately \$37,000 in license revenues and processing taxes. The first wholesale value of the 1966 catch is estimated to be \$1,308,000.

### KING SALMON COMMERCIAL FISHERY

A commercial fishery was first established in 1918 and has continued each year with the exception of the period 1925 to 1931. Prior to 1961 the commercial fishery was restricted to catch quotas of varying sizes; a quota of 50,000 kings was in effect during most years. During the period 1954 through 1960, a 65,000 king salmon quota was divided between the following areas of the river: 50,000 kings below the mouth of the Anuk River, 10,000 between the mouths of the Anuk and Anvik Rivers, and 5,000 above the mouth of the Anvik River. Commercial fishing was allowed for five and one-half days a week until the quota was taken.

Since 1961 quotas have been removed for that portion of the river below Owl Slough near Marshall and this fishery has been regulated by scheduled openings and closures each week. Limited quotas still are in effect for areas above Owl Slough.

TABLE 18

NUMBER OF COMMERCIAL FISHING LICENSES ISSUED  
FOR YUKON DISTRICT, 1966

	<u>Commercial</u>	<u>Vessel</u>	<u>Set Net 1/</u>	<u>Drift Net 1/</u>	<u>Tenders</u>
Subdistrict #1	393	365	345(39,230)	97(5,385)	
Subdistrict #2	143	113	101(5,515)	88(4,690)	
Subdistrict #3	21	18	17(1,025)	4(250)	
Subdistrict #4 <u>2/</u>	20	20	5(400)	-	
Totals, 1966	577	516	468(46,170)	189(10,325)	34
Totals:					
1965	539	486	420(40,220)	164(9,915)	27
1964	487	451	409(39,510)	159(9,450)	17
1963	451	413	407(37,860)	114(8,210)	22
1962	533	490	434(42,935)	177(11,680)	23
1961	412	350	338(32,351)	103(6,055)	18

1/ Fathoms in parenthesis

2/ 17 fishwheels registered also

Although the duration of fishing periods have been altered somewhat during the past six seasons, a total of four days a week has been open to commercial fishing in subdistricts #1 and #2 during the king salmon season. For the past four seasons, the commercial fishing periods have been as follows: 6 a.m. Monday to 6 a.m. Wednesday (48 hours) and 6 p.m. Thursday to 6 p.m. Saturday (48 hours) in subdistrict #1 and 6 p.m. Sunday to 6 p.m. Tuesday (48 hours) and 6 a.m. Thursday to 6 a.m. Saturday (48 hours) in subdistrict #2. All fishing gear (commercial and subsistence) must be removed from the river during the weekly closures in these two subdistricts.

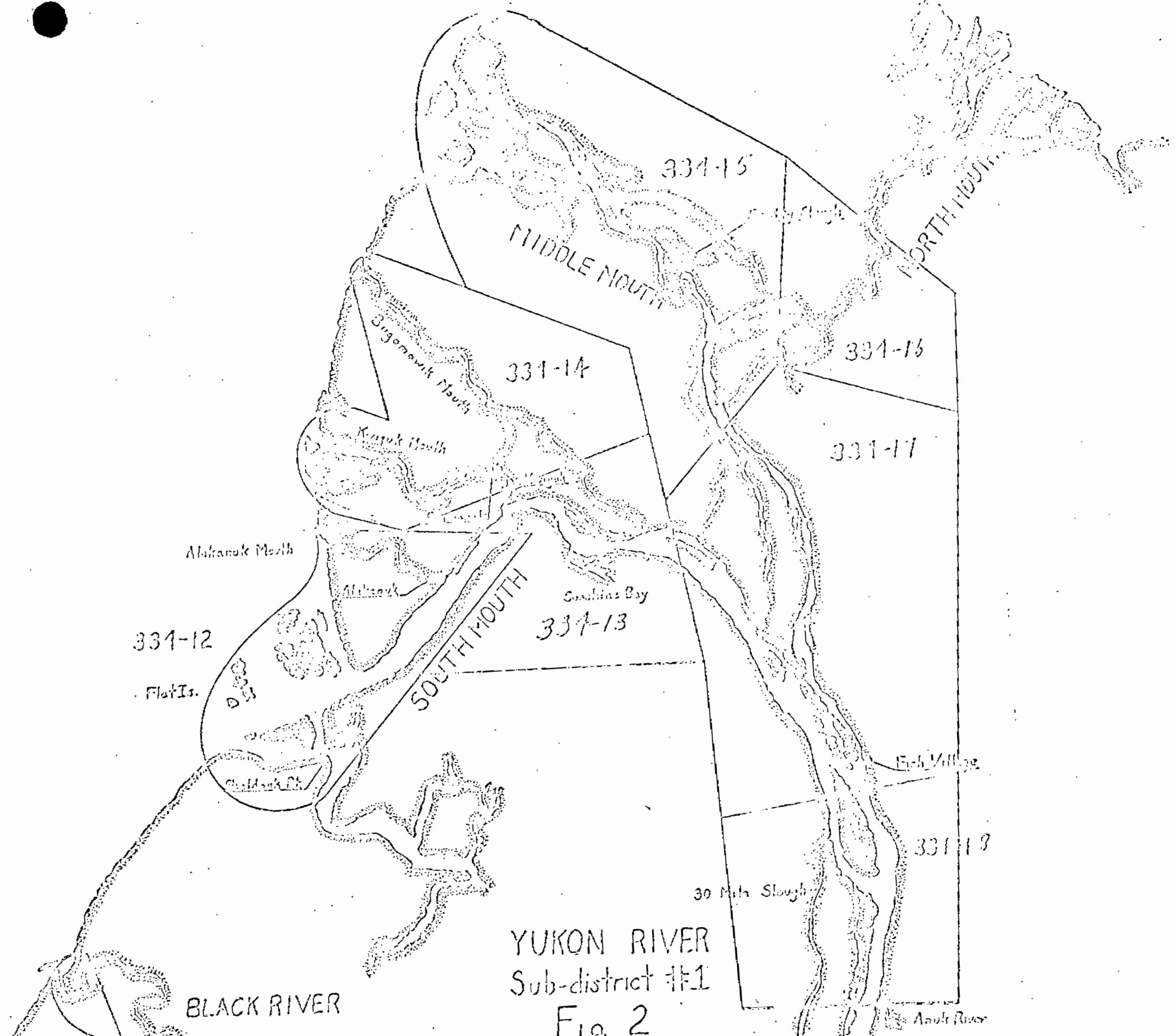
Commercial fishing in subdistrict #3 is allowed for a total of four days a week (6 p.m. Monday to 6 p.m. Friday) until a quota of 3,000 kings is taken. In subdistrict #4 commercial fishing is allowed seven days a week until a quota of 2,000 king salmon is taken.

Figures 2 and 3 illustrate subdistrict and statistical area boundaries.

1966 Fishery: Tables 19 , 20 , 21 and 22 present daily catch and fishing effort data for subdistricts #1 through #4. Table 23 shows the catches made in each statistical area within subdistricts #1, #2 and #3. Table 24 compares catch and effort data for 1960 - 1966.

The 1966 district catch (93,315) was the smallest taken during the past six seasons. On the other hand, a record number of fishermen were licensed in this district during 1966 with most of the increase taking place in subdistrict #1. For example, there were about 45 more fishing vessels licensed in subdistrict #1 than in 1962 and 1965, the two previous "high" years.

Approximately 14,026 cases (48% cases) were locally processed by five shore-based canneries. Subdistrict #1 and #2 king salmon averaged 3.3 to 3.6 to the case while the few subdistrict #4 (Rampart) king salmon canned averaged about 7.0 to the case. A total of 398 tierces and 60 one-half tierces were mild cured (some hard-salted) by four salteries. In addition the expanding



YUKON RIVER  
Sub-district #1

Fig. 2



TABLE 19

COMMERCIAL SALMON CATCHES FROM SUB-DISTRICT #1,  
YUKON DISTRICT, ALL GEAR COMBINED, 1/ 1966

Date of Landing	Hours Fished	No. of Fishing Vessels	Total Catch			Accumulative Catch			
			Kings	Cohos	Chums	Kings	Cohos	Chums	
June	10	24	59	225	-	-	225	-	-
	11	18	87	381	-	-	606	-	-
	12	-	-	-	-	-	-	-	-
	13	18	114	920	-	-	1,526	-	-
	14	24	187	1,733	-	-	3,259	-	-
	15	6	157	1,553	-	-	4,812	-	-
	16	6	12	107	-	-	4,919	-	-
	17	24	284	7,251	-	-	12,170	-	-
	18	18	297	10,910	-	-	23,080	-	-
	19	-	-	-	-	-	-	-	-
	20	18	218	4,468	-	-	27,548	-	-
	21	24	287	7,192	-	-	34,740	-	-
	22	6	280	6,187	-	-	40,927	-	-
	23	6	27	259	-	-	41,186	-	-
	24	24	269	6,937	-	-	48,123	-	-
	25	6	289	6,279	-	-	54,402	-	-
	26	-	-	-	-	-	-	-	-
	27	18	224	4,544	-	-	58,946	-	-
	28	18	305	7,717	-	-	66,663	-	-
	29	-	-	-	-	-	-	-	-
	30	6	13	95	-	-	67,758	-	-
July	1	24	218	2,651	-	-	69,409	-	-
	2	6	201	1,374	-	-	70,783	-	-
Sub-Totals	<u>2/</u>			70,783	0	0			
July	25	18	23	-	-	273	-	-	273
	26	24	34	-	-	508	-	-	781
	27	6	48	-	1	444	-	1	1,225
	28	-	-	-	-	-	-	-	-
	29 <u>3/</u>	30	29	1	2	111	70,784	3	1,336
	30	18	66	1	19	449	70,785	22	1,785
	31	-	-	-	-	-	-	-	-
August	1	18	108	-	66	7,861	-	88	9,646
	2	24	120	1	66	6,582	70,786	154	16,228
	3	6	89	-	72	3,224	-	226	19,452
	4	6	52	1	141	1,014	70,787	367	20,466
	5	24	133	1	226	3,402	70,788	593	23,868
	6	18	132	-	365	2,589	-	958	26,457
	7	-	-	-	-	-	-	-	-
	8	18	127	-	1,242	7,998	-	2,200	34,455
	9	24	153	-	3,095	13,261	-	5,295	47,716
	10	6	144	-	1,011	7,342	-	6,306	55,058
	11	6	5	-	57	210	-	6,363	55,268
	12	24	79	-	373	362	-	6,736	55,630
	13	18	70	-	346	302	-	7,082	55,932

TABLE 19 (continued)

COMMERCIAL SALMON CATCHES FROM SUB-DISTRICT #1,  
YUKON DISTRICT, ALL GEAR COMBINED, 1/ 1966

Date of Landing	Hours Fished	No. of Fishing Vessels	Total Catch			Accumulative Catch		
			Kings	Cohos	Chums	Kings	Cohos	Chums
August 14	-	-	-	-	-	-	-	-
15	18	50	-	965	1,167	-	8,047	57,099
16	24	66	-	787	1,599	-	8,834	58,698
17	6	81	-	1,213	3,357	-	10,047	62,055
18	6	4	-	13	27	-	10,060	62,082
19	24	89	-	1,315	1,483	-	11,375	63,565
20	18	97	-	961	1,316	-	12,336	64,881
21	-	-	-	-	-	-	-	-
22	18	58	-	685	549	-	13,021	65,430
23	24	95	-	1,921	1,753	-	14,942	67,183
24	6	74	-	769	696	-	15,711	67,879
25	6	12	-	206	166	-	15,917	68,045
26	24	80	-	1,160	803	-	17,077	68,848
27	18	73	-	638	307	-	17,715	69,155
28	-	-	-	-	-	-	-	-
29	18	55	-	614	239	-	18,329	69,394
30	24	47	-	369	218	-	18,698	69,612
31	6	39	-	188	125	-	18,886	69,737
Sept. 1	-	-	-	-	-	-	-	-
2	30	12	-	157	66	-	19,043	69,803
3	18	16	-	146	33	-	19,189	69,836
4	-	-	-	-	-	-	-	-
5	18	5	-	25	-	-	19,214	-
6	24	2	-	20	-	-	19,234	-
7	6	1	-	7	-	-	19,241	-
8	-	-	-	-	-	-	-	-
9	30	2	-	11	-	-	19,252	-
10	18	1	-	2	-	-	19,254	-
Sub-Totals <u>4/</u>			<u>5</u>	<u>19,254</u>	<u>69,836</u>			
Grand Totals			70,788	19,254	69,836			

1/ Drift & Set Gill Nets2/ King salmon season (June 10-July 2)3/ 13 pink caught this date4/ Fall salmon season (July 25-Sept. 10)

TABLE 20

COMMERCIAL CATCHES OF KING SALMON FROM SUB-DISTRICT #2,  
YUKON DISTRICT, ALL GEAR COMBINED 1/, 1966

Date of Landing	Hours Fished	No. of Fishing Vessels	Total Catch	Accumulative Catch
June 11	6	5	13	13
12	6	2	3	16
13	24	30	71	87
14	18	56	214	301
15	-	-	-	-
16	18	51	164	465
17	24	65	511	976
18	6	56	409	1,385
19	-	-	-	-
20	30	91	1,744	3,129
21	18	118	2,944	6,073
22	-	-	-	-
23	18	80	1,293	7,366
24	18	112	2,086	9,452
25	-	-	-	-
26	-	-	-	-
27	30	94	2,750	12,202
28	6	101	2,029	14,231
29	-	-	-	-
30	18	79	1,226	15,457
July 1	18	90	1,470	16,927

1/ Drift & Set Gill Nets.

