AYK REGION
NORTON SOUND/KOTZEBUE SALMON ESCAPEMENT
REPORT # 31

1983 Kwiniuk River Salmon Counting Tower

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INTRODUCTION

The Kwiniuk River is located about 98 miles east-northeast of Nome and drains into Norton Sound at Moses Point. A salmon counting tower was initiated on this system in 1965. Counting methods have not changed since they were carefully described in the 1976 Kwiniuk River Report, (AYK Reports, Norton Sound/Kotzebue Escapement Report #17).

OBJECTIVES

1. Obtain daily and seasonal timing and magnitude of salmon escapement.

2. Take 60 age, sex and size samples from the Moses Point commercial chum salmon catch and as many as 450 samples from the Kwiniuk River escapement.

Methods and Results

The 18-hour counting schedule began June 19 and ended July 27. The tower was set up at the same location as in the past three years.

The unexpanded counts were: 267 chinook, 55,107 chum and 254,538 pink salmon (Table 1). These counts were then adjusted to account for missing hours that were normally counted. Adjacent hourly counts were averaged to give an 18-hour count. Once a week a 24-hour count was made and from that an expansion factor was computed to compensate for the 6-hour time block not normally counted. This factor was used to expand the 18-hour count three days before and after the 24-hour count (Table 4). The hourly counts for chum and pink salmon are shown in Tables 2 and 3. Chinook salmon counts were not expanded because of the small sporatic daily counts and the small percentage change made when expanding counts was insignificant.

Table 5 shows the results of the chinook commercial catch sampling. Only 10 samples were taken.

Tables 6 and 7 show the commercial catch and escapement, age, sex and size sampling results. The two tables were very similar with roughly 60% of chum salmon sampled being four year olds and nearly all others being five year olds.

DISCUSSION

The Kwiniuk Tower had an inexperienced crew at the beginning of this field season. Fortunately a former crew member from 1982 was available to spend a week with the crew early in the field season

to train the inexperienced observers and verify their observations. Without this experienced observer the project biologist would have had to spend time training the crew when he may have been needed elsewhere.

For the first time in several years, subsistence fishermen fished above the tower site. These fishermen consisted of about 5 families who took roughly 500 chum salmon and 200 pink salmon. Only estimates of catch were available because the crew was not aware of this activity until after it had been going on for a week.

Due to the limited number of days suitable to fly aerial surveys this year, the Kwiniuk River was not surveyed during the salmon spawning peaks. The Tubutulik River was surveyed and peak counts of 135 king, 16,345 chum and 40,797 pink salmon were recorded on July 13.

It was interesting to note the very similar age composition of chum salmon caught in commercial gear (5 7/8" gillnet) and those caught up river using seines.

The Kwiniuk Tower data base has become a very effective managment tool. During the field season, the tower crew radios in its daily counts and a running table similar to Table 1 is kept. By comparing this table with the aopendix tables, the manager can project the chum run by mid-season. At present a sustained harvest of chum salmon is the objective but a pink salmon escapement table is being developed also. By June 27, 1983, it was apparent that the Kwiniuk River chum salmon stocks would meet or exceed the minimum escapement goal of 20,000 fish. So the area biologist issued an emergency order extending fishing periods. Moses Point is the only salmon subdistrict in this area that has such a successful management tool.

RECOMMENDATIONS

The renewed interest in subsistence fishing above the tower site will provide an easy way to collect escapement age-length samples. This interaction between fishermen and Fish and Game personnel will help spark public acceptance of fisheries management. Subsistence catches above the tower should be subtracted from the escapement counted at the tower in the future.

The project's 16' Smokercraft is showing its age. The transom is weak and it has some minor leaks. At the beginning of the field season we found local people had used the skiff and left it on the far side of the river. Fortunately the skiff was undamaged. In the future the skiff should be checked to make sure it is still usable prior to the field season. Should this skiff be

replaced, a heavily worn boat from another project should be substituted due to the possibility of damage from spring duck hunters.

Table 1. Daily and Cumulative Salmon Escapement. Kwiniuk River. 1983.

Date	King	King Cum.	Pink	Pink Cum.	Chum	Chum. Cum.
6/19	0	0	0	0	0	0
6/20	0	0	0	0	81	86 1/
6/21	0	0	0	0	1507	1593
6/22	0	0	0	0	1346	2939
6/23	5	5	0	0	536	3475
6/24	13	18	0	0	2310	5785
6/25	4	22	38	38	2585	8370
6/26	8	30	110	148	853	9223
6/27	3	33	1	149	268	9491
6/28	16	49	52	201	2972	12463
6/29	1	50	29	230	426	12889
6/30	12	62	69	299	968	13857
7/1	61	123	1732	2031	8256	22113
7/2	3	126	80	2111	159	22272
7/3	19	145	972	3083	2417	24689
7/4	11	156	468	3551	1544	26233
7/5	25	181	2746	6297	4729	30962
7/6	16	197	2440	8737	2145	33107
7/7	7	204	4976	13713	3265	36372
7/8	17	221	8767	22480	4758	41130
7/9	5	226	18285	40765	1871	43001
/10	3	229	19725	60491	1607	44608
/11	1	230	14696	75187	863	45471
7/12	1	231	8011	83198	272	45743
7/13	1	232	8341	91539	700	46443
7/14	2	234	1919	93458	238	46681
7/15	2	236	1711	95169	414	47095
7/16	1	237	5480	100649	1109	48204
7/17	8	245	14266	114915	1464	49668
7/18	0	245	4891	119806	163	49831
7/19	11	256	20022	139828	1072	50903
7/20	3	259	25257	165085	1782	52685
7/21	4	263	25582	190667	806	53491
7/22	1	264	14330	204997	425	53916
7/23	0	264	29715	234712	719	54635
7/24	0	264	12499	247211	223	54858
7/25	0	264	1768	248979	53	54911
7/26	2	266	2846	251825	75	54986
7/27	1	267	2713	254538	121	55107

1/ 25 chum salmon were added after aerial survey.

Table 4. Adjusted and Expanded Daily Salmon Migration, Kwiniuk River, 1983.

