TUBUTULIK RIVER SALMON COUNTING TOWER
1980

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INTRODUCTION

A salmon counting tower project was initiated in 1980 on the Tubutulik River, approximately 115 miles east of Nome and 10 miles north of Moses Point (Figure 1). The Tubutulik River has a moderate run of chum salmon and in recent years, a large run of pink salmon. The salmon run is subjected to an intensive commercial and subsistence fishery at Moses Point. This fishery is supported almost exclusively by salmon returns to the Kwiniuk and Tubutulik Rivers. A counting tower has been operated on the Kwiniuk River since 1965 and it has been assumed that the salmon stocks of each river contribute equally to the commercial catch. Although recent years catch levels have not changed markedly, apparent changes in the distribution of the fishing effort have led biologists to speculate that perhaps more effort is being placed on the Tubutulik River stocks and that it may be the Tubutulik River stocks that are sustaining the commercial salmon catch rather than the countinued strength of the Kwiniuk River stocks.

The Tubutulik River counting tower project was initiated to provide the background data necessary for continued sound salmon management practices.

OBJECTIVES

The 1980 project objectives were to:

1. To locate and operate a salmon escapement counting tower on the lower portion of the Tubutulik River.

2. To perform a salmon tagging program within Kwiniuk Inlet to determine migration routes and timing of salmon passing through this portion of the fishery.

METHODS

A portable 20 foot aluminum counting tower was erected on the Tubutulik River approximately 12 miles upstream from the mouth (Figure 2). The tower site was located at the confluence of two channels of the river and a second counting tower was constructed in a spruce tree overlooking the secondary or "side channel". The aluminum tower was placed on the "primary" OR "main channel", which appeared to have the majority of the river water and water current and was assumed to be the primary salmon migration route. Each channel was approximately 80-100 feet wide and approximately 4-6' deep at its deepest point. Stream flow in the main channel was in excess of one meter per second and in the side channel about one-half meter per second.

A 50 foot weir of 4' tall poultry netting and fence posts was constructed on each channel to divert upstream migrants towards the counting tower. A 50' x 3' white canvas background panel was placed on the river substrate to enhance counting visibility. It was secured by 1/4-inch wire cable which was threaded through panel eyelets. The cable, weighted with sandbags at intervals, was anchored from two fence stakes, one immediately below the tower and the other in mid-stream. A powerline with four 400-watt light bulbs housed in 18-inch diameter reflectors was strung across each channel to provide illumination during periods of darkness and

