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Kobuk River Test Fishing Project, 1995

By

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INTRODUCTION

The Kobuk River originates on the south side of the Brooks Range in the Arrigetch Mountains inside the Gates of the Arctic National Park. The river flows roughly 500 river miles west where it terminates at Kobuk Lake. The lower two-thirds of the river is stained by tannin from primarily the Pah River, an upper river tributary. Five villages are located on the Kobuk River and all depend on Kobuk River chum salmon for subsistence use. Residents of Kotzebue also depend on Kobuk River chum salmon as a subsistence resource. The Kobuk River is also thought to support up to 50% of the commercial catch of chum salmon in the Kotzebue District.

This was the third consecutive year a drift gill net test fishing project operated in the lower Kobuk River (Lingnau, 1993; Lingnau, 1994). A test fishing project on the Noatak River was initiated in 1975 and continued through 1978, then operated again from 1987 to 1991. A Kobuk River test fishing project was considered in the mid-1980's but because of the importance of the Noatak River chum salmon stocks to the commercial fishery and it's close proximity, the test fishery was instituted on the Noatak River instead (Knuefer, 1990; Blaney and Lingnau, 1992; Lingnau, 1992). The Noatak River now has a separate escapement assessment project monitoring the chum salmon migration in that river. The only previous salmon project in the Kobuk River drainage was a counting tower site on the Squirrel River, which was too distant to provide timely information for fisheries management. Because of the Kobuk River's tannic stain, test fishing is less susceptible to net avoidance by salmon than clear water systems. This was a problem with the Noatak River test fishing project during years with low and clear water. This report presents the results of the third year of the Kobuk River drift test fishing project.

Management of the Kotzebue District commercial salmon fishery, particularly during the month of July, is dependent primarily on comparing commercial fishing period and cumulative season catch statistics to those of prior years. The drift test fishing project was initiated because of the need for an inseason index of run timing and abundance for Kobuk River chum salmon stocks, which largely support the first portion of the commercial season in the Kotzebue District. While test fishing is a relatively low cost approach, it is also inherently susceptible to interannual variability in fish catchability. That typically requires that the data be interpreted in a somewhat qualitative way as an abundance index if calibration is not possible between years.

The objectives of the test fishing project for 1995 were:

1. To continue to evaluate the feasibility of indexing chum salmon abundance in the Kobuk River using systematic drift gill net catches.

2. Describe the migratory timing for chum salmon in the lower Kobuk River.

3. Sample for age, sex and size.

In addition, a long term goal of the project, once sufficient historical data are available for comparison, is to assess, in a qualitative way, the impact of the Kotzebue District commercial salmon fishery on chum salmon abundance in the lower Kobuk River for fisheries management

purposes. Primary fishery management objectives are to provide for adequate chum salmon escapement through the commercial fishery: (1) to ensure sustained runs by allowing adequate natural escapement, and (2) to meet subsistence harvest needs.

METHODS

Site Description

The site is approximately 70 river miles from the Kobuk Lake commercial salmon fishing district boundary markers (Figure 1). This is the furthest downstream site where the river runs through a single channel. The test fishing site was selected because of it's desirable stream characteristics. The site consists of a 1 mile river section located approximately 3 miles downstream from Kiana. The width of the river was approximately 300 meters and was divided into two sites (Figure 2). Site N is the north side of the river (right bank), which is the cut bank side of the river with the swiftest current. Site S is located on the south side of the river (left bank). Site S is located downstream from a major sandbar and has a gradual gradient. It is also the site with the slowest current. A bottom profile at the test fish site this year revealed a near uniform bottom with a depth of 4-5 meters. The deepest portion of the river was in the second quarter from the left bank (Figure 3).

Test Fishing

Fishing was scheduled to sample salmon passage during three different segments of the day at each of the two sites; morning (0800), mid-day (1500), and late evening (2200). Drifts were conducted by a two person crew, six days per week. During the peak of the run, the first two weeks of August, drifts were conducted every day of the week.

All test fishing drifts were made from a 20 foot open outboard motorboat for approximately 20 minutes with a 50 fathom gill net. If catch rates were high, fishing time was reduced in order to control mortality. The net was composed of 5-7/8 in (14.9 cm) stretched mesh multifilament webbing, 45 meshes deep, and hung at a ratio of 2:1. Age-sex-length data were collected from chum salmon. Mortalities were given to elders or individuals for subsistence purposes.

Standardized Catches

Actual catches were converted to catch per unit of effort (CPUE) by considering fishing time and the length of net used. Each CPUE index was the number of fish which would have been caught if 100 fathoms of net had been fished for 60 minutes. The index (I) was calculated as follows:

$$I = \frac{6,000(c)}{(l)(t)}$$

Where: c = number of chum salmon caught
l = length of net in fathoms
t = mean fishing time in minutes

Mean fishing time (t) was defined as the amount of time the entire net was fishing plus half the time it took to deploy and retrieve the net. Mean daily drift CPUE indices were calculated using the sum of the total time fished and total fish caught for each day. The mean daily indices were summed to produce total seasonal CPUE indices for the period of data collection. Cumulative proportions of seasonal total test fish CPUE indices were also calculated.

Catch rate for each time period and site was determined by using the fishing time and number of fish caught for those specific time periods and sites. Seasonal abundance by site and time period were indexed by summing CPUE indices for each of the daily sites and time periods. Temporal distribution was depicted as a percent calculated by dividing each time period total by the total CPUE indices. Spacial distribution was described by dividing each sites CPUE seasonal total by the total of both sites CPUE indices. Temporal and spatial distribution was described as a percent since the number of drifts made at each site and the amount of time fished varied.

RESULTS

Drifting began on July 12 and continued through August 16. CPUE indices were calculated for each drift and site (Table 1). There were 1,139 chum salmon caught in a total of 202 drifts (101 drift time periods) producing 3,574.9 chum salmon drift period CPUE index points (Table 6). Peak catch occurred on July 27 with a catch of 73 salmon. The daily CPUE was 63.94 and comprised 5.4% of the seasonal CPUE index. However, the peak daily CPUE of 72.91 occurred on August 1 and was 6.2% of the seasonal CPUE index. Totals of 29.6, 34.7 and 35.7 percent of the seasonal CPUE indices were caught at 0800, 1500, and 2200 hours (Table 4). Totals of 34.3 and 65.7 percent of the total seasonal CPUE indices were caught at sites N and S. Unlike 1993 and 1994, the time of day with the most movement was nearly equal between mid-afternoon and late evening. The greatest proportion of the seasonal CPUE (65.7) was caught from the portion of the river with the slowest current at Site S, but was significantly less than last year's 91.6%. The difference in river level most likely affected the migration pattern. The mean secchi for 1995 was 3.5 meters, significantly clearer than 2.1 meters for 1993 or 1.4 meters for 1994. Daily catch rates, in most cases, tended to mirror the daily secchi readings. When water clarity was up, catch rates tended to be higher (Figure 7).

There were 1,025 ageable chum salmon scales from test net samples. The age composition was 2.2% Age-0.2, 61.5% Age-0.3, 34.0% Age-0.4 and 2.2% Age-0.5 (Table 8). Enough scale samples were taken to stratify age and sex composition by week (Table 7.) The age composition

of the 1995 Kotzebue commercial and Noatak River test fish catch is shown for comparison. Length by age comparison indicates that the Kotzebue commercial samples were slightly larger than the Kobuk River drift test fish catch. Chum salmon caught in test nets at the Noatak River sonar site were smaller by age class. These discrepancies are probably caused by the type of gear used. Most fishermen in the Kotzebue commercial fishery use 5-7/8 in or 6 in mesh gear. The test fishery at the Noatak River sonar site uses a range of mesh sizes (2-3/4 in, 4 in, 5 in and 6 in). Of all 1,139 chum salmon caught in the Kobuk River test fishery, none were released. All were either transported to elders or given to local residents using daily CB announcements notifying people about the availability of salmon.

The test fishing methods were set up the same as they had been in the prior two years. The test fishing gear was intended to match the gear being used in the commercial fishery. Three days of test fishing were missed due to regular days off. No drifts were missed due to equipment failure. Climatological data are presented in Table 9. Seasonal test fishing data for 1993-1995 are presented in Tables 2, 3, 5 and 6, and in Figures 4 through 6. Figure 4 shows test fishing CPUE by day for 1993-1995. Figure 5 and 6 compares cumulative CPUE and cumulative proportions of CPUE indices.

The test fishing CPUE indices generated (number of salmon caught) are influenced considerably by commercial fishing activity in Kotzebue Sound, as well as the number of drifts conducted and their timing compared to commercial periods. In addition, local salmon migration patterns can be greatly influenced by weather conditions. For these reasons, no interpolations were made for missing data points since the accuracy of these estimates may not be reliable.