Date		Chum Count Adjusted	Chum Count Expanded 1/		Pink Count Adjusted	Pink Count Expanded 1/
6/19		0	0		0	0
6/20		86	86		0	0
6/21 2/		1507	2450		0	0
6/22		1346	1346		0	0
6/23		536	536		0	0
6/24		2310	2310		0	0
6/25		2585	2585		38	38
6/26		853	853		110	110
6/27		268	268		1	1
6/28	1.00	2972	2972	1.00	52	52
6/29		426	426		29	29
6/30		968	968		69	69
7/1		8256	8256		1732	1732
7/2		159	159		80	80
7/3		2417	2417		972	972
7/4		1544	1544		468	468
7/5	1.00	4729	4729	1.00	2746	2746
7/6		2145	2145		2440	2440
7/7		3265	3265		4976	4976
7/8 3/		4758	5290		8767	9428
7/9		1871	1946		18285	18285
7/10		1607	1671		19726	19726
7/11		863	898		14696	14696
7/12	1.04	272	272	1.00	8011	8011
7/13		700	728		8341	8341
7/14		238	248		1919	1919
7/15		414	430		1711	1711
7/16		1109	1087		5480	5425
7/17		1464	1435		14266	14123
7/18		163	160		4891	4842
7/19	0.98	1072	1072	0.99	20022	20022
7/20		1782	1746		25257	25004
7/21		806	790		25582	25326
7/22		425	416		14330	14187
7/23		719	856		29715	28229
7/24		223	265		12499	11874
7/25		53	63		1768	1680
7/26		75	75		2846	2846
7/27		121	144		2713	2577
Total		55107	56907		278968	251965

1/ Adjusted count expanded by factor during weekly 24-hour count, factor shown in adjusted count column.

2/ Counts adjusted to account for missed hours using the two nearest complete sample days.

3/ Counts adjusted to account for missing half hour using previous half hour multiplied by 2.

Table 2. Daily Hourly Migration past Kwiniuk River Counting Tower. 1983. Species: Chum.

Date	00	01	02	03	04	05	12	13	14	15	16	17	18	19	20	21	22	23	18-Hr Total	Daily % of Total
6/19							0	0	0	0	0	0	0	0	0				0	0.0
6/20										-1	0	0	0	0	0	0	29	33	61	1.1
6/21							0	30	26	25	8	147	179	272	272	11	193	344	1507	2.7
6/22	272	121	117	12	-4	0	0	0	0	0	0	0	0	5	16	126	177	504	1346	2.4
6/23	32	144	42	13	0	-2	0	0	0	51	84	5	0	12	41	44	58	11	536	1.0
6/24	15	7	8	4	1	-1	3	255	92	81	35	21	448	1029	35	129	122	26	2310	4.2
6/25	68	41	4	1	-4	3	118	5	91	410	1017	148	8	53	58	176	342	46	2585	4.7
6/26	124	85	4	-1	1	1	1	6	2	5	301	161	43	0	3	62	5	50	853	1.5
6/27	1	2	0	0	0	0	0	0	0	135	-1	0	1	1	33	2	52	42	268	0.5
6/28	259	293	565	0	1	-2	186	179	704	376	49	9	228	90	31	0	2	0	2970	5.4
6/29	1	1	1	4	-7	0	0	1	0	0	13	51	29	63	70	56	85	58	426	0.8
6/30	27	239	22	0	0	1	2	-1	1	0	8	293	252	48	29	14	4	29	968	1.8
7/1	12	65	53	-1	0	-2	-3	1	24	0	232	194	1444	3254	1792	999	100	92	8256	15.0
7/2	18	11	0	2	0	0	1	-1	-1	0	0	0	19	93	6	11	2	-2	159	0.3
7/3	-14	-6	-3	-2	0	0	0	0	0	16	47	107	506	1188	327	17	27	207	2417	4.4
7/4	1184	46	1	9	4	0	5	7	2	-4	0	1	0	2	157	98	14	18	1544	2.8
7/5	178	85	18	9	7	1	0	0	-2	0	13	31	16	950	1580	978	279	584	4727	8.6
7/6	294	164	20	5	6	3	63	-6	24	79	94	102	15	581	6	9	590	96	2145	3.9
7/7	172	53	11	2	0	5	588	1034	-2	302	45	375	380	209	12	5	39	35	3265	5.9
7/8	161	7	1	0	0	0	9	90	91	524	532	825	1895	348	159	102	10	4	4758	8.6
7/9	1	0	0	2	2	1	2	3	4	59	37	161	318	176	602	273	166	64	1871	3.4
7/10	12	7	11	30	35	16	65	170	75	90	1	15	14	40	539	375	82	30	1607	2.9
7/11	8	2	0	73	42	10	-3	32	89	155	174	83	59	7	43	68	8	13	863	1.6
7/12	1	0	0	2	40	4	0	0	4	20	14	1	6	2	9	79	65	13	260	0.5
7/13	33	10	1	0	0	0	2	3	2	9	278	93	22	3	4	123	64	53	700	1.3
7/14	73	4	0	0	5	1	0	0	11	7	2	2	0	20	14	41	35	23	238	0.4
7/15	25	1	0	1	0	0	8	37	4	18	30	19	13	11	23	17	161	46	414	0.8
7/16	8	2	0	-1	-1	0	1	0	0	1	112	707	134	61	2	17	36	30	1109	2.0
7/17	8	11	5	272	38	12	12	9	8	11	130	121	15	347	116	172	121	56	1464	2.7
7/18	30	2	3	1	3	1	2	2	51	17	3	12	2	8	3	3	4	16	163	0.3
7/19	11	5	1	0	1	2	25	78	51	531	43	14	57	210	32	13	10	14	1098	2.0
7/20	84	26	10	43	30	11	77	35	8	17	213	311	371	351	120	39	26	10	1782	3.2
7/21	4	2	3	5	3	3	20	362	228	73	8	0	0	0	3	29	34	29	806	1.5
7/22	5	1	3	13	16	4	1	2	36	90	17	26	54	101	18	10	14	14	425	0.8
7/23	24	3	7	29	82	22	9	63	64	107	70	36	9	13	10	95	55	21	719	1.3
7/24	15	0	4	24	21	37	32	7	22	8	2	16	10	9	6	3	6	1	223	0.4
7/25	0	1	1	2	1	-2	1	4	8	16	6	1	4	1	1	1	0	7	53	0.1
7/26	0	0	0	3	0	3	0	0	1	1	7	2	15	7	1	9	7	7	63	0.1
7/27	0	4	0	2	1	2	1	0	4	2	6	4	53	19	18	3	2	0	121	0.2
Total	3146	1439	913	558	324	134	1228	2407	1722	3231	3630	4095	6619	9584	6191	4209	3026	2624	55080	
% of Total	5.7	2.6	1.7	1.0	0.6	0.2	2.2	4.4	3.1	5.9	6.6	7.4	12.0	17.4	11.2	7.6	5.5	4.8		100.0