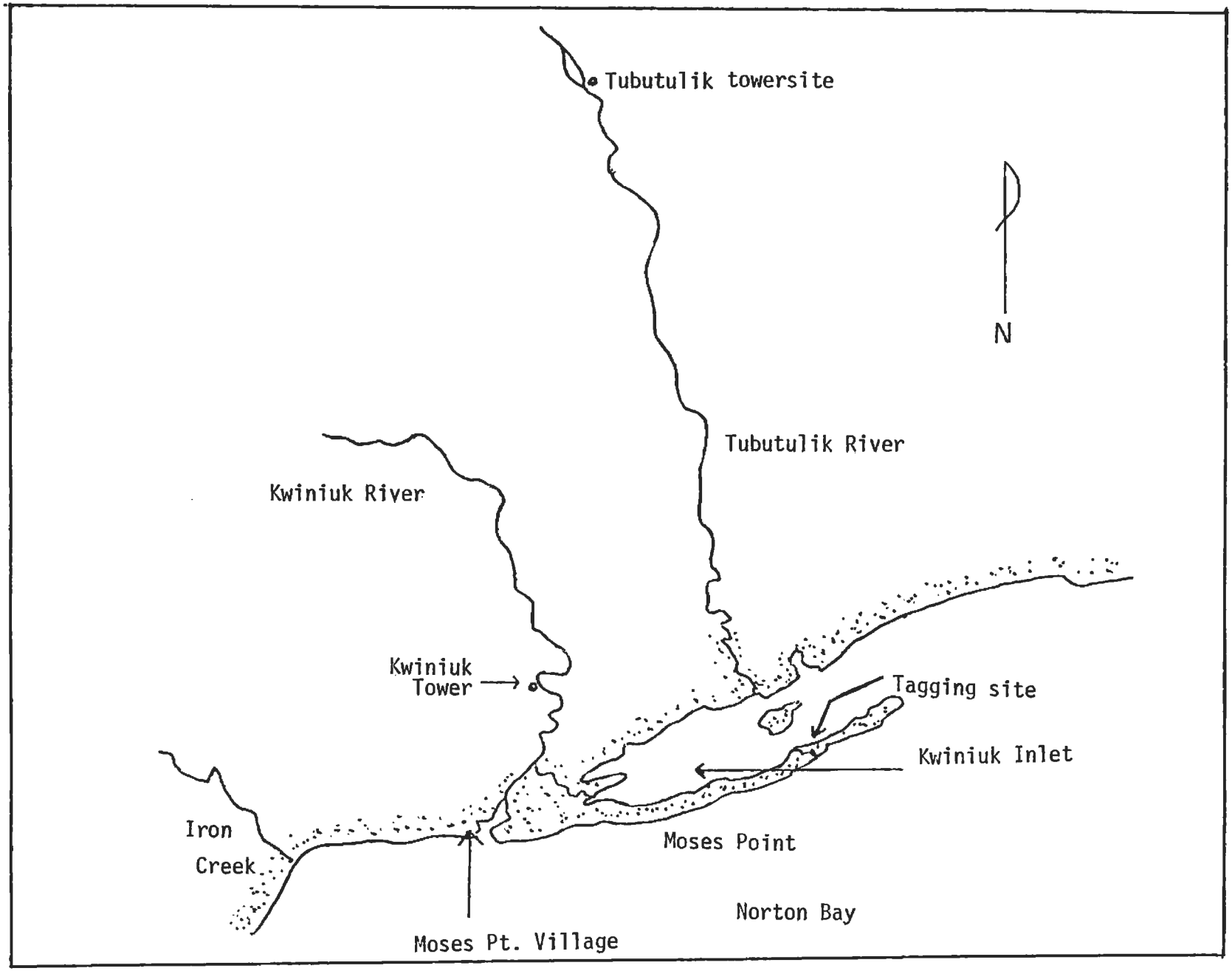

Figure 1. Salmon counting tower location, Tubutulik River, 1980.
Scale 1:250,000

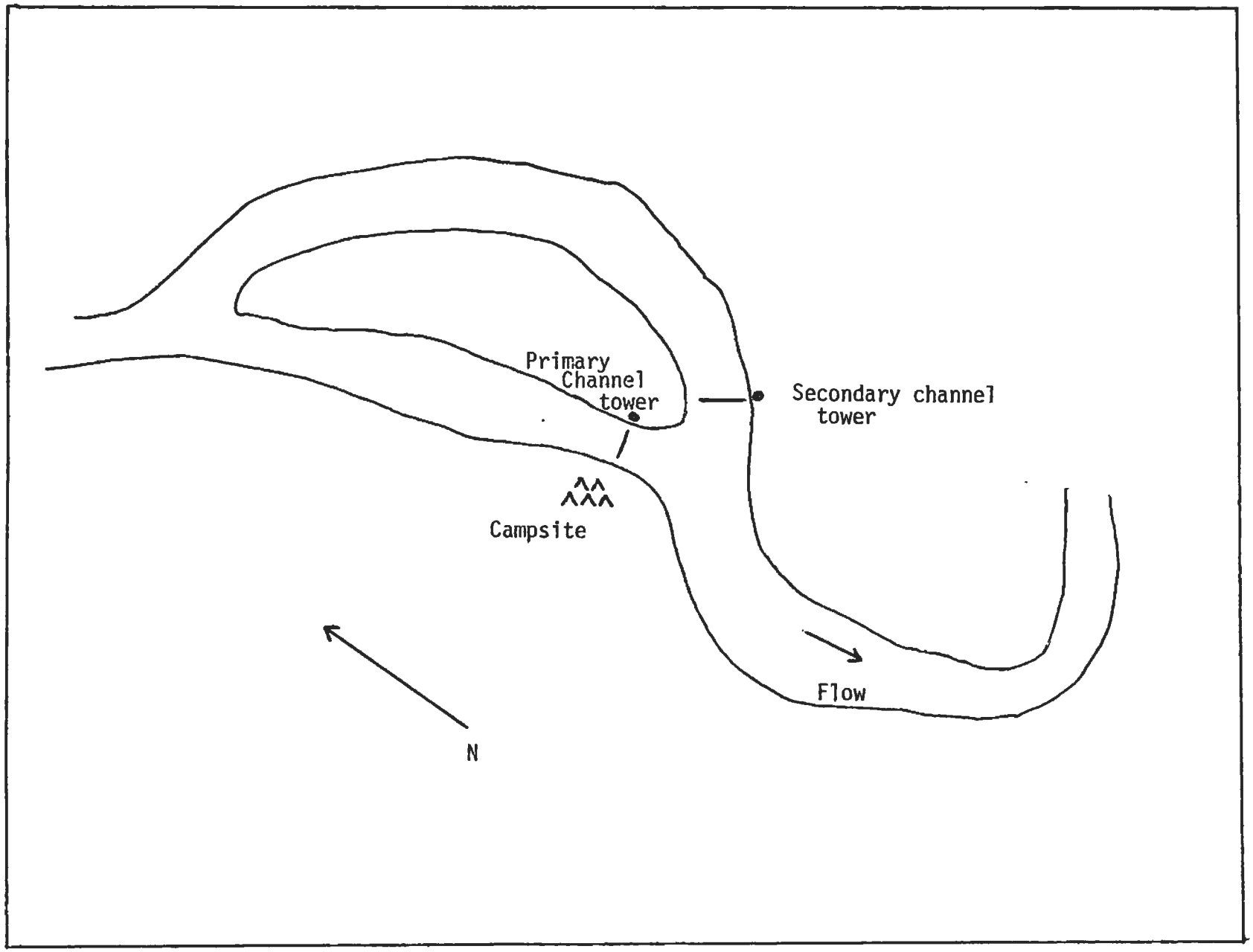

Figure 2. Tubutulik River tower and campsite location, Tubutulik River, 1980.

overcast. A heavy tripod weighted with sandbags, was positioned on the sandbar opposite the tower. A rope was strung from the tower to the top of the tripod. The powerline was attached onto the rope with loops and drawn across the river to the tripod. A 2750 watt generator provided electrical power for the lights.

A three person crew began 18-hour counting operations on June 30 and terminated counting on July 28. Each crew member counted salmon for two 3-hour shifts daily, from 1200 hours until 0600 hours the following day. Hourly counts were totaled and live salmon moving downstream were subtracted from the total. During the first eight days of counting the crew apportioned their counting hours to count the salmon migration in both channels in order to determine the proportion of the run in each channel. Based on that information, the "main channel" was counted 18-hours daily beginning July 8, with only periodic counts made of the side channel.

Ten-minute counts were made at the beginning of each counting hour to determine if 10-minute counts could be used as a basis for estimating hourly migration. Ten-minute counts were expanded by a factor of six to obtain an estimate of hourly migration.

Chum and pink salmon were captured in 5-3/8" gillnets of 50 fathom length in the south side of Kwiniuk Inlet, about two miles from the mouth of the Tubutulik River. The captured salmon were removed from the net immediately and tagged. The tags were applied by tightly wrapping a rubber band, with a one foot long streamer of colored surveyor's tape attached, around the caudal peduncle. The color of the tag used was changed daily.

RESULTS

A total of 10,560 chum salmon, 421,761 pink salmon and 404 king salmon were counted past the primary channel tower in 1980 (Table 1). Simultaneous comparative counts made on the primary channel and the side channel indicated that approximately 10% of the chum salmon and 20 percent of the pink salmon used the side channel as a migration route (Table 2). Expansion of the total salmon counts by this factor would result in a total of 11,616 chum salmon and 463,937 pink salmon past the counting tower site.

