Marshall Cooperative Chinook Salmon Drift Test Fishery Project, 2008

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Final Report

by

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ABSTRACT

A Chinook salmon test fishery was conducted daily near the village of Marshall (approximately river mile 171) on the Yukon River from 11 June 11 to 15 July, 2008. The test fishery crew was comprised of local hire technicians providing a conservation and stewardship experience for rural residents and students. The fishery performed drifts in two established sites twice daily using 8.25-inch mesh drift gillnets to estimate the timing and relative abundance of the Chinook salmon run. Data were collected to estimate the age,, sex, and length (ASL) composition of Chinook salmon run. The total catch was 724 Chinook salmon and cumulative catch per unit effort (CPUE) index was 1074.45 and was high relative to the 2007 test fishery and is higher than seen at either Pilot Station or Lower Yukon Test Fisheries. Chinook salmon daily CPUE indices also show that there were potentially three pulses in the Chinook salmon run, the first on 17 June, the second on 26 June, and potentially a third on 30 June. These pulse dates correspond with pulse timing data extrapolated from Lower Yukon Test Fishery data and average travel speed that estimated the first pulse of Chinook in Marshall on 17 June, the second on 25 June, and the third on 29 June. A total of 515 Chinook salmon were aged from the test fishery harvest. The test fishery harvest was dominated by 5 year old males (N=208; 40.4%) and 6 year old females (N=159; 30.9%). The harvest of chum salmon relative to Chinook salmon in the test fishery was calculated with a cumulative Chinook to chum salmon CPUE ratio of 1.47. The test fishery was successful and may provide valuable data on Chinook and chum salmon relative abundance and run timing.

INTRODUCTION

Recent declines in Yukon River chinook (*Onchorynchus tshawytscha*) and chum (*O. keta*) salmon abundance have made optimal harvest management of these stocks especially difficult (Waltemyer 2007a) . The vast majority of the commercial salmon harvests occur near the mouth of the Yukon River in Districts 1 and 2 (Figure 1). The subsistence fishery has priority use of these resources, but the fish pass through the major commercial harvesting area in the lower river before they arrive into the upper regions where about half of the subsistence harvest occurs. Fishery managers are challenged to quickly and accurately assess run timing and abundance inseason to ensure that sufficient numbers of salmon pass through the downstream commercial fishing districts in order to provide for subsistence needs and adequate escapements to Alaskan and Canadian streams.

The Alaska Department of Fish and Game (ADF&G) Lower Yukon test fishery (LYTF) near Emmonak is generally recognized as a good indicator of Chinook salmon relative abundance and run timing. Pilot Station sonar appears to do a reasonable job of estimating summer chum relative abundance relative to Chinook salmon passing by the sonar site; however, the Chinook salmon estimates are of questionable quality. This discrepancy has been attributed to the order of magnitude differences between summer chum and Chinook salmon which overlap in run timing; Chinook salmon being a much smaller fraction in the apportionment of salmon counted by the sonar. This magnitude of difference between summer chum and Chinook salmon abundance makes it more difficult to accurately define the Chinook salmon passage component for management purposes.

The best way to assess relative abundance in river is to have multiple projects distributed throughout the river. When the assessments made by each tool are combined, a more complete and reliable picture relative abundance of is available for managers to use. The Marshall Test Fishery can be used to “cross-check” Pilot Station sonar timing and passage estimate of Chinook salmon with the LYTF and vice-versa thus providing more information to further increase managers' confidence in Chinook abundance. In addition, this test fishery provided a measure of relative abundance upriver from the lower river commercial fishing subdistricts.

The information gathered will aid in the management of both Canada and U.S. Chinook salmon stocks, so that the escapement goals are achieved, the subsistence priority is met, and appropriate levels of commercial harvest may be allowed.

This project is designed to foster research in the form of data collection and analysis that directly contributes to the assessment of the current state of knowledge of Chinook salmon abundance for in-season management. This project will also provide an opportunity to build community capacity and stewardship for local residents/students in a work experience and promote training, teaching, and learning in the areas of fisheries research and management. An established project like this one can support a resource management project in a cost effective manner and facilitate communications between various community and government entities. In addition, the project has been successful at building community capacity and has support in the local area.

STUDY AREA

The study area is located near the village of Marshall on the Yukon River approximately 171 river miles (275 kilometers) from the mouth (Figure 1.) The test fishery sites are located along the north (Site A) and south (Site B) banks. These two sites were also used in 1999, 2000, and 2005-2007.