Table 3. Daily Hourly Migration Past Kwiniuk River Counting Tower. 1983. Species: Pink

Date	00	01	02	03	04	05	12	13	14	15	16	17	18	19	20	21	22	23	18-Hr Total	% of Total
6/19							0	0	0	0	0	0	0	0	0				0	0.0
6/20										0	0	0	0	0	0	0	0	0	0	0.0
6/21							0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
6/22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
6/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
6/25	0	0	0	0	0	0	0	0	0	0	8	12	2	0	0	4	10	2	38	0.0
6/26	24	9	0	0	0	25	1	7	2	1	19	11	4	2	-4	4	3	2	110	0.0
6/27	0	0	0	-6	-1	-11	0	0	0	0	0	0	1	11	4	0	3	0	1	0.0
6/28	7	0	4	2	1	2	4	-2	2	11	2	2	12	9	2	0	-1	-5	52	0.0
6/29	0	0	0	0	-3	0	0	0	0	0	0	4	0	2	6	11	8	1	29	0.0
6/30	2	6	4	0	0	-2	0	0	1	0	4	12	14	8	0	5	7	8	69	0.0
7/1	2	10	6	-1	0	0	0	0	0	0	8	5	225	804	541	71	43	18	1732	0.7
7/2	8	4	0	0	0	0	6	4	-2	0	0	5	4	36	0	9	5	1	80	0.0
7/3	-8	-11	-2	0	0	0	0	0	0	2	2	6	130	632	116	38	40	27	972	0.4
7/4	288	24	-1	2	0	0	2	8	9	0	0	0	0	2	56	23	35	20	468	0.2
7/5	110	41	7	9	10	0	0	0	2	0	14	20	3	390	927	715	256	239	2743	1.1
7/6	263	286	141	3	2	0	33	0	5	97	64	156	30	590	10	20	581	159	2440	1.0
7/7	517	123	87	15	0	2	489	1693	0	321	128	99	668	355	58	127	141	153	4976	1.9
7/8	307	36	10	0	4	0	0	4	19	618	1322	1517	3420	750	613	660	116	32	9428	3.7
7/9	11	30	58	42	16	2	16	62	46	298	254	2316	2408	1674	4006	3853	2014	979	18285	7.2
7/10	310	94	491	374	243	62	70	455	1166	955	1	914	130	838	5270	5947	1712	694	19726	7.7
7/11	261	62	83	684	1063	121	-53	63	508	3889	2781	2636	510	6	448	1232	162	240	14696	5.8
7/12	28	10	10	18	804	65	0	2	6	26	54	11	59	1193	1618	1695	1790	589	7978	3.1
7/13	452	77	30	15	3	10	-94	-113	44	27	2827	192	76	-8	233	1785	1554	1231	8341	3.3
7/14	1153	96	4	0	19	7	-122	-84	-74	8	24	8	0	40	30	224	160	426	1919	0.8
7/15	53	-7	-13	-3	-1	0	37	89	46	25	68	85	28	15	59	126	838	265	1711	0.7
7/16	147	51	29	27	18	2	0	0	0	9	474	1573	1556	637	133	116	466	242	5480	2.1
7/17	138	61	10	8	849	81	65	71	74	197	505	555	1422	1617	1846	2989	2669	1109	14266	5.6
7/18	320	170	100	395	582	67	83	111	145	182	135	526	398	396	532	180	192	377	4891	1.9
7/19	279	173	197	355	334	78	300	1308	1219	5096	416	415	1109	6010	810	576	589	895	20159	7.9
7/20	737	118	77	1147	1069	60	1	227	21	524	3263	3025	3030	5110	1960	2543	1901	444	25257	9.9
7/21	167	6	65	400	483	52	282	8607	4465	2796	444	15	223	273	589	2934	2294	1487	25582	10.0
7/22	304	70	70	765	1630	410	15	36	312	1670	601	966	1900	3120	850	600	685	326	14330	5.6
7/23	100	46	123	915	4020	570	79	1215	1333	2287	3346	1835	815	1000	946	5535	3110	2440	29715	11.6
7/24	295	55	123	1596	720	1106	1240	240	3010	229	318	628	701	960	558	290	380	50	12499	4.9
7/25	1	9	4	21	-26	-11	30	8	510	42	102	77	226	93	138	204	140	200	1768	0.7
7/26	9	0	0	96	64	31	40	50	49	370	350	420	360	157	48	439	339	167	2989	1.2
7/27	40	24	30	17	67	75	19	10	217	4	199	250	626	222	366	396	116	35	2713	1.1
	6325	1673	1747	6896	11970	2804	2543	14071	13135	19685	17733	18296	20090	27144	22769	33351	22358	12853	255443	
% of Total	2.5	0.7	0.7	2.7	4.7	1.1	1.0	5.5	5.1	7.7	6.9	7.2	7.9	10.6	8.9	13.1	8.8	5.0		100.0

TABLE 5. AGE, SEX AND SIZE COMPOSITION OF NORTON SOUND KING SALMON, MOSES POINT, COMMERCIAL SAMPLE, 5 1/2" - 6" GEAR, 1983.

