AYK REGION
NS/K Esc. Report #29

1982 Kwiniuk River Salmon Counting Tower Salmon Escapement Report

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INTRODUCTION

The Kwiniuk River is located about 98 miles 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. Periodically sample the Moses Point commercial salmon catch and the Kwiniuk River escapement for age, sex, and size composition.

RESULTS

The 18-hour counting schedule began June 21 and ended July 26. The tower was set up at the same location as 1980 and 1981.

The unexpanded counts were: 138 chinook, 41,127 chum, and 434,630 pink (Table 1 and 4). The adjusted and expanded counts were: 44,036 chum and 469,674 pinks (Table 7). King salmon counts were not expanded because of the sporadic and small daily counts observed and the small percentage change made when expanding counts. Fifteen commercial chinook salmon catch samples were collected at Moses Point. 53% were 4_2 age using the Gilbert-Rich method of aging, 33% were 5_2 and the remainder were 6_2 (Table 5). After each commercial fishing period, 60 chum salmon were sampled for age data. 29% of the samples were age 5_1, 67% age 4_1 and the remaining 4% were age 3_1 or 6_1 (Table 6).

The tower crew recorded the hourly counts as well as the first 30 minutes count each hour. Using these numbers, the daily expanded 30 minute count could be compared with the daily actual count. A ratio of estimated count/actual count was computed on a daily basis (Table 9). These ratios were treated as a student's t-distribution and confidence limits were calculated.

Using the ratios from Table 9 for chum salmon, n=35 is the sample size, therefore, (n-1) = v = 34 degrees of freedom. $\bar{Y}$ = 1.0123 is the sample mean. S = 0.2586 is the standard deviation of the sample. The confidence limits can be found using the equations $L_1 = \bar{Y} \pm (\frac{S}{\sqrt{n}})$ $L_2 = \bar{Y} + t\ (\frac{S}{\sqrt{n}})$ where L_1 is the lower limit and L_2 is the upper limit. t is found in Table Q of <u>Statistical Tables</u> by Rohlf and Sokal using the degrees of freedom and percentage confidence interval that is desired. For the 99% confidence limit, t = 2.731 and for the 95% confidence limit t = 2.031.

So: $\bar{Y} \pm t\left(\frac{s}{\sqrt{n}}\right)$ for the 99% confidence interval becomes 1.0123 ± 0.1193, and for the 95% confidence interval $1.0123 \pm .0888$. Using the ratios from Table 9 for pink salmon, $n = 35$, $\bar{Y} = .9551$, and $s = 0.1393$. The expression $\bar{Y} \pm t\left(\frac{s}{\sqrt{n}}\right)$ for the 99% confidence interval is 0.9551 ± 0.0643 and for the 95% confidence interval is 0.9551 ± 0.0477.

Statistical methods used here are found in Biometry (Sokal and Rohlf). The table of critical values is found in Statistical Tables (Rohlf and Sokal).

DISCUSSION

The tower crew operated on an 18-hour counting schedule. Once a week a 24-hour count was made in order to expand the 18-hour daily count. The expanded count was made by multiplying the actual count with a percentage derived from the nearest 24-hour sample period. It was felt that run timing differed in each year so that average percentages should not be used. A comparison of half hour counts to whole hour counts did not show as close a relationship as in 1981. Half hour counts of chum salmon ranged from 89.3% to 113.2% of the actual count on a daily basis at the 99% confidence level. With 95% confidence levels chum salmon ranged from 92.4% to 110.1% of the actual count. In other words, there is a 95% assurance that the daily error will be less than ten percent when half hour counts are made on chum salmon.

A comparison of half hour counts to whole hour counts for pink salmon had about the same error as chum salmon this year and about 2.8 percentage points wider range than last year. At the 99% confidence level the range was 89.1% to 101.9% and at the 95% confidence level it was 90.7% to 100.3%.

Even with these wider confidence intervals, it should still be possible to get the needed accuracy for management in the Moses Pt. subdistrict using the half hour counts to estimate total escapement.

Large daily counts usually had a more constant flow of fish upstream and, therefore, a closer correlation between expanded half hour counts and hourly counts, making for accurate cumulative expanded count.

The Kwiniuk tower project was fortunate during 1982 to have experienced personnel. The crew leader had spent the two previous years on the project and one of the crew members had worked the 1981 season there also. Crew experience and counting conditions being what they were makes the 1982 counts very reliable.

During 1982, aerial surveys were generally under less than ideal conditions. Due to the poor weather Kwiniuk River was not flown at peak spawning levels since other streams had higher priority during the few nice days available for surveys. The Kwiniuk River was only flown on June 24 and a count of 2,216 chum and 702 pink salmon was recorded. The Tubutulik was flown twice with peak counts of 2,044 chum recorded on July 15 and 53,350 pink salmon on July 19. The Kwiniuk and Tubutulik River surveys are not comparable for 1982. In future years an attempt should be made to survey the Kwiniuk during the peak of chum spawning.

RECOMMENDATIONS

The 16' Smokercraft riverboat needs to have the transom stiffened. The rivets are worn on the hull and beginning to leak also. A general overhaul of the boat should be made before the field season.

Half hour counts should be discontinued because they create extra work and the accuracy of using half hour counts has already been determined through the last two-year's analysis.

