

NOATAK RIVER SALMON STUDIES, 1982

By
Brian S. Bigler
Alaska Department of Fish and Game
Division of Commercial Fisheries
Kotzebue, Alaska

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INTRODUCTION

Located approximately 30 miles above the arctic circle, Kotzebue Sound supports the northern most commercial fishery in Alaska (Figure 1). Although the numerous drainages in the region support five species of pacific salmon (Oncorhynchus sp.) chum salmon (O. keta), that spawn in the Noatak and Kobuk Rivers, are the most abundant. Historic escapement data (based on aerial surveys and, recently, sonar enumeration) indicate that the Noatak River supports a chum salmon population roughly four to five times that of the Kobuk River. The Noatak River is the single greatest contributor of chum salmon to the commercial fishery in Kotzebue Sound.

Chum Salmon Fry Abundance Study

A study was conducted in 1982 to test the feasibility of producing an abundance index of the annual Noatak River chum fry emigration.

The forecast model for Kotzebue Sound chum salmon predicts returns of four and five year old chum salmon based on relationships between age class survivorship: Three year old chum salmon abundance in year x is correlated with four year old abundance in year x+1. A similar relationship exists between four and five year old chum salmon. Three year old returns are presently predicted using the statistical mean return per spawner. An annual index of juvenile chum salmon abundance could allow more accurate predictions of three year old, as well as four and five year old, age class returns.

Objectives of the study were to:

- 1) Determine the feasibility of indexing the abundance and run timing of the Noatak River chum fry emigration using fyke nets and beach seines.
- 2) Determine the feasibility of estimating annual chum fry abundance using mark and recapture techniques.

Sonar Enumeration of Adult Salmon

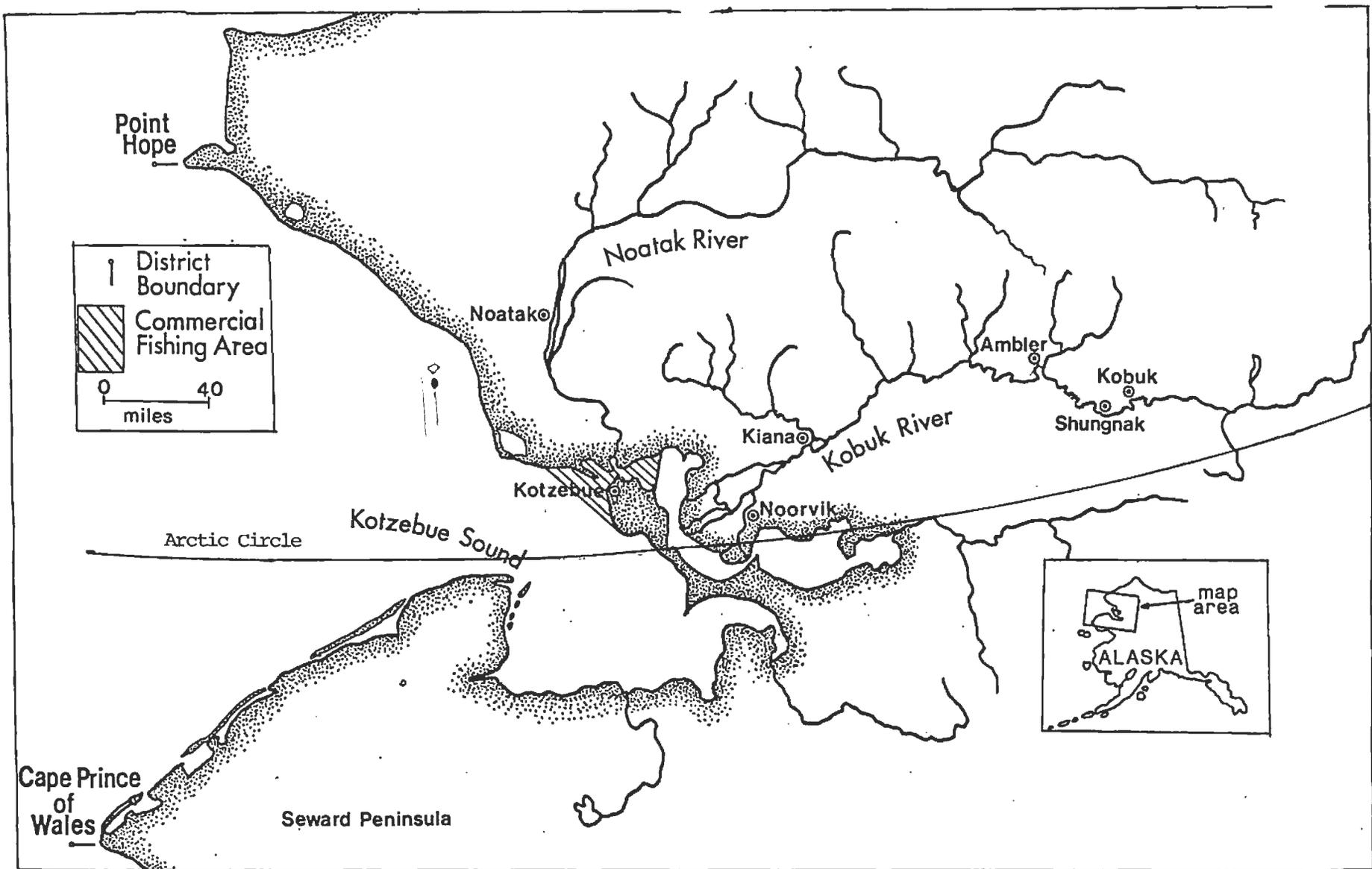
The Noatak River sonar project was established in 1979 primarily to develop an annual escapement index which could be used, because of its close proximity to the commercial fishery, as an in-season management tool.

Other objectives were to:

- 1) Sample species, sex and age composition of Noatak River escapement using gill nets.
- 2) Determine run timing and magnitude of pink salmon (O. gorbuscha) and arctic char (Salvelinus alpinus) escapement.
- 3) Develop an annual index of chum salmon escapement based on test net catch per unit effort.