	COMBINED			4-2			5-2			6-2		
	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH
Male	5	50.0	593.0	4	40.0	557.5	1	10.0	735.0	0	0	--
Female	5	50.0	825.0	1	10.0	610.0	1	10.0	815.0	3	30.0	900.0
Total	10	100.0	709.0	5	50.0	568.0	2	20.0	775.0	3	30.0	900.0

TABLE 6. AGE, SEX AND SIZE COMPOSITION OF NORTON SOUND CHUM SALMON, MOSES POINT COMMERCIAL CATCH SAMPLE, 1983.

	COMBINED			3-1			4-1			5-1			6-1		
	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH
Male	221	49.6	596.8	1	0.2	560.0	142	31.8	589.4	74	16.6	609.3	4	0.9	637.5
Female	225	50.4	578.2	1	0.2	520.0	137	30.7	570.2	87	19.5	591.4	0	0	--
Total	446	100.0	587.4	2	0.4	540.0	279	62.6	580.0	161	36.1	599.6	4	0.9	637.5

TABLE 7. AGE, SEX AND SIZE COMPOSITION, KWINIUK RIVER ESCAPEMENT SAMPLES, 1983.

	COMBINED			3-1			4-1			5-1			6-1		
	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH
Male	54	47.0	604.3	0	0	--	30	26.1	593.3	24	20.9	618.1	0	0	--
Female	61	53.0	566.1	0	0	--	38	33.0	562.4	23	20.0	572.2	0	0	--
Total	115	100.0	584.0	0	0	--	68	59.1	576.0	47	40.9	595.6	0	0	--

Table 8. Daily Water Temperatures. 1983.

Date	Temperature F
6/19	54
6/20	56
6/21	59
6/22	56
6/23	52
6/24	58
6/25	60
6/26	59
6/27	58
6/28	52
6/29	58
6/30	52
7/1	56
7/2	54
7/3	56
7/4	56
7/5	58
7/6	58
7/7	57
7/8	60
7/9	62
7/10	62
7/11	63
7/12	60
7/13	58
7/14	54
7/15	52
7/16	52
7/17	52
7/18	52
7/19	54
7/20	58
7/21	56
7/22	60
7/23	62
7/24	60
7/25	60
7/26	55

APPENDIX TABLE 1. DAILY TOTAL CUMULATIVE SALMON ESCAPEMENTS. KWINIUK RIVER, 1965-1979.

Species	Date	1965	1966	1967	1968	1969
CHUM	6/18	6				
	6/19		24			
	6/20		50			
	6/21		158			
	6/22		506			
	6/23		759			
	6/24		1,048	5		
	6/25		597	24	66	
	6/26		1,060	77	231	57
	6/27	218	1,189	270	1,066	113
	6/28	983	1,697	315	1,812	427
	6/29	2,576	1,768	1,455	2,838	571
	6/30	3,445	2,180	2,148	3,509	1,475
	7/1	7,741	3,728	2,739	4,443	2,057
	7/2	3,794	7,619	3,027	5,971	2,744
	7/3	9,988	8,054	3,491	5,914	3.861
	7/4	11,050	10,050	5,647	8,427	6,056
	7/5	12,078	11,958	6,157	9,409	7,137
	7/6	12,502	13,184	9,605	10,247	8,107
	7/7	13,445	13,703	13,088	12,428	9,314
	7/8	13,824	15,703	15,691	15,033	10,368
	7/9	15,630	17,703	18,513	16,720	11,727
	7/10	19,147	17,472	21,487	18,003	12,197
	7/11	22,518	19,551	23,459	18,284	12,577
	7/12	23,491	25,549	25,165	18,349	13,200
	7/13	26,444	27,225	26,473	18,415	14,198
	7/14	32,026	27,579	26,459	18,431	14,379
	7/15	32,190	28,604	26,532	18,564	15,057
	7/16	32,437	28,336	26,584	18,590	16,634
	7/17	32,503	28,384	26,398	18,601	17,117
	7/18	32,861	29,965	26,625	18,636	18,345
	7/19		31,884	26,631	18,760	18,707
	7/20		32,154	26,631	18,315	18,918
	7/21		32,389	26,561	18,347	19,233
	7/22		32,723		18,907	19,373
	7/23		32,938		18,951	19,390
	7/24		33,000		19,976	19,525
	7/25		33,137			19,534
	7/26		33,153			19,749
	7/27		33,153			
	7/28		33,184			
	7/29		33,182			
		2/ -6,227	2/ -396	2/ -2,217	2/ -163	2/ -62
		26,634	32,786	24,444	18,813	19,687

1970 was the first year of 18-hour counts, 12 noon until 6 AM the next day. The average escapement for the hours from 6 AM until 12 noon for the years 1965-1969 was 2.1% of the total escapement for chums and 3.66% for pink salmon.

2/ Subsistence catch.

APPENDIX TABLE 1. DAILY TOTAL CUMULATIVE SALMON ESCAPEMENTS, KWINIUK RIVER, 1965-1979. (CONTINUED)