The chum salmon migration exhibited peaks on July 8 with 9.5% and on July 18, with 11.8% of the run passing the tower on those dates (Table 3). The pink run peaked on July 19 with 13.3% of the pinks passing the tower (Table 4).

Peak hourly counts were recorded between 1900 hours and 2200 hours for pink salmon when 43.0% of the daily run passed the tower (Table 3). Chum salmon counts peaked between 2000 hours and 0200 hours when 56% of the daily run passed the tower (Table 4).

A total of 20 chum and 30 pink salmon were tagged in Kwiniuk Inlet in four days of tagging. The tagging was done between July 8 and July 12. One tagged chum salmon passed the Tubutulik River tower site. The fish had been tagged on July 8 and passed the tower on July 16, and elapsed travel time of approximately 8 days. Four tagged chums and two tagged

Table 1. Primary channel tower daily and cumulative salmon counts, Tubutulik River 1980.

Date	Hours Counted	Daily Total			Cumulative Totals		
		King	Chum	Pink	King	Chum	Pink
6/30/80	2	0	0	0	0	0	0
7/1	5	1	13	0	1	13	0
7/2	3	0	2	0	1	15	0
7/3	3	0	0	0	1	15	0
7/4	14	2	22	3	3	37	3
7/5	14	4	74	5	7	111	8
7/6	12	19	687	13	26	798	21
7/7	15	16	187	49	42	985	70
7/8	18	29	1019	237	71	2004	307
7/9	18	40	1001	327	111	3005	644
7/10	No Counts Made				111	3005	644
7/11	10	18	449	209	129	3454	853
7/12	No Counts Made				129	3454	853
7/13	12	11	140	236	140	3590	1089
7/14	18	35	395	3950	175	3985	5039
7/15	24	23	407	12552	198	4392	17591
7/16	18	19	453	18863	217	4845	36463
7/17	18	28	768	25812	245	5613	62275
7/18	18	42	1244	35231	287	6857	97506
7/19	18	24	1087	56140	311	7944	153646
7/20	18	24	695	48711	335	8642	202357
7/21	18	11	286	30377	346	8928	232734
7/22	18	13	403	40196	359	9331	272930
7/23	18	13	284	33600	377	9615	306530
7/24	18	8	318	28321	380	9933	334851
7/25	18	6	189	24321	386	10122	359172
7/26	18	5	93	14573	392	10215	373745
7/27	18	5	203	29872	397	10418	403617
7/28	15	7	141	18163	404	10560	421761
				Total	404	10560	421761

Table 2. Side channel tower, daily and cumulative salmon counts, Tubutulik River, 1980.

Date	Hours Counted	Daily Total			Cumulative Total		
		King	Chum	Pink	King	Chum	Pink
6/30/80	1	0	0	0	0	0	0
7/1	1	0	0	0	0	0	0
7/2	2	0	0	0	0	0	0
7/3	2	1	1	0	1	1	0
7/4	3	0	1	3	1	2	3
7/5	6	3	22	0	4	24	3
7/6	6	32	92	23	36	116	26
7/7	6	6	23	45	42	139	71
7/8	-	-	-	-	42	139	71
7/9	-	-	-	-	42	139	71
7/10	18	21	259	706	63	398	777
7/11	-	-	-	-	-	-	-
7/12	-	-	-	-	-	-	-
7/13	-	-	-	-	-	-	-
7/14	-	-	-	-	-	-	-
7/15	3	2	27	1332	65	425	2109
7/16	2	3	24	333	68	449	2446
				Total	68	449	2446

Table 3. Daily/Hourly pink salmon migration past Tubutulik River counting tower, 1980.