TABLE 21

COMMERCIAL SALMON CATCHES FROM SUB-DISTRICT #3,  
YUKON DISTRICT, ALL GEAR COMBINED 1/, 1966

Date of Landing	Hours Fished	No. of Fishing Vessels	Total Catch		Accumulative Catch	
			Kings	Chums	Kings	Chums
June 14	24	1	5	-	5	-
15	24	3	11	-	16	-
16	24	2	10	-	26	-
17	18	5	119	-	145	-
18	-	-	-	-	-	-
19	-	-	-	-	-	-
20	6	2	52	-	197	-
21	24	7	123	-	320	-
22	24	5	85	-	405	-
23	24	7	183	-	588	-
24	18	9	299	-	887	-
25	-	-	-	-	-	-
26	-	-	-	-	-	-
27	-	-	-	-	-	-
28	30	4	186	-	1,703	-
29	24	12	341	-	1,414	-
30	24	13	548	-	1,962	-
July 1	18	11	229	-	2,191	-
Date Unknown <u>2/</u>	-	-	<u>1,421</u>	-	3,612	-
Sub-Totals <u>3/</u>			3,612	0		
Sub-Totals <u>4/</u> (8/9 - 10/2)		1	<u>0</u>	<u>1,209</u>		
Grand Total			3,612	1,209		

1/ Drift & Set Gill Nets

2/ Catches represent smoked salmon sold by individual fishermen

3/ King Salmon season

4/ Fall salmon season

TABLE 22

COMMERCIAL CATCHES OF KING SALMON CAPTURED BY FISHWHEELS  
 IN SUB-DISTRICT #4,  
 YUKON DISTRICT, 1966 1/

Date or Landing	Hours Fished	No. of Fishing Vessels	Total Catch	Accumulative Catch
June 29	24	1	20	20
30	"	2	22	42
July 1	"	1	6	48
2	"	4	148	196
3	"	7	212	408
4	"	3	110	518
5	"	4	308	826
6	"	5	240	1,066
7	"	6	348	1,414
8	"	2	50	1,464
9	"	2	26	1,490
10	"	3	74	1,564
11	"	3	106	1,670
12	"	3	66	1,736
13	"	3	74	1,810
14	"	3	126	1,936
15	"	3	52	1,988

1/ Most catches were made in the vicinity of the following villages: Rampart, Tanana & Nenana.

TABLE 23

COMMERCIAL KING SALMON CATCHES BY STATISTICAL AREAS  
 IN SUB-DISTRICTS #1, #2 & #3  
 OF THE YUKON DISTRICT, 1966

<u>Statistical Area</u>	<u>Total Catch</u>	<u>Maximum No. of Vessels during season</u>
334-11	2,495	19
-12	20,038	102
-13	5,460	46
-14	4,143	27
-15	10,858	45
-16	3,009	20
-17	12,898	59
-18	<u>11,882</u>	<u>51</u>
Sub-District #1 Total	70,783	305
334-21	7,072	36
-22	4,724	42
-23	2,030	28
-24	<u>3,101</u>	<u>33</u>
Sub-District #2 Total	16,927	118
334-31	1,036	7
-32	1,155	6
Area Unknown	<u>1,421</u>	<u>-</u>
Sub-District #3 Total	3,612	13

TABLE 24  
YUKON RIVER KING SALMON COMMERCIAL FISHERY  
COMPARATIVE CATCH STATISTICS, 1960-1966 <sup>1/</sup>

	Year	Y-1	Y-2	Y-3	Total	Y-4 <sup>2/</sup>
Catch	1960	50,713	15,994	-	66,707	884
	1961	84,406	29,028	4,965	118,399	1,804
	1962	67,072	22,224	4,687	93,983	724
	1963	85,004	24,211	6,976	116,191	803
	1964	67,555	20,246	4,705	92,506	1,081
	1965	89,268	23,763	3,204	116,235	1,863
	1966	70,783	16,927	3,612	91,322	1,988
Total Vessel Hours (Catch per Vessel Hr.)	1960	40,848 (1.24)	34,914 (0.46)	-	75,762 (0.88)	
	1961	79,224 (1.07)	29,118 (1.00)	2,808 (1.77)	111,150 (1.06)	
	1962	84,792 (.79)	38,118 (0.58)	2,520 (1.86)	125,430 (0.75)	
	1963	72,288 (1.18)	27,672 (0.87)	5,616 (1.24)	105,576 (1.10)	
	1964	56,736 (1.19)	22,398 (0.91)	4,596 (1.02)	83,730 (1.10)	
	1965	78,096 (1.14)	31,008 (.77)	2,286 (1.40)	111,390 (1.04)	
	1966	69,894 (1.01)	22,380 (.76)	1,782 (1.23) <sup>3/</sup>	94,056 (.96)	
Licenses Issued Vessel (Tenders)	1960	186	33	-	219 (7)	10
	1961	210	112	18	340 (13)	10
	1962	320	127	31	478 (23)	12
	1963	272	113	22	407 (21)	6
	1964	314	101	24	439 (17)	12
	1965	322	111	26	459 (27)	27
	1966	365	113	18	496	20
Drift Gill Nets (Number Fathoms)	1960	2 (100)	44 (2,631)	-	2,231	0
	1961	17 (925)	86 (5,130)	-	6,755	0
	1962	55 (3,200)	98 (6,750)	24 (1,730)	11,680	0
	1963	24 (1,225)	85 (6,585)	5 (400)	8,210	0
	1964	65 (3,835)	89 (5,390)	5 (225)	9,450	0
	1965	62 (3,615)	98 (6,050)	4 (250)	9,915	0
	1966	97 (5,385)	88 (4,690)	4 (250)	189 (10,325)	-
Set Gill Nets (Number Fathoms)	1960	183 (21,750)	59 (3,324)	-	(25,074)	2 (100)
	1961	217 (25,560)	101 (6,050)	19 (691)	(32,301)	1 (50)
	1962	303 (35,470)	117 (6,465)	14 (900)	(42,835)	2 (100)

TABLE 24 (continued)  
 YUKON RIVER KING SALMON COMMERCIAL FISHERY  
 COMPARATIVE CATCH STATISTICS, 1960-1966 1/

	Year	Y-1	Y-2	Y-3	Total	Y-4 <u>2/</u>
Set Gill Nets	1963	259 (30,975)	101 (5,445)	21 (1,350)	(37,770)	2 ( 90)
(Number Fathoms)	1964	277 (32,090)	100 (5,105)	28 (2,080)	(39,275)	4 (235)
	1965	292 (32,980)	98 (5,410)	23 (1,480)	(39,870)	7 (350)
	1966	345 (39,230)	101 (5,515)	17 (1,025)	463 (45,770)	5 (400)

1/ King Salmon season only (June & early July)

2/ Also 5 & 17 fishwheels were registered during 1965 and 1966 respectively.

3/ Catch per vessel hour does not include 1,421 king salmon captured by an unknown number of fishermen.

fresh and frozen markets accounted for approximately 18,000 king salmon which were handled by nine buyers or processors. A majority of this catch was frozen by three freezerships and a single shore based plant in the vicinity of the mouth.

Although the season opened on June 1, the lower river was not fishable until June 5 or 6 due to the presence of ice. Commercial fishing in the vicinity of the mouth commenced on June 10 when a few king salmon were taken. Subdistrict #1 and #2 catches (including catch per vessel hour) during the first four fishing periods (June 10-22) were relatively poor. Subdistrict #2 catches during this time were especially poor indicating that few king salmon were escaping the intensive subdistrict #1 fishery (See Appendix Tables A-1 and A-2 ; also Appendix Figures A-1 and A-2 ).

To insure adequate escapement, commercial fishing periods in subdistricts #1 and #2 were reduced from 48 hours to 36 hours by emergency order effective June 23. Thus fishing time was reduced from 4 days to 3 days a week from June 23 until the season was closed on July 1 in subdistrict #2 and July 2 in subdistrict #1. Based on catch per vessel hour data it was estimated that 13,000 to 14,000 king salmon escaped the subdistrict #1 and #2 fisheries as a result of fishing time restrictions. Fishing conditions (river and weather) were generally good throughout the season in the lower Yukon area.

The 3,000 quota for subdistrict #3 was exceeded (3,612 kings taken) and the sale of king salmon was prohibited by emergency order on July 4. The 2,000 quota for subidstrict #4 was not exceeded. (1,988 kings taken).

Timing and Magnitude of Runs in Lower Yukon: The timing of the 1965 and 1966 runs was similar although the first reported catch in the vicinity of the mouth was made about 3 days earlier in 1965. Examination of commercial catches indicated that the south mouth (334-12) run peaked on about June 18 while tagging site catches indicated a later peak on about June 25. The tagging

site catches may have erroneously indicated a later peak due to the reduction of commercial fishing time after June 22. With the exception of June 18-20, very poor fishing was experienced in the middle mouth (334-15) with total and individual catches declining markedly after June 25. An exceptionally large run entered the middle mouth in 1965 but apparently a weak run was experienced in 1966. For example, 23,729 and 11,000 king salmon were taken in middle mouth during 1965 and 1966 respectively.

Based on catch per unit effort and total catch, salmon abundance declined during the last open fishing period in all statistical areas within subdistrict #1 and in the lower portion of subdistrict #2 (334-21 and 22). Based on middle mouth and south mouth tagging site catches, the run steadily declined in magnitude after the July 2 subdistrict #1 closure. Catches were about the same or slightly greater (when compared to the previous period) for the upper end of subdistrict #2 (334-23 and 24) during the last open period. The above information indicates that the season was not closed prematurely as the bulk of the king salmon run had passed through the subdistrict #1 and #2 fisheries prior to July 1 or 2.

#### SMALL SALMON COMMERCIAL FISHERY

Relatively unrestricted commercial utilization of chum and coho salmon was made during the 1918 - 1921 period with catches ranging from 100,000 (1918) to 365,000 (1919). The 1919 catch has never been surpassed. Due to complaints of poor fishing by upriver subsistence fishermen, largely precipitated by the 1919 commercial chum salmon catch, the Yukon commercial fishery was closed from 1921 to 1931. Since 1921 limited commercial catches of small salmon have been taken only during 1956 and 1961 through 1966. From 1961 to 1965, the sale of small salmon has not been permitted until after July 31 in subdistrict #1 with commercial fishing allowed four days a week. During these years subsistence fishing was also permitted during periods closed to commercial fishing.

Due to the increased interest in commercial utilization of these salmon and the need to insure adequate escapement, the subdistrict #1 season was opened by emergency order on July 25 in 1966 with commercial and subsistence fishing allowed only during the same four days of each week.

During 1966 a total of 5 king salmon, 19,254 coho salmon and 69,836 fall chum salmon were taken in subdistrict #1 from July 25 to September 10 (See Table 19 ). In addition 1,209 chum salmon were taken in subdistrict #3 during August 9 to September 2.

A total of 836 cases of coho salmon and 2,812 cases of chum salmon were processed in addition to 8,765 cohos and 43,659 chums that were marketed as fresh or frozen fish by five local operators. A majority of the chum salmon were frozen in the round locally for export to Japan. Frozen chums were transferred to Japanese ships laying off the river mouth in early September.

Although the actual number of fishermen that operated in subdistrict #1 during 1966 is not known, the greatest number delivering in any single day was 153. Fishing effort (based on vessel hours) was similar to that of 1962 but considerably greater than that of other years in the 1961-1966 period.

Although commercial fishing effort in subdistrict #1 was conducted during 42 days, a total of 46,268 chum salmon or 66% of the total catch was made during 6 days of fishing. Peak chum catches were made during August 1-3 and August 8-10. Needless to say fishing for chum salmon on other than these days was generally poor. The 1962 season was very similar in that the largest chum catches were made during only a few days, August 6 and August 20-23. Coho salmon catches fluctuated less during the season with the best catches made during August 8-10 and August 15-24.

#### SUBSISTENCE FISHERY

Introduction: As in previous years, a Department of Fish and Game survey crew, traveling by boat, counted fish on drying racks and in smokehouses in

every fish camp and village from the river mouth to Fort Yukon. The survey also extended up the Tanana River as far as Hoonah. The survey crew traveled by chartered aircraft in order to record the catches made in Venetie. In addition, catch calendars on which daily catches could be recorded were mailed to fishermen prior to the fishing season. Many fishermen completed and returned these forms to the Department. Catch calendar data recorded after the boat surveys were made are included in the total figures. Catches for Alaskan villages on the Koyukuk River and above Fort Yukon were not documented. Finally, catches for fishing communities in Canada were obtained from records kept by the Canadian Department of Fisheries office at Whitehorse. King, pink and summer chum catches, as in previous surveys, more nearly represent actual catches as those runs had already passed through the villages at the times of the boat survey. The Arctic-Yukon-Kuskokwim Area Annual Report for 1963 describes survey methods in detail.

1963 Fishery: As shown in Table 25, a total of 14,017 kings, 213,867 chums, and 369 pinks, totaling 228,253 salmon were recorded as being taken for subsistence purposes. A total of 527 known fishing families were surveyed and 513 units of chum gill nets (5½ inch stretched measure), 130 units of king gill net (8½ inch mesh), and 116 fishwheels were recorded as being operated. Fewer fishing families and fishwheels were recorded in 1966 than in any other year. (See Table 26). Fishwheels have steadily declined each year, e.g., 301 fishwheels were recorded in 1920, 182 in 1961, and 155 in 1964. This emphasizes the decline in dependence upon the salmon subsistence fishery.