Species	Date	1970	1971	1972	1973	1974	1975
CHUM	6/18						
	6/19					16	
	6/20					79	
	6/21					80	
	6/22					202	
	6/23					479	
	6/24					950	
	6/25	2			11	1,113	
	6/26	17	23		13	3,316	
	6/27		31		17	5,047	
	6/28		95	33	17	6,942	
	6/29	645	139	51	17	8,358	
	6/30	2,302	196	158	25	9,805	
	7/1	3,327	452	597	97	11,266	
	7/2	6,420	728	1,375	207	13,776	
	7/3	14,467	1,181	1,607	402	15,674	
	7/4	20,873	3,362	2,793	1,514	16,985	72
	7/5	26,699	4,783	4,143	4,545	17,972	363
	7/6	30,596	6,178	5,314	4,933	19,061	728
	7/7	31,468	6,531	9,277	3,075	19,479	835
	7/8	34,695	10,677	12,100	8,495	19,766	985
	7/9	40,012	11,539	14,384	8,870	20,126	1,136
	7/10	40,362	13,401	16,242	15,022	20,347	1,446
	7/11	44,180	16,902	17,537	15,337	21,633	1,887
	7/12	47,305	18,694	21,735	16,303	22,745	2,046
	7/13	47,738	19,346	22,997	16,776	23,682	2,354
	7/14	50,304	20,566	24,998	18,944	25,084	3,430
	7/15	56,943	20,858	25,389	19,666	31,243	3,151
	7/16	60,275	21,909	25,305	20,138	32,179	7,395
	7/17	62,577	26,955	26,133	22,396	32,570	9,497
	7/18	63,065	27,336	27,284	24,075	33,388	10,443
	7/19	63,624	30,680	27,993	25,227	33,891	11,919
	7/20	65,673	33,800	28,371	25,995	34,084	12,676
	7/21	65,717	34,473	28,502	27,304	34,209	13,435
	7/22	66,062	35,237	29,020	27,341	34,294	13,809
	7/23	66,176	35,510	29,458	27,570	34,676	13,962
	7/24	66,336	36,185	29,756	28,008	34,979	14,033
	7/25	66,545	36,959	29,995	28,029	35,130	14,049
	7/26	66,584	37,680	30,005		35,161	
	7/27	66,599	38,107				
	7/28	66,602	38,186				
	7/29	66,604	38,243				
		1/ x 2.1	1/ x 2.1	1/ x 2.1	1/ x 2.1	1/ x 2.1	1/ x 2.1
Expanded		1,400	803	631	588	738	295
Escapement		+ 66,604	+ 38,243	+ 30,053	+ 28,029	+ 35,151	+ 14,049
Total		68,004	39,046	30,686	28,617	35,899	14,344
Expanded			- 367 2/				
Escapement			38,679				

APPENDIX TABLE 1. DAILY TOTAL CUMULATIVE SALMON ESCAPEMENT, KWINIUK RIVER. 1965-1981. (CONTINUED)

ecies	Date	1976	1977	1978 3/	1979 3/	1980
CHUM	6/18					
	6/19					
	6/20					
	6/21					
	6/22					0
	6/23					10
	6/24					54
	6/25					201
	6/26					339
	6/27		12		14	390
	6/28	6	271		188	639
	6/29	31	468		294	985
	6/30	33	678		1,923	1,099
	7/01	105	2,095		2,185	3,579
	7/02	134	2,924		2,316	3,529
	7/03	195	4,133		2,588	3,436
	7/04	428	4,607	591	2,842	3,651
	7/05	746	6,065	1,498	2,884	5,268
	7/06	884	7,049	3,163	3,228	6,721
	7/07	1,095	8,295	4,203	3,406	8,050
	7/08	1,515	11,949	5,320	3,594	10,965
	7/09	1,622	14,680	6,112	4,508	11,569
	7/10	1,776	16,207	6,812	5,216	12,103
	7/11	2,160	18,118	7,496	5,418	12.701
	7/12	2,639	19,264	8,754	5,528	13,800
	7/13	3,343	19,445	9,181	6,236	15,468
	7/14	3,459	19,867	9,448	6,866	15,222
	7/15	3,872	20,601	10,173	8,141	15,457
	7/16	4,239	20,716	10,470	9,196	15,750
	7/17	4,809	20,999	10,564	9,757	16,505
	7/18	4,899	21,245	10,830	8,910	17,161
	7/19	5,112	21,492	10,827	10,272	17,745
	7/20	5,419	21,643	10,891	10,688	18,272
	7/21	5,773	21,815	10,952	11,275	18,686
	7/22	6,021	22,083	10,957	11,938	18,771
	7/23	6,300	22,189		12,027	18,894
	7/24	6,384	22,255		12,069	18,931
	7/25	6,484	22,289		12,101	18,960
	7/26	6,675				18,964
	7/27	6,732				18,971
	7/28	6,770				18,974
	7/29	6,804				
	7/30	6,813				
	7/31	6,834				
		x 2.1%	x 2.1%	x 2.1%	x 2.1%	x 2.1%
Expanded		143	468	230	254	400
Escapement		+6,834	+22,289	+10,957	+12,101	+18,974
Total		6,977	22,757	11,187	12,355	19,374
anded		- 511 2/				
aoement		6,466		14,408 4/		

3/ Corrected figures. Expanded to compensate for missing hourly counts.
4/ Point estimates (range 13,698-15,120). Expanded figure to comoensate for fish not counted before 7/04 and after 7/22.

Appendix Table 1. Daily Total Cumulative Salmon Escapement, Kwiniuk River.

Species	Date	1981	1982	1983
Chum	6/18			
	6/19	96		0
	6/20	154		86
	6/21	186	0	1593
	6/22	465	368	2939
	6/23	939	531	3475
	6/24	2375	560	5785
	6/25	3390	5023	6370
	6/26	4510	8831	9223
	6/27	5077	9810	9491
	6/28	5137	10305	12453
	6/29	5601	10886	12889
	6/30	6989	11638	13857
	7/01	7724	11004	22113
	7/02	7927	12522	22272
	7/03	11582	15391	24689
	7/04	13466	18335	26233
	7/05	13257	21044	30962
	7/06	15058	21562	33107
	7/07	16374	25119	35372
	7/08	16714	28678	41120
	7/09	19678	31312	43001
	7/10	20203	31639	44608
	7/11	20598	32021	45471
	7/12	22783	33674	45743
	7/13	23744	35299	46443
	7/14	25529	35783	46681
	7/15	27091	36602	47095
	7/16	27933	36941	48204
	7/17	28643	37252	49668
	7/18	29546	38041	49831
	7/19	30016	38773	50903
	7/20	31219	39989	52585
	7/21	32005	40382	53491
	7/22	32195	40582	53916
	7/23	33184	40921	54635
	7/24	33757	40899	54858
	7/25	34043	40977	54911
	7/26	34123	41073	54986
	7/27	34231		55107
	7/28	34231		
	7/29	34269		
	7/30	34298		
	7/31	34299		
	8/01	34307		
	8/02	34310		
		34561 5/	44036 5/	56907 5/

5/ Expanded using weekly 24-hour counts to compensate for 6 AM - 12 Noon Counts.