Hour/ Date	00	01	02	03	04	05	12	13	14	15	16	17	18	19	20	21	22	23	Daily Total	Daily % of Total
6/30/80	-	-	-	-	-	-	0	-	-	-	0	-	-	-	-	-	-	-	0	0.0
7/1/80	0	-	-	-	0	-	-	-	-	-	0	-	-	-	0	-	-	-	0	0.0
7/2	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	0	0.0
7/3	0	-	-	-	-	-	0	-	-	-	0	-	-	-	-	-	-	-	0	0.0
7/4	0	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	3	0	3	0.0
7/5	1	0	0	-	-	-	0	1	0	0	0	0	3	0	0	0	-	-	5	0.0
7/6	-	-	-	-	-	-	1	2	-1	0	1	0	1	2	0	2	0	5	13	0.0
7/7	1	3	0	-	-	-	0	0	0	3	0	2	5	6	12	7	6	4	49	0.0
7/8	3	7	2	-	-	-	0	8	3	5	8	30	11	31	28	44	39	11	237	0.0
7/9	19	20	10	-1	2	-2	0	4	3	2	19	18	50	28	46	74	16	19	327	0.1
7/11	132	59	31	12	9	-3	7	5	2	35	-	-	-	-	-	-	-	-	209	0.0
7/13	-	-	-	-	-	-	3	0	5	6	16	9	22	35	60	11	35	34	236	0.0
7/14	32	16	9	12	35	44	12	51	50	131	166	344	396	504	535	504	543	566	3950	0.9
7/15	88	25	63	34	-1	-51	54	119	345	909	1022	1731	1784	1805	1504	1390	1319	615	12552*	2.9
7/16	944	844	705	1165	672	-360	50	47	245	714	1064	1135	2175	3230	2656	1201	1191	1185	18863	4.5
7/17	2010	1706	1783	1162	868	520	16	85	112	1268	2007	2027	2445	3129	2584	1580	1112	1948	25812	6.1
7/18	2041	2011	1265	993	856	573	479	981290		1152	3764	2115	1971	3172	3315	3221	2851	3177	35231	8.3
7/19	3283	3410	3733	2223	2626	1675	4	470	968	1325	2471	2179	2730	4698	4495	5721	7465	6564	56140	13.3
7/20	4158	3531	4194	3110	2710	2069	-173	11	373	2422	1930	4032	2612	4636	4661	3615	5045	775	48711	11.5
7/21	1041	158	66	533	396	1182	-103	34	311	1847	1723	2734	2862	3910	3720	3075	3840	3048	30377	7.2
7/22	2647	834	533	262	762	320	-218	162	345	2314	3340	3144	3647	4666	4350	5706	4341	3041	40196	9.5
7/23	1411	265	337	420	903	126	-28	-10	1135	1516	3013	4048	3315	5671	4602	2762	2971	1143	33600	7.9
7/24	565	306	266	559	775	421	8	263	512	1670	2371	4311	3513417		3716	2403	2329	926	28321	6.7
7/25	358	65	69	272	527	98	37	232	388	1121	2232	3452	2696	4167	3406	3490	1725	-21	24321	5.8
7/26	-26	-38	13	43	20	4	-23	40	0	562	1238	2223	1744	2707	2176	3088	730	72	14573	3.4
7/27	112	43	52	192	13	4	93	326	776	1821	3111	3607	3832	5054	6220	3420	1036	164	29872	7.1
7/28	179	45	81	34	23	10	-50	85	377	459	1792	2641	2908	3054	2856	2420	1161	88	18163	4.3
																			421761	100.0
Hourly Total	18999	13310	13165	11025	11196	6630	179	2920	7239	19272	31298	39782	38722	53922	50402	43734	37758	23364		
% of Hourly Total	5.0	3.0	3.0	3.0	3.0	2.0	0.0	1.0	2.0	5.0	7.0	9.0	9.0	13.0	12.0	10.0	9.0	6.0		

* 24 hour count total

Table 4 . Daily/Hourly chum salmon migration past Tubutulik River counting tower, 1980.