CONCLUSIONS

The Kobuk River test fishing project was successful in it's third year of operation. This year's low and clear water conditions were the opposite of last years high water levels. The tannic staining of the river, even in 1995, reduced salmon net avoidance problems and provided a more comparable catch rate. During periods of clear water, the tannic stain provides enough concealment of the gillnets that fish were caught throughout the run.

Frequent and shorter commercial openings significantly buffered fluctuations in the test fishery daily catch rate that is sometimes caused by the commercial fishery in Kotzebue. This created a smoother curve in the daily and cumulative catch rate graphs. There were, therefore, no pronounced fluctuations in the test fishery data this year with which to evaluate the time of the migration from the commercial fishery to the test fish site. Previous information from department projects and local residents indicate it is between 5-6 days.

The project was run to the extent the budget would allow. It's six week duration seemed to cover most of the migration. However, when the project ended catch rates were still strong. Aerial surveys corroborated the assessment based on high cumulative catch rate in test fishing. Three of four index areas (Salmon, Squirrel, Tutuksuk and Upper Kobuk Rivers) were double

the escapement goal and the other tributary goal was met.

Local subsistence fishermen were interviewed throughout the season by the test fish crew. Catch rates from the test fishery seemed to track with subsistence catches. In the past there was only limited inseason run timing and abundance information provided by subsistence fishermen from the Kobuk River. This information was usually not available in a timely manner. With a test fish crew in Kiana, travel to subsistence fish camps to compare test fishing catch rates with subsistence catch rates is now feasible.

Logistically, test fishing on the Kobuk River near Kiana at the site used in 1993-1995 appears feasible. This year's low and clear water (although tannin stained) and the previous year's high and dirty water allowed the department to evaluate the project at both extremes of water conditions. The project has proven itself in both of these extremes and the data obtained indicate that chum salmon run timing and an index of abundance may be obtained from this project. This information will be useful to managers in the near future and could be used as a management tool with additional years of data.

LITERATURE CITED

Knuepfer, G. 1990. Kotzebue District Lower Noatak Test Fishing Project, 1989. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3N90-03, Anchorage.

Blaney, A. C. and Lingnau, T. L. 1992. Noatak River Test Fish Report, 1990. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A92-19, Anchorage.

Lingnau, T. L. 1992. Noatak River Test Fishing Project, 1991. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A92-05, Anchorage.

Lingnau, T. L. 1993. Kobuk River Test Fishing Project, 1994. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A93-20, Anchorage.

Lingnau, T. L. 1994. Kobuk River Test Fishing Project, 1994. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 3A94-35, Anchorage.

Table 1. Kobuk River drift test fish chum salmon CPUE by day, drift and site, 1995. [a]

Date	CPUE by Drift [b]			CPUE by Site [c]		Daily CPUE	Cumm. CPUE
	#1	#2	#3	N	S		
12-Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13-Jul	0.00	2.86	0.00	0.00	1.88	0.93	0.93
14-Jul	2.82	5.52	0.00	1.89	3.69	2.80	3.73
15-Jul	5.58	0.00	2.76	0.00	5.50	2.77	6.50
16-Jul [d]							6.50
17-Jul	0.00	0.00	0.00	0.00	0.00	0.00	6.50
18-Jul	2.76	2.67	0.00	0.00	3.61	1.81	8.31
19-Jul	0.00	12.90	16.18	1.86	17.39	9.89	18.20
20-Jul	10.79	16.36	21.82	5.54	26.67	16.30	34.50
21-Jul	39.13	26.97	49.03	12.73	62.54	38.54	73.04
22-Jul	20.65	24.00	18.88	3.66	37.45	21.18	94.22
23-Jul	53.05	59.22	37.71	16.36	91.64	50.58	144.80
24-Jul	39.07	36.46	10.91	12.92	44.88	28.46	173.26
25-Jul	16.18	10.91	109.41	28.80	52.00	40.16	213.42
26-Jul	20.57	35.45	47.41	43.97	24.44	35.15	248.57
27-Jul	50.23	34.67	102.86	58.38	70.48	63.94	312.51
28-Jul	39.40	88.16	67.92	37.89	94.05	62.49	375.00
29-Jul	48.75	8.37	85.06	39.69	54.12	46.11	421.11
30-Jul	67.06	59.22	48.61	54.74	61.09	57.86	478.97
31-Jul	49.03	20.87	19.09	27.83	32.00	29.89	508.86
01-Aug	61.46	81.04	76.92	37.33	120.00	72.91	581.77
02-Aug	45.00	66.21	35.45	45.00	52.91	48.71	630.48
03-Aug	53.65	74.37	22.07	47.59	49.13	48.40	678.88
04-Aug	45.33	60.00	53.79	36.00	70.00	53.00	731.88
05-Aug	55.14	38.82	56.73	61.78	37.50	49.95	781.83
06-Aug [d]							781.83
07-Aug	55.81	68.06	19.76	38.40	55.22	46.39	828.22
08-Aug	21.57	74.37	41.74	31.74	57.78	44.02	872.24
09-Aug	38.92	58.06	114.10	73.26	63.53	68.22	940.46
10-Aug	73.22	29.59	71.25	7.50	103.20	56.33	996.79
11-Aug	56.84	20.87	34.29	18.05	70.24	37.95	1,034.74
12-Aug	31.30	105.45	56.25	39.27	94.38	63.92	1,098.66
13-Aug [d]							1,098.66
14-Aug	8.09	54.43	23.48	12.17	46.29	29.35	1,128.01
15-Aug	25.45	18.46	32.00	7.33	45.52	25.26	1,153.27
16-Aug	22.86	45.41	[e]	29.09	40.56	35.04	1,188.31

[a] Catch per unit effort is calculated in catch/100fm/hour
[b] Drift 1 begins at 0800, Drift 2 at 1500, Drift 3 at 2200.
[c] Site N is the North Bank (right bank), Site S is the South Bank (left bank).
[d] Regular Day Off
[e] End of the season, no drifts were conducted.

Table 2. Kobuk River chum salmon drift test fish mean daily and cumulative CPUE, 1993–1995. [a]

	1993		1994		1995	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.
12–Jul	11.18	11.18			0.00	0.00
13–Jul	14.22	25.40	0.00	0.00	0.93	0.93
14–Jul	20.57	45.97	2.68	2.68	2.80	3.73
15–Jul	35.08	81.05	2.58	5.26	2.77	6.50
16–Jul	13.19	94.24	11.35	16.61	[b]	6.50
17–Jul	17.27	111.51	[b]	16.61	0.00	6.50
18–Jul	[b]	111.51	7.16	23.77	1.81	8.31
19–Jul	10.71	122.22	12.40	36.17	9.89	18.20
20–Jul	2.76	124.98 +	3.65	39.82	16.30	34.50
21–Jul	3.20	128.18	7.30	47.12	38.54	73.04
22–Jul	5.52	133.70	3.56	50.68	21.18	94.22
23–Jul	27.15	160.85	16.49	67.17	50.58	144.80
24–Jul	9.06	169.91	[b]	67.17	28.46	173.26
25–Jul	[b]	169.91	14.38	81.55	40.16	213.42
26–Jul	15.22	185.13	47.65	129.20	35.15	248.57
27–Jul	8.06	193.19	40.66	169.86	63.94	312.51 +
28–Jul	16.36	209.55	57.83	227.69	62.49	375.00
29–Jul	0.93	210.48	33.62	261.31	46.11	421.11
30–Jul	0.92	211.40	69.21	330.52 +	57.86	478.97
31–Jul	12.58	223.98	[b]	330.52	29.89	508.86
01–Aug	[b]	223.98	82.16	412.68	72.91	581.77
02–Aug	6.74	230.72	65.12	477.80	48.71	630.48 *
03–Aug	54.49	285.21 *	71.79	549.59	48.40	678.88
04–Aug	44.23	329.44	108.98	658.57 *	53.00	731.88
05–Aug	89.30	418.74 +	59.74	718.31	49.95	781.83
06–Aug	18.60	437.34	102.56	820.87	[b]	781.83
07–Aug	20.52	457.86	[b]	820.87	46.39	828.22
08–Aug	[b]	457.86	62.75	883.62	44.02	872.24
09–Aug	1.84	459.70	96.86	980.48 +	68.22	940.46 +
10–Aug	12.63	472.33	45.83	1,026.31	56.33	996.79
11–Aug	18.11	490.44	57.02	1,083.33	37.95	1,034.74
12–Aug	3.74	494.18	90.54	1,173.87	63.92	1,098.66
13–Aug			11.36	1,185.23	[b]	1,098.66
14–Aug			[b]	1,185.23	29.35	1,128.01
15–Aug			5.13	1,190.36	25.26	1,153.27
16–Aug			16.23	1,206.59	35.04	1,188.31
17–Aug			0.00	1,206.59		
18–Aug			0.00	1,206.59		
19–Aug			3.12	1,209.71		
20–Aug			0.00	1,209.71		
21–Aug			[b]	1,209.71		
22–Aug			0.00	1,209.71		
23–Aug			0.00	1,209.71		
24–Aug			0.00	1,209.71		
25–Aug			0.91	1,210.62		
26–Aug			5.56	1,216.18		
27–Aug			1.86	1,218.04		
28–Aug			0.93	1,218.97		
29–Aug			0.00	1,218.97		
30–Aug			0.00	1,218.97		

[a] Quartiles are indicated by the "+" and the mid–points are indicated by a "*".
[b] Regular day off.