APPENDIX TABLE 2. DAILY TOTAL CUMULATIVE SALMON ESCAPEMENT, KWINIUK RIVER, 1965-1979. (CONTINUED)

Species	Date	1965	1966	1967	1968	1969
PINK	6/18					
	6/19					
	6/20					
	6/21					
	6/22					
	6/23					
	6/24					
	6/25					
	6/26					17
	6/27					19
	6/28	174			48	41
	6/29	250			214	52
	6/30	220			534	117
	7/01	276		1	735	131
	7/02	314	11	3	1,330	232
	7/03	349	29	4	1,732	378
	7/04	396	317	6	2,501	1,165
	7/05	388	517		3,141	2,259
	7/06	390	533		4,777	3,974
	7/07	412	568	18	13,719	6,415
	7/08	588	607	45	38,560	8,683
	7/09	650	673	521	67,509	11,406
	7/10	820	683	718	81,776	12,684
	7/11	1,120	722	1,282	105,997	13,539
	7/12	1,526	758	,926	112,984	15,447
	7/13	1,653	817	2,685	113,323	18,250
	7/14	2,856	898	3,138	113,247	19,379
	7/15	4,488	1,205	3,160	114,504	25,056
	7/16	7,301	1,008	3,320	115,018	27,850
	7/17	7,456	1,206	3,348	117,172	34,863
	7/18	7,571	1,771	3,380	121,392	37,840
	7/19	8,668	3,259	3,406	124,510	43,897
	7/20		3,864	3,432	125,848	47,625
	7/21		4,190	3,567	127,088	51,943
	7/22		5,558	3,587	128,002	54,177
	7/23		6,777		128,466	54,772
	7/24		7,843		129,052	55,741
	7/25		10,015			56,217
	7/26		10,691			57,497
	7/27		10,798			
	7/28		10,364			
	7/29					
		2/ -367	2/ -235	2/ - 79	2/ -2,288	2/ -614
		8,301	10,629	3,508	126,764	56,683

2/ Subsistence catch.

APPENDIX TABLE 2. DAILY TOTAL CUMULATIVE SALMON ESCAPEMENTS, KWINIUK RIVER, 1963-1979.

pecies	Date	1970	1971	1972	1973	1974
PINK	6/18					
	6/19					
	6/20					1
	6/21					2
	6/22					39
	6/23					223
	6/24					464
	6/25	3			322	359
	6/26	13			831	1,513
	6/27	16			1,053	2,436
	6/28	17	9	15	1,276	3,455
	6/29	47	12	48	1,413	5,390
	6/30	198	31	513	1,575	8,506
	7/01	298	125	1,490	1,762	10,047
	7/02	465	182	2,780	1,854	12,512
	7/03	1,096	241	2,899	1,938	14,668
	7/04	4,643	552	4,210	2,190	17,674
	7/05	10,949	819	7,564	3,491	19,180
	7/06	20,413	1,221	10,521	3,556	21,600
	7/07	20,159	1,327	21,264	3,631	22,668
	7/08	25,359	2,343	27,662	4,795	23,385
	7/09	30,729	2,490	35,297	4,979	23,781
	7/10	31,459	3,061	39,082	7,079	24,187
	7/11	39,601	3,963	42,529	7,327	24,764
	7/12	50,921	6,462	47,520	8,539	25,604
	7/13	52,800	6,994	49,581	9,251	25,840
	7/14	59,521	7,418	52,553	12,512	29,336
	7/15	90,681	7,519	53,539	13,393	33,294
	7/16	127,335	7,732	53,923	14,569	34,160
	7/17	148,750	9,646	54,483	18,347	34,302
	7/18	155,935	10,401	55,674	21,214	35,690
	7/19	161,963	12,470	57,721	27,748	36,313
	7/20	179,160	13,938	57,698	30,789	36,920
	7/21	185,247	14,571	57,997	32,842	37,086
	7/22	198,958	15,123	59,024	33,249	37,298
	7/23	208,403	15,309	59,576	35,112	38,101
	7/24	214,233	15,485	59,892	36,956	38,668
	7/25	222,209	15,638	60,147	37,070	39,263
	7/26	225,546	15,318	60,246		39,375
	7/27	226,712	15,996	60,256		
	7/28	226,329	16,089			
	7/29	226,331	16,151			
		1/ x 3.66%	1/ x 3.66%	1/ x 3.66%	1/ x 3.66%	1/ x 3.66%
		8,300	59	2,205	1,356	1,441
Expanded Escapement		226,831	+16,151	+60,256	+37,070	+39,375
		235,131	16,742	62,461	38,426	40,816
			- 108 2/			
al Expanded Escapement			16,534			

1/ 1970 was the first year of 18-hour counts, 12 noon until 6 AM the next day. The average escapement for the hours from 6 AM until 12 noon for the years 1963-1969 was 2.1% of the total escapement for chums and 3.66% for pink salmon.

2/ Subsistence catch.

APPENDIX TABLE 2. DAILY TOTAL CUMULATIVE SALMON ESCAPEMENT, KWINIUK RIVER, 1965-1981. (CONTINUED)