More scale samples would be useful in establishing age structure of the chum salmon population. A spawning ground survey might be the easiest way to collect scales immediately after termination of tower counts.

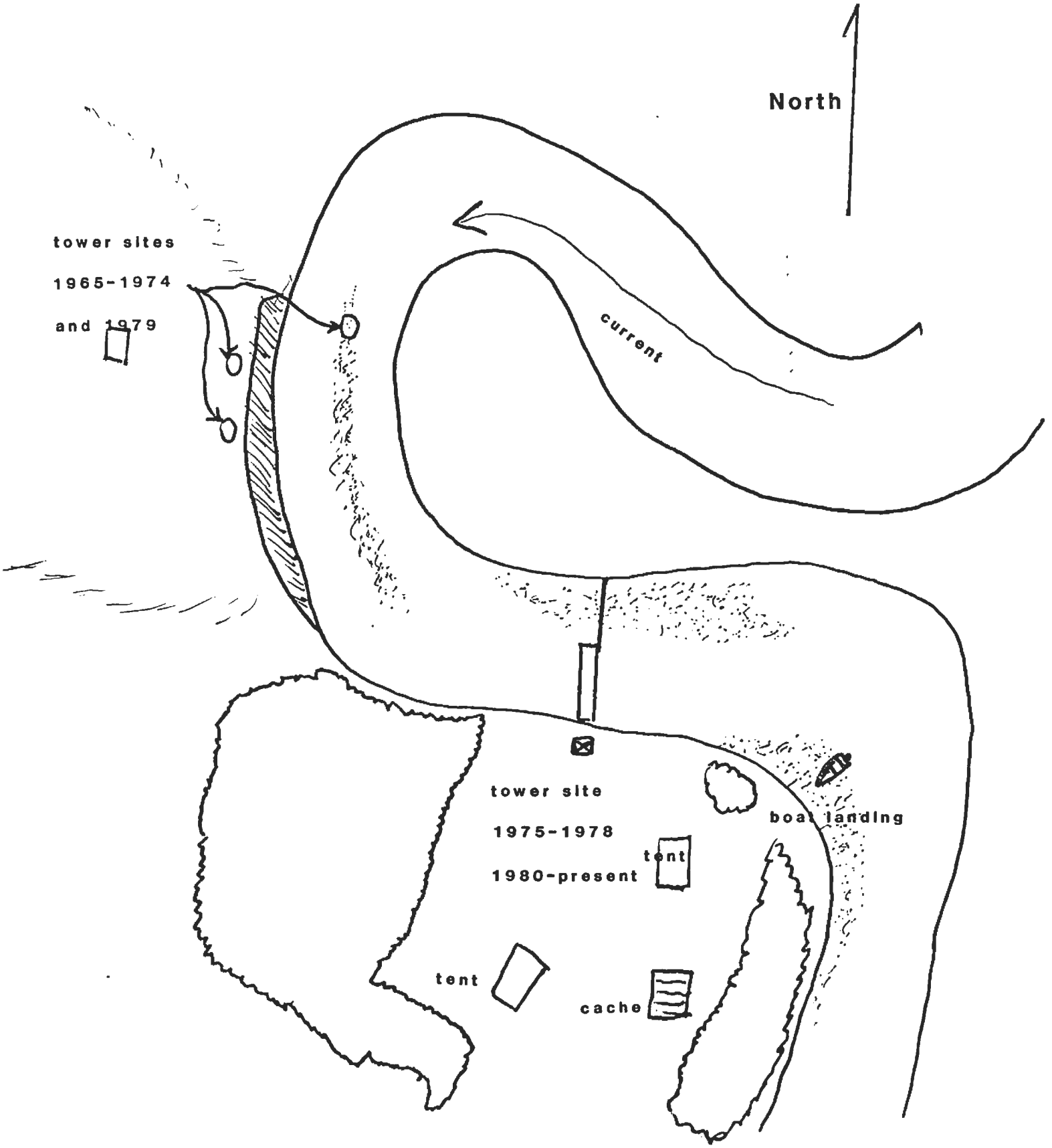

Figure 1. Kwiniuk River salmon counting tower site.