Hour/ Date	00	01	02	03	04	05	12	13	14	15	16	17	18	19	20	21	22	23	Daily Total	Daily % of Total
6/30/80	-	-	-	-	-	-	0	-	-	-	0	-	-	-	-	-	-	-	0	0.0
7/1/80	14	-	-	-	-	-	-	-	-	-	0	-	-	-	0	-	-	-	13	0.1
7/2	-	-	-	-	-	-	0	-	-	-	-	-	-	-	2	-	-	-	2	0.0
7/3	0	-	-	-	-	-	0	-	-	-	0	-	-	-	-	-	-	-	0	0.0
7/4	-1	-	-	-	-	-	-	-	-2	0	0	1	0	10	1	-1	14	-1	22	0.2
7/5	-3	10	0	-	-	-	-1	3	0	6	3	0	8	42	6	0	-	-	74	0.7
7/6	-	-	-	-	-	-	15	20	9	59	84	108	42	68	21	110	114	37	687	6.5
7/7	19	29	0	-	-	-	0	0	3	2	1	0	3	14	39	122	45	20	187	1.7
7/8	57	51	16	0	0	0	8	7	10	3	30	114	124	87	133	114	171	86	1019	9.6
7/9	102	237	70	21	7	-7	2	3	8	8	25	24	26	28	79	178	77	113	1001	9.5
7/11	147	186	53	24	8	-7	10	6	4	18	-	-	-	-	-	-	-	-	449	4.2
7/13	-	-	-	-	-	-	3	3	2	9	28	13	23	28	18	1	8	4	140	1.3
7/14	25	6	4	7	6	8	0	3	17	19	41	23	17	25	31	45	57	61	395	3.7
7/15	15	4	7	4	-4	-5	8	4	15	35	56	45	39	42	39	15	31	27	407*	3.8
7/16	63	31	38	18	9	6	7	4	15	26	24	25	14	53	36	23	27	34	453	4.3
7/17	74	44	40	17	40	21	6	15	28	35	54	63	47	49	61	63	44	67	768	7.2
7/18	46	54	51	19	22	13	55	180	102	38	64	120	61	91	99	78	80	61	1244	11.8
7/19	105	119	76	38	33	27	12	40	57	47	77	62	60	75	49	63	78	69	1087	10.3
7/20	83	88	72	72	28	18	10	12	17	42	38	46	22	66	58	21	40	15	695	6.6
7/21	33	18	5	6	11	19	3	8	10	10	24	31	17	29	13	18	15	16	286	2.7
7/22	43	19	11	2	10	7	-1	3	10	53	48	41	34	25	27	22	19	30	403	3.8
7/23	34	23	9	6	2	2	1	10	32	14	20	33	27	31	9	8	6	17	284	2.7
7/24	26	11	8	7	6	8	14	21	18	22	26	54	28	13	19	12	8	17	318	3.0
7/25	11	3	5	6	8	4	-1	2	2	7	21	27	20	28	19	18	10	-1	189	1.8
7/26	-3	1	3	0	1	1	0	3	0	6	10	19	11	21	9	8	4	-1	93	0.9
7/27	3	5	2	3	2	1	2	2	10	16	20	18	28	25	22	26	10	8	203	1.9
7/28	4	4	3	-	-	-	2	6	11	5	13	7	8	17	24	17	11	9	141	1.3
																			10560	99.6
Hourly Total	897	943	473	250	189	116	155	355	378	490	707	874	659	867	814	973	869	688		
% of Hourly Total	8.0	9.0	4.0	2.0	2.0	1.0	1.0	3.0	4.0	5.0	7.0	8.0	6.0	8.0	8.0	9.0	8.0	7.0		

* 24 hour count total

pinks passed the Kwiniuk River tower.

An aerial survey salmon count was done on July 30, to determine the distribution and magnitude of salmon spawning below the tower site. An estimated 200,000 pinks and 10,000 chums were seen with spawning activity appearing to be at its peak from the river mouth to the tower site.

DISCUSSION

The number of salmon counted past the Tubutulik River weir in 1980 was a minimum escapement count. The major factor preventing a total count was the necessity of placing the tower site on a braided section of the river in order to find areas where the water was shallow enough and the river narrow enough for effective counting. Although there were only two river channels, a three man crew was not sufficient to totally count each channel. Therefore after determining which channel was the primary migration route, a subsample count was made of the other channel as time allowed. This subsample showed that approximately 10 percent of chum salmon and up to 20% of the pink salmon used the secondary channel. The total chum salmon run could possibly be increased by another 1000 fish to account for two counting days lost on July 10 and 12 due to equipment failure.