Test Fishing

Prior to the 1982 season test netting was conducted in conjunction with sonar enumeration primarily to produce an annual index of chum salmon CPUE. This index was developed using only large mesh nets (5 7/8 to 6 inch stretched mesh).



Test fishing results were also used to apportion sonar counts to species. Since the net used in past work was selective for chum salmon, most sonar counts were thought to represent chum salmon. The 1982 season represents the first year that nets of differing selectivity were used in species apportionment.

METHODS AND MATERIALS

Chum Salmon Fry Abundance Study

A three person crew flew to Noatak Village, rafted downriver and began operations on 2 June, three days after ice movement past the sampling site. All salmon spawning activity occurs upriver of this site (Figure 2).

A fyke net with attached livebox (Bird, 1981, Figure 3) and a beach seine (200 feet long, 6 feet deep, 1/8 inch knotless nylon mesh, dyed green) were used to capture fry. As many as two fyke nets were operated in front of camp, two beaches were located that were suitable for seining (Figure 2, items 1 and 4).

Captured fry were to be counted, transported to camp, a biological stain applied (Bismark Brown Y, according to White, 1981), and released an adequate distance upriver to allow thorough redistribution of marked fish into the emigrant population. Marked chum fry would be recaptured downstream and a total seasonal abundance estimated using the expression:

$$\sum_{i=1}^n N_i = \frac{M_i + C_i}{R_i} \quad (1)$$

where N_i is the population estimation for period i , M_i is the number of fry marked in period i , C_i is the total chum fry catch during period i and R_i is the number of marked fry recaptured in period i .

Confidence limits for N_i are based on treating R_i as a Poisson variable. The expression:

$$R_i + 1.92 \pm 1.96\sqrt{R_i+1} \quad (2)$$

generates two values of R_i that are then run through expression (1) to produce 95 percent confidence values for N_i (Ricker, 1975).

N_i (population estimate) was to be applied according to total daily catch. Once the emigrant population had been estimated for period i the generated estimate would be applied to subsequent days that the number of fry captured remained constant. That is, if a population estimate was developed while capturing an average of 1,000 fry per day, that estimate would be applied for as long as an average of 1,000 fry per day were captured. A new estimate would be generated when a consistent change of 15 percent was noted in the daily catch.

Sonar Enumeration

Sonar equipment consisted of two 1978 model, Bendix side scanning sonar counters.

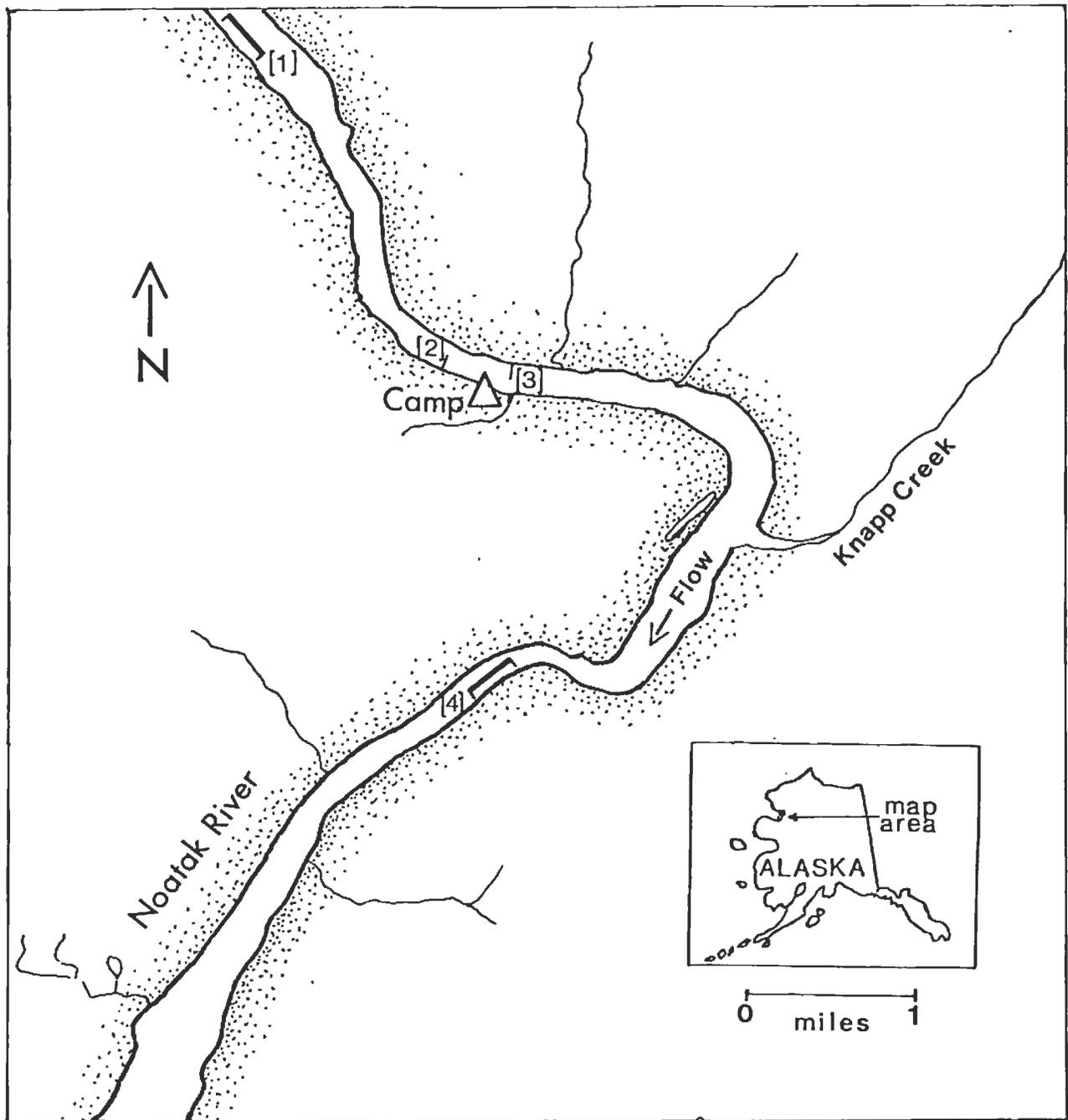


Figure 2. Site of Noatak River chum fry sampling ([1], [4], see text for explanation) and side scan sonar enumeration ([2]- south bank counter, [3] - north bank counter), 1982.