Although the village of Stebbins is located in the Yukon district, its subsistence catches are taken mainly from small coastal streams and not from the Yukon River. The following catches were reported by 19 Stebbins fishermen and are not included in Table 25: 114 kings, 350 pinks and

TABLE 25

SUBSISTENCE SALMON CATCH (EXPANDED) BY VILLAGE,  
YUKON RIVER DRAINAGE, 1966

Fishing Unit	Date of Survey	Fishing Families Surveyed	No. People in Fishing Families	No. Of Dogs	Salmon			Total Salmon	Units of Gear		
					Kings	Chums	Pinks		Chum Net	King Net	Fish- Wheels
Alkanuk	7/29-30	54	317	204	263	9,817	13	10,093	55	11	0
Sheldons Point	8/1	21	118	113	127	2,995	12	3,134	22	2	0
Kwiguk-Emmonak	8/2	35	241	185	160	11,767	57	11,984	48	0	0
Aproka Pass - Snotty Slough	8/5	32	210	176	645	10,683	58	11,386	54	12	0
Hamilton - Kotlik	8/6-7	14	110	60	47	2,930	73	3,050	18	0	0
Mt. Village	8/9	32	236	114	217	7,451	97	7,765	41	11	0
Pitkas Pt. - St. Marys	8/10-11	38	237	135	499	8,421	39	8,959	39	11	0
Pilot Station	8/12	26	166	96	440	5,569	18	6,027	25	10	0
Marshall	8/12	18	95	110	350	3,640	0	3,690	22	8	0
Russian Mission	8/13	14	74	73	800	2,706	1	3,507	12	9	0
Holy Cross	8/14	26	166	115	2,645	4,228	0	6,873	20	25	6
Anvik	8/23	14	70	127	144	14,239	0	14,383	10	2	8
Grayling	8/24	15	99	124	85	11,436	1	11,522	5	3	8
Kaltag	8/25	21	163	236	47	21,729	0	21,776	23	0	9
Mulato	8/27	33	227	306	218	22,017	0	22,235	31	4	7
Koyukuk	8/27	14	91	125	93	7,443	0	7,536	17	10	1
Galena	8/29	13	90	89	407	8,296	0	8,703	5	9	7
Ruby	8/31	10	59	96	887	5,530	0	6,417	0	0	8
Tanana	9/2-3	9	49	108	421	10,421	0	10,842	0	0	9
Rampart	9/12	4	25	48	859	4,056	0	4,925	0	0	5
Stevens Village	9/13	8	40	63	620	1,900	0	2,520	0	2	5
Beaver	9/12	4	27	22	31	4,135	0	4,166	1	1	3
Fort Yukon	9/13	18	109	182	1,074	3,960	0	5,034	0	0	19
Dawson 1/	2/	1	2/	2/	50	50	0	100	2	0	0
Mayo 1/	"	2	"	"	100	0	0	100	2	0	0

TABLE 25  
 SUBSISTENCE SALMON CATCH (EXPANDED) BY VILLAGE,  
 YUKON RIVER DRAINAGE, 1966 (CONT.)

Fishing Unit	Date of Survey	Fishing Families Surveyed	No. People in Fishing Families	No. Of Dogs	Units of Gear			Total Salmon	Units of Gear			
					Kings	Chums	Pinks		Chum Net	King Net	Fish Wheel	
Fort Selkirk <u>1/</u>	"	1	"	"	125	450	0	575	1	0	0	
Pelly <u>1/</u>	"	3	"	"	350	0	0	350	5	0	0	
Minto <u>1/</u>	"	3	"	"	350	450	0	800	3	0	0	
Carmacks <u>1/</u>	"	6	"	"	1,050	100	0	1,150	5	0	0	
Ross River <u>1/</u>	"	4	"	"	120	0	0	120	2	0	0	
Teslin River <u>1/</u>	"	<u>2/</u>	"	"	300	0	0	300	1	0	0	
MAIN RIVER TOTALS		493	3,019	2,907	13,534	186,415	369	200,322	469	130	95	
Hanley Hot Springs - Minto		9/15	13	85	123	146	7,152	0	7,298	0	0	10
Manana		9/14-15	8	40	82	272	12,023	0	12,295	0	0	11
TANANA RIVER TOTALS			21	125	205	418	19,175	0	19,593	0	0	21
Venetie		9/14	13	75	101	0	1,098	0	1,098	17	0	0
CHANDALAR RIVER TOTALS			13	75	101	0	1,098	0	1,098	17	0	0
Chalkytsik			<u>2/</u>	<u>2/</u>	No Salmon Catches Reported							
Old Crew		<u>2/</u>	<u>2/</u>	<u>2/</u>	65	7,175	0	7,240	27	0	0	
PORCUPINE RIVER TOTALS			<u>2/</u>	<u>2/</u>	<u>2/</u>	65	7,175	0	7,240	27	0	0
YUKON DRAINAGE - GRAND TOTALS			527 +	3,219 +	3,213 +	14,017	213,667	369	223,253	513	130	116

1/ From Canadian Department of Fisheries, Whitehorse office

2/ Information not available

TABLE 26

COMPARATIVE SUBSISTENCE FISHERY DATA  
FOR YUKON RIVER FOR 1961-1966 <sup>1/</sup>

Year	Number of Fishing Families	Number of people in Fishing Families <sup>2/</sup>	Number of Dogs Owned <sup>3/</sup>	Number of Fishwheels Operated
1961	624	3,626 (5.8)	4,806 (7.7)	169
1962	564	3,279 (5.8)	3,848 (6.8)	138
1963	597	3,460 (6.9)	4,155 (7.0)	156
1964	602	3,524 (6.0)	4,003 (6.6)	155
1965	541	3,453 (7.3)	3,974 (7.3)	127
1966	494	3,144 (6.4)	3,112 (6.3)	116

<sup>1/</sup> Includes only the main river from the mouth to Fort Yukon and including Tanana River.

<sup>2/</sup> Mean number of people per fishing family shown in parenthesis.

<sup>3/</sup> Mean number of dogs owned per fishing family shown in parenthesis.

5,228 chums.

The total king and chum salmon catches were the ~~smallest~~ smallest ever recorded by the survey. Previously the smallest king salmon catch of 19,723 was made in 1965 and the smallest chum salmon catch of 356,754 was made in 1962. In order to take into account differences in the number of fishermen each year, the average catch per fishing family is shown below:

	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
Kings	32	18	40	34	30	23
Chums	644	577	624	767	787	400

This analysis also indicates a record low 1966 catch per fishing family for chum salmon but a king salmon catch slightly greater than the previous record low of 1962.

There are several factors, not related to salmon abundance, that probably limited the 1966 harvest:

1. Low subsistence fishing effort - many of the subsistence fishermen left their villages to fight fires that were common throughout Interior Alaska during the summer. The number of fishwheels operated in 1966 decreased 36% from that of 1961 and 10% from that of 1965. The fishwheel is one of the most effective types of gear for the capture of Yukon River salmon.

2. Low water levels: Low water levels during the fishing season prevented efficient utilization of fishwheels. For example, at times Fort Yukon fishermen could not find deep enough areas to operate their fishwheels.

#### ESCAPEMENT INDICES - KING SALMON

Table 27 compares escapement data for certain tributaries for the 1960 - 1966 period. The Yukon River drainage is too extensive for complete aerial survey coverage during any given season. In addition poor survey condi-

TABLE 27

COMPARATIVE ESCAPEMENT DATA FOR 1960-1966, YUKON RIVER DRAINAGE 1/

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
East Fork, Andraefsky River	1,020	1,003	675*	-	867	-	361
West Fork, Andraefsky River	<u>1,220</u>	-	<u>762*</u>	-	<u>705</u>	355*	<u>303</u>
Totals, Andraefsky River	2,240	-	1,437*	-	1,572	-	664
Anvik River	1,950	1,226	-	-	-	650*	638
Salcha River	1,660	2,878	937	-	450	408	800
Whitehorse Dam Bypass - Actual Count <u>2/</u>	648	1,068	1,500	483	587	903	517

1/ With exception of Whitehorse Dam Count, escapement data are from aerial surveys', a (\*) indicates poor survey conditions.

2/ 1,054 counted in 1959.

tions have prevented aerial surveys from being flown during some years. In some cases different observers made the aerial survey counts shown in Table 27 but surveys were flown of similar stream sections usually under fair to good conditions each year.

The 1966 Andreafsky River counts were the poorest ever obtained although the survey conditions were considered excellent (no cloud cover with low, clear water). The 1966 Salcha River count was up from the previous two years but lower than that recorded in 1960 and 1961. The Whitehorse Dam count (not an aerial survey) obtained in 1966 was below average and was similar to the low count of 483 recorded in 1963. The 1966 Anvik River count was also less than that recorded in previous surveys.

#### DISCUSSION

King Salmon: As shown in Table 24 the 1966 catch per vessel hour data indicate a run only slightly below average when compared to the 1960 - 1966 period. However, the 1966 catch per vessel hour data may be biased by the reduction in fishing time from 48 to 36 hour fishing periods. Generally, catches per unit of effort increase with shorter fishing periods. Subsistence and aerial survey data (previously discussed) indicate a relatively small escapement passed the main commercial fishery located in the Lower Yukon area. For this reason the 1966 king salmon run was judged to be below average in magnitude when compared to the 1960-1965 runs.

During the past few years the Japanese mothership fishery in the North Pacific has expanded and is viewed as a threat to Arctic-Yukon-Kuskokwim Area salmon runs. The mothership fishery took a record total of 410,150 king salmon in 1964 and 184,504 in 1965, a majority of which were immature four year olds. Over 50% of these catches were made in Bering Sea waters. Although the origin and distribution of king salmon in offshore waters is not known, it seems likely that substantial numbers of Arctic-Yukon-Kuskokwim king

salmon were captured by the mothership fishing fleet and influenced the relatively poor return of Yukon River king salmon this past season.

Since six year old king salmon have been the greatest contributors to the Yukon River commercial fishery, most of the 1967 commercial catch should be comprised of 1961 brood year fish. A record total of 120,203 kings were commercially harvested in 1961 which was the first year that the Fishery was managed by scheduled open and closed fishing periods instead by the quota system. Thus the results of the 1967 fishery will be the first test of the present system of management and will indicate if optimum harvests have been made since 1961.

Small Salmon: The summer chum salmon run is not fished commercially and the only indicators of run magnitude from year to year are subsistence and Department test net catches. Both subsistence and test net (tagging site) catches indicated that the 1966 run was below average in magnitude.

Subdistrict #1 catches of fall chum salmon since 1961 have ranged from 8,347 in 1964 to 69,836 in 1966. There was no effort in 1963 and only limited and sporadic effort in 1965, which limits comparison between 1961, 1962 and 1966 seasons. Based on catch per vessel hour data, fall chum salmon were most abundant during 1961 (2.2 chums/vessel hour) followed by 1966 (1.5) and 1962 (1.1). Subsistence catches indicate that the 1965 run was one of the largest runs to enter the Yukon River during recent years.

Incidental Catch of Chum Salmon: Significant numbers of chum salmon are taken incidentally during the subdistrict #1 and #2 commercial king salmon fishery. Regulations have prohibited the sale of these salmon which must be utilized for subsistence. Department studies conducted during 1964-1966 revealed that a majority of the incidental chum salmon catch was not being properly utilized by local fishermen. Acting on a joint staff and public proposal, the Alaska Board of Fish and Game in December of 1966 ruled that all species of

salmon could be sold during the subdistrict #1 and #2 king salmon commercial fishery beginning with the 1967 season. The Board further ruled that only gill nets of not less than 8 inch stretched mesh could be operated during the king salmon season which prevents increased commercial fishing pressure on chum salmon.

Table 28 shows the estimated incidental catch of chum salmon made in subdistricts #1 and #2 during the last three seasons. Catch ratios obtained by commercial fisherman (from return of catch calendars) and tagging site catches were applied to the commercial catches to give these estimates. The estimated chum salmon catch during this period ranged from 56,000 in 1966 to 90,000 in 1965.

A decline in the dependence on subsistence chum fishing in subdistricts #1 and #2 over the 1961 - 1966 period can be shown by data presented in Table 29 . This table shows a decline in the number of fishwheels operated and in the number of sled dogs in the area. Fishwheels are the most efficient gear for capture of chum salmon, most of which are fed to dogs. Increased employment produced by the commercial fishery and the use of power snow machines, which are replacing sled dogs, have largely resulted in the recent decline in subsistence fishing effort and utilization in these two sub-districts.

TABLE 28

INCIDENTAL CHUM SALMON CATCHES MADE  
DURING THE COMMERCIAL KING SALMON SEASON  
IN SUBDISTRICTS #1 AND #2, YUKON DISTRICT  
1964-1966

<u>Test Catches</u> <sup>1/</sup>	<u>1964</u>	<u>1965</u>	<u>1966</u>
Chum	244	1,758	1,774
King Salmon	260	2,197	2,791
Chum:King Ratio	1:1.07	1:1.25	1:1.57
<u>Estimated Incidental Chum Salmon Catch</u>			
Subdistrict #1	64,000	71,000	45,000
Subdistrict #2	<u>19,000</u>	<u>19,000</u>	<u>11,000</u>
Totals	83,000	90,000	56,000

<sup>1/</sup> From Tagging site catch data and records maintained by Flat Island commercial fishermen. All catches were made by 8 1/2 mesh gill nets.

TABLE 29

SUBSISTENCE FISHERY DATA FOR  
SUBDISTRICTS #1 AND #2, YUKON DISTRICT  
1961-1966

Year	Number of People	Mean No. of People Per Fishing Family	Number of Dogs	Mean No. of Dogs Per Fishing Family	Number of Fishwheels
1961	1,711	5.8	2,113	7.2	10
1962	1,670	5.9	1,879	6.6	3
1963	1,769	5.8	1,944	6.4	3
1964	1,936	6.2	2,091	6.3	0
1965	1,861	6.2	1,673	5.5	0
1966	1,730	6.4	1,193	4.4	0

1/ 17 fishwheels were operated during 1956.

1966 ANNUAL REPORT  
ARCTIC-YUKON-KUSKOKWIM AREA

S E C T I O N    I I  
S P E C I A L   S T U D I E S

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## AGE, SEX AND SIZE COMPOSITION OF SALMON EGGS

### INTRODUCTION

The Arctic-Yukon-Nunavut salmon sampling program, instituted in 1964, was continued in 1966. The objectives of this program are to provide such basic management information as age, length, weight and sex composition of the various salmon runs. This information is needed for run predictions and in assessing the effects of a fishery upon run productivity.

### METHODS

Sampling procedures were identical to those used in previous years. Sexle samples were taken from one area of the first or second seals run above the lateral line and located on a diagonal line down from the base of the dorsal fin. For purposes of this report a 1/2 salmon is defined as having spent one winter in fresh water (two annuli), two winters in the ocean (two annuli) and so on. The first year of life (total of three annuli). For example, a 1/2 salmon returning to spawn in 1966 would be the progeny of the 1962 run that migrated from fresh water to the ocean in the spring of 1964. Chum salmon do not over-winter in fresh water and so only their coral eyes are given. All lengths measured in the following tables were taken from the mid-occipital of the eye to the vent of the caudal fin (total length). Sex was determined by examining the gonads of each fish sampled. The occurrence of predator and lamprey markings was noted as was the relative stage of sexual maturity of each fish sampled.