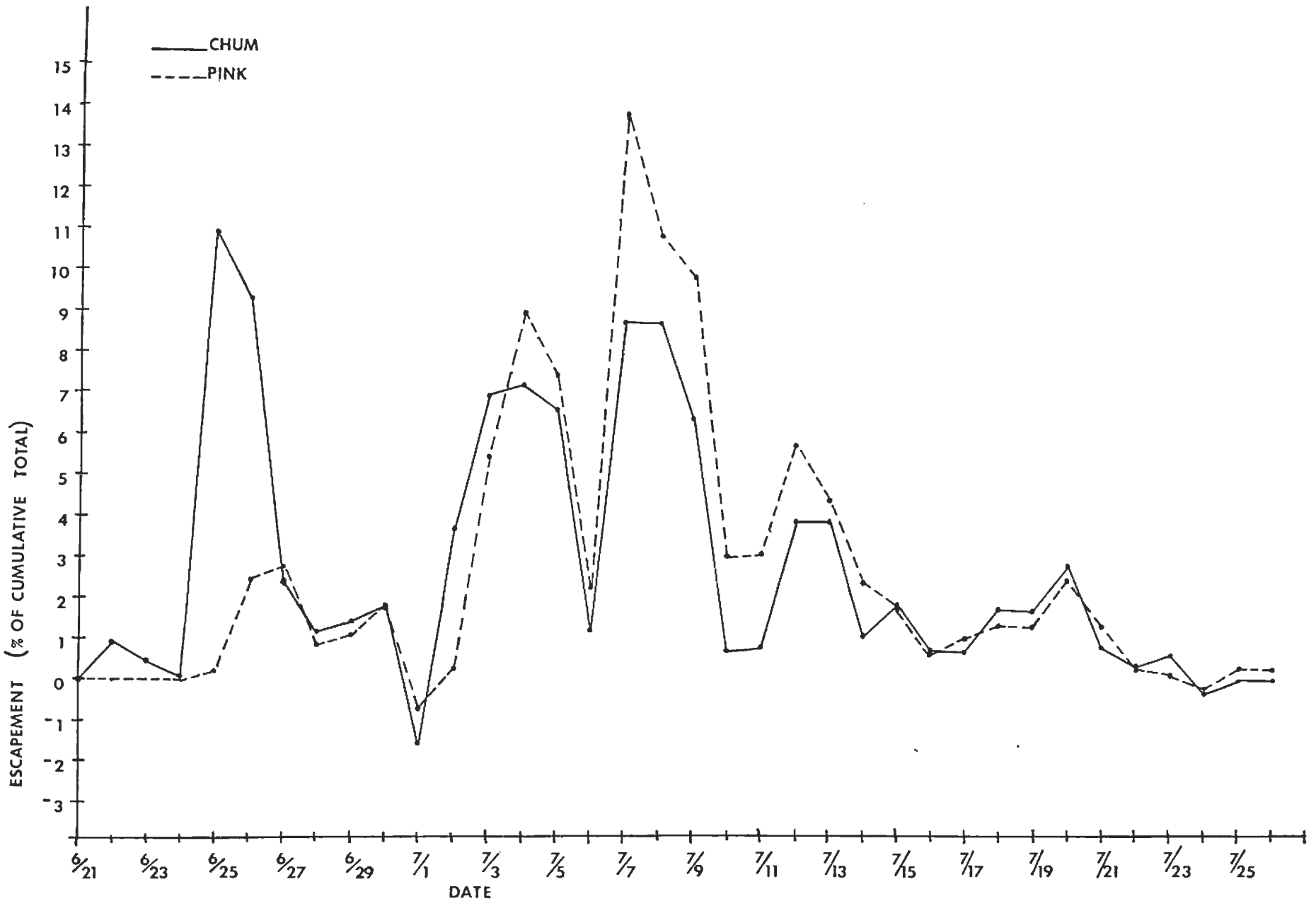

FIGURE 2. DAILY SALMON ESCAPEMENT PAST KWINIUK COUNTING TOWER, 1982.

Table 1. Estimate of daily salmon migration past Kwiniuk River Tower, using expanded 30 minute counts, Kwiniuk River, 1982.

	Chum Salmon			Pink Salmon		
Date	30 minute Counts	Expanded 1/ 30 minute Counts	Actual Counts	30 minute Counts	Expanded 1/ 30 minute Counts	Actual Counts
6/21	0	0	0	3	6	3
6/22	157	304	365	67	134	151
6/23	110	220	166	39	78	63
6/24	32	64	29	27	54	54
6/25	2989	5978	4463	2819	5638	5258
6/26	1635	3270	3808	4178	8356	10273
6/27	555	1110	1012	6267	12534	12476
6/28	239	478	495	1524	3048	3292
6/29	191	382	581	2156	4312	4679
6/30	393	786	752	3830	7660	7289
7/1	-274	-548	-634	-1105	-2210	-2628
7/2	655	1310	1518	256	512	1459
7/3	1519	3038	2869	11272	22544	23971
7/4	1535	3070	2944	18750	37500	39079
5	1443	2886	2730	16240	32480	32835
/6	250	500	518	4839	9678	9863
7/7	1614	3228	3557	27701	55402	59487
7/8	1821	3642	3559	25439	50878	47243
7/9	1354	2708	2634	22742	45484	42805
7/10	151	302	327	7527	15054	13464
7/11	175	350	382	6075	12150	13660
7/12	827	1654	1653	13074	26148	25258
7/13	846	1692	1625	8808	17616	19294
7/14	256	512	484	5739	11478	10735
7/15	394	788	819	4040	8080	8104
7/16	189	378	339	1957	3914	3647
7/17	134	268	311	2500	5000	5090
7/18	367	734	789	2959	5918	6523
7/19	328	656	732	2750	5500	6119
7/20	627	1254	1216	5678	11356	11317
7/21	228	456	393	3171	6342	6395
7/22	123	246	200	1202	2404	2143
7/23	165	330	339	496	992	1209
7/24	-8	-16	-22	82	164	162
7/25	22	44	78	812	1624	2065
7/26	49	98	96	835	1670	1793
Totals	21091	42128	41127	214749	429498	434630

1/ Expanded to whole hour counts.

Table 2. Daily/Hourly migration past Kwiniuk River Counting Tower, 1982. Species: Chum.