Table 3. Kobuk River chum salmon drift test fish daily and cumulative proportions, 1993–1995. [a]

	1993		1994		1995	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.
12–Jul	0.023	0.023			0.000	0.000
13–Jul	0.029	0.051	0.000	0.000	0.001	0.001
14–Jul	0.042	0.093	0.002	0.002	0.002	0.003
15–Jul	0.071	0.164	0.002	0.004	0.002	0.005
16–Jul	0.027	0.191	0.009	0.014	0.000	0.005
17–Jul	0.035	0.226	[a]	0.014	0.000	0.005
18–Jul	[a]	0.226	0.006	0.020	0.002	0.007
19–Jul	0.022	0.247	0.010	0.030	0.008	0.015
20–Jul	0.006	0.253	0.003	0.033	0.014	0.029
21–Jul	0.006	0.259	0.006	0.039	0.032	0.061
22–Jul	0.011	0.271	0.003	0.042	0.018	0.079
23–Jul	0.055	0.325	0.014	0.055	0.043	0.122
24–Jul	0.018	0.344	[a]	0.055	0.024	0.146
25–Jul	[a]	0.344	0.012	0.067	0.034	0.180
26–Jul	0.031	0.375	0.039	0.106	0.030	0.209
27–Jul	0.016	0.391	0.033	0.139	0.054	0.263
28–Jul	0.033	0.424	0.047	0.187	0.053	0.316
29–Jul	0.002	0.426	0.028	0.214	0.039	0.354
30–Jul	0.002	0.428	0.057	0.271	0.049	0.403
31–Jul	0.025	0.453	[a]	0.271	0.025	0.428
01–Aug	[a]	0.453	0.067	0.339	0.061	0.490
02–Aug	0.014	0.467	0.053	0.392	0.041	0.531
03–Aug	0.110	0.577	0.059	0.451	0.041	0.571
04–Aug	0.090	0.667	0.089	0.540	0.045	0.616
05–Aug	0.181	0.847	0.049	0.589	0.042	0.658
06–Aug	0.038	0.885	0.084	0.673	0.000	0.658
07–Aug	0.042	0.927	[a]	0.673	0.039	0.697
08–Aug	[a]	0.927	0.051	0.725	0.037	0.734
09–Aug	0.004	0.930	0.079	0.804	0.057	0.791
10–Aug	0.026	0.956	0.038	0.842	0.047	0.839
11–Aug	0.037	0.992	0.047	0.889	0.032	0.871
12–Aug	0.008	1.000	0.074	0.963	0.054	0.925
13–Aug			0.009	0.972	0.000	0.925
14–Aug			[a]	0.972	0.025	0.949
15–Aug			0.004	0.977	0.021	0.971
16–Aug			0.013	0.990	0.029	1.000
17–Aug			0.000	0.990		
18–Aug			0.000	0.990		
19–Aug			0.003	0.992		
20–Aug			0.000	0.992		
21–Aug			[a]	0.992		
22–Aug			0.000	0.992		
23–Aug			0.000	0.992		
24–Aug			0.000	0.992		
25–Aug			0.001	0.993		
26–Aug			0.005	0.998		
27–Aug			0.002	0.999		
28–Aug			0.001	1.000		
29–Aug			0.000	1.000		
30–Aug			0.000	1.000		

[a] Regular day off.

Table 4. Kobuk River drift test fish chum salmon CPUE indices, mean CPUE and percent by drift (time of day) and site (location), 1995.

Drift Period	Season CPUE Indicies	No. of Period Drifts	Season Mean CPUE	Percent	Station	Season CPUE Indicies	No. of Site Drifts	Season Mean CPUE	Percent
1 0800 hrs.	1,059.7	36	29.4	29.6	N North Bank	830.8	33	25.2	34.3
2 1500 hrs.	1,239.8	33	37.6	34.7	S South Bank	1,589.7	33	48.2	65.7
3 2200 hrs.	1,275.5	33	38.7	35.7					
Total	3,574.9	102	35.0	100.0		2,420.5	66	36.7	100.0

Table 5. Kobuk River drift test fish chum salmon diurnal and spacial distribution expressed as mean CPUE by drift period and by site, 1993–1995. [a]

Year	Mean CPUE by Drift Period			Yearly Mean CPUE	Percent Mean CPUE by Drift Period			Mean CPUE by Site		Yearly Mean CPUE	Percent Mean CPUE by Site	
	1	2	3		1	2	3	N	S		N	S
1993	13.0	21.3	15.9	16.8	25.4	43.4	31.1	10.0	24.9	17.4	28.7	71.3
1994	25.8	33.2	23.7	27.5	31.7	39.8	28.5	4.9	53.5	29.2	8.4	91.6
1995	29.4	37.6	38.7	35.0	29.6	34.7	35.7	25.2	48.2	36.7	34.3	65.7

[a] Drift 1 begins at 0800, Drift 2 at 1500, Drift 3 at 2200. Site N is the North Bank (right bank), Site S is the South Bank (left bank).

Table 6. Kobuk River chum salmon drift test fish CPUE and cumulative CPUE by drift, 1993–1995.

	1993			1994			1995		
Date	Drift	Daily	Cum.	Drift	Daily	Cum.	Drift	Daily	Cum.
12–Jul	1	15.48	15.48				1	0.00	0.00
	2	2.50	17.98				2	0.00	0.00
	3	16.00	33.98				3	0.00	0.00
13–Jul	1	5.39	39.37	1	0.00	0.00	1	0.00	0.00
	2	15.50	54.87	2	0.00	0.00	2	2.86	2.86
	3	25.41	80.28	3	0.00	0.00	3	0.00	2.86
14–Jul	1	13.19	93.47	1	0.00	0.00	1	2.82	5.68
	2	0.00	93.47	2	5.27	5.27	2	5.52	11.20
	3	46.06	139.53	3	2.61	7.88	3	0.00	11.20
15–Jul	1	20.57	160.10	1	4.95	12.83	1	5.58	16.78
	2	33.91	194.01	2	2.61	15.44	2	0.00	16.78
	3	46.53	240.54	3	0.00	15.44	3	2.76	19.54
16–Jul	1	2.70	243.24	1	5.11	20.55	1 [a]		19.54
	2	32.50	275.74	2	10.43	30.98	2		19.54
	3	2.73	278.47	3	18.88	49.86	3		19.54
17–Jul	1	23.48	301.95	1 [a]		49.86	1	0.00	19.54
	2	28.70	330.65	2		49.86	2	0.00	19.54
	3	0.00	330.65	3		49.86	3	0.00	19.54
18–Jul [a]	1		330.65	1	2.64	52.50	1	2.76	22.30
	2		330.65	2	0.00	52.50	2	2.67	24.97
	3		330.65	3	18.46	70.96	3	0.00	24.97
19–Jul	1	5.45	336.10	1	23.74	94.70	1	0.00	24.97
	2	2.70	338.80	2	10.32	105.02	2	12.90	37.87
	3	23.48	362.28	3	2.76	107.78	3	16.18	54.05
20–Jul	1	2.79	365.07	1	2.86	110.64	1	10.79	64.84
	2	5.39	370.46	2	8.09	118.73	2	16.36	81.20
	3	0.00	370.46	3	0.00	118.73	3	21.82	103.02
21–Jul	1	2.76	373.22	1	10.79	129.52	1	39.13	142.15
	2	5.52	378.74	2	11.03	140.55	2	26.97	169.12
	3	1.90	380.64	3	0.00	140.55	3	49.03	218.15
22–Jul	1	2.79	383.43	1	5.45	146.00	1	20.65	238.80
	2	0.00	383.43	2	2.58	148.58	2	24.00	262.80
	3	13.19	396.62	3	2.70	151.28	3	18.88	281.68
23–Jul	1	2.70	399.32	1	24.83	176.11	1	53.05	334.73
	2	26.09	425.41	2	13.48	189.59	2	59.22	393.95
	3	51.61	477.02	3	11.16	200.75	3	37.71	431.66
24–Jul	1	8.18	485.20	1 [a]		200.75	1	39.07	470.73
	2	8.09	493.29	2		200.75	2	36.46	507.19
	3	10.91	504.20	3		200.75	3	10.91	518.10
25–Jul [a]	1		504.20	1	24.27	225.02	1	16.18	534.28
	2		504.20	2	13.48	238.50	2	10.91	545.19
	3		504.20	3	5.39	243.89	3	109.41	654.60
26–Jul	1	10.91	515.11	1	32.73	276.62	1	20.57	675.17
	2	8.09	523.20	2	63.67	340.29	2	35.45	710.62
	3	26.37	549.57	3	44.65	384.94	3	47.41	758.03
27–Jul	1	15.48	565.05	1	21.33	406.27	1	50.23	808.26
	2	8.09	573.14	2	59.35	465.62	2	34.67	842.93
	3	0.00	573.14	3 [b]		465.62	3	102.86	945.79