This equipment was deployed in accordance with the accompanying manual: Installation and Operation Manual-Side Scan Sonar Counter-1978 model.

Once deployed and operating, a daily schedule of calibration and test fishing commenced and continued until project termination (July 4 - September 6). Daily activity started at 0830 when test nets were deployed and the first of three daily calibration counts occurred (0830, 1430 and 2030).

Calibration consisted of observing echoes displayed on a Tektronix 323 oscilloscope connected to the sonar receiver. Observation periods were of 40 minutes duration, 30 minutes of which the sonar was operated at the normal 60 foot range. Following this 30 minute period the sonar beam was extended to 100 feet for 10 minutes to include chum migration beyond the normal operating range.

Total daily sonar counts were adjusted by the expression:

$$A \times \frac{\sum B_i}{\sum C_i} \times \frac{\sum (D_i + E_i)}{\sum D_i} = \text{Adjusted Daily Count}$$

where; A = total daily sonar counts, B = observed (oscilloscope) counts during calibration period i, C = sonar counts during calibration period i, D = observed counts within 60 foot range for period i and, E = observed counts from 60 to 100 feet during period i.

Adjustments were made in the Fish Velocity Control setting if the difference between oscilloscope and sonar counts exceeded 15 percent.

Test Fishing

Two test gill nets were operated daily on alternating sides of the river immediately upstream of each sonar for species apportionment, and chum salmon age and sex composition. The nets used were designed to selectively capture fish of average chum and pink salmon size (5 7/8 and 4 1/2 inch stretched mesh, respectively). Percentages of anadromous species caught (chum and pink salmon and arctic char) in test nets were applied to the adjusted daily count and communicated to the Kotzebue office at the morning radio schedule (0800). All chum salmon captured were examined for sex and a scale removed, from the preferred scale area, for age determination. The adipose fin was removed from each sampled fish to avoid duplication if recaptured.

Periodically a 5 7/8 inch stretched mesh gill net was fished on the bottom of the river in the area beyond the 100 foot extended sonar beam. This net was fished when time and weather allowed to compare sonar-related test net catches with those of a midriver net.

RESULTS AND DISCUSSION

Chum Salmon Fry Abundance Study

A total of 1,789 chum salmon fry was captured from 2 through 18 June (Figure 3).

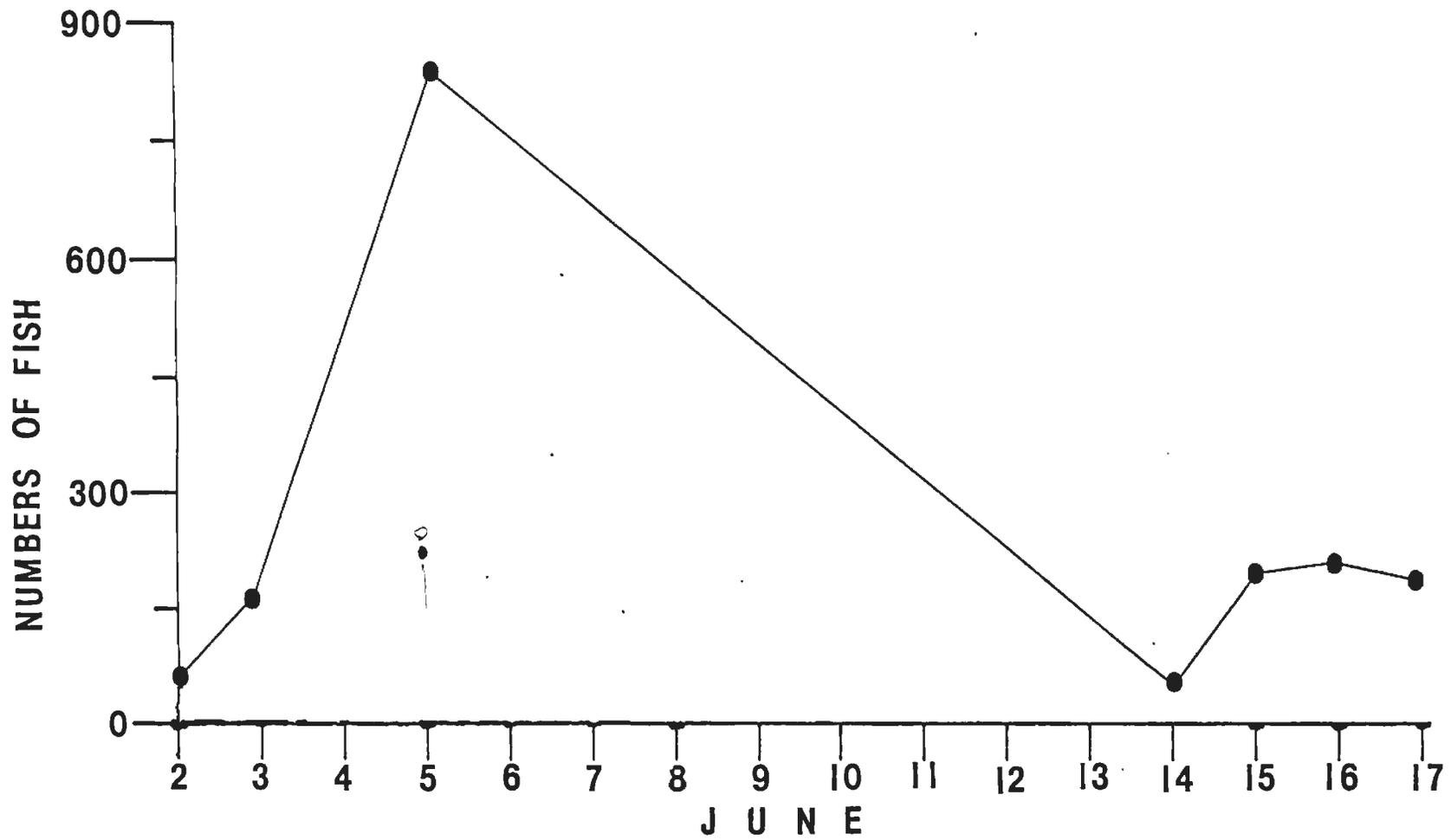


Figure 3. Daily beach seine catches of chum salmon fry, 2-17 June, 1982.