Date	Hour 00	01	02	03	04	05	12	13	14	15	16	17	18	19	20	21	22	23	Daily Total	Daily % of Total
6/21													0	0	0	0	0	0	0	0.0
6/22							0	0	0	0	0	0	0	1	217	109	29	9	365	0.9
6/23	6	-1	3	0	-2	0	0	0	0	0	0	13	1	5	6	3	82	50	166	0.4
6/24	13	15	-4	-2	-1	0	0	0	0	0	-10	0	0	0	-5	7	0	16	29	0.1
6/25	21	20	16	2	0	1	0	0	5	241	35	88	863	1934	548	254	191	244	4463	10.9
6/26	227	86	57	16	7	9	5	11	7	51	228	101	51	285	302	610	1386	369	3808	9.3
6/27	125	37	59	25	17	16	7	5	2	0	1	69	141	79	134	119	78	65	979	2.4
6/28	40	34	20	26	9	3	1	13	2	-1	19	6	9	12	137	66	79	20	495	1.2
6/29	3	4	-5	-29	-86	-125	0	0	0	0	0	1	22	46	92	81	247	330	581	1.4
6/30	71	7	6	8	2	1	26	0	1	82	27	43	96	73	60	155	76	18	752	1.8
7/1	1	-1	0	0	1	0	0	0	0	-4	0		0	-31	-96	-166	-205	-133	-634	-1.5
7/2	-79	-34	-6	-12	-9	-9	0	0	0	0	104	233	105	102	111	441	376	195	1518	3.7
7/3	140	65	84	6	5	2	-1	0	56	137	110	312	725	540	350	119	141	78	2869	7.0
7/4	23	15	1	3	4	2	1	4	5	1	75	343	854	722	393	384	101	13	2944	7.2
7/5	-1	0	5	42	56	24	0	45	220	425	246	175	901	407	78	61	13	12	2709	6.6
7/6	15	23	18	22	8	-2	1	0	3	166	23	56	48	32	10	25	43	27	518	1.3
7/7	13	4	0	7	42	29	0	-8	20	26	286	421	280	197	474	853	378	535	3557	8.7
7/8	519	198	37	19	42	26	164	287	208	263	519	491		528	148	62	35	13	3559	8.7
7/9	9	2					17	248	517	202	338	363	440	22	44	18	326	88	2634	6.4
7/10	27	7	3	11	17	23	8	5	7	15	69	96	23	3	4	5	3	1	327	0.8
7/11	-2	-1	0	1	0	0	0	0	8	3	13	-12	47	70	65	121	45	24	382	0.9
7/12	3	7	2	16	23	25	69	50	44	50	123	270	21	150	115	186	273	226	1653	4.0
7/13	135	28	21	127	361	108	2	1	0	10	17	61	44	35	63	101	266	245	1625	4.0
7/14	36	13	19	55	9	2	3	24	54	95	53	19	37	24	17	9	12	3	484	1.2
7/15	0	-1	1	4	2	0	43	50	53	57	67	3	3	18	51	192	231	45	819	2.0
7/16	24	6	6	18	27	7	1	1	2	11	39	7	7	44	66	63	8	2	339	0.8
7/17	1	-1	0	-1	2	0	0	4	9	0	4	4	0	46	100	120	16	7	311	0.8
7/18	1	4	5	1	11	0	2	8	64	63	41	153	267	113	28	13	4	11	789	1.9
7/19	8	-1	0	5	3	1	1	5	-2	12	24	72	135	57	69	66	128	149	732	1.8
7/20	144	83	47	140	65	129	15	-25	-3	86	176	79	42	11	21	12	35	159	1216	3.0
7/21	42	22	8	59	14	5	2	33	10	11	81	20	11	48	19	5	3	0	393	1.0
7/22	-6	0	6	0	1	3	2	0	1	8	89	72	13	0	4	4	1	2	200	0.5
7/23	-2	0	0	1	0	0	-18		5	12	9	47	63	196	22	-2	5	1	339	0.8
7/24	-7	-5	-12	-1	3	-3	-2	0	-2	-2	0	2	5	0	8	-1	-1	-4	-22	-0.1
7/25	-8	-2	-2	-1	3	4	-6	3	4	-2	5	2	10	8	14	28	14	4	78	0.2
7/26	-2	0	-4	10	14	5	0	2	1	0	1	14	14	4	8	25	4		96	0.2
	1540	633	391	578	650	286	343	766	1301	2018	2812	3624	5278	5781	3677	4148	4423	2824	41073	
rly% f Total	3.7	1.5	1.0	1.4	1.6	0.7	0.8	1.9	3.2	4.9	6.8	8.8	12.9	14.1	9.0	10.1	10.8	6.9		100.0

Table 3. Daily/Hourly migration past Kwiniuk River Counting Tower, 1982. Species: Pink