## YUKON DISTRICT KING SALMON

Age and Sex Composition: Table 5 shows the age composition by sex of 983 king salmon representing commercial catches and Department tagging site catches by 8½ inch mesh gill nets. The 6<sub>2</sub> age class represented 71.8% of the sample followed by the 5<sub>2</sub>(13.5%), 7<sub>2</sub>(9.7%) and 7<sub>3</sub> (3.7%) age groups. The sample contained 53.5% males and 46.5% females. As in previous samples (1964 and 1965) 6 and 7-year old fish were composed of a slight majority of females while the younger age groups were composed of a majority of males.

The sample was taken during 10 different sampling dates from June 10 - July 5 and thus trends in age and sex composition could be observed. Considering all age classes, males were especially abundant during the early stages of the run. A total of 193 males and 117 females were sampled during June 10- 14 while from June 15 on a near equal sex ratio was obtained, 333 males:340 females. There were no distinct trends in changing age composition as the season progressed with the exception of an apparent decline in the abundance of the 5<sub>2</sub> age class.

Compared to samples taken in 1964 and 1965, the 1966 sample contained the greatest percentage of the 6<sub>2</sub> age class and the smallest percentages of the 7<sub>2</sub> and 7<sub>3</sub> age classes. There was little difference in the 5<sub>2</sub> age class percentages (13.5 - 19.0%). The greatest percentage of 4<sub>2</sub> fish was found in the 1964 sample (7.2%) followed by 1965 (1.0%) and 1966 (0.8%).

Length and Weight Composition: Table 6 presents the mean orbit lengths and weights by sex for each age class. The mean length and weight of the sample, sexes combined, was 83.9 centimeters and 23.0 pounds.

## YUKON DISTRICT CHUM SALMON

Age, Sex and Size Compositions: Table 7 presents age, sex and size composition data of Summer and Fall chum salmon taken with 5½ inch

TABLE 5

AGE COMPOSITION OF YUKON DISTRICT KING SALMON  
 CAPTURED WITH 8½ INCH STRETCHED MESH GILL NETS  
 DURING JUNE 10-JULY 5, 1966

Age Class	M A L E S		F E M A L E S		COMBINED SEXES	
	Number	Percentage	Number	Percentage	Number	Percentage
4 <sub>2</sub>	8	0.8	0	0.0	8	0.8
5 <sub>2</sub>	122	12.4	11	1.1	133	13.5
6 <sub>2</sub>	322	32.8	383	39.0	705	71.8
6 <sub>3</sub>	5	0.5	0	0.0	5	0.5
7 <sub>2</sub>	46	4.7	49	5.0	95	9.7
7 <sub>3</sub>	<u>23</u>	<u>2.3</u>	<u>14</u>	<u>1.4</u>	<u>37</u>	<u>3.7</u>
Combined Ages	526	53.5	457	46.5	983	100.0

TABLE 6

LENGTHS AND WEIGHTS OF YUKON DISTRICT KING SALMON  
 CAPTURED WITH 8½ INCH STRETCHED MESH GILL NETS  
 DURING JUNE 10-JULY 5, 1966

## Mean Orbit Lengths in Centimeters

Age Class	M A L E S		F E M A L E S		COMBINED SEXES	
	Number	Mean Length	Number	Mean Length	Number	Mean Length
4 <sub>2</sub>	8	55.9	0	-	8	55.9
5 <sub>2</sub>	122	72.0	11	74.3	133	72.2
6 <sub>2</sub>	322	85.5	383	85.1	705	85.3
6 <sub>3</sub>	5	70.0	0	-	5	70.0
7 <sub>2</sub>	46	95.8	49	91.0	95	93.3
7 <sub>3</sub>	<u>23</u>	<u>82.4</u>	<u>14</u>	<u>82.2</u>	<u>37</u>	<u>82.3</u>
Combined Ages	526	82.5	457	85.4	983	83.9

## Mean Weight in Pounds

Age Class	M A L E S		F E M A L E S		COMBINED SEXES	
	Number	Mean Weight	Number	Mean Weight	Number	Mean Weight
4 <sub>2</sub>	8	6.4	0	-	8	6.4
5 <sub>2</sub>	122	14.1	11	16.4	133	14.3
6 <sub>2</sub>	322	23.8	383	23.1	705	23.4
6 <sub>3</sub>	5	12.8	0	-	5	12.8
7 <sub>2</sub>	46	33.2	49	26.9	95	30.2
7 <sub>3</sub>	<u>23</u>	<u>21.1</u>	<u>14</u>	<u>21.4</u>	<u>37</u>	<u>21.2</u>
Combined Ages	526	22.7	457	23.4	983	23.0

TABLE 7

AGE AND SIZE COMPOSITION OF YUKON DISTRICT SUMMER AND FALL CHUM SALMON  
CAPTURED WITH 5½ INCH MESH GILL NETS DURING 1966<sup>1/</sup>

AGE/SEX CLASS	SUMMER CHUMS <sup>2/</sup>				FALL CHUMS <sup>3/</sup>				TOTAL			
	No.	%	F.L.	Wt.	No.	%	F.L.	Wt.	No.	%	F.L.	Wt.
<u>Three-Year-Olds</u>												
Males	6	2.0	55.2	5.9	17	4.4	55.8	6.9	23	3.4	55.7	6.6
Females	4	1.3	52.5	5.3	25	6.5	55.0	6.1	29	4.2	54.7	6.0
Both Sexes	10	3.3	54.1	5.6	42	10.9	55.3	6.4	52	7.6	55.1	6.2
<u>Four-Year-Olds</u>												
Males	54	18.0	56.4	7.4	130	33.9	59.9	8.0	184	26.9	58.9	7.8
Females	157	52.3	55.7	6.1	150	39.1	57.3	6.5	307	44.9	56.5	6.3
Both Sexes	211	70.3	55.8	6.4	280	73.0	58.5	7.2	491	71.8	57.4	6.8
<u>Five-Year-Olds</u>												
Males	24	8.0	60.4	8.3	35	9.1	61.3	8.3	59	8.6	60.9	8.3
Females	55	18.4	57.4	6.4	27	7.0	57.7	6.4	82	12.0	57.5	6.4
Both Sexes	79	26.4	58.3	7.0	62	16.1	59.8	7.5	141	20.6	59.0	7.2
<u>Combined Ages</u>												
Males	84	28.0	57.5	7.5	182	47.4	59.8	7.9	266	38.9	59.1	7.8
Females	216	72.0	56.0	6.1	202	52.6	57.1	6.4	418	61.1	56.5	6.3
Both Sexes	300	100.0	56.4	6.5	384	100.0	58.4	7.1	684	100.0	57.5	6.9

<sup>1/</sup> Fork lengths in centimeters - weight in pounds

<sup>2/</sup> Captured during 6/12 - 7/14

<sup>3/</sup> Captured during 7/15 - 8/1

mesh gill nets during the 1966 season. Summer chum samples were collected during June 12 - July 14 and represent tagging and test fishing site catches made at Flat Island, Middle Mouth and Alakanuk. Fall chum samples were collected during July 15 - August 1 and represent Department test fishing catches and commercial catches made in the South Mouth.

Fall chum salmon differed from summer chum salmon in the following respects: larger size; greater percentages of females and 3 year olds; and lesser percentage of 5 year olds. The summer chum sample was composed of only 28% males as compared to 47% for Fall chum salmon. The unequal sex ratio found in the Summer chum sample is probably the result of selectiveness of the 5½ inch mesh for 4 year old females.

Table 8 compares age, sex and size composition of Summer chum salmon captured by 5½ inch mesh and 8½ inch mesh gill nets. These samples were taken during June and early July in the lower Yukon at Department tagging sites. This comparison indicates that the 8½ inch mesh "selected out" 4 and 5 year old males and the 5½ inch mesh "selected out" 4 year old females. These comparisons may be influenced by unequal sampling of the run in that both types of nets were not always fished during the same day.

Use of Age Composition Studies in Run Predictions: The percentage age compositions of samples collected from 1961 - 1966 are as follows:

<u>AGE CLASS</u>	<u>1961</u> <sup>1/</sup>	<u>1962</u> <sup>1/</sup>	<u>1963</u> <sup>1/</sup>	<u>1964</u> <sup>2/</sup>	<u>1965</u> <sup>2/</sup>	<u>1966</u> <sup>3/</sup>
3	4.1	1.9	6.0	33.2	0.2	7.6
4	75.3	69.3	83.3	63.0	97.3	71.8
5	20.6	28.8	10.2	3.7	2.5	20.6
6	0.0	0.0	.5	0.0	0.0	0.0
n	97	915	650	268	486	684

1/ Captured by fishwheel; mostly summer chums.

2/ Captured by 5½" - 8½" gill nets, mostly summer chums.

3/ Captured by 5½" - 8½" gill nets; summer and fall chums.

As can be seen above, the age compositions vary considerably from year to

TABLE 8

AGE AND SIZE COMPOSITION OF YUKON DISTRICT CHUM SALMON  
CAPTURED WITH 8½ INCH MESH GILL NETS (6/14-7/5) AND 5½ INCH  
MESH GILL NETS (6/12-30) DURING 1966

AGE/SEX CLASS	8½ INCH MESH NET				5½ INCH MESH NET			
	No.	Percentage	F.L. <sup>1/</sup>	Wt. <sup>2/</sup>	No.	Percentage	F.L. <sup>1/</sup>	Wt. <sup>2/</sup>
<u>Three-Year-Olds</u>								
Males	0	0.0	-	-	1	1.1	52.2	5.8
Females	1	0.4	55.0	6.5	0	0.0	-	-
Both Sexes	1	0.4	55.0	6.5	1	1.1	52.2	5.8
<u>Four-Year-Olds</u>								
Males	84	36.4	59.0	7.3	12	12.8	57.2	7.2
Females	55	23.8	56.5	6.2	53	56.4	55.5	6.1
Both Sexes	139	60.2	58.0	6.9	65	69.2	55.8	6.3
<u>Five-Year-Olds</u>								
Males	50	21.6	60.5	8.1	12	12.8	60.8	8.6
Females	41	17.8	58.1	6.8	16	17.0	57.9	6.6
Both Sexes	91	39.4	59.4	7.5	28	29.8	59.1	7.5
<u>Combined Ages</u>								
Males	134	58.0	59.6	7.6	25	26.6	59.0	7.8
Females	97	42.0	57.2	6.5	69	73.4	56.0	6.3
Both Sexes	231	100.0	58.6	7.1	94	100.0	56.8	6.7

1/ Fork length in centimeters

2/ Weight in pounds

year. There is some evidence that differences in age compositions, at least during years influenced by a "strong" year class, may be used to make general run predictions. It is apparent that the 1961 brood year stock experienced very good survival and these fish were unusually abundant during the 1964 - 1966 seasons. As discussed in the 1964 Annual Report, the comparatively high percentage of 3 year-olds in the 1964 sample indicated a strong return of 4 year olds in 1965. Also as speculated in the 1965 Annual Report, the 1966 run was expected to be composed of a "greater-than-normal" percentage of 5 year olds but there was no indication that the run would be above average in size. Although the actual numbers of chum salmon that returned during the 1965 and 1966 seasons are not known, these runs exhibited the above characteristics.

# SALMON FECUNDITY STUDIES

## INTRODUCTION

In 1966 ovary samples were collected from king, chum, and pink salmon for the purpose of determining the average fecundity. King salmon ovaries were collected from the Yukon River commercial fishery. Chum and pink salmon ovaries were taken from the Moses Point commercial fishery. Also chum salmon ovaries were collected from the Kotzebue commercial fishery.

The primary objectives of the salmon fecundity studies are to determine the average number of eggs by species in each area in relation to age at maturity, length, and weight, and to compare fecundity between areas.

## METHODS AND MATERIALS

Due to time and personnel considerations it was not feasible to collect ovary samples periodically throughout the salmon runs. Yukon River king salmon were sampled intermittently during the season. Primary emphasis was placed on sampling the large (greater than 30 lbs.) and small (less than 20 lbs.) kings. All the Moses Point chum and pink samples and the Kotzebue chum samples were collected on a single day, usually during the peak of the runs. Weight and length measurements were taken and scale samples were collected for age determinations. Each ovary sample was preserved in a 10% formalin solution immediately upon removal from the salmon. The number of eggs per sample was determined by making actual counts with the use of a hand tally register.

## RESULTS

King Salmon: A total of 22 Yukon River king salmon ovaries were collected. In Table 15 fecundity by age class is presented. For the combined sample the average fecundity per king salmon was 9,351 eggs with a range of 6,044 to 14,419 eggs. The average number of eggs for age 7<sub>2</sub> kings (10,703) greatly exceeded that of age 6<sub>2</sub> fish (8,063). Comparisons between other age classes could not be made due to lack of samples. Age determinations could not be assigned to four of the fish sampled.

Chum Salmon: A total of 3 Moses Point and 21 Kotzebue chum salmon ovaries were collected. Average fecundity by age class for each area is presented in Tables 16 and 17. Moses Point chums averaged 2,661 eggs per female. Due to the very limited samples it is not possible to compare fecundity between age classes. The average fecundity for Kotzebue chums was 3,499 eggs per female with a range of 2,641 to 4,767 eggs. The dominant age class, 4-year olds, averaged 3,369 eggs per fish. The limited ovary samples collected of 3 and 5-year olds precludes comparisons between age classes. However, it would be expected that fecundity would be greater for the older and larger fish.

Pink Salmon: Results of fecundity sampling of Moses Point pink salmon are presented in Table 16. The average fecundity of 20 pinks was 1,219 eggs per female with a minimum of 687 eggs and a maximum of 1,632 eggs.