The fyke net was deployed for the first time on 3 June, at midriver. Midriver placement resulted in the total submergence of the entire assembly due to current strength. Retrieval was accomplished when the anchor unexpectedly released and the assembly momentarily floated to the surface. Fyke nets were thereafter operated in slower moving water until high debris levels forced their permanent removal.

Beach seining was the most productive capture method used. Two beaches were selected that fit the following criteria:

- 1) A variety of current velocities.
- 2) Clear of vegetation or debris that would cause net fouling.
- 3) Within ten miles of camp. (This was necessary to keep fuel consumption to a minimum while replenishment was impossible due to ice blockage of the river.)

While experimental seine hauls were performed at several beaches, only two met all criteria (Figure 2, items 1 and 4).

On 3 June, 230 chum fry had been accumulated and were used as an experiment group for staining. The following procedure was used to mark the fry:

- 1) One gram of Bismark Brown Y dye was placed in a one pint sample jar and mixed with freshwater.
- 2) This mixture was poured into a galvanized tub containing 8 gallons of water, stirred, and the fry introduced. (In this study, up to 846 chum salmon fry were stained simultaneously in 8 gallons of water for 2 hours. It is probable that many more could have received adequate staining.)
- 3) The water was continually aerated using a small 110 volt compressor powered by a gas generator. (It is very important to keep the compressor as far from the generator exhaust as possible.)

Chum fry took on a slight golden tint on the caudal and pectoral fins after 30 minutes in the dye solution. Fins were brightly colored and the body slightly tinted after one hour. Maximum time in the stain solution in this study was two hours, after which chum fry were distinctly golden colored but had lost vigor. All fish regained original vigor after two hours in fresh water. Mortality due to the dying procedure was very low, 2 percent when the water was aerated; up to 20 percent without aeration.

After two hours in the solution, retention of the dye was fair to poor. Although readily distinguishable from unstained fry, most pigment was lost within 36 hours. Fish were held up to 72 hours after staining. Stain retention was adequate over this period but it is speculated all stain would have been lost within 96 hours (4 days).

All chum fry captured were retained no more than three days. All that survived were stained and released, no stained fry were recaptured.

Table 1. Adjusted daily and cumulative Noatak River side scan sonar counts by species, 1982.

Date	Daily Adjusted Sonar Count	Chum Salmon			Pink Salmon			Arctic Char		
		Test Net Proportion	Daily Count	Cumulative Count	Test Net Proportion	Daily Count	Cumulative Count	Test Net Proportion	Daily Count	Cumulative Count
July										
4	283	0.11	31	31	0.81	229	229	0.07	20	20
5	1950	0.11	215	246	0.81	1580	1809	0.07	137	157
6	3031	0.25	758	1004	0.66	2000	3809	0.09	273	430
7	4505	0.03	135	1139	0.93	4190	7999	0.03	135	565
8	2895	0.03	97	1236	0.94	2721	10720	0.03	97	662
9	2591	0.00	0	1236	0.98	2531	13251	0.02	60	722
10	3868	0.00	0	1236	0.95	3675	16926	0.05	193	915
11	2392	0.00	0	1236	1.00	2392	19318	0.00	0	915
12	1599	0.00	0	1236	0.71	1142	20460	0.29	457	1372
13	2075	0.00	0	1236	1.00	2075	22535	0.00	0	1372
14	1074	0.00	0	1236	1.00	1074	23609	0.00	0	1372
15	2783	0.80	2226	3462	0.20	557	24166	0.00	0	1372
16	4780	0.10	455	3917	0.86	4097	28263	0.05	228	1600
17	12230	0.00	0	3917	0.98	12026	40289	0.02	203	1803
18	6550	0.00	0	3917	0.98	6416	46705	0.02	134	1937
19	5570	0.06	309	4226	0.89	4951	51656	0.06	309	2246
20	4830	0.00	0	4226	1.00	4830	56486	0.00	0	2246
21	5601	0.13	700	4926	0.63	3501	59987	0.25	1400	3646
22	4385	0.14	626	5552	0.71	3132	63119	0.14	626	4272
23	5037	0.24	1185	6737	0.68	3407	66526	0.09	444	4716
24	4237	0.24	997	7734	0.68	2866	69392	0.09	374	5090
25	2732	0.41	1125	8859	0.59	1607	70999	0.00	0	5090
26	3781	0.50	1891	10750	0.46	1745	72744	0.04	145	5235
27	4436	0.03	123	10873	0.83	3697	76441	0.14	616	5851
28	3790	0.00	0	10873	0.94	3567	80008	0.06	223	6074
29	4156	0.25	1039	11912	0.70	2909	82917	0.05	208	6282
30	3342	0.41	1370	13282	0.47	1571	84488	0.12	401	6683
31	5084	0.56	2860	16142	0.19	953	85441	0.25	1271	7954

Table 1. Adjusted daily and cumulative Noatak River side scan sonar counts by species, 1982 (continued).