Date	Time 00	01	02	03	04	05	12	13	14	15	16	17	18	19	20	21	22	23	Daily Total	Daily % of Total
6/21													0	0	0	0	0	3	3	0.0
6/22							0	0	0	0	0	0	0	0	43	71	24	13	151	0.0
6/23	7	1	7	-1	5	3	0	0	0	0	0	8	9	3	3	5	4	9	63	0.0
6/24	6	3	3	-1	0	0	0	0	0	0	-2	0	0	0	7	4	6	28	54	0.0
6/25	20	25	16	13	10	0	9	12	9	71	21	110	528	2059	671	643	626	415	5258	1.2
6/26	134	66	61	50	16	20	32	12	14	73	272	224	689	1274	1497	2769	2340	730	10273	2.4
6/27	216	77	137	110	48	56	52	73	17	0	16	612	2017	1434	2615	2410	1325	570	11785	2.7
6/28	78	103	80	237	68	34	3	221	3	-4	150	145	48	63	449	518	1024	72	3292	0.8
6/29	61	36	28	-127	-339	-362	0	0	0	10	6	63	77	169	430	1000	2191	1436	4679	1.1
6/30	570	57	74	21	9	9	134	0	3	662	242	365	560	858	655	2070	853	147	7289	1.7
7/1	40	21	7	4	20	-4	-3	-5	-2	-22	0		2	-96	-289	-783	-760	-758	-2628	-0.6
7/2	-1083	-296	-69	-77	-56	-33	0	0	0	0	12	69	51	167	232	1008	946	588	1459	0.3
7/3	397	197	84	50	13	12	0	0	624	1940	780	1120	5110	5340	3870	1473	1282	1679	23971	5.5
7/4	375	105	38	29	26	3	23	95	15	29	1870	2040	9360	12740	7310	3580	1335	106	39079	9.0
7/5	-75	9	14	904	1240	640	45	863	979	4320	4380	3840	8710	4350	589	947	277	295	32327	7.5
7/6	257	255	135	143	66	0	-3	5	106	2777	555	1303	1163	692	196	702	859	652	9863	2.3
7/7	141	22	19	326	888	573	151	-47	800	983	2171	3950	4370	3840	9970	10010	9780	11540	59487	13.7
7/8	3540	523	221	684	1192	1221	2138	3250	2830	3574	6530	7600		7570	2860	1830	1280	400	47243	10.9
7/9	227	16					670	7670	7890	3232	4400	3920	4540	1310	780	880	5850	1420	42805	9.9
7/10	131	21	42	526	1480	1450	341	340	396	431	1644	4560	1322	179	199	242	100	60	13464	3.1
7/11	14	-2	-3	-19	-108	-22	16	64	327	142	165	132	2136	2450	2350	3910	1680	428	13660	3.2
7/12	98	13	46	755	707	1033	1030	580	550	801	1410	2390	625	2410	1560	3550	4270	3430	25258	5.8
7/13	800	111	112	3183	3240	2540	68	84	39	192	292	589	694	629	1061	1380	2740	1540	19294	4.5
7/14	240	109	140	1748	453	51	50	760	543	1760	1470	640	1121	500	370	288	414	78	10735	2.5
7/15	-8	3	12	82	96	13	240	106	226	520	590	24	34	164	1637	1650	2322	393	8104	1.9
7/16	167	38	63	491	702	86	12	0	3	80	410	96	38	225	634	461	96	45	3647	.8
7/17	24	12	-12	99	109	11	40	159	257	38	48	35	8	620	1532	1720	300	90	5090	1.2
7/18	24	14	13	26	497	19	34	192	537	308	441	1500	1761	629	197	105	127	99	6523	1.5
7/19	50	17	14	94	115	35	21	116	69	223	142	580	901	461	690	587	1102	866	6083	1.4
7/20	517	230	231	1530	1116	1566	227	69	-60	1722	1305	851	416	222	264	196	316	599	11317	2.6
7/21	106	58	121	1640	568	175	13	251	85	238	1511	288	297	620	285	49	73	17	6395	1.5
7/22	4	-10	-1	4	12	20	-113	5	-13	65	910	857	130	63	128	51	22	9	2143	0.5
7/23	-15	-13	9	24	26	29	-68		46	61	48	117	149	458	91	117	84	46	1209	0.3
7/24	-37	-23	-51	-26	2	14	-2	-14	-1	35	17	53	23	27	68	35	34	8	162	0.0
7/25	7	-2	0	-5	21	16	-73	31	79	96	137	201	299	276	308	491	130	53	2065	0.5
7/26	53	23	69	90	226	59	6	33	36	70	67	274	186	69	259	205	68		1793	0.4
	7086	1819	1660	12607	12468	9267	5093	14925	16407	24427	32010	38556	47374	51775	43521	44174	43120	27106	433395	
Hourly % of Total	1.6	0.4	0.4	2.9	2.9	2.1	1.2	3.4	3.8	5.6	7.4	8.9	10.9	11.9	10.0	10.2	9.9	6.3		100.0

Table 4. Daily salmon migration past Kwiniuk River counting tower, 1982: CHINOOK

Date	Daily Count	Cumulative Count
6/25	7	7
6/26	6	13
6/27	4	17
6/28	4	21
6/29	-1	20
6/30	5	25
7/1	0	25
7/2	7	32
7/3	4	36
7/4	13	49
7/5	10	59
7/6	3	62
7/7	8	70
7/8	28	98
7/9	8	106
7/10	0	106
7/11	1	107
7/12	5	112
7/13	5	117
7/14	3	120
7/15	2	122
7/16	4	126
7/17	0	126
7/18	2	128
7/19	4	132
7/20	3	135
7/21	0	135
7/22	0	135
7/23	0	135
7/24	1	136
7/25	1	137
7/26	1	138

Table 5. Age, Sex, and Size Composition of Norton Sound King Salmon, Moses Point (Subdistrict 3) Commercial Catch, 5 3/8" - 5 7/8" Mesh, 1982.