OBJECTIVES

The objectives of this project were to:

1) Estimate the run-timing, relative abundance, and age, sex and length (ASL) composition of Chinook salmon in the Yukon River near the village of Marshall; and,

2) Promote a conservation and stewardship experience for rural local residents and/or students.

METHODS

Yukon River Drainage Fisheries Association (YRDFA) in cooperation with Ohogamiut Traditional Council (OTC) and ADF&G managed this test fishery project in 2008. Project design and sampling methods used this year were established in prior years and are described in project reports and workplans developed by Waltemyer (2007a,b). Details of test fishing and sampling methods are described in Appendix A. Daily test fishing was conducted at established drift sites from 11 June through 15 July. A total of two 20-minute drifts, twice daily, were conducted unless weather conditions were prohibitive. After the individual drifts were made, catch results were recorded and the catch of Chinook salmon was sampled for scales for age determination, sex, and length information. Daily Chinook salmon catch results were tabulated and daily CPUE statistics were calculated; these data were relayed to the ADF&G field office in Emmonak and YRDFA on a daily basis. This information was compiled and analyzed, in regards to relative abundance and migratory timing of Chinook salmon. Once the catch was sampled, the crew distributed the fish to local residents for subsistence use.

RESULTS and DISCUSSION

The project operated for 35 days from 11 June through 15 July, 2008. The project operated with four drifts every day except for one day of two drifts when inclement weather prohibited fishing and one day of two drifts on the initial training day. The daily project catch and CPUE results were tabulated and show generally that most of the Chinook run was monitored at the test fish site (Table 1). The total catch was 724 Chinook salmon. The corresponding cumulative CPUE index was 1074.45 and was high relative to last years and is higher than seen at either Pilot Station or Lower Yukon Test Fisheries. The 2007 Chinook cumulative CPUE for this test fishery was 558.46 for 32 days of test fishing with an average CPUE of 17.45 fish per day (Waltemyer 2007a). The 2008 test fishery fished for 35 days with an average CPUE of 30.70 fish per day using the same methodology and at the same sites. One possible explanation for the large difference in average daily and cumulative Chinook salmon is there were differences in fisherman efficiency between years as the fisheries operated with a different crew in 2008 than in 2007. The higher CPUE for this test fishery in relation Pilot Station and the Lower Yukon River Test Fisheries may be due to site differences and higher harvest potential drifting the fishing nets versus setting them in a fixed location.

The Marshall Test Fishery Chinook salmon daily CPUE indices show that there were potentially three pulses in the Chinook salmon run, the first on June 17th, the second on June 26th, and potentially a third on June 30th (Figure 2a). These pulse dates correspond with pulse timing data extrapolated from Lower Yukon Test Fishery data that estimate the first pulse of Chinook in Marshall June 17th, the second June 25th, and the third on June 29th.

Daily and cumulative CPUE indices were also tabulated for chum salmon (Table 2.) The catch of chum salmon relative to Chinook salmon is reflected by a cumulative Chinook to chum CPUE ratio of 1.47 which is lower than the ratio of 2.24 exhibited in the test fishery in 2007 (Waltemyer 2007a). Also, as there may be bias due to gear selectivity toward Chinook salmon, the indices for chum salmon should be used judiciously.

Scale samples were processed by ADF&G and summary statistics are presented by age and sex in Table 3. A total of 515 Chinook salmon were aged from the test fishery harvest. The test fishery harvest was dominated by 5 year old males (N=208; 40.4%) and 6 year old females (N=159; 30.9%). Relative accuracy of estimation of run timing and abundance of Chinook salmon is revealed through comparison of the Marshall Test Fishery daily catch and CPUE with Pilot Station sonar test fishery daily catch data (Figure 2a,b.). Similar peaks in daily catch in both of these fisheries demonstrate the utility of the Marshall Test Fishery as a check on the Pilot test fishery.

The project has been successful at building community capacity and has support in the local area. The crew consisted of three people from the village of Marshall and there was a very good working relationship between the crew, OTC, YRDFA, and ADF&G. The crew did an excellent job of providing the necessary inseason information, completing the project objectives, and worked to stay within the budget with high fuel costs. The test fishery was successful and may provide valuable data on Chinook and chum salmon relative abundance and run timing.

Table 1. Chinook salmon daily and cumulative catch and index, Marshall Test Fishery, 2008.