Date	Daily Adjusted Sonar Count	Chum Salmon			Pink Salmon			Arctic Char		
		Test Net Proportion	Daily Count	Cumulative Count	Test Net Proportion	Daily Count	Cumulative Count	Test Net Proportion	Daily Count	Cumulative Count
August										
1	4840	0.70	3406	19548	0.15	717	86150	0.15	717	8671
2	3164	0.45	1438	20896	0.55	1726	87884	0.00	0	8671
3	5354	0.64	3427	24413	0.16	857	88741	0.20	1071	9742
4	3750	0.71	2679	27092	0.14	536	89277	0.14	536	10278
5	4702	0.65	3056	30148	0.13	611	89888	0.22	1034	11312
6	4750	0.64	3040	33188	0.12	570	90458	0.24	1140	12452
7	2899	0.92	2670	35858	0.03	76	90534	0.05	153	12605
8	4141	0.84	3497	39355	0.04	184	90718	0.11	460	13065
9	6026	0.85	5122	44477	0.00	0	90718	0.15	904	13969
10	3970	0.79	3124	47601	0.05	195	90913	0.16	651	14620
11	4228	0.92	3902	51503	0.00	0	90913	0.08	326	14946
12	2736	0.87	2366	53869	0.03	74	90987	0.11	295	15241
13	4516	0.50	2258	56127	0.08	375	91362	0.42	1883	17125
14	4213	0.75	3160	59287	0.04	177	91539	0.21	876	18000
15	3617	0.97	3501	62788	0.00	0	91539	0.03	116	18116
16	4673	0.39	1799	64587	0.08	360	91899	0.54	2519	20635
17	5027	0.44	2212	66799	0.04	201	92100	0.52	2614	23249
18	4933	0.43	2116	68915	0.00	0	92100	0.57	2817	26066
19	5438	0.33	1813	70728	0.00	0	92100	0.67	3625	29691
20	3706	0.46	1686	72414	0.00	0	92100	0.55	2020	31711
21	1211	0.46	551	72965	0.00	0	92100	0.55	660	32371
22	1808	0.46	823	73788	0.00	0	92100	0.55	985	33356
23	1288	0.32	407	74195	0.00	0	92100	0.68	881	34237
24	2909	0.18	512	74707	0.00	0	92100	0.82	2397	36635
25	3390	0.38	1271	75978	0.00	0	92100	0.63	2119	38753
26	3394	0.69	2349	78327	0.00	0	92100	0.31	1045	39798
27	2854	0.38	1070	79397	0.06	180	92280	0.56	1604	41402
28	2514	0.96	2401	81798	0.00	0	92280	0.05	113	41515
29	1821	0.89	1613	83411	0.00	0	92280	0.11	208	41723
30	1480	0.82	1211	84622	0.00	0	92280	0.18	269	41992
31	1018	0.97	984	85606	0.00	0	92280	0.03	34	42026

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Table 1. Adjusted daily and cumulative Noatak River side scan sonar counts by species, 1982 (continued).

Date	Daily Adjusted Sonar Count	Chum Salmon			Pink Salmon			Arctic Char		
		Test Net Proportion	Daily Count	Cumulative Count	Test Net Proportion	Daily Count	Cumulative Count	Test Net Proportion	Daily Count	Cumulative Count
September										
1	1327	0.97	1290	86896	0.00	0	92280	0.03	37	42063
2	754	1.00	754	87650	0.00	0	92280	0.00	0	42063
3	1312	1.00	1312	88962	0.00	0	92280	0.00	0	42063
4	721	0.72	519	89481	0.00	0	92280	0.28	202	42265
5	650	0.87	566	90047	0.00	0	92280	0.13	84	42349
6	536	1.00	536	90583	0.00	0	92280	0.00	0	42349
Totals 225,257 (1)				90583			92280			42349

(1) The sum of daily counts may not equal the total daily count due to rounding.

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Sonar Enumeration

From 4 July through 6 September, 90,583 chum salmon, 92,280 pink salmon and 42,349 arctic char were counted by side scan sonar. Midpoints of the pink and chum salmon and char migrations were 19 July, 10 August and 12 August, respectively (Table 1, Figure 4).

An index of chum and pink salmon and arctic char escapement comparable to past years was generated using only catches in the large mesh net. These figures are 158,333 chum salmon, 56,457 pink salmon and 9,547 arctic char, and are only presented in this paper to record that the escapement goal, established using this type of inflated figure, was met in 1982.

Comparison of both spatial and temporal count distribution over the operating sonar range reveals strong dissimilarities between north and south bank migration patterns. Salmon migration over the south bank sonar was predominantly inshore (sector 1) where more than 20 percent of all south bank fish were counted. The inverse was true for the north bank, where most fish were counted offshore (sector 12; Figure 5).

The timing of peak fish movement over the north bank sonar occurred from 2300 to 0800, during hours of reduced light. Conversely, peak counts made by the south bank sonar occurred from 0600 through 1900 (Figure 5).

Midriver test net results and sector distributions of north bank sonar counts suggest that fish migrate beyond the sonar operating range, possibly because of site specific river conditions. At the sonar site, the Noatak River is approximately 800 feet wide and a maximum of 35 feet deep. Water velocity averages less than two feet per second. There appears to be little incentive for migrating species to follow a "path of least resistance" along the shore. The Bendix side scan sonar counter was designed for use in shallow, narrow, fast moving rivers where most salmon migration occurs along the shoreline. The present site of the sonar counters is marginally acceptable, but there are probably no alternative sites. The lower 70 miles of the Noatak River is suitably channelized for sonar enumeration. Beyond this point the river is extremely braided and the banks continually erode.

On 27 July the north bank sonar counter was transported and installed four miles upriver at the confluence of the Agashashok River. At this point the Noatak River is approximately 200 feet wide and up to 35 feet deep, water velocity is approximately 4 feet per second.

Average daily counts at the original site for the five days prior to removal had been 1,840 fish per day. Conditions at the Agashashok River confluence are considered more ideal than the present site, but the average counts fell to 513 fish per day. The counter operated at this site for six days before removal and placement at the original location.

Test Fishing

The test nets captured a total of 739 chum, 481 pink and 198 char (Table 2). These figures represent the combined catch of two nets of differing size selectivities and are not directly comparable with past data.

Four hundred five adult chum salmon were sampled from the test nets for age, sex and length composition. Females made up 60.5 percent of the total catch,

which was mostly four year old fish (Table 3). The dominance of females and age four fish is consistent with previous test fishing catches (Bigler and Hamner, 1981).