(continued)

Table 6. (Page 2 of 3)

Date	1993			1994			1995		
	Drift	Daily	Cum.	Drift	Daily	Cum.	Drift	Daily	Cum.
28-Jul	1	11.16	584.30	1 [b]		465.6	1	39.40	985.19
	2	16.18	600.48	2 [b]		465.6	2	88.16	1,073.35
	3	21.57	622.05	3	57.83	523.5	3	67.92	1,141.27
29-Jul	1	2.73	624.78	1	34.29	557.7	1	48.75	1,190.02
	2	0.00	624.78	2	52.50	610.2	2	8.37	1,198.39
	3	0.00	624.78	3	19.31	629.6	3	85.06	1,283.45
30-Jul	1	0.00	624.78	1	83.08	712.6	1	67.06	1,350.51
	2	0.00	624.78	2	38.52	751.2	2	59.22	1,409.73
	3	2.76	627.54	3	81.95	833.1	3	48.61	1,458.34
31-Jul	1	16.18	643.72	1 [a]		833.1	1	49.03	1,507.37
	2	16.18	659.90	2		833.1	2	20.87	1,528.24
	3	5.39	665.29	3		833.1	3	19.09	1,547.33
01-Aug [a]	1		665.29	1	51.43	884.5	1	61.46	1,608.79
	2		665.29	2	124.68	1,009.2	2	81.04	1,689.83
	3		665.29	3	67.20	1,076.4	3	76.92	1,766.75
02-Aug	1 [b]		665.29	1	27.00	1,103.4	1	45.00	1,811.75
	2	0.00	665.29	2	74.56	1,178.0	2	66.21	1,877.96
	3	13.33	678.62	3	92.80	1,270.8	3	35.45	1,913.41
03-Aug	1	42.20	720.82	1	62.34	1,333.1	1	53.65	1,967.06
	2	71.49	792.31	2	93.91	1,427.0	2	74.37	2,041.43
	3 [b]		792.31	3	51.69	1,478.7	3	22.07	2,063.50
04-Aug	1	16.74	809.05	1	124.93	1,603.6	1	45.33	2,108.83
	2	60.00	869.05	2	120.00	1,723.6	2	60.00	2,168.83
	3	51.26	920.31	3	82.39	1,806.0	3	53.79	2,222.62
05-Aug	1	40.85	961.16	1	78.86	1,884.9	1	55.14	2,277.76
	2	191.60	1152.76	2	14.12	1,899.0	2	38.82	2,316.58
	3	2.73	1155.49	3	78.32	1,977.3	3	56.73	2,373.31
06-Aug	1	12.77	1168.26	1	116.13	2,093.5	1 [a]		2,373.31
	2	13.79	1182.05	2	93.33	2,186.8	2		2,373.31
	3	29.33	1211.38	3	92.90	2,279.7	3		2,373.31
07-Aug	1	47.50	1258.88	1 [a]		2,279.7	1	55.81	2,429.12
	2	2.76	1261.64	2		2,279.7	2	68.06	2,497.18
	3	8.37	1270.01	3		2,279.7	3	19.76	2,516.94
08-Aug [a]	1 [a]		1270.01	1	77.65	2,357.3	1	21.57	2,538.51
	2		1270.01	2	64.76	2,422.1	2	74.37	2,612.88
	3		1270.01	3	49.66	2,471.8	3	41.74	2,654.62
09-Aug	1	5.52	1275.53	1	85.16	2,556.9	1	38.92	2,693.54
	2	0.00	1275.53	2	125.71	2,682.6	2	58.06	2,751.60
	3	0.00	1275.53	3	74.81	2,757.4	3	114.10	2,865.70
10-Aug	1	0.00	1275.53	1	9.47	2,766.9	1	73.22	2,938.92
	2	8.09	1283.62	2	54.86	2,821.8	2	29.59	2,968.51
	3	29.33	1312.95	3	86.04	2,907.8	3	71.25	3,039.76
11-Aug	1	11.29	1324.24	1	105.76	3,013.6	1	56.84	3,096.60
	2	40.42	1364.66	2	50.70	3,064.3	2	20.87	3,117.47
	3	0.00	1364.66	3	9.41	3,073.7	3	34.29	3,151.76
12-Aug	1	11.29	1375.95	1	17.91	3,091.6	1	31.30	3,183.06
	2	0.00	1375.95	2	183.16	3,274.7	2	105.45	3,288.51
	3	0.00	1375.95	3	0.00	3,274.7	3	56.25	3,344.76

(continued)

Table 6. (Page 3 of 3)

Date	1993			1994			1995		
	Drift	Daily	Cum.	Drift	Daily	Cum.	Drift	Daily	Cum.
13-Aug				1	23.53	3,298.3	1 [a]		3,344.76
				2	10.00	3,308.3	2		3,344.76
				3	3.43	3,311.7	3		3,344.76
14-Aug				1 [a]		3,311.7	1	8.09	3,352.85
				2		3,311.7	2	54.43	3,407.28
				3		3,311.7	3	23.48	3,430.76
15-Aug				1	6.96	3,318.7	1	25.45	3,456.21
				2	8.09	3,326.8	2	18.46	3,474.67
				3	0.00	3,326.8	3	32.00	3,506.67
16-Aug				1	3.33	3,330.1	1	22.86	3,529.53
				2	33.80	3,363.9	2	45.41	3,574.94
				3	11.25	3,375.1			
17-Aug				1	0.00	3,375.1			
				2	0.00	3,375.1			
				3	0.00	3,375.1			
18-Aug				1	0.00	3,375.1			
				2	0.00	3,375.1			
				3	0.00	3,375.1			
19-Aug				1	8.28	3,383.4			
				2	0.00	3,383.4			
				3	3.00	3,386.4			
20-Aug				1	0.00	3,386.4			
				2	0.00	3,386.4			
				3	0.00	3,386.4			
21-Aug				1 [a]		3,386.4			
				2		3,386.4			
				3		3,386.4			
22-Aug				1	0.00	3,386.4			
				2	0.00	3,386.4			
				3	0.00	3,386.4			
23-Aug				1	0.00	3,386.4			
				2	0.00	3,386.4			
				3	0.00	3,386.4			
24-Aug				1	0.00	3,386.4			
				2	0.00	3,386.4			
				3	0.00	3,386.4			
25-Aug				1	0.00	3,386.4			
				2	2.73	3,389.2			
				3	0.00	3,389.2			
26-Aug				1	2.76	3,391.9			
				2	13.79	3,405.7			
				3	0.00	3,405.7			
27-Aug				1	2.76	3,408.5			
				2	0.00	3,408.5			
				3	2.82	3,411.3			
28-Aug				1	2.82	3,414.1			
				2	0.00	3,414.1			
				3	0.00	3,414.1			
29-Aug				1	0.00	3,414.1			
				2	0.00	3,414.1			
				3	0.00	3,414.1			
30-Aug				1	0.00	3,414.1			
				2		3,414.1			
				3					

[a] Regular day off.

Table 7. Kobuk River drift test fish chum salmon age and sex composition by week, 1995.