Date	Combined Sex	No.	%	Length	4-2 No.	%	Length	5-2 No.	%	Length	6-2 No.	%	Length
6/22-7/15	Male	14	93.3	668.9	8	53.3	574.8	5	33.3	770.2	1	6.7	915.0
	Female	1	6.7	990.9	0	0	--	0	0	--	1	6.7	990.0
	Total	15	100.0	690.3	8	53.3	574.8	5	33.3	770.2	2	13.3	952.5

TABLE 6. AGE, SEX, AND SIZE COMPOSITION OF NORTON SOUND CHUM SALMON, MOSES POINT (SUBDISTRICT 3) COMMERCIAL CATCH, 5 3/8"-5 7/8" MESH, 1982.

	COMBINED				3-1			4-1			5-1			6-1		
DATE	SEX	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH	NO.	%	LENGTH
6/22	MALE	41	71.9	613.0	0	0	-	20	35.1	613.3	20	35.1	609.6	41	71.9	613.0
	FEMALE	16	28.1	575.3	0	0	-	13	22.8	573.0	3	5.3	585.3	16	28.1	575.3
	TOTAL	57	100.0	602.5	0	0	-	33	57.9	597.4	23	40.4	606.5	57	100.0	602.5
6/25	MALE	31	56.4	616.1	0	0	-	17	30.9	616.2	13	23.6	615.5	1	1.8	622.0
	FEMALE	24	43.6	584.8	0	0	-	9	16.4	581.0	14	25.5	585.9	1	1.8	603.0
	TOTAL	55	100.0	602.5	0	0	-	26	47.3	604.2	27	49.1	600.2	2	3.6	612.5
6/30	MALE	25	48.1	596.5	0	0	-	17	32.7	582.0	8	15.4	625.4	0	0	-
	FEMALE	27	51.9	603.4	0	0	-	14	26.9	619.1	13	25.0	586.5	0	0	-
	TOTAL	52	100.0	600.1	0	0	-	31	59.6	599.3	21	40.4	601.3	0	0	-
7/03	MALE	26	49.1	602.0	0	0	-	15	28.3	591.7	9	17.0	613.2	2	3.8	629.0
	FEMALE	27	50.9	568.8	0	0	-	16	30.2	560.6	11	20.8	580.8	0	0	-
	TOTAL	53	100.0	585.1	0	0	-	31	58.5	575.7	20	37.7	595.4	2	3.8	629.0
7/07	MALE	29	52.7	600.9	1	1.8	555.0	24	43.6	600.2	3	5.5	626.0	1	1.8	588.0
	FEMALE	26	47.3	575.2	0	0	-	20	36.4	571.7	5	9.1	583.0	1	1.8	607.0
	TOTAL	55	100.0	588.7	1	1.8	555.0	44	80.0	587.2	8	14.5	599.1	2	3.6	597.5
7/10	MALE	25	48.1	643.0	0	0	-	17	32.7	660.0	8	15.4	607.0	0	0	-
	FEMALE	27	51.9	592.3	0	0	-	21	40.4	590.3	5	9.6	592.4	1	1.9	635.0
	TOTAL	52	100.0	616.7	0	0	-	38	73.1	621.5	13	25.0	601.4	1	1.9	635.0
7/13	MALE	11	40.7	595.9	0	0	-	8	29.6	594.2	3	11.1	600.3	0	0	-
	FEMALE	16	59.3	581.0	0	0	-	14	51.9	579.7	2	7.4	590.5	0	0	-
	TOTAL	27	100.0	587.1	0	0	-	22	81.5	585.0	5	18.5	596.4	0	0	-
7/15	MALE	10	37.0	595.2	0	0	-	8	29.6	585.2	1	3.7	612.0	1	3.7	658.0
	FEMALE	17	63.0	569.0	0	0	-	12	44.4	559.0	4	14.8	594.8	1	3.7	585.0
	TOTAL	27	100.0	578.7	0	0	-	20	74.1	569.5	5	18.5	598.2	2	7.4	621.5
7/24	MALE	21	41.2	564.1	5	9.8	528.8	15	29.4	575.7	1	2.0	566.0	0	0	-
	FEMALE	30	58.8	585.2	2	3.9	537.0	27	52.9	588.6	1	2.0	591.0	0	0	-
	TOTAL	51	100.0	576.5	7	13.7	531.1	42	82.4	584.0	2	3.9	578.5	0	0	-
TOTAL	MALE	219	51.0	605.7	6	1.4	533.2	141	32.9	604.4	66	15.4	612.6	6	1.4	633.7
	FEMALE	210	49.0	582.7	2	0.5	537.0	146	34.0	581.2	58	13.5	586.2	4	0.9	607.5
	TOTAL	429	100.0	594.6	8	1.9	534.1	287	66.9	592.6	124	28.9	600.2	10	2.3	623.2

Table 7. Adjusted and Expanded Daily Salmon Migration, Kwiniuk River, 1982.