When sonar counting operations commenced (4 July) several chum salmon were captured daily in the test nets. But from 8 to 14 July many pink, but no chum salmon were captured (Table 2). On 16 July a large mesh (5 7/8 inch) net was submerged and fished in the center of the river (Table 4).

Because of the difficulty encountered with setting and recovering this net it was only operated when time and weather permitted. When first used on 16 July the net fished at midriver for 21.5 hours (overnight) and captured 27 chums (1.26 fish/hour), the large mesh, sonar-related test net caught 2 chums in 5.5 hours (0.36 fish/hour). The net was again set on 18 July when it was positioned near the south shore test net. The submerged net was set to act as an extension of the test net; where the sonar test net ended the submerged net began. No chums were captured in the sonar test net, 7 were captured in the deepest end of the submerged net. Similar results occurred on 20 July, no chums captured in test nets, 8 in the submerged net (Table 4). The net was fished to test whether fish could be captured beyond sonar range. An objective of 1983 sonar counting operations will be to quantify this midriver migration.

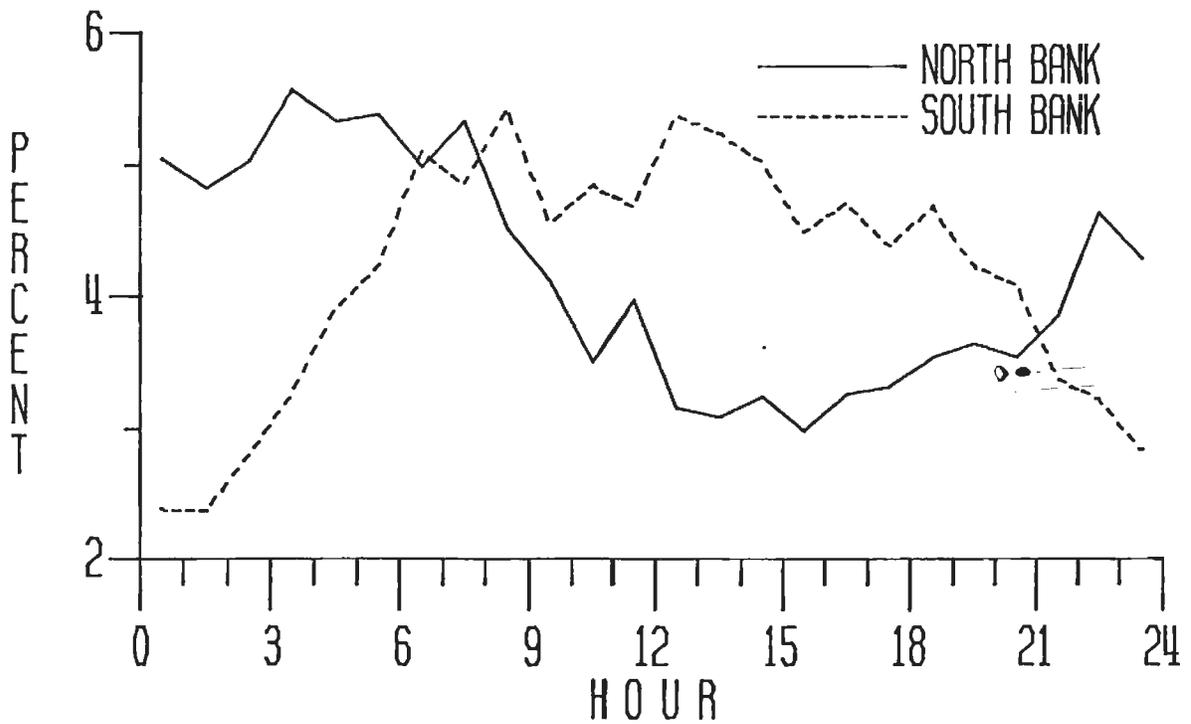
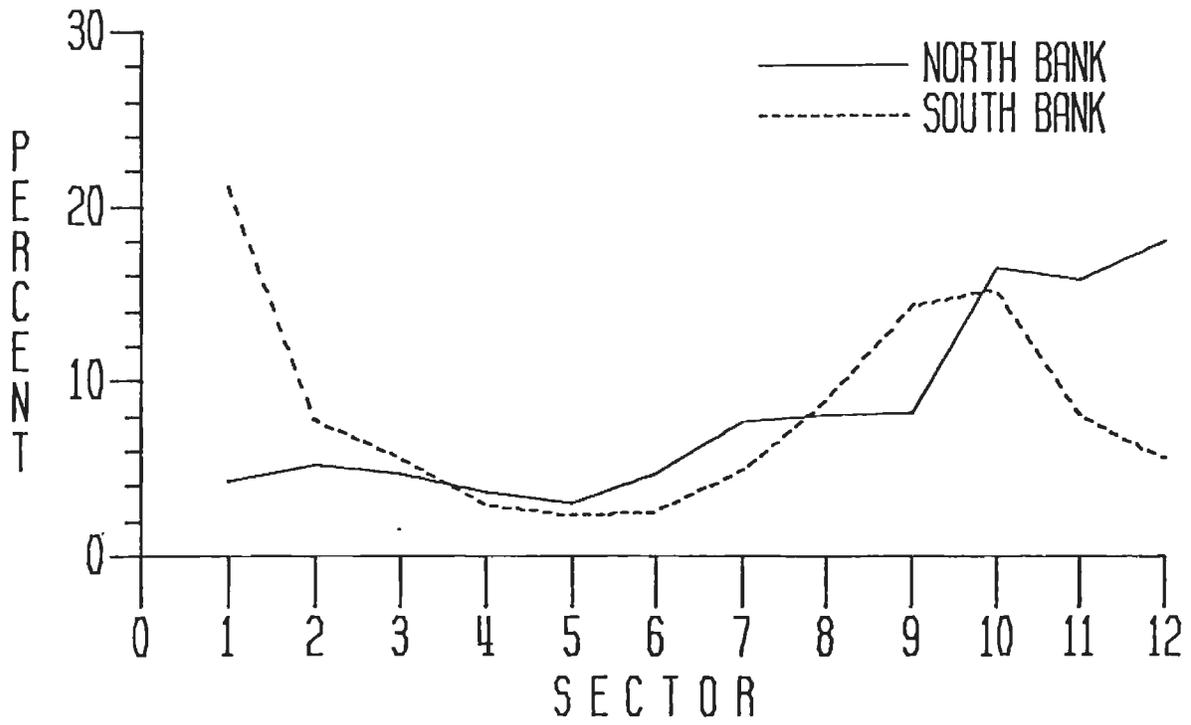


Figure 5. Sector and hourly distributions of chum salmon counted by side scan sonar, Noatak River, 1982. Sector distance totals 60 feet.