The inclusion of these factors, and the estimated aerial survey counts would place the figure for the total Tubutulik River escapement at a minimum of 650,000 pink salmon and 23,000 chum salmon.

Due to extremely large numbers of pinks spawning between the mouth of the river and the tower site, an accurate assessment of the number of chums below the tower was impossible and the aerial survey results were also an absolute minimum.

It has been assumed that the Tubutulik and Kwiniuk Rivers probably contributed equally to the Moses Point subdistrict salmon run; however there appears to be evidence that the Tubutulik River may be the more productive system. For example, the Tubutulik is a longer, wider river and probably has a greater flow. It also appears to have more available spawning gravel. The pink salmon run in the Tubutulik River in 1980 was greater than twice the size of the Kwiniuk River and the minimum estimate for the Tubutulik River chum run was larger than the total count for the Kwiniuk River chum run.

There was apparently a very good correlation between the peak chum salmon counts past the Kwiniuk and Tubutulik counting towers (Figure 3). A peak count at the Kwiniuk tower was followed 10 days later by a peak at the Tubutulik tower. This was consistent with all three peaks observed at the Kwiniuk tower. The approximate 10 day travel time from the mouth to the tower site was also indicated in that the single tagged chum salmon which passed the Tubutulik tower was sighted 8 days after being tagged near the mouth of the river.

There was a very good correlation between the expanded "10 minute count" estimate and the actual count (Table 5). If this project is to be continued it should be noted that it would be possible to count both