	Chum		Pink	
Date	Adjusted Count	Expanded Count 1/	Adjusted Count	Expanded Count 1/
6/21	0	0	3	3
6/22	365	377	151	159
6/23	166	171	63	66
6/24	29	30	54	57
6/25 2/	5326	5502	5786	6104
6/26	3808	3934	10273	10838
6/27	1012	1012	12476	12476
6/28	495	511	3292	3473
6/29	581	600	4679	4936
6/30	752	777	7289	7690
7/1 2/	-634	-613	-2627	-2483
7/2	1518	1530	1459	1481
7/3	2869	2892	23971	24331
7/4	2944	2968	39079	39665
7/5	2730	2730	32835	32835
7/6	518	522	9863	10011
7/7 2/	3557	3585	59487	60379
7/8 2/	4805	4843	66228	67221
7/9	2900	2929	51280	52049
7/10	327	330	13464	13666
7/11	382	385	13660	13865
7/12	1653	1666	25258	25637
7/13	1625	1625	19294	19410
7/14	484	484	10735	10799
7/15	819	819	8104	8153
7/16 2/	350	350	3727	3749
7/17	311	311	5090	5121
7/18	789	789	6523	6562
7/19	732	732	6119	6119
7/20	1216	1216	11317	11385
7/21	393	393	6395	6433
7/22	200	200	2143	2156
7/23	339	339	1209	1216
7/24	-22	-22	162	163
7/25	78	78	2065	2077
7/26 2/	104	104	1861	1872
	43521	44036	462767	469674

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.

Table 8. Daily Water Temperatures, 1982.

Date	Temperature °F
6/19	49
6/20	50
6/21	50
6/22	50
6/23	52
6/24	52
6/25	57
6/26	58
6/27	57
6/28	56
6/29	54
6/30	53
7/1	52
7/2	49
7/3	54
7/4	56
7/5	56
7/6	56
7/7	56
7/8	59
7/9	61
7/10	57
7/11	58
7/12	60
7/13	62
7/14	60
7/15	58
7/16	57
7/17	54
7/18	56
7/19	58
7/20	60
7/21	58
7/22	53
7/23	52
7/24	50
7/25	49
7/26	49

Table 9. 30 minute Estimated Count/Actual Count.

Date	Chum	Pink
6/22	0.86	0.89
6/23	1.33	1.24
6/24	2.21	1.00
6/25	1.34	1.07
6/26	0.86	0.81
6/27	1.10	1.00
6/28	0.97	0.93
6/29	0.66	0.92
6/30	1.05	1.05
7/1	0.86	0.84
7/2	0.86	0.35
7/3	1.06	0.94
7/4	1.04	0.96
7/5	1.06	0.99
7/6	0.97	0.98
7/7	0.91	0.93
7/8	0.90	0.93
7/9	1.03	1.06
7/10	0.92	1.11
7/11	0.92	0.89
7/12	1.00	1.04
7/13	1.04	0.91
7/14	1.06	1.07
7/15	0.96	1.00
7/16	1.12	1.07
7/17	0.86	0.98
7/18	0.93	0.91
7/19	0.90	0.90
7/20	1.03	1.00
7/21	1.16	0.99
7/22	1.23	1.12
7/23	0.92	0.82
7.24	0.73	1.01
7/25	0.56	0.79
7/26	1.02	0.93

Appendix Table 1. Daily total cumulative salmon escapement, Kwiniuk River.

Species	Date	1981	1982
Chum	6/18		
	6/19	96	
	6/20	154	
	6/21	186	0
	6/22	465	365
	6/23	939	531
	6/24	2375	560
	6/25	3390	5023
	6/26	4510	8831
	6/27	5077	9810
	6/28	5137	10305
	6/29	5601	10886
	6/30	6989	11638
	7/01	7724	11004
	7/02	7927	12522
	7/03	11582	15391
	7/04	13466	18335
	7/05	13257	21044
	7/06	15058	21562
	7/07	16374	25119
	7/08	16714	28678
	7/09	19678	31312
	7/10	20203	31639
	7/11	20598	32021
	7/12	22783	33674
	7/13	23744	35299
	7/14	25529	35783
	7/15	27091	36602
	7/16	27933	36941
	7/17	28643	37252
	7/18	29546	38041
	7/19	30016	38773
	7/20	31219	39989
	7/21	32005	40382
	7/22	32195	40582
	7/23	33184	40921
	7/24	33757	40899
	7/25	34043	40977
	7/26	34123	41073
	7/27	34231	
	7/28	34231	
	7/29	34269	
	7/30	34288	
	7/31	34299	
	8/01	34307	
	8/02	34310	
		---	---
		34561 5/	44036 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

Species	Date	1981	1982
PINK	6/18		
	6/19	16	
	6/20	54	
	6/21	30	3
	6/22	48	154
	6/23	95	217
	6/24	289	271
	6/25	446	5529
	6/26	674	15802
	6/27	890	27587
	6/28	1007	30879
	6/29	1294	35558
	6/30	1754	42847
	7/01	2118	49219
	7/02	2452	41678
	7/03	4015	65649
	7/04	6999	104728
	7/05	6883	137055
	7/06	12077	146918
	7/07	16246	206405
	7/08	20240	253648
	7/09	33601	296453
	7/10	36436	309917
	7/11	42353	323477
	7/12	56464	348835
	7/13	65414	368129
	7/14	82109	378864
	7/15	103658	386968
	7/16	136304	390615
	7/17	171869	395705
	7/18	203372	402228
	7/19	221204	408311
	7/20	269584	419628
	7/21	311694	426023
	7/22	338697	428166
	7/23	406350	429375
	7/24	485775	429537
	7/25	533035	431602
	7/26	536815	433395
	7/27	542727	
	7/28	542419	
	7/29	545815	
	7/30	547424	
	7/31	549059	
	8/01	549776	
	8/02	550283	
	Expanded Total	566417 5/	469674 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, 1965-1982.