Table 2. Daily test net catches and Catch Per Unit Effort (C.P.U.E.) of chum and pink salmon and arctic char in both 4 1/2 and 5 7/8 inch stretched mesh gill nets, Noatak River Sonar, 1982.

Date	Net Hours	Daily Catch			C.P.U.E.			Cumulative Catch		
		Chum	Pink	Char	Chum	Pink	Char	Chum	Pink	Char
July										
5	11.0	3	22	2	0.27	2.00	0.18	3	22	2
6	32.5	17	45	6	0.52	1.38	0.18	20	67	8
7	11.5	1	27	1	0.09	2.35	0.09	21	94	9
8	0.0	0	0	0	0.00	0.00	0.00	21	94	9
9	14.5	0	42	1	0.00	2.90	0.07	21	136	10
10	20.0	0	19	1	0.00	0.80	0.05	21	155	11
11	21.0	0	13	0	0.00	0.62	0.00	21	168	11
12	35.8	0	5	2	0.00	0.14	0.06	21	173	13
13	12.3	0	4	0	0.00	0.33	0.00	21	177	13
14	0.0	0	0	0	0.00	0.00	0.00	21	177	13
15	12.7	4	1	0	0.32	0.08	0.00	25	178	13
16	9.5	2	18	1	0.21	1.89	0.11	27	186	14
17	19.3	0	59	1	0.00	3.05	0.05	27	245	15
18	22.0	0	48	1	0.00	2.18	0.05	27	293	16
19(1)	16.0	1	16	1	0.06	1.00	0.06	28	309	17
20	15.5	0	8	0	0.00	0.52	0.00	28	317	17
21	12.3	1	5	2	0.08	0.41	0.16	29	322	19
22	30.0	1	5	1	0.03	0.17	0.03	30	327	20
23	0.0	0	0	0	0.00	0.00	0.00	30	327	20
24	12.0	8	23	3	0.67	1.92	0.25	38	350	23
25	13.3	14	20	0	1.05	1.50	0.00	52	370	23
26	13.0	13	12	1	1.00	0.92	0.08	65	382	24
27	18.3	1	30	5	0.06	1.64	0.27	66	412	29
28	11.5	0	16	1	0.00	1.39	0.09	66	428	30
29	8.0	5	14	1	0.63	1.75	0.13	71	442	31
30	0.0	0	0	0	0.00	0.00	0.00	71	442	31
31	8.0	9	3	4	1.13	0.38	0.50	80	445	35
August										
1(4)	18.1	19	4	4	1.05	0.22	0.22	99	449	39
2(4)	7.0	5	6	0	0.71	0.86	0.00	104	455	39
3	21.0	16	4	5	0.76	0.19	0.24	120	459	44
4	13.5	15	3	3	1.11	0.22	0.22	135	462	47
5	0.0	0	0	0	0.00	0.00	0.00	135	465	47
6	8.5	16	3	6	1.88	0.35	0.71	151	465	53
7	12.8	35	1	2	2.74	0.08	0.16	186	466	55
8	11.3	38	2	5	3.38	0.18	0.44	224	468	60
9	12.5	17	0	3	1.36	0.00	0.24	241	468	63
10(2)	14.5	48	3	10	3.31	0.21	0.69	289	471	73
11	12.3	36	0	3	2.93	0.00	0.24	325	471	77
12(3)	12.5	32	1	4	2.56	0.08	0.32	357	472	81
13	19.5	18	3	15	0.92	0.15	0.77	375	475	96
14	15.5	36	2	10	2.32	0.13	0.65	411	477	106
15	11.3	30	0	1	2.67	0.00	0.09	441	477	107
16	11.8	10	2	14	0.85	0.17	1.19	451	479	121
17	11.5	11	1	13	0.96	0.09	1.13	462	480	124

Table 2. Daily test net catches and Catch Per Unit Effort (C.P.U.E.) of chum and pink salmon and arctic char in both 4 1/2 and 5 7/8 inch stretched mesh gill nets, Noatak River Sonar, 1982. Continued...

Date	Net Hours	Daily Catch			C.P.U.E.			Cumulative Catch		
		Chum	Pink	Char	Chum	Pink	Char	Chum	Pink	Char
August										
18	0.0	0	0	0	0.00	0.00	0.00	462	480	124
19	12.5	6	0	12	0.48	0.00	0.96	468	480	136
20(4)	13.3	5	0	6	0.38	0.00	0.45	473	480	142
21(4)	0.0	0	0	0	0.00	0.00	0.00	473	480	142
22(4)	0.0	0	0	0	0.00	0.00	0.00	473	480	142
23(4)	0.0	0	0	0	0.00	0.00	0.00	473	480	142
24	11.8	3	0	14	0.26	0.00	1.19	476	480	156
25	12.8	6	0	10	0.47	0.00	0.78	482	480	166
26	11.5	9	0	4	0.78	0.00	0.35	491	480	170
27	12.8	6	1	9	0.47	0.00	0.70	497	481	179
28	13.0	21	0	1	1.62	0.00	0.08	518	481	180
29(4)	0.0	0	0	0	0.00	0.00	0.00	518	481	180
30	13.0	9	0	2	0.69	0.00	0.15	527	481	182
31	13.0	29(5)	0	1	2.23	0.00	0.08	556	481	183
September										
1	13.0	35(5)	0	1	2.69	0.00	0.08	591	481	184
2	13.0	32(5)	0	0	2.46	0.00	0.00	623	481	184
3	9.0	17(5)	0	0	1.89	0.00	0.00	640	481	184
4	12.0	18(5)	0	7	1.50	0.00	0.58	658	481	191
5	13.0	47(5)	0	7	3.62	0.00	0.54	705	481	198
6	8.5	34(5)	0	0	4.00	0.00	0.00	739	481	198
Total		795.8	739	481	198	0.95	0.26			

- (1) Pink salmon mean migration date.
- (2) Chum salmon mean migration date.
- (3) Arctic char mean migration date.
- (4) Fishing either severely hampered or precluded by high water and/or debris.
- (5) Many fish in an advanced spawning stages, moving downstream in current.