## DISCUSSION

Fecundity sampling was limited in 1966 because ovary samples were not taken periodically throughout the season. In addition, the number

TABLE 15

## FECUNDITY OF YUKON RIVER KING SALMON, 1966

Age	Number	Mean Weight (pounds)	Mean Fork Length (cm)	Mean Orbit Length (cm)	Number of Eggs		
					Mean	Minimum	Maximum
5 <sub>2</sub>	1	15.00	80.5	75.5	9,159	-	-
6 <sub>2</sub>	12	21.88	88.8	82.8	8,063	6,044	10,778
7 <sub>2</sub>	5	35.60	105.7	96.2	10,703	7,095	14,419
?	4	34.13	104.9	97.4	11,572	10,428	14,065
TOTAL	22	26.91	95.2	88.2	9,351	6,044	14,419

TABLE 16

## FECUNDITY OF MOSES POINT CHUM AND PINK SALMON, 1966

Species	Age	Number in Sample	Mean Weight (pounds)	Mean Fork Length (cm)	Mean Orbit Length (cm)	Number of Eggs		
						Mean	Minimum	Maximum
Chum	4	2	7.00	57.8	53.3	2,782	2,715	2,849
	5	1	9.50	62.0	58.0	2,420	-	-
TOTAL		3	7.83	59.2	54.8	2,661	2,420	2,849
Pink	2	20	3.23	45.1	41.1	1,219	687	1,632

TABLE 17

## FECUNDITY OF KOTZEBUE DISTRICT CHUM SALMON, 1966

Age	Number in Sample	Mean Weight (pounds)	Mean Fork Length (cm)	Mean Orbit Length (cm)	Number of Eggs		
					Mean	Minimum	Maximum
3	3	7.92	60.8	57.0	3,714	3,347	4,056
4	12	9.54	65.2	60.9	3,369	2,641	4,423
5	2	10.88	67.5	62.8	4,024	3,280	4,767
?	4	9.63	65.4	61.0	3,468	2,981	4,057
TOTAL	21	9.45	64.8	60.5	3,499	2,641	4,767

of ovary samples taken was less than desired. Due to the above restrictions, only general comments regarding fecundity levels by species between areas and years (1965-66) will be discussed.

King Salmon: It is difficult to compare average fecundity for the combined age classes of Yukon River king salmon between the 1965 and 1966 samples. Sampling in 1966 attempted to collect ovaries from the younger and older aged fish. It appears that the level of fecundity for the dominant age 6<sub>2</sub> fish was similar for both years: 7,733 eggs (1965) and 8,063 eggs (1966).

Chum Salmon: It is interesting to note the substantially greater fecundity of Kotzebue chums compared to other areas. Due to their greater size, Kotzebue chums have a greater fecundity (3,499 eggs) than Norton Sound or Yukon River summer chums. The average fecundity of Norton Sound and Yukon River summer chums in 1965 was 2,981 and 2,323 eggs, respectively. The level of fecundity for Kotzebue chums is probably similar to that of Yukon River fall chums since both are similar in size.

Pink Salmon: Moses Point pink salmon averaged 1,219 eggs per fish in 1965 versus 1,372 eggs in 1966. It would be expected that the average fecundity in 1965 and 1966 would be similar since the pinks were nearly equal in size (mean orbit lengths of 41.1 and 41.9 cm.).

YUKON RIVER SALMON TAGGING  
STUDIES, 1965- 1966

INTRODUCTION

This report discusses tagging and recovery projects conducted during 1965 and 1966. In 1965 all salmon were tagged at the Flat Island site, while salmon were tagged at two sites, Flat Island and Middle Mouth, during 1966. Salmon have been tagged at the Flat Island site since 1963 which is located in the South Mouth approximately five miles northwest of Sheldons Point. The Middle Mouth site is located at the mouth of Kawanak Channel (Middle Mouth), and 1966 marked its first year of operation.

The main objectives of these studies were to determine run timing, differentiation of races, migration rates, population size and percentage utilization by the commercial fishery of the salmon runs. Although all species are tagged, these studies are designed for study of king salmon.

METHODS

Gill nets of varying mesh sizes were operated for the purpose of capturing salmon for tagging. In addition a single fishwheel was operated for the same purpose at Flat Island during 1965. Most of the fishing gear, including the fishwheel, was operated near the north bank of the South Mouth at the Flat Island site and near the south bank at the Middle Mouth Site.

Captured salmon were tagged with spaghetti tags consisting of 13 inch lengths of yellow plastic tubing, 1/16 inch in diameter. These tags were inserted with a special needle applicator approximately one inch below and slightly forward of the insertion of the dorsal fin. The tag legend included reward information and the mailing address of the Anchorage Office of the Alaska Department of Fish and Game.

A one-dollar reward was offered for each tag recovery made.

and publicity notices were posted in every village throughout the Alaskan portion of the drainage. Canadian Department of Fisheries personnel collected tag recoveries in Yukon Territory. Most of the tag recoveries made by commercial fishermen were returned attached to fish tickets. These fish tickets are completed when salmon deliveries are made to tender boats or shore plants and show the fisherman's name, date of catch and area of catch. Other recoveries were either collected by Department personnel or were mailed to the Anchorage Office by fishermen.

It was not possible to estimate the number of tags not returned but because of the widespread knowledge of the program and the publicity given to it, the numbers of unreported tags are believed to be small. Also the lack of tags returned from previous years tends to support this view.

The sex and fork length were recorded for every salmon tagged. Each tagged salmon was classified as to its condition upon release. Fish classified as Category I were considered in good condition, Category 2 consisted of fish of questionable condition, and Category 3 were considered to have been released in poor condition. Salmon that were taken from the net in very poor condition, i.e., bleeding from the gills, were not tagged. These fish were sampled for age, sex and size information and then were given to local processors or subsistence fishermen.

#### RESULTS - KING SALMON

##### Numbers Tagged and Captured

Table 18 shows the daily numbers of king salmon tagged and captured during the 1965 and 1966 seasons. A total of 1,116 king salmon was captured during the 1965 season of which 819 were tagged. In 1966, a total of 976 king salmon was captured of which 573 were tagged. About 33% of the total numbers caught both seasons were not tagged because of mortality or injuries sustained after capture.

## Effect of the Commercial Fishery on Tagging Site Catches

The tagging sites were located at the river mouths where salmon could be captured, tagged and released below the majority of the commercial fishing gear. Locating the tagging sites within the commercial fishery would produce the following problems associated with the determination of recovery rates and run timing and magnitudes:

1. The commercial catches made downstream would effect run timing and magnitude at the tagging site.
2. Tagged salmon when released are often disoriented or weakened by the tagging and handling operation and tend to mill or move downstream prior to resuming normal migration. An increase in the amount of commercial fishing gear in and adjacent to the tagging site areas would increase the selectivity of tagged salmon.

Ideally the tagging sites should be located just outside the mouths and below all of the commercial fishery, but lack of suitable camp sites and logistic problems have made this impossible to date.

Since only about 5% (estimate 15-20 fishermen) of the Yukon River commercial fishing gear is operated below Flat Island, it was thought that the tagging site catches would not be influenced by the commercial catches. Table 19 compares Flat Island tagging site catches made by a 25 fathom gill net (8½ inch mesh) during days open to 0, 6, 18 and 24 hours of commercial fishing for 1963 through 1966. The largest tagging site catches during the 4 year period were made during days closed to commercial fishing (57 kings per day) and the smallest tagging site catches were made during days open 24 hours to commercial fishing (10 kings per day). Surprisingly, the data indicates that the small segment of the commercial fishery located below Flat Island does effect the tagging site catches to a considerable degree.

The commercial fishery apparently had little influence on the Middle

TABLE 19

Mean Catches of King Salmon Taken At Flat Island Tagging Site During Days  
Closed to Commercial Fishing and Open 6, 18 and 24 Hours, 1963-1966<sup>1/</sup>

HOURS EACH DAY OPEN TO COMMERCIAL FISHING<sup>2/</sup>

<u>Year</u>	<u>0</u>	<u>6</u>	<u>18</u>	<u>24</u>	<u>Total</u>
1963	70 (3)	48 (5)	18 (6)	16 (5)	34 (19.0)
1964	70 (1)	27 (1)	55 (1.4)	20 (1.5)	42 (4.9)
1965	45 (3)	17 (8)	31 (7.8)	9 (8)	22 (26.8)
1966	53 (3)	27 (6.4)	22 (4.3)	3 (5)	23 (13.7)
1963-1966	57 (10)	26 (20.4)	27 (19.5)	10 (19.5)	27 (69.4)

1/ Catches are from a single 25 fathom gill net 8½ inch mesh)

2/ Number of days on a 24 hour basis are shown in parenthesis.

Mouth tagging site catches in 1966. Although not documented, it is estimated that less commercial fishing gear was located below the Middle Mouth site as compared to the Flat Island site.

#### Run Magnitude and Timing

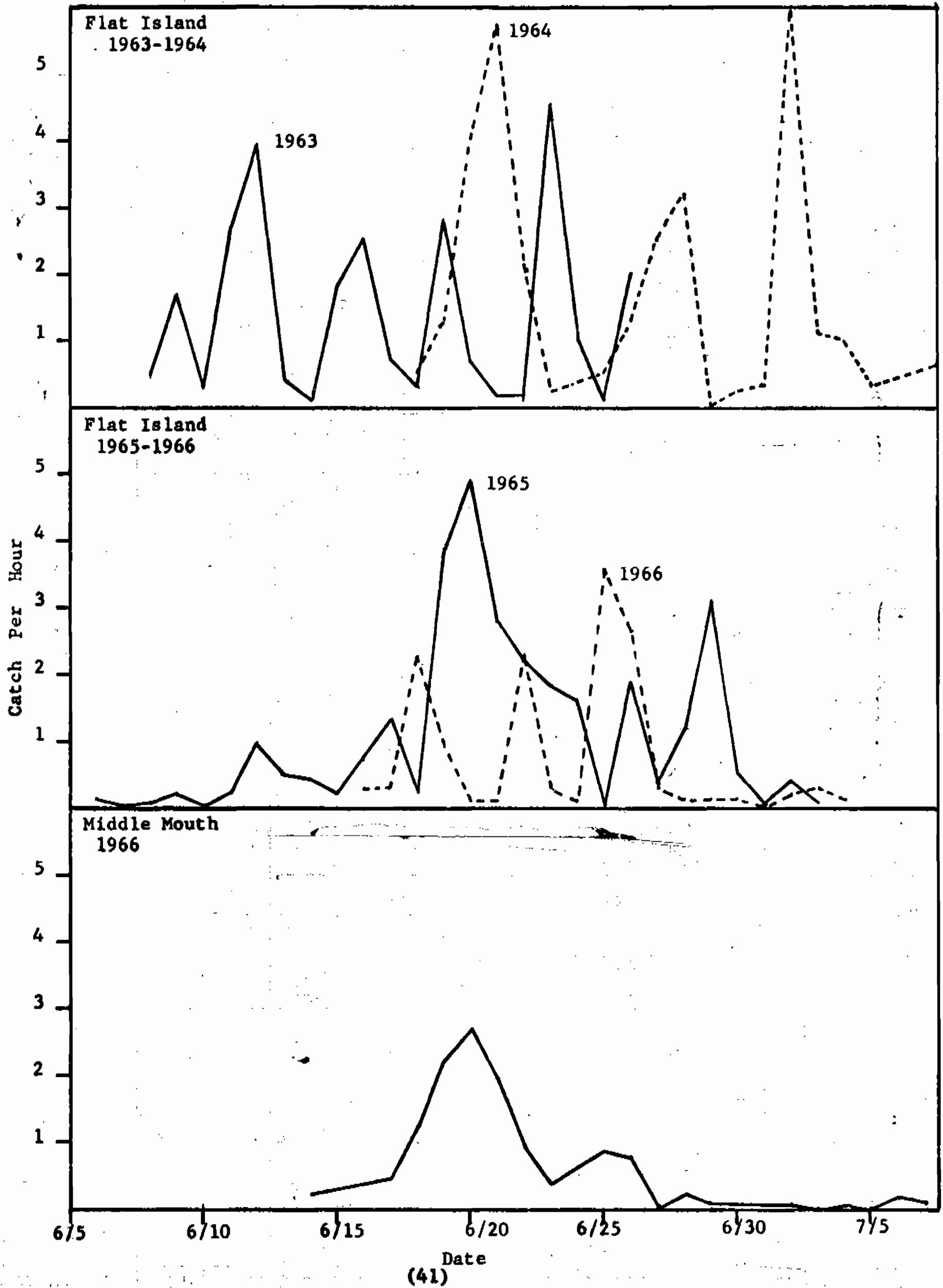
It should be pointed out that the catch per hour data presented in this report are probably affected by environmental conditions, <sup>(Hicks, 1965)</sup> varying fishing methods (position of the net, etc.) and other factors not necessarily related to salmon abundance. Also, as previously mentioned, the downriver commercial catches tend to limit tagging site catches. Even with these limitations, catch per unit of effort data is the best available indicator of run timing and relative run magnitude.

The catches shown in Table 18 do not necessarily reflect run magnitude or timing as varying amounts of gear were operated each day and season. A more meaningful indication of run magnitude and timing is shown in Figure 3. In this figure the catches per hour are compared for a 25 fathom gill net (8½ inch stretched mesh) operated during the 1963 - 1966 seasons. The Flat Island gill net was fished in the same general area each season. The figure does not show the timing and magnitudes of the early portion (first 2-4 days) of the 1963, 1964 and 1966 runs as a result of delays in setting out fishing gear. Appendix Table A-1 shows the number of hours fished and catch per hour for the Flat Island tagging site during 1963 - 1966.

The mean catch per hour (25 fathom, 8½ inch mesh net) at Flat Island was .89 and .77 for the 1965 and 1966 seasons respectively. The catch per hour for the middle mouth site was only .42 in 1966. This data, in support of commercial catch data previously discussed, indicates that the 1966 run into the South Mouth was similar or slightly smaller than in 1965, but the total Yukon River run was considerably smaller than in 1965 because of the indicated small Middle Mouth run.

FIGURE 3

King Salmon Catch per Hour with a 25 Fathom gill net (8½ inch mesh)  
Fished at Yukon River Tagging Sites during 1963-1966.



The mean catch per hour (25 fathoms, 8½ inch mesh net) at Flat Island was 1.40 and 1.55 for the 1963 and 1964 seasons respectively. Fewer days were fished and proportionately more of the fishing time occurred during the peak of the 1963 and 1964 runs. Therefore when comparing catch data for all four seasons (1963 - 1966), the 1963 and 1964 South Mouth runs were probably not as large as that indicated.