		Brood Year and Age Group				
		1992 (0.2)	1991 (0.3)	1990 (0.4)	1989 (0.5)	Total
Stratum Dates:	7/13–7/22					
Sampling Dates:	7/13–7/22					
Female	Sample Size	0	10	19	0	29
	Percent of Sample	0.0	10.1	19.2	0.0	29.3
Male	Sample Size	2	33	32	3	70
	Percent of Sample	2.0	33.3	32.3	3.0	70.7
Total	Sample Size	2	43	51	3	99
	Percent of Sample	2.0	43.4	51.5	3.0	100.0
	Standard Error	1.4	5.0	5.0	1.7	
Stratum Dates:	7/23–7/29					
Sampling Dates:	7/23–7/29					
Female	Sample Size	1	47	27	3	78
	Percent of Sample	0.3	16.3	9.4	1.0	27.1
Male	Sample Size	3	119	83	5	210
	Percent of Sample	1.0	41.3	28.8	1.7	72.9
Total	Sample Size	4	166	110	8	288
	Percent of Sample	1.4	57.6	38.2	2.8	100.0
	Standard Error	0.7	2.9	2.9	1.0	
Stratum Dates:	7/30–8/05					
Sampling Dates:	7/30–8/05					
Female	Sample Size	1	65	51	3	120
	Percent of Sample	0.3	20.1	15.7	0.9	37.0
Male	Sample Size	7	126	65	6	204
	Percent of Sample	2.2	38.9	20.1	1.9	63.0
Total	Sample Size	8	191	116	9	324
	Percent of Sample	2.5	59.0	35.8	2.8	100.0
	Standard Error	0.9	2.7	2.7	0.9	

(continued)

Table 7. (Page 2 of 2)

		Brood Year and Age Group 1992 (0.2)	1991 (0.3)	1990 (0.4)	1989 (0.5)	Total
Stratum Dates: 8/06–8/12						
Sampling Dates: 8/06–8/12						
Female	Sample Size	3	76	23	1	103
	Percent of Sample	1.2	31.3	9.5	0.4	42.4
Male	Sample Size	4	100	35	1	140
	Percent of Sample	1.6	41.2	14.4	0.4	57.6
Total	Sample Size	7	176	58	2	243
	Percent of Sample	2.9	72.4	23.9	0.8	100.0
	Standard Error	1.1	2.9	2.7	0.6	
Stratum Dates: 8/13–8/16						
Sampling Dates: 8/13–8/16						
Female	Sample Size	1	34	10	1	46
	Percent of Sample	1.4	47.9	14.1	1.4	64.8
Male	Sample Size	1	20	4	0	25
	Percent of Sample	1.4	28.2	5.6	0.0	35.2
Total	Sample Size	2	54	14	1	71
	Percent of Sample	2.8	76.1	19.7	1.4	100.0
	Standard Error	2.0	5.1	4.8	1.4	
Stratum Dates: 7/13–8/16		Season Total				
Sampling Dates: 7/13–8/16						
Female	Sample Size	6	232	130	8	376
	Percent of Sample	0.6	22.6	12.7	0.8	36.7
Male	Sample Size	17	398	219	15	649
	Percent of Sample	1.7	38.8	21.4	1.5	63.3
Total	Sample Size	23	630	349	23	1,025
	Percent of Sample	2.2	61.5	34.0	2.2	100.0
	Standard Error	0.5	1.5	1.5	0.5	

Table 8. Comparison of chum salmon age and sex composition and mean length from the Kobuk and Noatak River drift test fish catch and the Kotzebue District commercial catch, 1995. [a]

		Brood Year and Age Group					
		1992 (0.2)	1991 (0.3)	1990 (0.4)	1989 (0.5)	1988 (0.6)	Total
Stratum Dates:	7/13–8/16	Kobuk River					
Sampling Dates:	7/13–8/16						
Female	Sample Size	6	232	130	8	0.0	376
	Percent of Sample	0.6	22.6	12.7	0.8	0	36.7
	Mean Length	552.5	587.7	595.0	598.8		
Male	Sample Size	17	398	219	15	0.0	649
	Percent of Sample	1.7	38.8	21.4	1.5	0	63.3
	Mean Length	577.1	603.8	618.1	626.7		
Total	Sample Size	23	630	349	23	0.0	1,025
	Percent of Sample	2.2	61.5	34.0	2.2	0	100.0
	Standard Error	0.5	1.5	1.5	0.5		
Stratum Dates:	7/20–8/29	Noatak River					
Sampling Dates:	7/20–8/29						
Sample Size:	1,266						
Female	Percent of Sample	1.2	28.3	20.1	1.2	0.1	50.8
	Number in Catch	1,942	46,216	32,882	1,942	129	83,111
	Mean Length	546.7	569.0	576.0	589.3	600.0	
Male							
	Sample Size	0.8	27.9	19.7	0.7	0.1	49.2
	Percent of Sample	1,295	45,569	32,235	1,165	129	80,393
Total	Mean Length	575.5	597.2	609.3	621.7	620.0	
	Percent of Sample	2.0	56.1	39.8	1.9	0.2	100.0
	Number in Catch	3,236	91,785	65,117	3,107	259	163,504
	Standard Error	640	2,281	2,250	628	183	
Stratum Dates:	7/10–8/28	Kotzebue Commercial					
Sampling Dates:	7/11–8/28						
Sample Size:	4,735						
Female	Percent of Sample	1.0	27.5	19.1	1.2	0.0	48.8
	Number in Catch	2,842	79,880	55,663	3,583	0	141,967
	Mean Length	574.0	591.7	602.1	614.4		
Male	Percent of Sample	1.3	29.4	19.3	1.1	0.0	51.2
	Number in Catch	3,892	85,440	56,157	3,212	62	148,763
	Mean Length	577.4	613.5	625.4	637.7	637.0	
Total	Percent of Sample	2.3	56.9	38.5	2.3	0.0	100.0
	Number in Catch	6,734	165,319	111,819	6,796	62	290,730
	Standard Error	636	2,093	2,056	638	62	

[a] Lengths are in millimeters and measured from mid–eye to fork–of–tail.

Table 9. Kobuk River drift test fish climatological data, 1995.

Date	Time	Secchi (meters)	Water Temp(C)	Wind mph	Wind direction	Cloud Cover
12–Jul	1500	4.25	17.0	15	SW	1
13–Jul	0900	3.50	15.0	calm		2
14–Jul	0830	3.00	15.0	10	SW	3
15–Jul	0900	3.50	[c]	calm		1
16–Jul	[b]		[c]			
17–Jul	0830	2.50	[c]	10	SW	4
18–Jul		3.00	[c]	5	SW	4
19–Jul	1000	2.50	[c]	10	SW	4
20–Jul	0800	3.00	[c]	10	SW	3
21–Jul	0900	3.25	15.0	15	South	2
22–Jul	0930	4.00	15.0	5	East	1
23–Jul	1000	2.75	15.0	10	East	3
24–Jul	0800	3.00	14.0	5	East	1
25–Jul	0800	3.50	14.0	5	East	1
26–Jul	0800	3.00	14.0	5	East	1
27–Jul	0900	3.50	15.0	calm		1
28–Jul	0900	3.50	15.0	calm		2
29–Jul	0800	3.25	16.0	calm		2
30–Jul	0800	2.50	16.0	15	SW	3
31–Jul	0800	3.00	14.5	5	West	3
01–Aug	0900	4.00	15.0	5	East	3
02–Aug	0900	3.50	15.0	10	SW	3
03–Aug	0800	3.75	14.0	10	South	3
04–Aug	0900	3.00	15.0	calm		2
05–Aug	0830	5.00	14.0	calm		3
06–Aug	[b]					
07–Aug	0900	4.00	12.0	5	SE	3
08–Aug	0830	4.00	12.0	calm		4
09–Aug	0930	4.50	14.0	5	SE	4
10–Aug	0930	3.50	13.0	5	SW	2
11–Aug	0900	3.50	14.0	calm		3
12–Aug	1000	3.50	13.0	5	East	1
13–Aug	[b]					
14–Aug	1100	4.00	14.0	calm		2
15–Aug	1100	4.00	13.0	calm		1
16–Aug	0930	4.50	13.0	5	SW	1

[a] Wind speed unavailable.
[b] Regular day off.
[c] Broken thermometer.

Cloud Cover:
0 – No observation
1 – Clear sky; cloud cover less then 1/10th of the sky
2 – Cloud cover not more than 1/2 of the sky
3 – Cloud cover more than 1/2 of the sky
4 – Sky is completely overcast
5 – Fog or thick haze (smoke, dust, etc.)