		Catch		CPUE[a]	
Date	# Sets	Daily	Cumulative	Daily	Cumulative
11-Jun	2	0	0	0.00	0.00
12-Jun	4	14	14	22.53	22.53
13-Jun	4	9	23	14.30	36.83
14-Jun	4	13	36	23.10	59.93
15-Jun	4	14	50	22.58	82.52
16-Jun	4	12	62	19.07	101.59
17-Jun	4	18	80	28.93	130.52
18-Jun	4	32	112	51.96	182.48
19-Jun	4	44	156	70.11	252.59
20-Jun	4	45	201	63.77	316.37
21-Jun	4	26	227	41.83	358.20
22-Jun	4	28	255	42.02	400.22
23-Jun	4	30	285	50.22	450.43
24-Jun	4	19	304	31.78	482.22
25-Jun	4	20	324	29.56	511.78
26-Jun	4	44	368	60.72	572.49
27-Jun	4	49	417	70.32	642.80
28-Jun	4	53	470	71.01	713.80
29-Jun	4	45	515	59.65	773.45
30-Jun	4	58	573	76.33	849.79
1-Jul	4	35	608	50.91	900.70
2-Jul	4	33	641	46.59	947.28
3-Jul	4	26	667	32.75	980.04
4-Jul	4	13	680	22.42	1002.46
5-Jul	4	3	683	4.95	1007.41
6-Jul	4	12	695	16.32	1023.73
7-Jul	4	2	697	3.75	1027.48
8-Jul	4	3	700	4.62	1032.10
9-Jul	4	4	704	12.07	1044.16
10-Jul	2	7	711	10.22	1054.38
11-Jul	4	3	714	4.09	1058.07
12-Jul	4	5	719	8.03	1066.50
13-Jul	4	1	720	1.50	1068.00
14-Jul	4	1	721	1.62	1069.62
15-Jul	4	3	724	4.82	1074.45

[a] CPUE Index equals number of fish caught in 100 fathoms of gear in one hour of fishing time.
Daily CPUE represents the average CPUE of the sets made in that day.

Table 2. Daily and cumulative Chinook and Chum salmon CPUE and Chinook/chum CPUE ratio at the Marshall Test Fishery project, 2008.

		Chinook CPUE[a]		Chum CPUE[a]		Chinook/chum
Date	# Sets	Daily	Cumulative	Daily	Cumulative	CPUE Ratio
6/11	2	0.00	0.00	0.00	0.00	
6/12	4	22.53	22.53	0.00	0.00	
6/13	4	14.30	36.83	0.00	0.00	
6/14	4	23.10	59.93	1.69	1.69	
6/15	4	22.58	82.52	1.74	3.43	
6/16	4	19.07	101.59	0.00	3.43	
6/17	4	28.93	130.52	3.33	6.76	
6/18	4	51.96	182.48	17.14	23.9	
6/19	4	70.11	252.59	18.72	42.62	
6/20	4	63.77	316.37	37.67	80.29	
6/21	4	41.83	358.20	45.41	125.70	
6/22	4	42.02	400.22	15.58	141.28	
6/23	4	50.22	450.43	14.21	155.49	
6/24	4	31.78	482.22	26.84	182.33	
6/25	4	29.56	511.78	23.68	206.1	
6/26	4	60.72	572.49	23.13	229.14	
6/27	4	70.32	642.80	32.08	261.22	
6/28	4	71.01	713.80	24.78	286.00	
6/29	4	59.65	773.45	34.68	320.68	
6/30	4	76.33	849.79	79.06	399.74	
7/1	4	50.91	900.70	85.71	485.45	
7/2	4	46.59	947.28	25.56	511.01	
7/3	4	32.75	980.04	37.24	548.25	
7/4	4	22.42	1002.46	9.52	557.77	
7/5	4	4.95	1007.41	8.28	566.05	
7/6	4	16.32	1023.73	7.74	573.79	
7/7	4	3.75	1027.48	1.75	575.54	
7/8	4	4.62	1032.10	9.73	585.27	
7/9	4	12.07	1044.16	63.00	648.27	
7/10	2	10.22	1054.38	44.33	692.60	
7/11	4	4.09	1058.07	4.83	697.43	
7/12	4	8.03	1066.50	6.32	703.75	
7/13	4	1.50	1068.00	14.55	718.30	
7/14	4	1.62	1069.62	12.72	731.02	
7/15	4	4.82	1074.45	1.67	732.69	1.47

[a] CPUE Index equals number of fish caught in 100 fathoms of gear in one hour of fishing time.
Daily CPUE represents the average CPUE of the sets made in that day.

Table 3. Marshall Test Fishery length means grouped by age and sex for the 2008 season.