#### Gear Efficiency

Table 20 compares the catch per hour of various types of gear that were operated on similar dates during 1965 and 1966. This data shows that 8½ inch mesh gill nets were the most efficient in the capture of king salmon followed by 7 inch mesh gill nets and 10 inch mesh gill nets. The fishwheel, operated in 1965, captured king salmon at about the same rate as the 10 inch mesh gill net. Gill nets of 5½ inch mesh were fished only during periods of low king salmon abundance, and thus the comparisons with 8½ inch mesh gill nets are probably not valid. The various types of gear were fished in different locations in the vicinity of Flat Island which also probably influenced the catches to some degree. Appendix Table A-2 shows the numbers of salmon tagged and captured including the catch per hour data for all types of gear operated during 1965 and 1966. It is not possible to draw conclusions regarding gear efficiency in respect to capture of king salmon for much of this data as the various types of gear were not always fished on similar dates.

#### Sex and Size Composition of Tagged King Salmon

As shown in Appendix Table A-3, tagged king salmon taken in all gill nets during 1965 and 1966 were composed of approximately 60% males and 40% females, each having mean fork lengths of about 89 centimeters (orbit lengths of 82-83 cm.). Tagged king salmon captured with 10 inch mesh gill nets in 1965 had mean fork lengths of 91.6 cm. compared to 89.4 cm. and 84.5 for

TABLE 20

Catch Per Hour of King Salmon Recorded for Various Types of Gear,  
Yukon River, 1965-1966

(All Nets were 25 F. in Length)

Type of gear	Year	Dates Fished	Hours Fished	Catch Per Hour
<b>GILL NETS</b>				
10 inch mesh <sup>1/</sup>	1965	6/13-14	376	.22
8½ inch mesh		6/16-7/2	456	1.44
7 inch mesh <sup>1/</sup>	1965	6/13,14,16,17,20	128	.91
8½ inch mesh		21,23,24,27	216	1.58
7 inch mesh <sup>1/</sup>	1966	6/13-16,6/23	117	.26
8½ inch mesh		6/29-30,7/7-8	198	.76
5½ inch mesh <sup>1/</sup>	1966	6/13-16	190	.08
8½ inch mesh		7/2-3	212	.02
5½ inch mesh <sup>2/</sup>	1966	6/28-7/10	225	.07
8½ inch mesh			238	.08
FISHWHEEL <sup>1/</sup>	1965	6/8-7/4	503	.23
GILL NETS (ALL MESH SIZES)			2,037	.49

1/ Flat Island Site

2/ Middle Mouth Site

8½ inch and 7 inch mesh gill nets respectively.

The mean fork length of all king salmon captured by the fishwheel in 1965 was 79.7 cm., almost 10 centimeters less than the gill net sample (all mesh sizes). This was the first known instance of a fishwheel being operated at the river's mouth. Previous studies in the Taku River have shown that fishwheels are selective to the smaller sized king salmon. Although the fishwheel probably "selected out" the smaller sized king salmon, it may have taken a more representative sample of the run than any of the gill nets.

#### Tag Recovery

General: Table 21 shows the numbers of king salmon tagged and recovered during the study period. In 1965 a total of 318 or 38.8% of the king salmon tagged at the Flat Island site was recovered. The 1966 recovery rates were 26.5% (n=104) for Flat Island tags and 37.6% (n=68) for Middle Mouth tags for a combined value of 30.0% (n=172).

Over 90% of all recoveries each season were taken in the lower 279 miles of river with 8½ inch mesh gill nets, most of which were operated by commercial fishermen.

Differences in Recovery Rates: The 1966 recovery rate for Flat Island tagged king salmon was considerably lower than that recorded for the Middle Mouth site during the same year and for the Flat Island site during 1965. These differences may be a result of the following factors:

1. Greater mortality of Flat Island tagged king salmon. Although tagged mortality may have been a contributing factor, it is very doubtful that it could have accounted entirely for these differences. Approximately 25% of the king salmon tagged at Flat Island in 1966 would have to have sustained mortality to account for the differences in the recovery rates

TABLE 21  
 Numbers of King Salmon Tagged and Recovered  
 During 1965-1966, Yukon River<sup>1/</sup>

Tagging Gear	Flat Island, 1965		Flat Island, 1966		Middle Mouth, 1966		Totals, 1966	
	Tagged	Recovered	Tagged	Recovered	Tagged	Recovered	Tagged	Recovered
10 inch mesh	63	23(36.5%)	0	-----	0	-----	0	-----
8½ inch mesh	597	246(41.2%)	377	104(27.5%)	172	66(38.4%)	549	170(31.0%)
7 inch mesh	48	11(22.9%)	10	0(0)%	0	-----	10	0(0%)
5½ inch mesh	0	-----	5	0(0)%	9	2(22.2%)	14	2(14.3%)
Totals - gill net	708	279(39.4%)	392	104(26.5%)	181	68(37.6%)	573	172(30.0%)
Fishwheel	111	38(34.2%)	0	-----	0	-----	0	-----
Totals - All Gear	819	318(38.8%)	392	104(26.5%)	181	68(37.6%)	573	172(30.0%)

<sup>1/</sup> % recovery in parenthesis

noted.

2. Approximately 50% of the Flat Island tagged king salmon were released after June 22 when commercial fishing time was reduced from 4 to 3 days a week in the lower 160 miles of river. By comparison only 33% of the Middle Mouth tagged kings were released after June 22. Therefore king salmon tagged at Flat Island, as a group, were exposed to less fishing effort during 1966.

Distribution of Tag Recoveries by Recovery Location: Table 22

shows the distribution of 1965 and 1966 tag recoveries for various locations in the Yukon River drainage. Differences in the distribution of tag recoveries between the two tagging sites in 1966 are largely dependent on the distribution of commercial fishing gear. For example a much greater amount of gear was fished in the South Mouth area especially near Flat Island when compared to the Middle Mouth area. The majority of the Flat Island recoveries were made in the lower 24 miles of the South Mouth, while the majority of the Middle Mouth site recoveries were made above Fish Village. Only 1.9% and 3.5% of all the 1965 and 1966 recoveries respectively were made above Mile 279.

The movement or distribution of tagged salmon after release in the lower river is important in evaluating tag recovery data. In order to obtain unbiased data necessary in harvest rate and population size computations, the tagged salmon should be randomly distributed within the migrating population. For example a majority of the king salmon tagged at the Flat Island site were captured near the north shore. It was speculated that after release these salmon would not "mix" with the untagged portion of the run but would continue to migrate upstream along the north shore in the lower river.

The recovery location in respect to north and south shore was

TABLE 22

RECOVERIES OF TAGGED KING SALMON BY AREA  
1965 - 1966

General Recovery Area	Mileages From Tagging Site	Recoveries By Tagging Site			Total
		1965 Flat Is.	1966 Flat Is.	1966 Middle Mouth	
<u>South Mouth</u>					
Below Flat Island	-	30	8		8
Flat Island (Tag. Site)	0	58	22		22
Flat Island - Alakanuk	1 - 11	69	29	1	30
Alakanuk	17	49	4		4
Kwiguk - Emmonak	24	46	13		13
Aproka - Kwikpak Passes	30 - 43	5	1		1
<u>Middle Mouth</u>					
Mouth (Tag. Site)	0			5	5
Snotty Slough	20			5	5
Lower Aproka Pass	25 - 35			4	4
New Hamilton	40			1	1
Recovery Location Unknown				6	6
<u>North Mouth</u>					
Hamilton	-			1	1
<u>Main River</u>					
Fish Village - Anuk River	52 - 63	21	12	14	26
Patsy's Cabin-Mt. Village	71 - 87	8	3	4	7
Old Andreafsky	97	3		4	4
Mouth of Andreafsky River	104	1		1	1
Goose Island	109	2	1		1
Pilot Station	122	6	4	8	12
Pilot Village	138	1	1	1	2
Marshall	161	1		2	2
Ingrihak	170		1		1
Russian Mission	213	2		1	1
Paimiut	251	1			
Holy Cross	279		2	2	4
Anvik and Vicinity	317 - 366	1			
Nulato	484			1	1
Ruby and Vicinity	553 - 582	4			
Tanana	695	1			
Rampart Canyon	720			1	1
Fort Yukon	1,002			1	1
Dawson	1,319		1	1	2
Carmacks	1,550		1		1
Recovery Area Unknown		9	1	4	5
<b>Total Recoveries</b>		<u>318</u>	<u>104</u>	<u>68</u>	<u>172</u>

obtained for 68 recoveries of king salmon tagged at Flat Island during 1966 (Table 23). Only those recoveries made below Mile 62 were used. Of the 68 recoveries, 43% and 57% were taken near the north and south shore respectively. The large numbers of north shore recoveries in the "Flat Island and Vicinity" area can probably be attributed to commercial fishing gear being operated near the release points for tagged salmon. The data in Table 23 shows a general random pattern of distribution of tagged salmon in the lower river. A more precise description of salmon movements cannot be shown since the actual distribution of commercial fishing gear was not documented.

Distribution of Tag Recoveries by Tagging Date: It has been suspected but never shown that the Yukon run is composed of separate races bound for different spawning areas, each possibly differing in run timing, relative abundance, productivity, etc. (See Annual Report for 1964, pgs 127-128). A tag and recovery program is one possible method of identifying and separating these races, assuming they differ in run timing and destination. Similar to that found in other large river systems (Columbia, Sacramento Rivers), Yukon king salmon bound for the upper portions of the drainage may migrate earlier in the season.

Table 24 shows the number of recoveries made by tagging date (10-day periods) for the area above Mile 484 during 1962, 1963, 1965 and 1966. The 1964 data was not used due to the unusual late season and entry of the run into the river that year. The 1963, 1965 and 1966 data represent salmon tagged at the river mouth (Mile 0) while in 1962 salmon were tagged at Mile 96. For comparative purposes, the grouping of the 1962 recoveries was obtained by subtracting 5 days from each tagging date (assuming a migration rate of king salmon of about 20 miles a day). In addition the percentages of total tags applied and total recoveries made above 484

TABLE 23

Recoveries by Shore Position of King Salmon  
Tagged at Flat Island (North shore) During 1966<sup>1/</sup>

<u>Recovery Location</u>	<u>North Shore Recoveries</u>	<u>South Shore Recoveries</u>	<u>Total Recoveries</u>
Below Flat Island	0	8	8
Flat Island & Vicinity	16	1	17
Mile 3 - 9	10	17	27
Mile 17 - 24	1	6	7
Mile 30 - 43	1	0	1
Mile 52 - 62	<u>1</u>	<u>7</u>	<u>8</u>
All Locations	29	39	68

<sup>1/</sup> Recoveries made above Mile 62 not shown

during each tagging period are compared in Table 24.

Tagging dates for salmon recovered above Mile 484 ranged from June 9 to June 30 during the 5 year period with the majority of recoveries having been tagged during June 11 to June 20. However the limited data shows that the percentage of total recoveries for each tagging period was dependent on the numbers tagged, and there was no indication that king salmon bound for the upper river migrated early in the season.

Recovery of King Salmon Classified as to Condition: Table 25

compares recovery of tagged salmon according to their condition upon release. Salmon classified as Condition 2 and 3 had lower recovery rates when compared to the Condition 1 group. This same tendency was found to occur in 1963 and 1964 studies which indicates a higher mortality rate of Condition 2 and 3 tagged salmon after release. This should be taken into account in population estimates or harvest rate computations.

Migration Rates of Tagged King Salmon: Table 26 presents the migration rates (miles travelled per day) for recoveries made in various areas of the river during 1965 and 1966. The mean migration rates of all recoveries were 11.8 and 21.2 miles per day during 1965 and 1966 respectively. The data indicates that the migration rate increases as the run progresses upriver. However migration rates calculated from tag and recovery data are probably influenced by the following:

1. Tagged fish may be released in a weakened or disoriented condition which results in their slower upstream progress, especially in the lower river.
2. The percentage of error in calculations of normal rates of travel is, in most cases, greater over the smaller the distances travelled before recovery is made.

TABLE 24

Tagging Dates of Yukon River Salmon Recoveries Made  
Above Mile 484 During 1962, 1963, 1965 and 1966.

Tagging Dates	Number of Recoveries					Percentage of	
	1962	1963	1965	1966	Total	Total Recoveries <sup>1/</sup>	Total Tags <sup>2/</sup>
June 1-10	0	0	1	0	1	4	3
June 11-20	3	5	2	4	14	59	57
June 21-30	6	0	2	1	9	37	35
July 1-10	0	0	0	0	0	0	4
July 11-20	0	0	0	0	0	0	.8
July 21 +	0	0	0	0	0	0	.2
	—	—	—	—	—	—	—
Totals	9	5	5	5	24	100%	100%

<sup>1/</sup> Recoveries above Mile 484

<sup>2/</sup> Total Tags applied at all tagging sites

TABLE 25

Percentage Recovery For Tagged King Salmon Classified as to  
Condition During 1965 - 1966, Yukon River

Condition Classification	Numbers Tagged				Percentage Recovery			
	1965 F.I.	1966		Total	1965 F.I.	1966		Total
	F.I.	M.M.			F.I.	F.I.	M.M.	
1	622	304	105	409	40.3	29.3	40.0	32.0
2	148	87	67	154	34.4	17.2	31.3	23.4
3	45	1	6	7	33.3	0	33.3	28.6
Unclassified	<u>4</u>	<u>0</u>	<u>3</u>	<u>3</u>	<u>25.0</u>	<u>0</u>	<u>100.0</u>	<u>100.0</u>
Totals	819	392	181	573	33.8	26.5	37.6	30.0

F.I. Flat Island Site

M.M. Middle Mouth Site

TABLE 26

Migration Rates of Yukon River King Salmon Recoveries, 1965-1966

Recovery Area	1965 1/		1966 2/	
	No. of Recoveries	Average Miles Per Day	No. of Recoveries	Average Miles Per Day
Alakanuk-Anuk River	67	7.3	32	10.7
Mt. Village-Koyukuk	21	12.2	23	18.3
Above Koyukuk	3	28.1	5	30.6
All Areas	91	11.8	60	21.2

1/ All salmon tagged at Flat Island

2/ Alakanuk-Anuk River recoveries include only Flat Island tags. The other recoveries shown include both Flat Island and Middle Mouth tags.