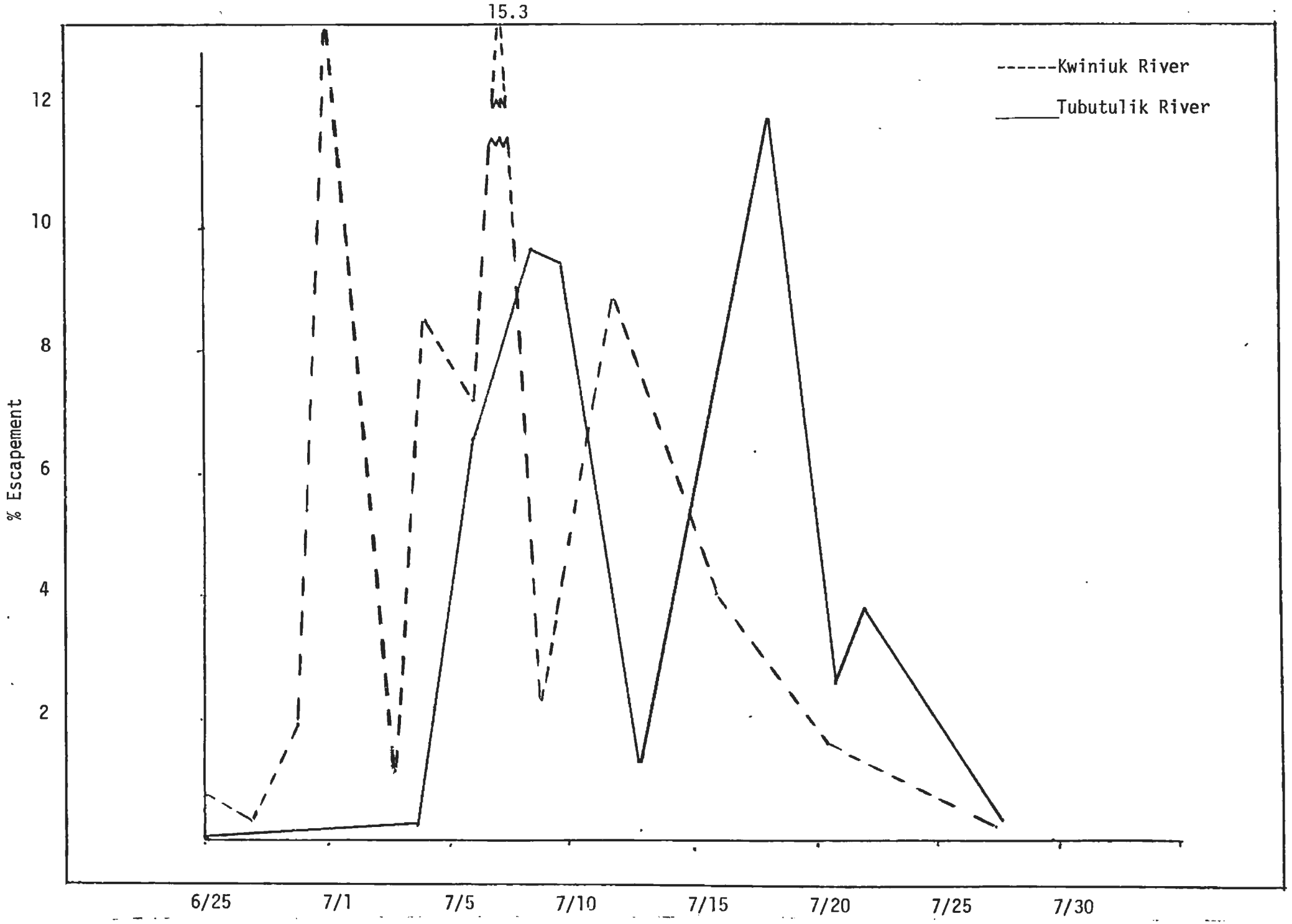

Figure 3. Daily chum salmon escapement past the Tubutulik and Kwiniuk River Towers, 1980.

Table 5. Estimated hourly counts versus actual counts, chum and pink salmon, Tubutulik River, 1980.

Date	Chum Salmon		Pink Salmon	
	Estimated hourly Total (10 min count x 6)	Actual Count	Estimated hourly Total (10 min count x 6)	Actual Count
6/30	0	0	0	0
7/1	0	13	0	0
7/2	0	2	0	0
7/3	0	0	0	0
7/4	36	22	0	3
7/5	54	74	0	5
7/6	1162	687	24	13
7/7	130	187	18	49
7/8	870	1019	336	237
7/9	900	1001	302	327
7/10	No counts			
7/11	420	449	248	209
7/12	No counts			
7/13	150	140	264	236
7/14	456	395	3130	3950
7/15	360	407	14748	12552
7/16	480	453	19868	18863
7/17	862	768	22408	25812
7/18	914	1244	25218	35231
7/19	1050	1087	48054	56140
7/20	642	698	39612	48711
7/21	372	286	26598	30377
7/22	474	403	32304	40196
7/23	246	284	32412	33600
7/24	300	318	21416	28321
7/25	192	189	21318	24321
7/26	78	93	12474	14573
7/27	282	203	29268	29872
7/28	204	141	12168	18163
Total	10634	10560	362188	421761
% of actual	101%		86%	

channels using the expanded 10 minute count method, and still maintain a three-person crew. Since the site is too far above the fishery to be used as in-season management tool, this may be a viable alternative.

Table 6 shows the relationship of the Tubutulik River water temperature and the percent of salmon escapements. It appears salmon movements increased as water temperatures near 50°F (10°C).

Table 6. Air and water temperatures and chum and pink salmon migration percentages, Tubutulik River, 1980.

Date	Air Temp °F	Water Temp °F	% Chum Escapement	% Pink Escapement
7/9/80	66	47	9.5	0.1
7/10	58	47	-	-
7/11	61	48	4.2	0.0
7/12	65	45	-	-
7/13	57	45	1.3	0.0
7/14	55	45	3.7	0.9
7/15	62	47	3.8	2.9
7/16	63	48	4.3	4.5
7/17	75	52	7.2	6.1
7/18	80	54	11.8	8.3
7/19	80	58	10.3	13.3
7/20	72	58	6.6	11.5
7/21	70	58	2.7	7.2
7/22	76	58	3.8	9.5
7/23	80	58	2.7	7.9
7/24	65	57	3.0	6.7
7/25	58	56	1.8	5.8

* Observations made at 1200 hrs. daily.