Species	Date	1975	1976	1977	1978	1979	1980
INK	6/18						
	6/19						
	6/20						
	6/21						
	6/22						0
	6/23						3
	6/24						20
	6/25						34
	6/26						43
	6/27			17			48
	6/28		213	35		17	75
	6/29		406	116		17	116
	6/30		439	191		213	130
	7/01		702	313		572	812
	7/02		781	491		605	601
	7/03		1,004	592		1,051	708
	7/04		1,756	699	98	1,531	1,323
	7/05		2,763	884	460	1,662	2,561
	7/06	79	3,300	1,240	1,473	2,683	3,952
	7/07	185	4,229	2,037	2,341	5,062	7,476
	7/08	176	5,869	2,707	3,142	6,547	35,832
	7/09	294	6,942	5,478	4,487	9,744	41,967
	7/10	584	8,034	9,435	7,227	12,746	53.421
	7/11	820	9,903	21,882	9,475	14,356	62,417
	7/12	959	11,105	27,876	18,087	15,615	78,464
	7/13	1,001	14,384	30,466	26,128	20,113	115,995
	7/14	1,013	14,982	33,086	28,619	27,872	111,660
	7/15	1,304	16,072	37,508	37,930	44,290	119.532
	7/16	1,770	16,947	38,005	41,055	63,390	130,144
	7/17	2,529	19,185	39,530	45,077	75,904	160,738
	7/18	5,183	19,692	40,232	52,343	82,253	187,484
	7/19	10,772	20,121	40,926	54,786	100,508	226,843
	7/20	22,354	20,956	41,480	60,573	113,462	254,669
	7/21	38,220	22,084	42.361	60,273	134,349	285,090
	7/22	45,466	23,038	43,467	69,719	153,686	291,675
	7/23	50,902	24,663	44,236		158,229	299,332
	7/24	52,935	25,170	44,479		160,871	301,695
	7/25	54,858	25,710	44,602		161,578	305,246
	7/26	55,293	26,411				307,044
	7/27		27,045				308,736
	7/28		27,333				309,077
	7/29		27,549				
	7/30		28,063				
	7/31		28,307				
	8/01		28,431				
		x3.66%	x3.66%	x3.66%	x3.66%	x3.66%	x3.66%
		2,024	1,040	1,632	2,551	5,914	11,312
Expanded		+55,293	+28,431	+44,602	+69,719	+161,578	+309,077
					3/	3/	
Escapement		57,317	29,471	46,234	72,270	167,492	320,389
			-1,381 2/		4/		
cal Expanded Escapement			28,087		75,993		

2/ Subsistence catch.
3/ Corrected figure. Expanded to compensate for missing hourly counts.
4/ Expanded to compensate for an estimated 9% of total pink escapement not counted after 7/22.

Appendix Table 2. Daily Total Cumulative Salmon Escapement. Kwiniuk River.

Species	Date	1981	1982	1983
Pink	6/18			
	6/19	16		0
	6/20	54		0
	6/21	30	3	0
	6/22	48	154	0
	6/23	95	217	0
	6/24	289	271	0
	6/25	446	5529	38
	6/26	674	15802	148
	6/27	890	27587	149
	6/28	1007	30879	201
	6/29	1294	35558	230
	6/30	1754	42847	299
	7/01	2118	49219	2031
	7/02	2452	41678	2111
	7/03	4015	65649	3083
	7/04	6999	104728	3551
	7/05	6883	137005	6297
	7/06	12077	146918	8737
	7/07	16246	206405	13713
	7/08	20240	253646	22480
	7/09	33601	296453	40765
	7/10	36436	309917	60491
	7/11	42353	323477	75187
	7/12	56464	348835	83198
	7/13	65414	368129	91539
	7/14	82109	378864	93458
	7/15	103658	386968	95169
	7/16	136304	390615	100649
	7/17	171869	395705	114915
	7/18	203372	402228	119806
	7/19	221204	408311	139828
	7/20	269584	419628	165085
	7/21	311694	426023	190667
	7/22	338697	428166	204997
	7/23	406350	429375	234712
	7/24	485775	429537	247211
	7/25	533035	431602	248979
	7/26	536815	433395	251825
	7/27	542727		254538
	7/28	542419		
	7/29	545815		
	7/30	547424		
	7/31	549059		
	8/01	549776		
	8/02	550283		
Expanded Total		566417 5/	469674 5/	251965 5/

5/ Expanded using weekly 24-hour counts to compensate for 6 AM - 12 Noon counts.

Appendix Table 3. Kwiniuk River Counting Tower Escapement Rates, Chum Salmon. 1965-1983.

Date	Cumulative Total	Cumulative %
6/18	6	0.00
6/19	142	0.02
6/20	375	0.07
6/21	2023	0.37
6/22	4495	0.82
6/23	6216	1.13
6/24	10611	1.93
6/25	20053	3.66
6/26	28894	5.27
6/27	33997	6.20
6/28	42463	7.74
6/29	50677	9.24
6/30	62257	11.35
7/1	87616	15.97
7/2	102896	18.76
7/3	128238	23.37
7/4	157426	28.69
7/5	187452	34.17
7/6	211768	38.60
7/7	233351	42.53
7/8	279210	50.89
7/9	310958	56.68
7/10	335820	61.21
7/11	360293	65.67
7/12	388948	70.90
7/13	407023	74.19
7/14	427776	77.97
7/15	452939	82.56
7/16	465841	84.91
7/17	484419	88.30
7/18	496414	90.48
7/19	510439	93.04
7/20	524087	95.53
7/21	530458	96.69
7/22	535191	97.55
7/23	539710	98.38
7/24	543870	99.13
7/25	546009	99.52
7/26	547602	99.81
7/27	548260	99.93
7/28	548415	99.96
7/29	548543	99.99
7/30	548579	99.99
7/31	548599	100.00
8/1	548619	100.00

Appendix Table 4. Kwiniuk River Counting Tower Escapement Rates, Chum Salmon, for "Early Years": 1974, 1978-79, 1981-83.

Date	Daily Total	Daily %	Cumulative %
6/19	112	0.06	0.06
6/20	207	0.11	0.17
6/21	1540	0.81	0.98
6/22	2124	1.11	2.09
6/23	1458	0.77	2.86
6/24	4247	2.23	5.08
6/25	9265	4.86	9.93
6/26	8110	4.25	14.20
6/27	3592	1.89	16.09
6/28	5612	2.95	19.03
6/29	3019	1.58	20.61
6/30	5202	2.73	23.34
7/1	10101	5.30	28.65
7/2	4533	2.38	31.02
7/3	11134	5.84	36.86
7/4	8552	4.49	41.35
7/5	9186	4.82	46.17
7/6	7566	3.97	50.14
7/7	9802	5.14	55.28
7/8	11533	6.05	61.34
7/9	9830	5.16	66.50
7/10	4091	2.15	68.65
7/11	3815	2.00	70.65
7/12	6603	3.47	74.11
7/13	5358	2.81	76.92
7/14	4806	2.52	79.45
7/15	10954	5.75	85.20
7/16	4456	2.34	87.53
7/17	3531	1.85	89.39
7/18	3110	1.63	91.02
7/19	3118	1.64	92.66
7/20	4874	2.56	95.21
7/21	2758	1.45	96.66
7/22	1566	0.82	97.48
7/23	2518	1.32	98.80
7/24	1119	0.59	99.39
7/25	627	0.33	99.72
7/26	290	0.15	99.87
7/27	229	0.12	99.99
7/28	0	0.00	99.99
7/29	38	0.02	100.01
7/30	19	0.01	100.02
7/31	11	0.01	100.03
8/1	8	0.00	100.03
	190599		

APPENDIX TABLE 5. KWINIUK RIVER COUNTING TOWER ESCAPEMENT RATES, CHUM SALMON "NORMAL" TIMING, 1966, 1968, 1969, 1970, 1972, 1976, 1977, 1980.