## Population Estimate

Any population estimate of the king salmon run must take the following factors into consideration:

1. Relatively small numbers were tagged and recovered.
2. Non-random tagging and recovery.
  - (a) Salmon were not always tagged in proportion to their relative abundance.
  - (b) Gear selectivity: Tagging site gear, mainly 8½ inch mesh nets, sampled a somewhat different age, sex and size segment of the run than did the upper river fishwheel fishery.
  - (c) Tagged fish are more susceptible to capture in the lower river. This is a result of milling of tagged fish caused by their disorientation or weakened condition.
  - (d) Tagged fish may not be randomly distributed with the untagged portion of the population. As discussed previously, this does not seem to be a problem for Flat Island king salmon tagged during 1966.
3. Tag Loss: There were one or two unverified reports by fishermen of salmon taken with missing tags.
4. Mortality of Tagged Salmon: Although salmon with bleeding gills or in a very weakened condition were not tagged, it is probable that a few died as a result of the tagging and handling operation.
5. Unreported Tag Recoveries.

Table 27 shows the relationship of tag recoveries to catches for various areas of the Yukon River during the study period. The ratios of recoveries to total catch for 1966 were more consistent when the data from both tagging sites were used versus the data from a single tagging site.

TABLE 27

RELATION OF TAG RECOVERIES TO CATCHES  
OF KING SALMON FOR VARIOUS AREAS OF THE YUKON RIVER, 1965-1966  
(INCLUDES YUKON TERRITORY CATCHES)

Area	Catches			No. of Recoveries	Recoveries: Total Catch
	Commercial	Subsistence	Total		
<u>1965 (Flat Island)</u>					
Mouth - Anuk R. (Y-1)	89,268	783	90,051	278	1:324
Anuk R. - Marshall (Y-2)	23,763	2,780	26,543	22	1:1207
Marshall - Holy Cross	3,204	3,744	6,948	3	1:2,316
Above Holy Cross	<u>4,437</u>	<u>12,146</u>	<u>16,583</u>	<u>6</u>	<u>1:2,764</u>
	120,672	19,453	140,125	318 <sup>1/</sup>	1:441
<u>1966 (Flat Island)</u>					
Mouth - Anuk R. (Y-1)	70,783	1,242	72,025	89	1:809
Anuk R. - Marshall (Y-2)	16,927	1,506	18,433	9	1:2,048
Marshall - Holy Cross	3,612	3,445	7,057	3	1:2,352
Above Holy Cross	<u>5,038</u>	<u>8,069</u>	<u>13,107</u>	<u>2</u>	<u>1:6,553</u>
	96,360	14,262	110,622	104 <sup>2/</sup>	1:1,064
<u>1966 (All Sites)</u>					
Mouth - Anuk R. (Y-1)	70,783	1,242	72,025	126	1:572
Anuk R. - Marshall (Y-2)	16,927	1,506	18,433	29	1:636
Marshall - Holy Cross	3,612	3,445	7,057	6	1:1,176
Above Holy Cross	<u>5,038</u>	<u>8,069</u>	<u>13,107</u>	<u>6</u>	<u>1:2,185</u>
	96,360	14,262	110,622	172 <sup>3/</sup>	1:643

1/ Includes 9 recoveries from unknown areas

2/ 1 recovery from unknown area

3/ 5 recoveries from unknown area

Table 28 presents a number of simple Petersen estimates of the 1966 run size using different sets of data. These estimates, excluding Methods VIII and IX, ranged from 310,000 to 387,000. Method VIII and IX are estimates of just the middle mouth and south mouth runs respectively which totalled 282,264. This estimate does not include North Mouth (Apoon Pass), Kwiguk Pass, Alakanuk Pass and Bugomowik Pass runs.

The accuracy of these estimates is not known but Methods V-VII (310,000 - 342,000) are considered more reliable due to the following factors:

1. Only Condition 1 tags and recoveries were used.
2. Only subdistrict #1 and #2 catches or catches by 8 $\frac{1}{2}$  inch mesh nets were used.
3. Recoveries and catches made in the vicinity of the South Mouth from Flat Island downstream were not included in the computations.

The population estimates, as shown in Table 28, are probably too high as a result of biases such as unreported tag recoveries, tag loss, mortality of tagged fish, etc.

#### RESULTS - CHUM SALMON

##### Numbers tagged and captured

Table 29 shows the daily numbers of chum salmon captured and tagged at all sites during 1965 and 1966. A total 1,065 was tagged at the Flat Island site during 1965 while a combined total of only 299 was tagged at two sites during 1966. More chums were tagged during 1965 due to the operation of a fishwheel which was relatively efficient in the capture of this species.

##### Run Timing

The first chum salmon was captured on June 9, 1965 and on June 14 at the Middle Mouth site in 1966. Sustained tagging site catches were made beginning June 12 and June 15 during 1965 and 1966 respectively.

TABLE 28

ALTERNATIVES FOR COMPUTING POPULATION ESTIMATES  
(PETERSEN METHOD) OF YUKON RIVER KING SALMON, 1966  
FLAT ISLAND-MIDDLE MOUTH DATA COMBINED

Data Used	Tags	Recoveries	Catch <sup>1/</sup>	Pop. Estimate
I. All recoveries Total catch	573	172	111,000	369,784
II. All recoveries by 8½ inch gear, Commercial Catch <sup>2/</sup>	573	169	96,000	325,491
III. Y-1 recoveries Y-1 Total Catch	573	126	72,000	327,428
IV. Condition 1 tags only All recoveries minus Flat Is. and downstream recoveries. Total Catch minus Flat Is. and downstream catch.	384	106	107,000	387,622
V. Same as IV but recoveries by 8½ inch gear only <sup>2/</sup> Commercial Catch with 8½" gear.	384	103	92,000	342,990
VI. Same as IV but Y-1 recoveries and Y-1 Total Catch	384	89	72,000	310,651
VII. Same as IV but Y-2 recoveries and Y-2 Total Catch only	384	22	18,433	321,739
<u>Flat Island Data Only</u>				
VIII. Condition 1 tags, 334-12 Commercial Catch and recoveries, minus Flat Is. and downstream recoveries and catches.	279	29	16,000	153,931
<u>Middle Mouth Data Only</u>				
IX. Condition 1 tags, 334-15 Commercial Catch and recoveries	105	9	11,000	<u>128,333</u>
Totals of VIII and IX (Estimate of South Mouth and Middle Mouth Runs)				282,264

<sup>1/</sup> Commercial and subsistence catches including Yukon Territory catches.

<sup>2/</sup> Does not include 3 fishwheel recoveries. Does not include 9 recoveries made by unknown gear (probably mostly 8½ inch nets)

TABLE 29

Numbers of Chum Salmon Tagged and Captured During 1965-1966,  
Yukon River

Date Tagged	Flat Island, 1965 <sup>1/</sup>			Flat Island, 1966			Middle Mouth, 1966			Combined Sites, 1966		
	Tagged	Unt.	Total	Tagged	Unt.	Total	Tagged	Unt.	Total	Tagged	Unt.	Total
June												
6	0	0	0									
7	0	0	0									
8	0	0	0	0	0	0				0	0	0
9	1 (1)	0	1 (1)	0	0	0				0	0	0
10	0	0	0	0	0	0				0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	2 (1)	7	9 (1)	0	0	0	0	0	0	0	0	0
13	0	5	5	0	0	0	0	0	0	0	0	0
14	1	1	2	0	0	0	0	1	1	0	1	1
15	5	12	17	1	1	2	0	0	0	1	1	2
16	98 (44)	15	113 (44)	0	19	19	0	5	5	0	24	24
17	270 (192)	395 (26)	665 (218)	8	9	17	3	5	8	11	14	25
18	40 (26)	27 (4)	67 (30)	26	28	54	6	8	14	32	36	68
19	15 (13)	13	28 (13)	7	27	34	8	6	14	15	33	48
20	177 (157)	273 (132)	450 (289)	2	6	8	0	3	3	2	9	11
21	38 (38)	277 (108)	315 (146)	1	1	2	0	0	0	1	1	2
22	78 (68)	58 (2)	136 (70)	12	20	32	12	5	17	24	25	49
23	70 (64)	31	101 (64)	3	12	15	2	1	3	5	13	18
24	128 (115)	65 (21)	193 (136)	1	6	7	8	8	16	9	14	23
25	5 (3)	9 (6)	14 (9)	4	11	15	17	24	41	21	35	56
26	5	3	8	10	10	20	6	1	7	16	11	27
27	5	270	275	0	4	4	0	0	0	0	4	4
28	10 (6)	3 (1)	13 (7)	1	4	5	2	1	3	3	5	8
29	17 (16)	9 (1)	26 (17)	6	12	18	1	37	38	7	49	56
30	4 (3)	4 (2)	8 (5)	3	5	8	0	59	59	3	64	67

TABLE 29 (Continued)

Date	Flat Island, 1965 <sup>1/</sup>			Flat Island, 1966			Middle Mouth, 1966			Combined Sites, 1966		
	Tagged	Unt.	Total	Tagged	Unt.	Total	Tagged	Unt.	Total	Tagged	Unt.	Total
July												
1	5 (5)	0	5 (5)	4	2	6	0	0	0	4	2	6
2	11 (9)	20	31 (9)	19	13	32	3	3	6	22	16	38
3	78 (76)	33 (3)	111 (79)	9	7	16	2	0	2	11	7	18
4	2 ( 2)	0	2 ( 2)	7	11	18	21	25	46	28	36	64
5				4	33	37	3	15	18	7	48	55
6				10	20	30	22	44	66	32	64	96
7				3	5	8	4	9	13	7	14	21
8				16	25	41	0	7	7	16	32	48
9				11	14	25	5	11	16	16	25	41
10				6	8	14	0	0	0	6	8	14
Totals	1065 (839)	1530 (306)	2595 (1145)	174	313	487	125	278	403	299	591	890

<sup>1/</sup> Numbers of chums captured by fishwheel are shown in parenthesis

Figure 4 depicts the timing of the 1965 and 1966 runs at the Flat Island site.

The catch per hour data is from a single 25 fathom, 8½ inch mesh gill net fished in the same general area each season. Chum salmon were most abundant from June 17 to about June 26 during both seasons.

#### Gear Efficiency

Appendix Table A-6 shows numbers captured and tagged by each type of gear fished during the two seasons. Also the number of hours fished and the resultant catch per hour of each gear type is presented in this table. Much of this data is not comparable as the various gear types were often fished during different days and, therefore, during different stages of the run.

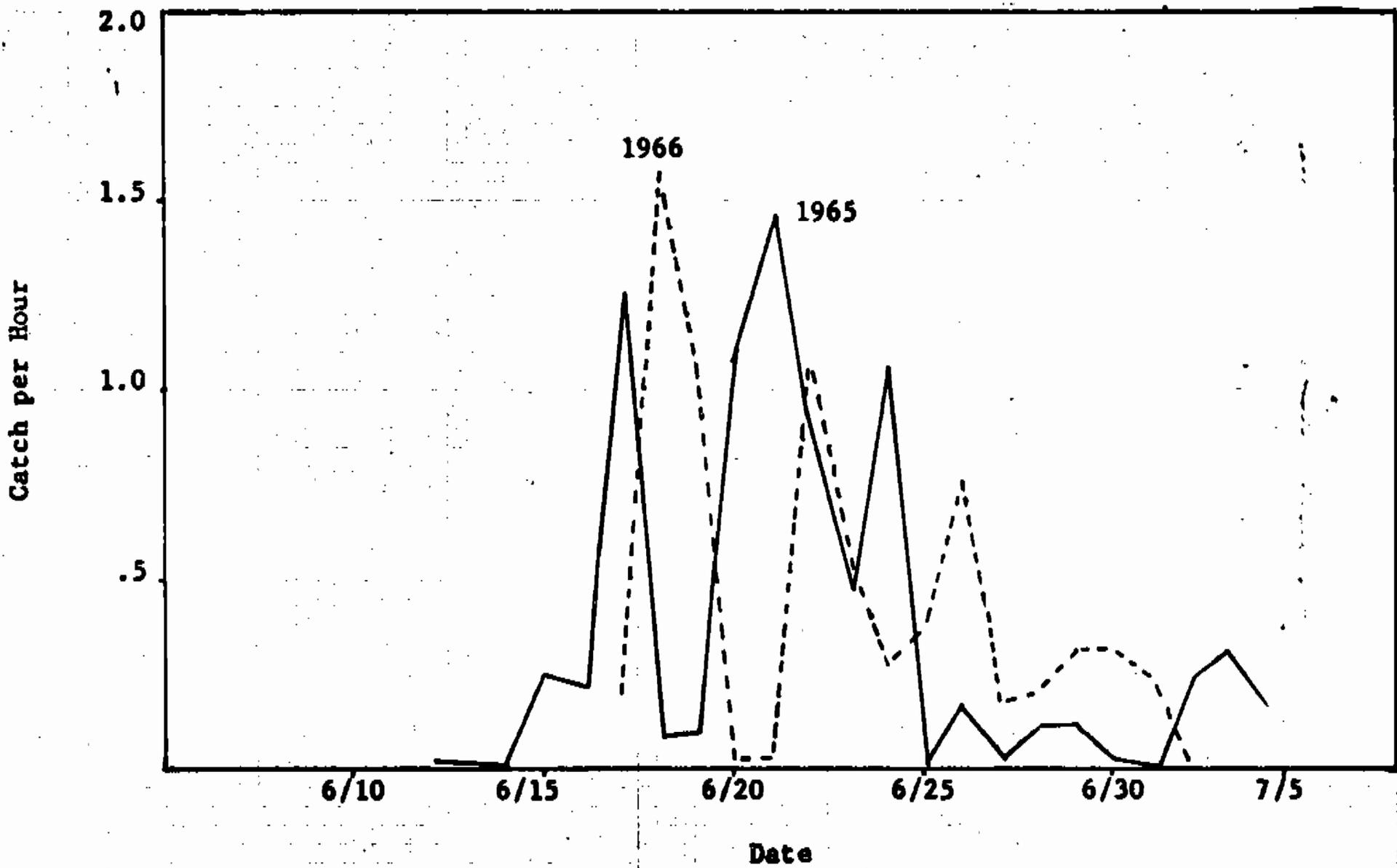
However, some comparisons can be made. During 1965 the fishwheel and 8½ inch mesh gill nets were fished throughout most of the June 6- July 4 period. The fishwheel catch per hour (2.28) during this time was much greater than that for 8½ inch mesh gill nets (.40). The catches per hour for all gear types fished during 1966 were less than in 1965 which indicates a smaller run.