Precipitation:
0 – No observation
1 – Intermittent rain
2 – Continuous rain
3 – Snow
4 – Snow and rain mix
5 – Hail
6 – Thunderstorm
7 – No precipitation

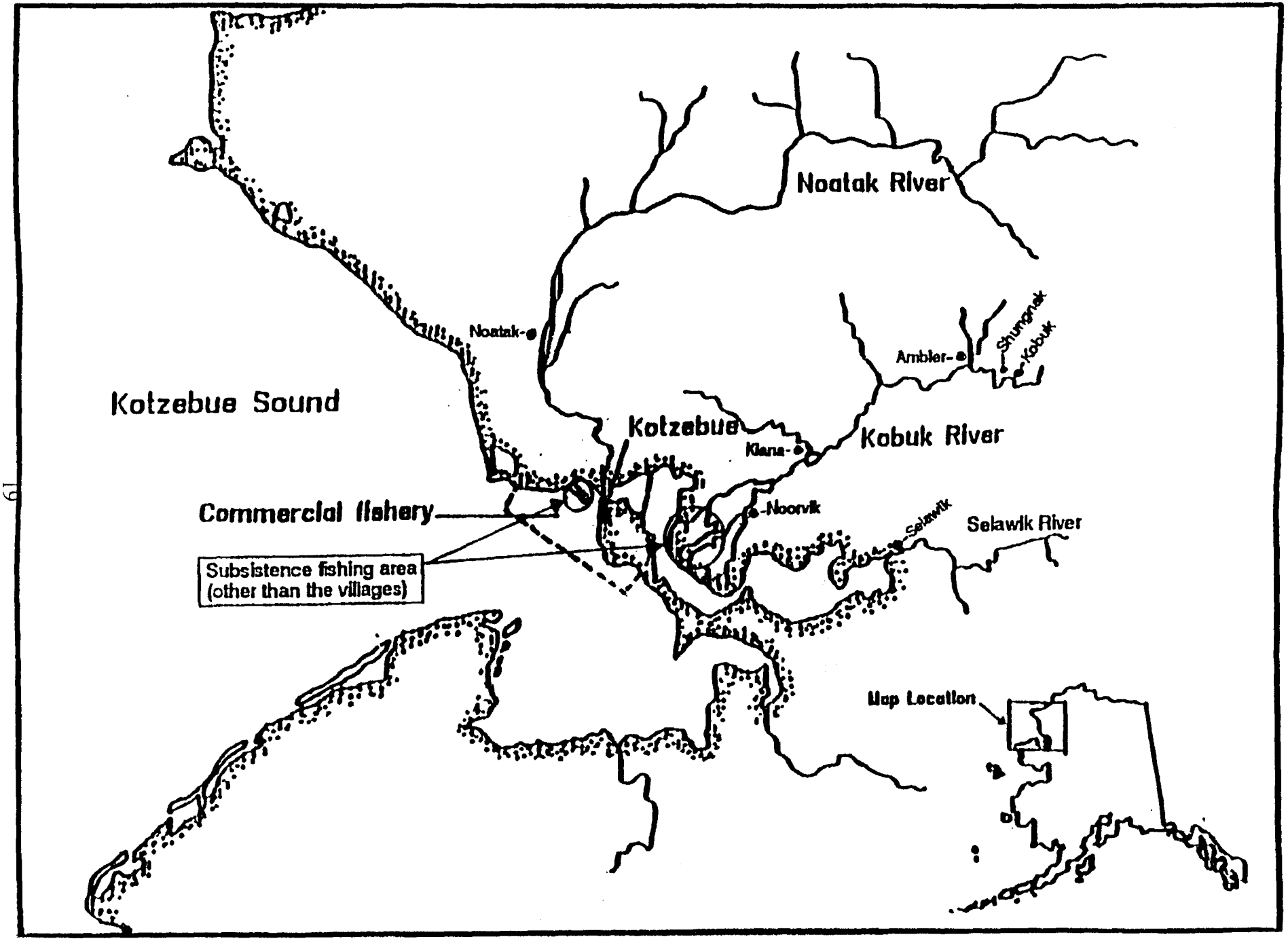

Figure 1. Kotzebue Sound commercial fishing district, villages and subsistence fishing areas.

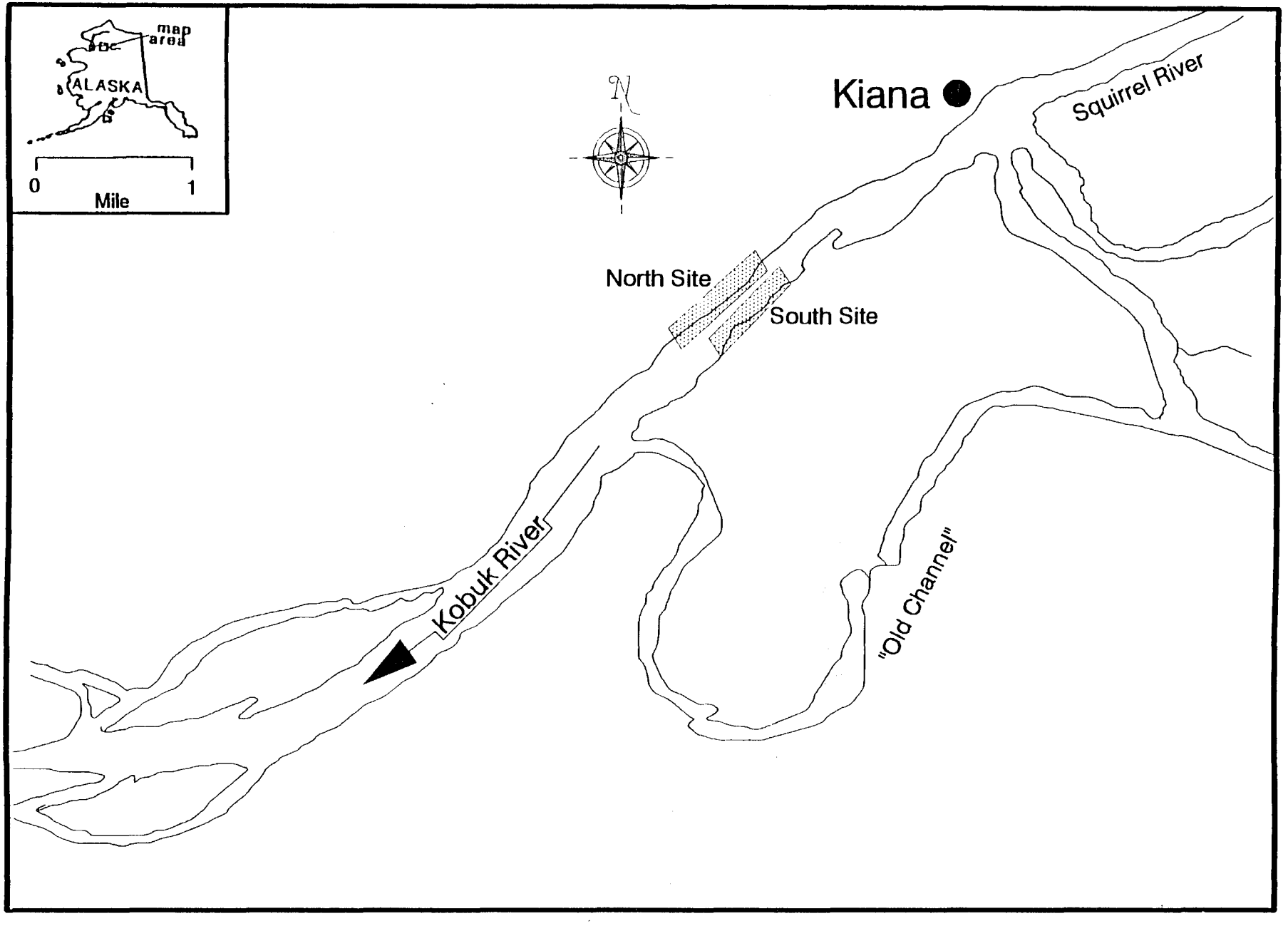

Figure 2. Lower Kobuk River test fish sites.