Date	Cumulative Total	Cumulative %
6/18	6	0.00
6/19	142	0.03
6/20	289	0.06
6/21	430	0.09
6/22	1556	0.32
6/23	2741	0.56
6/24	4826	0.98
6/25	11683	2.37
6/26	19671	3.99
6/27	24506	4.97
6/28	30000	6.08
6/29	37788	7.66
6/30	48400	9.81
7/1	65503	13.27
7/2	80624	16.34
7/3	103549	20.98
7/4	131193	26.58
7/5	156490	31.71
7/6	178661	36.20
7/7	196979	39.91
7/8	238080	48.24
7/9	267957	54.30
7/10	291212	59.01
7/11	314822	63.79
7/12	343205	69.54
7/13	360580	73.06
7/14	381095	77.22
7/15	405844	82.24
7/16	417637	84.63
7/17	434751	88.09
7/18	446583	90.49
7/19	459536	93.12
7/20	471402	95.52
7/21	476967	96.65
7/22	481275	97.52
7/23	485075	98.29
7/24	489012	99.09
7/25	491098	99.51
7/26	492616	99.82
7/27	493153	99.93
7/28	493308	99.96
7/29	493436	99.98
7/30	493472	99.99
7/31	493492	100.00
8/1	493512	100.00

Appendix Table 4. Kwiniuk River Counting Tower Escapement Rates, Pink Salmon, 1979-1982.

Date	Cumulative Total	Cumulative %
6/19	16	0.00
6/20	54	0.00
6/21	33	0.00
6/22	202	0.01
6/23	315	0.02
6/24	580	0.04
6/25	3009	0.21
6/26	16999	1.17
6/27	29216	2.01
6/28	32669	2.24
6/29	37676	2.59
6/30	45635	3.14
7/1	44412	3.05
7/2	46029	3.16
7/3	72114	4.95
7/4	115272	7.92
7/5	149360	10.26
7/6	166829	11.46
7/7	236388	16.24
7/8	317466	21.81
7/9	382964	26.31
7/10	413719	28.42
7/11	443902	30.50
7/12	500577	34.39
7/13	570850	39.22
7/14	601704	41.34
7/15	655647	45.04
7/16	721652	49.58
7/17	805415	55.33
7/18	876617	60.23
7/19	958101	65.82
7/20	1058578	72.73
7/21	1158391	79.58
7/22	1213459	83.37
7/23	1294521	88.94
7/24	1379113	94.75
7/25	1432696	98.43
7/26	1445979	99.34
7/27	1447671	99.46
7/28	1447704	99.46
7/29	1451100	99.69
7/30	1452709	99.80
7/31	1454344	99.92
8/1	1455061	99.97
8/2	1455568	100.00

Appendix Table 5. Kwiniuk River Counting Tower Escapement Rates, Chum Salmon, for "Early Years": 1974, 1978, 1979, 1981, 1982.

Date	Daily Total	Daily %	Cumulative %
6/19	112	0.08	0.08
6/20	121	0.09	0.17
6/21	33	0.02	0.19
6/22	778	0.57	0.76
6/23	922	0.68	1.44
6/24	1937	1.41	2.85
6/25	6680	4.93	7.78
6/26	7257	5.36	13.14
6/27	3324	2.45	15.59
6/28	2640	1.95	17.54
6/29	2593	1.91	19.45
6/30	4234	3.12	22.57
7/1	1845	1.36	23.93
7/2	4374	3.23	27.16
7/3	8717	6.43	33.60
7/4	7008	5.17	38.77
7/5	4457	3.29	42.06
7/6	5421	4.00	46.06
7/7	6537	4.82	50.88
7/8	6775	5.00	55.88
7/9	7959	5.87	61.76
7/10	2484	1.83	63.59
7/11	2952	2.18	65.77
7/12	6331	4.67	70.44
7/13	4658	3.44	73.88
7/14	4568	3.37	77.25
7/15	10540	7.78	85.04
7/16	3347	2.47	87.51
7/17	2067	1.53	89.04
7/18	2947	2.18	91.22
7/19	2046	1.51	92.73
7/20	3092	2.28	95.01
7/21	1952	1.44	96.45
7/22	1141	0.84	97.29
7/23	1799	1.33	98.62
7/24	896	0.66	99.28
7/25	574	0.40	99.68
7/26	215	0.16	99.84
7/27	108	0.08	99.92
7/28	0	0.00	99.92
7/29	38	0.03	99.95
7/30	19	0.01	99.96
7/31	11	0.01	99.97
8/1	8	0.01	99.98
	135,427		

Appendix Table 6. Kwiniuk River Counting Tower Escapement Rates, Chum Salmon "Normal" Timing, 1966, 1968, 1969,1970, 1972, 1976, 1977, 1980.

Date	Chum Total	Chum %	@ 20000	@ 25000	@ 30000
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
7/8	102183	51.55	10310	12888	15465
7/9	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 7. 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

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