#### Sex and Size Composition of Tagged Chum Salmon

Appendix Table A-7 shows the mean fork length and sex composition for each type of gear. The very limited data indicates that the 5½ inch mesh gill nets were selective to the smaller fish, most of which are females, and the 7 inch mesh gill nets were selective to the larger fish, most of which are males. The larger mesh gill nets (8½ and 10 inch) may not be very selective for size as most of the chum salmon captured in this gear were not gilled but became entangled by their mouths or snouts. The fishwheel sample was composed of a greater percentage of females (52%) compared to all gill nets operated during 1965 with the exception of the 5½ inch mesh gill net. Larger samples collected throughout the run are required before any definite statements regarding selectivity by gear can be made.

FIGURE 4

CHUM SALMON CATCH WITH A 25 FATHOM  
GILL NET (8½" MESH) FISHED AT FLAT ISLAND  
DURING 1965 AND 1966



Tag Recovery

Table 30 shows the numbers tagged and recovered during the study period. A total of 64 or 6.0% of the chum salmon tagged during 1965 were recovered. In 1966 a total of only 12 or 4.0% of the tags out were recovered. Table 31 shows the area of recovery for all 1965 and 1966 tag recoveries.

Recovery rates for chum salmon tagged at the river mouth during the 1963-1966 period has ranged from 4.0% in 1966 to 11.9% in 1963. Only 117 and 136 chum salmon were tagged at the Flat Island site during 1963 and 1964 respectively.

TABLE 30

Numbers of Chum Salmon Tagged by Gear and Recovered  
During 1965-1966, Yukon River<sup>1/</sup>

Tagging Gear	Flat Island, 1965		Flat Island, 1966		Middle Mouth, 1966		Combined Sites, 1966	
	Tagged	Recovered	Tagged	Recovered	Tagged	Recovered	Tagged	Recovered
10 inch mesh	20	5(25.0%)	0	-	0	-	0	-
8½ inch mesh	103	10( 9.3%)	89	7(7.9%)	65	3(4.6%)	154	10(6.5%)
7 inch mesh	16	3(18.8%)	23	0(0.0%)	0	-	23	0(0.0%)
5½ inch mesh	82	1(1.2%)	62	0(0.0%)	60	2(3.3%)	122	2(1.1%)
Totals Gill Net	226	19(8.4%)	174	7(4.0%)	125	5(4.0%)	299	12(4.0%)
Fishwheel	839	45(5.4%)	0	-	0	-	0	-
Totals - All Gear	1,065	64(6.0%)	174	7(4.0%)	125	5(4.0%)	299	12(4.0%)

<sup>1/</sup> Percentage Recovery in parenthesis

TABLE 31

Recoveries of Tagged Chum Salmon By Area  
1965-1966

<u>Area of Recovery</u>	<u>Mileages fr. Tagging Site</u>	<u>1965</u> <sup>1/</sup>	<u>1966</u> <sup>2/</sup>
<u>South Mouth</u>			
Below Flat Island		7	
Flat Island (tagging site)	0	6	2
Flat Is. - Alakanuk	1-11	12	2
Alakanuk	17	7	
Kwiguk - Emmonak	24	2	1
Aproka - Kwikpak Passes	30-43	1	
<u>Middle Mouth</u>			
Snotty Slough	20		2
<u>Main River</u>			
Fish Village - Anuk River	52-63	2	1
Patsy's Cabin - Mt. Village	71-87	5	
Old Andreafsky	97		1
Mouth, Andreafsky River	104	2	
Pilot Station	122	1	2
Ohagamut	185	1	
Russian Mission	213	2	
Holy Cross	279	2	
Mouth, Bonasila River	306	2	
Anvik & Vicinity	317- 366	3	
Nulato	484	2	
Galena	530	1	
Rampart	763	1	1
<u>Koyukuk River</u>			
Huslia	711	1	
<u>Recovery Area Unknown</u>	--	4	
<b>TOTAL RECOVERIES</b>		<b>64</b>	<b>12</b>

1/ Flat Island tagging site2/ Flat Island and Middle Mouth tagging sites

TABLE A-1

KING SALMON FISHING EFFORT FOR A 25 F. GILL NET (8½ inch mesh), FLAT ISLAND  
YUKON RIVER, 1963-1966

Date	1963			1964			1965			1966		
	Hours Fished	No. of Kings	Catch Per Hr.	Hours Fished	No. of Kings	Catch Per Hr.	Hours Fished	No. of Kings	Catch Per Hr.	Hours Fished	No. of Kings	Catch Per Hr.
June 6							6.5	1	0.15			
7							18.4	0	0			
8	24	11	0.46				24	2	0.08			
9	24	41	1.71				24	5	0.21			
10	24	6	0.25				24	0	0			
11	24	64	2.67				24	5	0.21			
12	24	95	3.96				24	23	0.96			
13	24	10	0.42				24	11	0.46	7.5	0	0
14	24	2	0.08				24	10	0.42	24	0	0
15	24	44	1.83				24	5	0.21	17.5	0	0
16	24	61	2.54				24	17	0.71	14	4	.29
17	24	13	0.75				24	31	1.29	24	7	.29
18	24	7	0.29	4	2	0.50	24	1	0.15	24	54	2.25
19	24	68	2.83	3	11	1.33	24	91	3.79	24	22	.92
20	24	16	0.67	8	33	4.13	24	117	4.88	24	1	.04
21	24	2	0.08	8.5	48	5.65	24	66	2.75	24	1	.04
22	24	4	0.17	7.7	16	2.08	24	53	2.21	24	55	2.29
23	24	109	4.54	4	1	0.25	24	42	1.75	24	6	.25
24	24	25	1.04	0	-	-	24	38	1.58	24	4	.17
25	24	3	0.13	5.3	3	0.57	24	0	0	24	86	3.58
26	24	51	2.13	6	8	1.33	24	45	1.86	24	63	2.63

TABLE A-1 (CONT.)

Date	1963			1964			1965			1966		
	Hours Fished	No. of Kings	Catch Per Hr.	Hours Fished	No. of Kings	Catch Per Hr.	Hours Fished	No. of Kings	Catch Per Hr.	Hours Fished	No. of Kings	Catch Per Hr.
<b>June</b>												
27				6	15	2.50	24	7	0.29	24	9	.38
28				6	19	3.17	24	1	0.15	24	29	1.21
29				4	0	0	24	1	0.15	24	75	3.13
30				4.5	1	0.22	24	1	0.15	24	11	.46
<b>July</b>												
1				4	1	0.25	24	0	0	24	2	.03
2				3	18	6.00	24	5	0.21	24	9	.38
3				8	9	1.13	24	7	0.29	24	1	.04
4				9	9	1.00	6	1	0.15	24	2	.08
5				10.5	3	0.29				24	0	0
6				9.5	4	0.42				14	0	0
7				5	0	0				24	0	0
8				4.7	3	0.64				15	0	0
9				1.7	2	1.13						
10				2.7	1	0.37						
11				1.5	0	0						
12				1	3	3.00						
13				3.3	1	0.31						
<b>TOTALS</b>	<b>456</b>	<b>637</b>	<b>1.40</b>	<b>135.9</b>	<b>211</b>	<b>1.55</b>	<b>654.9</b>	<b>586</b>	<b>0.89</b>	<b>572.0</b>	<b>441</b>	<b>0.77</b>

APPENDIX TABLE A-2

Numbers of King Salmon Tagged and Captured with  
Various Types of Gear at Yukon River Tagging Sites, 1965-1966

FLAT ISLAND, 1965

Tagging Gear	Tagged	Untagged	Total Catch	Total Hr. Fished	Catch Per. Hour
10 inch mesh (2 nets=50F.)	63	21	84	376.1	.22
8½ inch mesh (3 nets=60F.)	597	202	799	1,489.7	.54
7 inch mesh (1 net=25F.)	48	69	117	127.9	.91
5½ inch mesh (1 net=25F.)	<u>0</u>	<u>2</u>	<u>2</u>	<u>43.1</u>	<u>.05</u>
Total Gill Net (7nets=160F.)	708	294	1,002	2,036.8	.49
Fishwheel	<u>111</u>	<u>3</u>	<u>114</u>	<u>502.5</u>	<u>.23</u>
Combined gear	819	297	1,116	2,539.3	.44

FLAT ISLAND, 1966

8½ inch mesh (3 nets=60F.)	377	251	628	1,124.0	.56
7 inch mesh (1 net=25F.)	10	25	35	192.0	.18
5½ inch mesh (1 net=25F.)	<u>5</u>	<u>11</u>	<u>16</u>	<u>265.7</u>	<u>.02</u>
Total Gill Net (5 nets=110F.)	392	287	679	1,581.7	.43

MIDDLE MOUTH, 1966

8½ inch mesh (3 nets=75F.)	172	109	281	1,030.4	.27
5½ inch mesh (1 net=25F.)	<u>9</u>	<u>7</u>	<u>16</u>	<u>225.3</u>	<u>.07</u>
Total Gill Net (4 net=100F.)	181	116	297	1,255.7	.24

APPENDIX TABLE A-3

Sex Composition and Mean Fork Lengths (in Centimeters) of Tagged King Salmon During 1965-1966, Yukon River<sup>1/</sup>

Flat Island, 1965

Gear	Males		Females		Combined Sexes		Percentage Females
	No.	Length	No.	Length	No.	Length	
10 inch mesh	41	93.5	22	87.9	63	91.6	35
8½ inch mesh	350	89.8	245	88.7	595	89.4	41
7 inch mesh	<u>34</u>	<u>84.5</u>	<u>14</u>	<u>84.6</u>	<u>48</u>	<u>84.5</u>	<u>29</u>
Totals-gill net	425	89.8	281	88.4	706	89.2	40
Fishwheel	65	77.9	44	82.4	109	79.7	40

Flat Island, 1966

8½ inch mesh	212	89.9	165	88.3	377	89.2	44
7 inch mesh	7	86.2	3	89.5	10	87.2	30
5½ inch mesh	<u>3</u>	<u>83.7</u>	<u>2</u>	<u>95.0</u>	<u>5</u>	<u>88.2</u>	<u>40</u>
Totals-gill net	222	89.7	170	88.4	392	89.1	43

Middle Mouth, 1966

8½ inch mesh	90	88.0	79	89.8	169	88.8	47
5½ inch mesh	<u>5</u>	<u>90.4</u>	<u>4</u>	<u>92.0</u>	<u>9</u>	<u>91.1</u>	<u>44</u>
Totals-gill net	95	88.1	83	90.0	178	89.0	47

<sup>1/</sup> A few tagged king salmon were not measured or sexed. Therefore total numbers will be less than shown in other tables.

APPENDIX TABLE A-4

Numbers of Chum Salmon Tagged and Captured With  
Various Types of Gear at Yukon River Tagging Sites, 1965-1966

FLAT ISLAND, 1965 (6/6-7/4)

Tagging Gear	Tagged	Untagged	Total Catch	Total Hrs Fished	Catch Per Hour
10 inch mesh (2 nets=50F.)	20	139	159	376.1	.42
8½ inch mesh (3 nets=60F.)	108	481	589	1,489.7	.40
7 inch mesh (1 net=25F.)	16	150	166	127.9	1.30
5½ inch mesh (1 net=25F.)	82	454	536	43.1	12.44
Total Gill Net (7 nets=160F.)	226	1,224	1,450	2,036.8	.71
Fishwheel	839	306	1,145	502.5	2.28
Combined Gear	1,065	1,530	2,595	2,539.3	1.02

FLAT ISLAND, 1966 (6/8-7/10)

8½ inch mesh (3 nets=60F.)	90	158	248	1,124.0	.22
7 inch mesh (1 net=25F.)	23	33	56	192.0	.29
5½ inch mesh (1 net=25F.)	61	122	183	265.7	.69
Total Gill Net (5 nets=110F.)	174	313	487	1,581.7	.31

MIDDLE MOUTH, 1966 (6/11-7/10)

8½ inch mesh (3 nets=75F.)	65	79	144	1,030.4	.14
5½ inch mesh (1 net=25F.)	60	199	259	225.3	1.15
Total Gill Net (4 nets=100F.)	125	278	403	1,255.7	.32

APPENDIX TABLE A-5

Sex Composition and Mean Fork Lengths (in Centimeters)  
of Tagged Chum Salmon During 1965-1966, Yukon River

FLAT ISLAND, 1965

Tagging Gear	Males		Females		Combined Sexes		Percentage Females
	No.	Length	No.	Length	No.	Length	
10 inch mesh	11	62.3	9	60.5	20	61.5	45
8½ inch mesh	56	62.8	45	60.0	101	61.5	44
7 inch mesh	9	67.1	7	62.8	16	65.2	44
5½ inch mesh	36	63.4	46	59.9	82	61.4	56
Total Gill Net	112	63.3	107	60.2	219	61.8	49
Fishwheel	401	62.8	436	59.0	837	60.8	52
Totals-All Gear	513	62.9	543	59.2	1,056	61.0	51

Flat Island, 1966

8½ inch mesh	57	64.8	32	61.0	89	63.4	36
7 inch mesh	18	65.6	5	62.5	23	65.0	22
5½ inch mesh	20	61.6	42	57.8	62	59.0	68
Totals-Gill Net	95	64.3	79	59.4	174	62.1	45

Middle Mouth, 1966

8½ inch mesh	36	63.9	29	62.2	65	63.1	45
5½ inch mesh	12	60.8	48	59.8	60	60.0	80
Totals-Gill Net	48	63.1	77	60.7	125	61.6	62