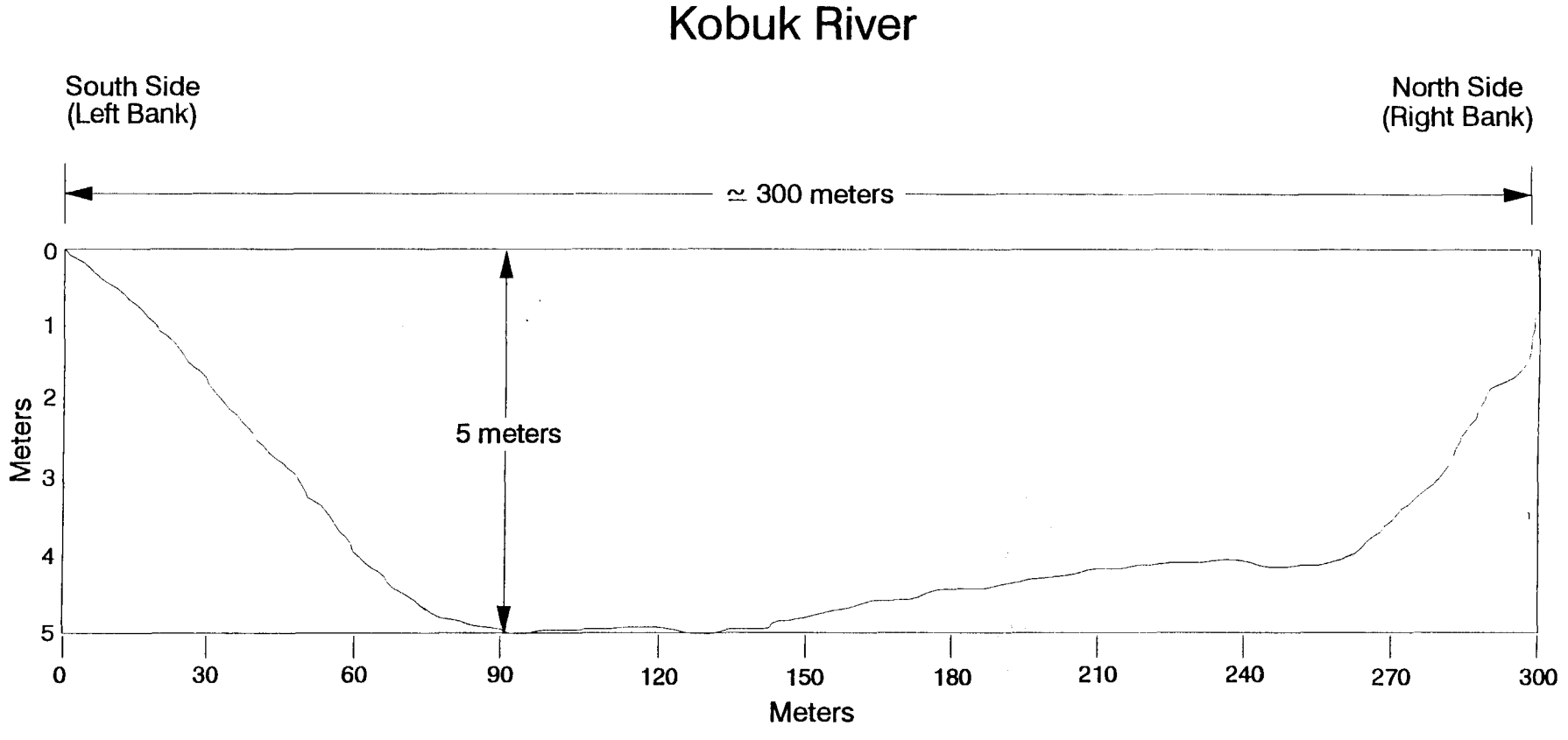

Figure 3. Kobuk River bottom profile at the test fish site, August 4, 1995.

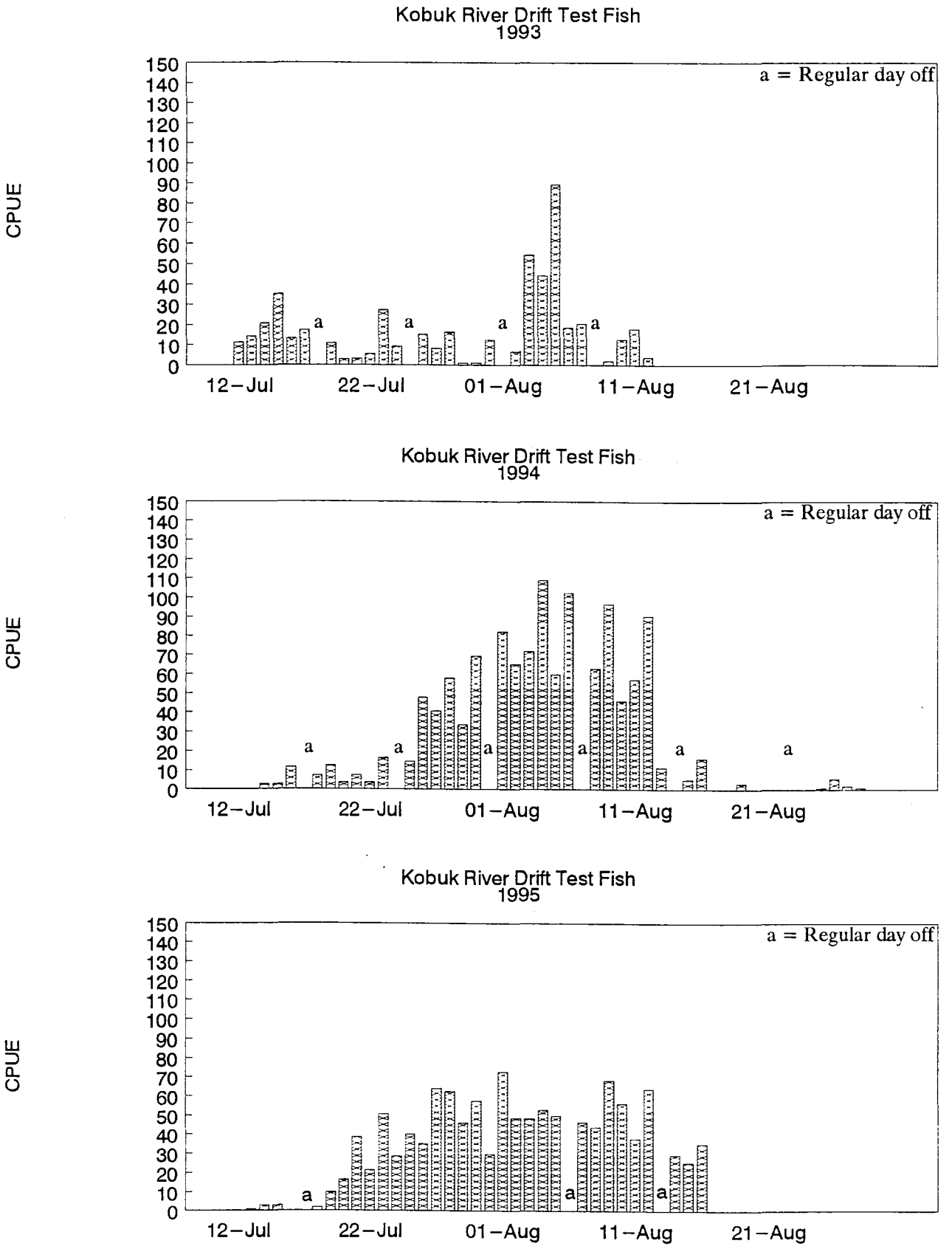

Figure 4. Kobuk River chum salmon drift test fish daily CPUE, 1993–1995.

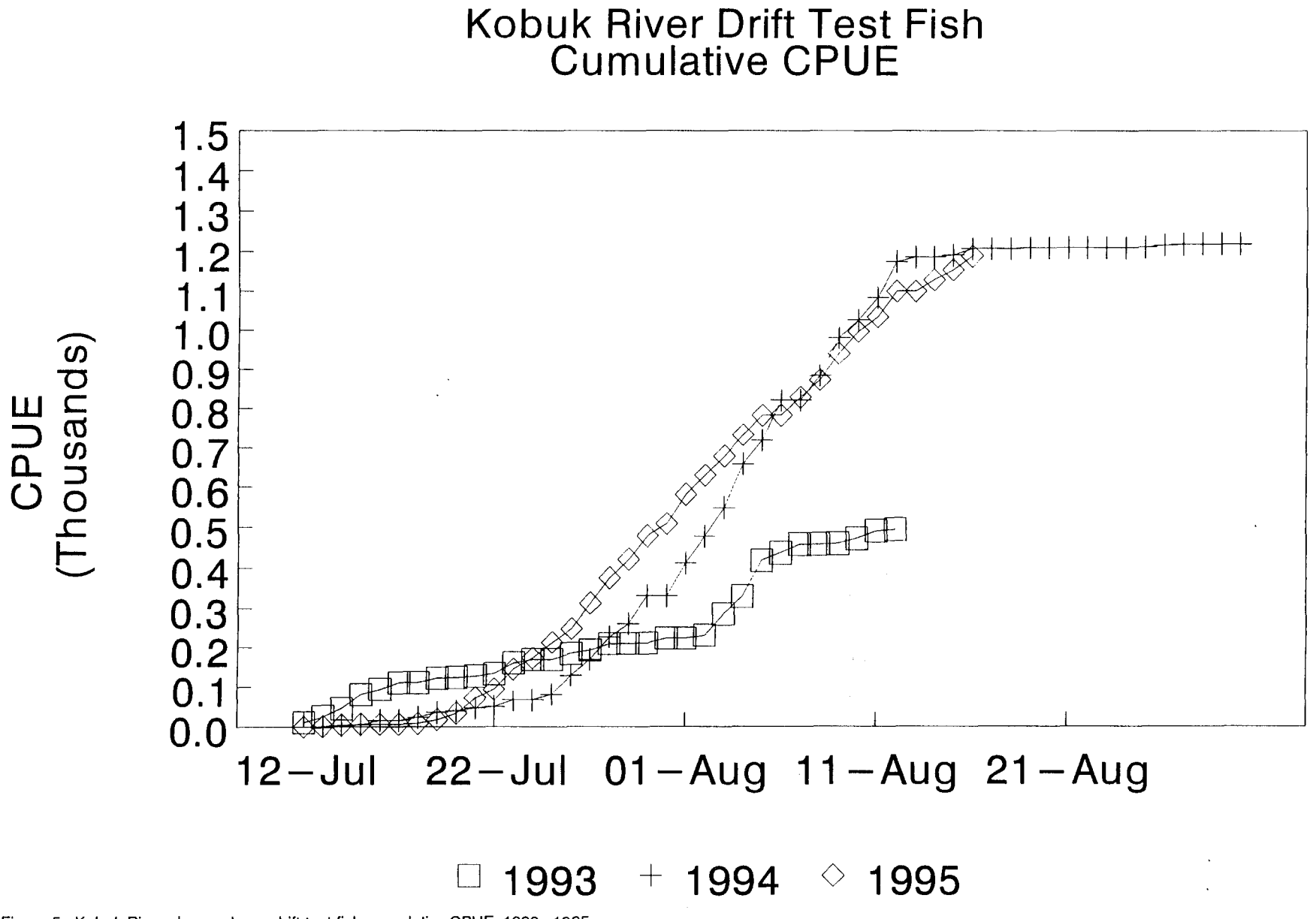

Figure 5. Kobuk River chum salmon drift test fish cumulative CPUE, 1993–1995.