Table 3. Chum salmon age, size and sex composition taken in Noatak River Test Fishing, 1982.

	Age Class (Gilbert-Rich)				Total
	31	41	51	61	
<u>MALES</u>					
Percent	3.20	23.80	11.30	1.20	39.50
Avg. Length (mm)	571.54	610.09	635.89	670.00	616.25
Std. Error	5.90	2.73	3.18	12.85	3.44
Sample Size	13	96	46	5	160
<u>FEMALES</u>					
Percent	6.90	38.60	14.80	.20	60.50
Avg. Length (mm)	556.64	587.21	613.75	617.00	590.34
Std. Error	4.61	1.96	3.22	0.00	2.58
Sample Size	28	156	60	1	245
<u>SEXES COMBINED</u>					
Percent	10.10	62.40	26.10	1.40	100.00
Avg. Length (mm)	561.36	595.93	623.36	661.17	600.57
Std. Error	5.02	2.26	3.20	12.85	2.92
Sample Size	41	252	106	6	405

Table 4. Test net catches and Catch Per Unit Effort (C.P.U.E.) of chum salmon based on 5 7/8 inch stretched mesh nets only, Noatak River Sonar/Test Fish, 1982.

Date	Net Hours	Daily Catch	C.P.U.E.	Cumulative Catch	Shoreline Fished
July					
5	0.0	0	0.00	0	Not Fished
6	18.5	17	0.92	17	North
7	4.5	1	0.22	18	South
8	0.0	0	0.00	18	Not Fished
9	7.5	0	0.00	18	North
10	7.0	0	0.00	18	South
11	10.5	0	0.00	18	North
12	24.0	0	0.00	18	South
13	6.5	0	0.00	18	North
14	0.0	0	0.00	18	Not Fished
15	6.2	4	0.65	22	South
16	5.5	2	0.36	24	North
16(1)	21.5	27	1.26		Mid-River
17	9.5	0	0.00	24	South
18	11.0	0	0.00	24	South
18(1)	5.0	7	1.40		Mid-River
19	8.0	1	0.13	25	South
20	10.5	0	0.00	25	South
21	6.0	0	0.00	25	North
20	22.0	8	0.36		Mid-River
22	24.0	1	0.04	26	North
23	0.0	0	0.00	25	Not Fished
24	6.0	2	0.33	27	South
24(1)	6.5	1	0.15		Mid-River
25	6.5	14	2.15	41	North
26	6.5	13	2.00	54	South
27	9.3	1	0.11	55	North
27(1)	6.5	5	0.77		Mid-River
28	6.0	0	0.00	55	South
28(1)	9.8	9	0.92		Mid-River
29	0.0	0	0.00	55	Not Fished
30	5.0	5	1.00	60	North
30(1)	6.5	28	4.31		Mid-River
31	4.5	6	1.33	66	South
August					
1(2)	9.1	13	1.43	79	South
2(2)	3.3	4	1.21	83	North
3	9.5	10	1.05	93	South
4	6.5	13	2.00	106	North
5	0.0	0	0.00	106	Not Fished
6	4.0	6	1.50	112	South
7	5.3	30	5.66	142	North
8	5.5	10	1.82	152	South
8(1)	5.0	0	0.00		Mid-River
9	6.5	5	0.77	157	North
9(1)	6.5	3	0.46		Mid-River
10	7.5	21	2.80	178	South
11	6.3	22	3.49	200	North

Table 4. Test net catches and Catch Per Unit Effort (C.P.U.E.) of chum salmon based on 5 7/8 inch stretched mesh nets only, Noatak River Sonar/Test Fish, 1982. Continued...

Date	Net Hours	Daily Catch	C.P.U.E.	Cumulative Catch	Shoreline Fished
August					
10	6.5	9	1.38		Mid-River
12	6.0	11	1.83	211	South
12(1)	4.3	6	1.40		Mid-River
13	7.5	11	1.47	222	North
14	7.0	26	3.71	248	South
14(1)	4.5	17	3.78		Mid-River
15	5.5	20	3.64	268	North
15(1)	6.0	5	0.83		Mid-River
16	6.0	6	1.00	274	South
17	6.0	10	1.67	280	North
18(2)	0.0	0	0.00	280	Not Fished
19(2)	6.0	6	1.00	286	South
20(2)	5.8	3	0.52	289	North
21(2)	0.0	0	0.00	289	Not Fished
22(2)	0.0	0	0.00	289	Not Fished
23(2)	0.0	0	0.00	289	Not Fished
24	6.3	1	0.16	290	South
25	6.8	2	0.29	292	North
26	6.0	9	1.50	301	South
27	6.8	4	0.59	305	North
28	6.0	16	2.67	321	South
29(2)	0.0	0	0.00	321	Not Fished
30	7.0	4	0.57	325	North
31(3)	7.0	20	2.86	345	South
September					
1(3)	7.0	23	3.29	368	North
2(3)	6.0	11	1.83	379	South
3(3)	5.0	7	1.40	386	North
4(3)	6.2	9	1.45	395	South
5(3)	7.5	33	4.40	428	North
6(3)	4.5	20	4.44	448	South

- (1) A 5 7/8 inch mesh net was fished periodically in the center of the river. Mid-river catch data not included in sonar-related test net data.
- (2) High water and/or bad weather hampered or precluded fishing.
- (3) Many fish in an advanced spawning stages, moving downstream in current.

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