Date	Chum Total	Chum %	@ 20,000	@ 25,000	@ 30,000
6/18	0	0	0	0	0
6/19	24	00.01	2	3	3
6/20	50	00.03	6	8	9
6/21	158	00.08	16	20	24
6/22	506	00.26	52	65	78
6/23	769	00.39	78	98	117
6/24	1102	00.56	112	140	168
6/25	869	00.44	88	110	132
6/26	1653	00.83	166	208	249
6/27	2664	01.34	268	335	402
6/28	4470	02.25	450	563	675
6/29	6805	03.43	686	585	1029
6/30	9980	05.03	1006	1258	1509
7/1	20047	10.11	2022	2528	3033
7/2	28046	14.15	2830	3538	4245
7/3	38882	19.61	3922	4903	5883
7/4	50909	25.68	5136	6420	7704
7/5	64402	32.49	6498	8213	9747
7/6	74140	37.40	7480	9350	11220
7/7	84489	42.62	8524	10655	12786
8	102183	51.55	10310	12888	15465
9	116926	58.98	11796	14745	17694
7/10	122412	61.75	12350	15438	18525
7/11	132790	66.99	13398	16748	20097
7/12	148923	75.12	15024	18780	22536
7/13	154948	78.16	15632	19540	23448
7/14	160200	80.81	16162	20203	24243
7/15	169957	85.74	17148	21435	25722
7/16	174044	87.80	17560	21950	26340
7/17	178857	90.23	18046	22558	27069
7/18	182618	92.12	18424	23030	27636
7/19	186685	94.17	18834	23543	28251
7/20	190733	96.22	19244	24055	28866
7/21	192122	96.92	19384	24230	29076
7/22	193981	97.85	19570	24463	29355
7/23	195304	98.52	19704	24630	29556
7/24	197067	99.41	19882	24853	29823
7/25	197786	99.77	19954	24943	29931
7/26	198046	99.91	19982	24978	29973
7/27	198125	99.95	19990	24988	29985
7/28	198200	99.98	19996	24995	29994
7/29	198234	100.00	20000	25000	30000

APPENDIX TABLE 6. KWINIUK RIVER COUNTING TOWER ESCAPEMENT RATES. "LATE" YEAR, 1971, 1973, 1975.

Date	Chum Total	Chum %	@ 20000	@ 25000	@ 30000
6/25	11	.0001	2	3	3
6/26	25	.0004	8	10	12
6/27	32	.0008	16	20	24
6/28	44	.0013	26	33	39
6/29	24	.0016	32	40	48
6/30	66	.0024	48	60	72
7/1	327	.0065	130	163	195
7/2	386	.0113	226	283	339
7/3	648	.0194	388	485	582
7/4	3365	.0613	1226	1533	1839
7/5	4743	.1204	2408	3010	3612
7/6	2148	.1471	2942	3678	4413
7/7	722	.1561	3122	3903	4683
7/8	7596	.2507	5014	6267	7521
7/9	1388	.2680	5360	6700	8040
7/10	8324	.3717	7434	9292	11151
7/11	4257	.4248	8496	10620	13044
7/12	2917	.4611	9222	11527	13833
7/13	1433	.4789	9578	11972	14367
7/14	4464	.5345	10690	13362	16035
7/15	2735	.5686	11372	14215	17058
7/16	3767	.6155	12310	15387	18465
7/17	9406	.7326	14652	18315	21978
7/18	3506	.7763	15526	19407	23289
7/19	6472	.8569	17138	21422	25707
7/20	4645	.9147	18294	22867	27441
7/21	1741	.9364	18728	23410	28092
7/22	1175	.9510	19020	23775	28530
7/23	655	.9592	19184	23980	28776
7/24	1184	.9739	19478	24347	29217
7/25	811	.9840	19680	24600	29520
7/26	721	.9930	19860	24825	29790
7/27	427	.9984	19968	24960	29952
7/28	79	.9994	19988	24985	29982
7/29	57	1.0000	20000	25000	30000

Appendix Table 7. Kwiniuk River Counting Tower Escapement Rates, Pink Salmon, 1979 1983.

Date	Cumulative Total	Cumulative %
6/19	16	0.00
6/20	54	0.00
6/21	87	0.01
6/22	202	0.01
6/23	315	0.02
6/24	580	0.03
6/25	3047	0.18
6/26	17147	1.00
6/27	29365	1.72
6/28	32870	1.92
6/29	37906	2.22
6/30	45934	2.69
7/1	46443	2.72
7/2	48140	2.82
7/3	75197	4.40
7/4	118823	6.95
7/5	155657	9.10
7/6	175566	10.27
7/7	250101	14.62
7/8	339946	19.88
7/9	423729	24.78
7/10	474210	27.73
7/11	519089	30.35
7/12	583775	34.14
7/13	662389	38.73
7/14	695189	40.65
7/15	750816	43.90
7/16	822301	48.08
7/17	920330	53.82
7/18	996423	58.27
7/19	1097929	64.20
7/20	1223663	71.55
7/21	1349058	78.89
7/22	1418456	82.95
7/23	1529233	89.42
7/24	1626324	95.10
7/25	1681675	98.34
7/26	1697804	99.28
7/27	1702209	99.54
7/28	1702242	99.54
7/29	1705638	99.74
7/30	1707247	99.83
7/31	1708882	99.93
8/1	1709599	99.97
8/2	1710106	100.00