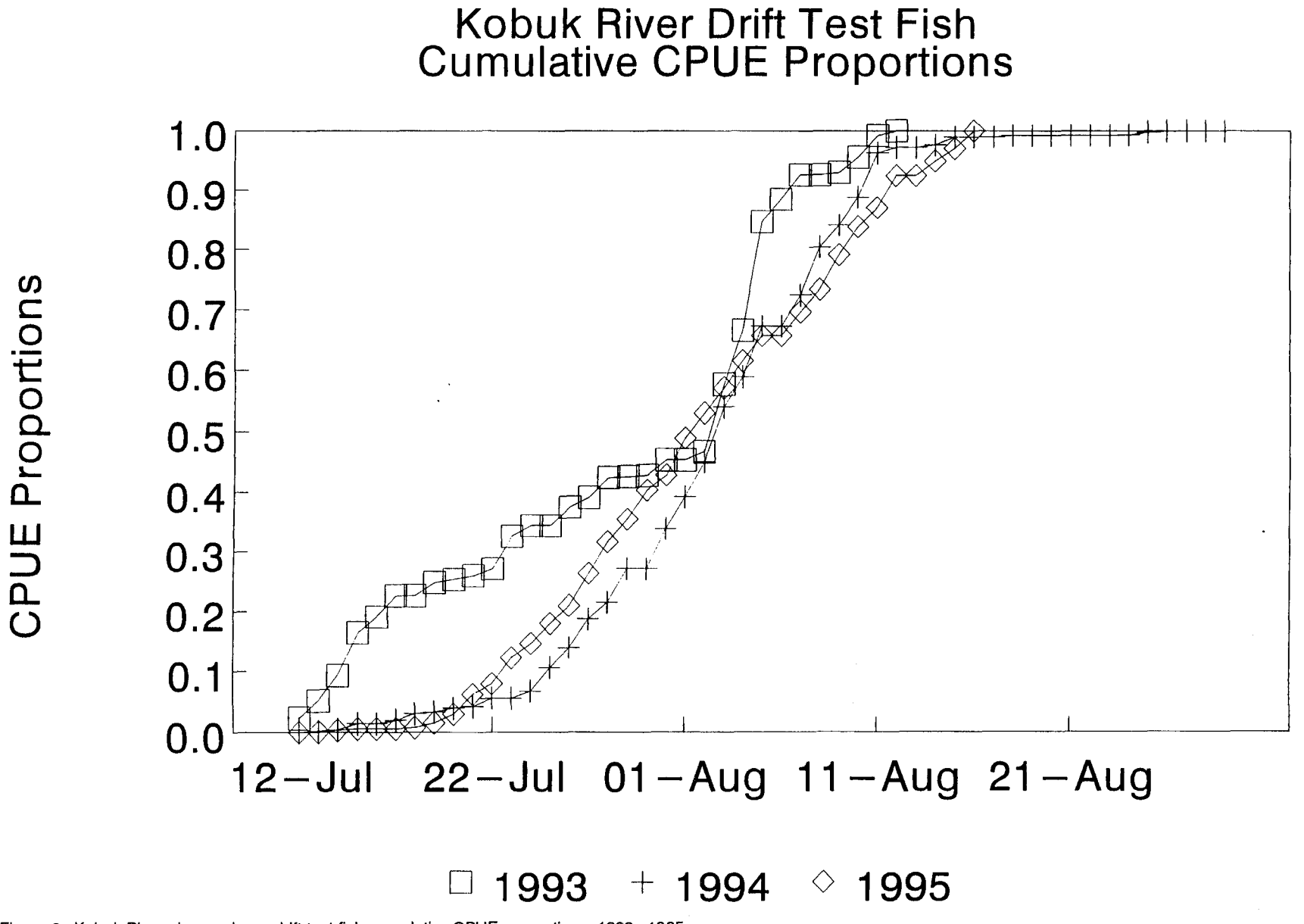

Figure 6. Kobuk River chum salmon drift test fish cumulative CPUE proportions, 1993–1995.

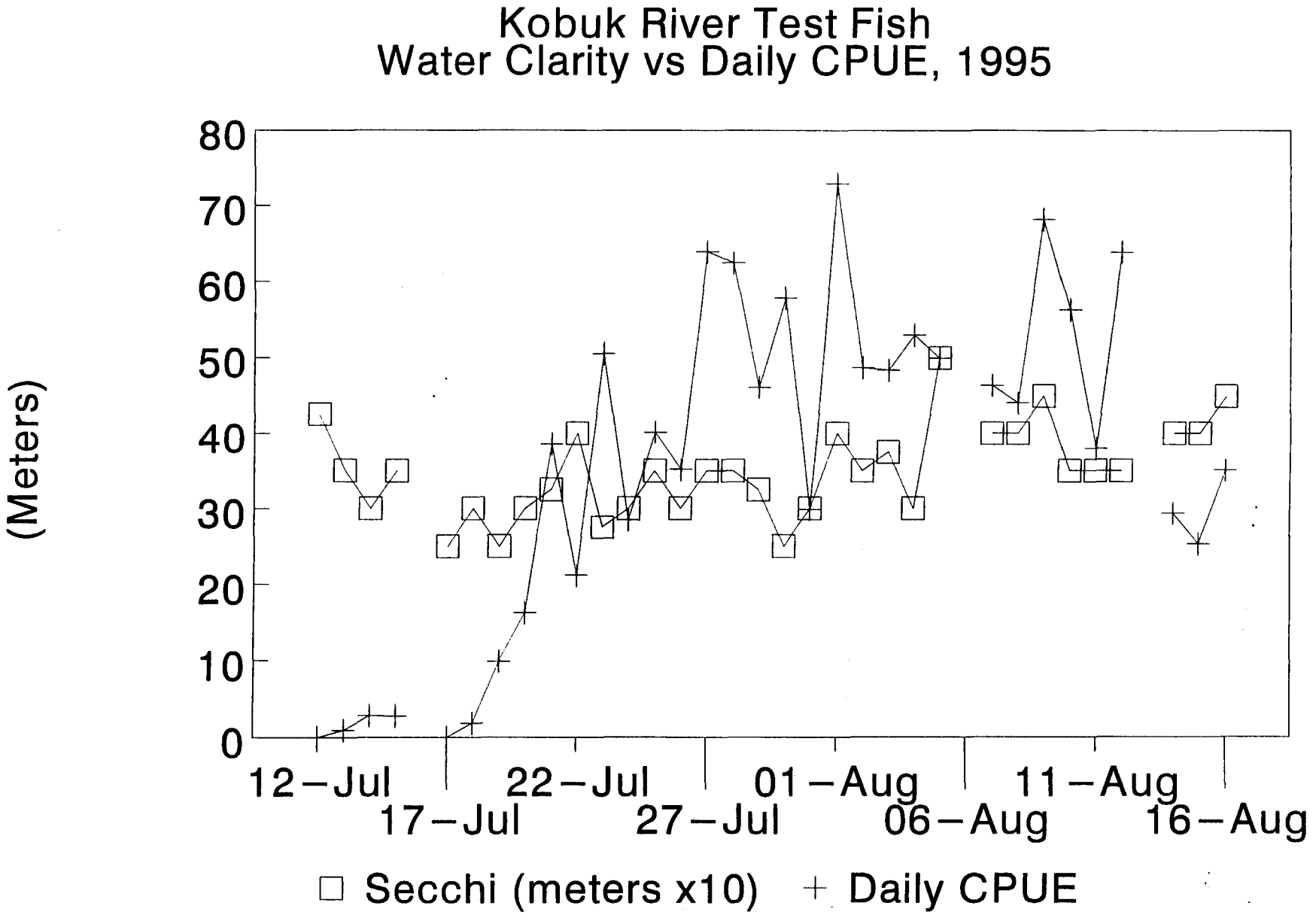

Figure 7. Kobuk River drift test fish daily secchi readings in meters compared to the daily chum salmon CPUE, 1995.