Sex-Age	Male 4	Female 5	Male 5	Female 6	Male 6	Female 7	Male 7
Length							
Mean	555.36	812.09	736.95	866.48	832.64	883.75	900.00
SE	13.67	6.54	3.85	3.75	8.6613	14.42	33.80
SD	51.16	42.86	55.50	47.25	72.47	49.96	101.40
Count	14	43	208	159	70	12	9
Percentage	2.7	8.3	40.4	30.9	13.6	2.3	1.7

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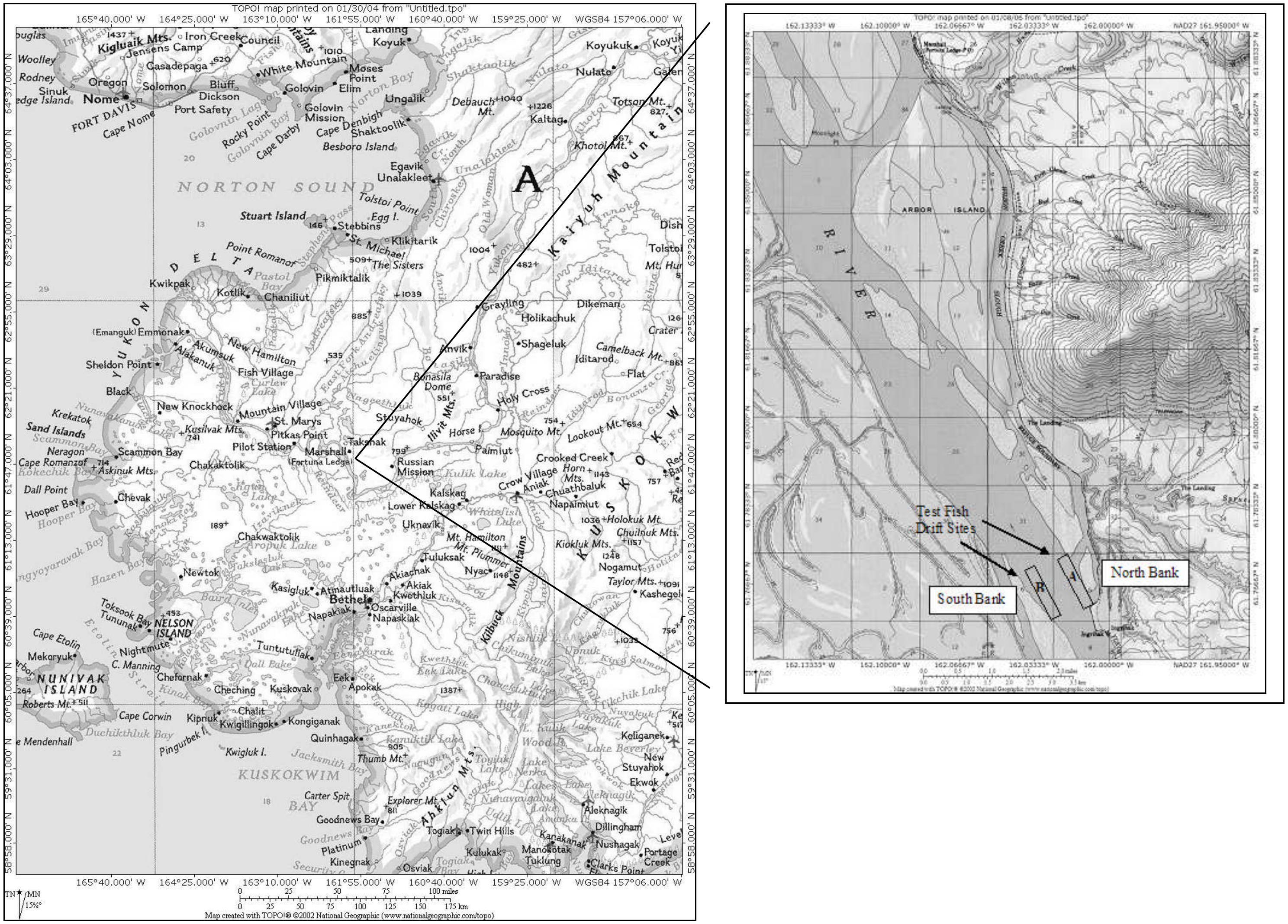
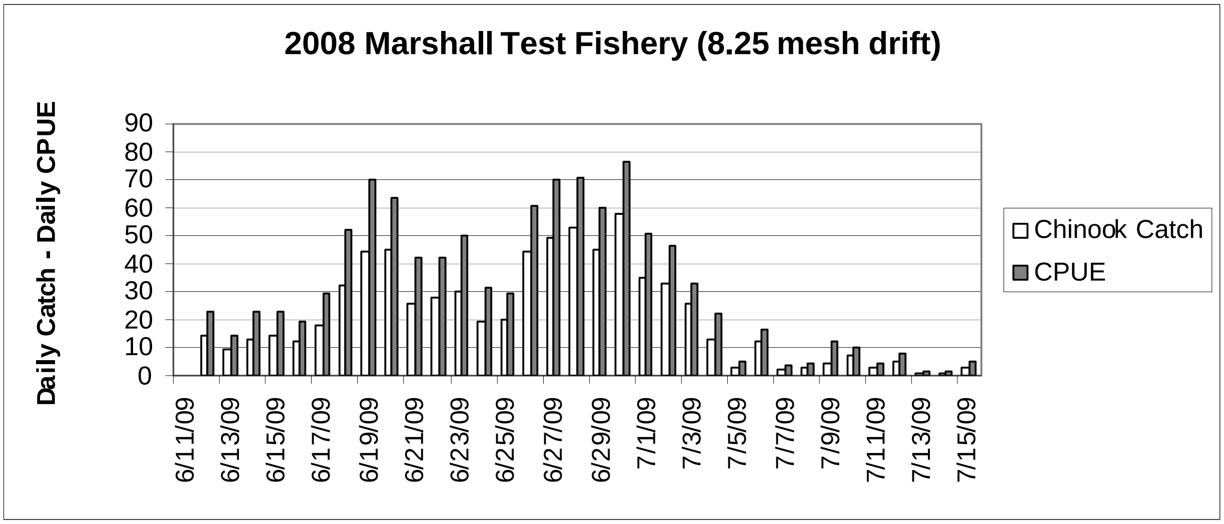
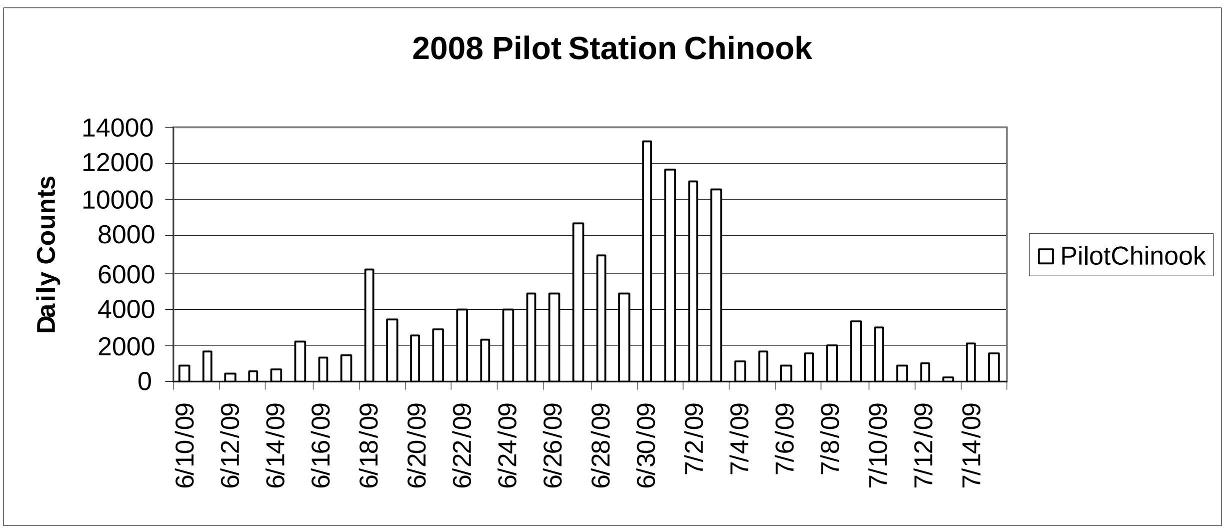


Figure 2. Location of drift fishing sites for the Marshall Test Fishery project in 2008 (map from Waltemyer 2007b)



(a)



(b)

Figure 2. 2008 Chinook salmon catch and CPUE at the Marshall Test Fishery (a) and 2008 Chinook salmon daily counts at Pilot Station Sonar (b).

Appendix A. Marshal Test Fishery: *Test Fishing Procedures (adapted from Waltemyer 2007b).*

A total of two 20-minute drifts, twice daily, were conducted unless weather conditions were prohibitive. The first set of two drifts was made mid morning and the second set should be made mid afternoon. Once the time of sampling is defined, this schedule should be followed throughout the project duration. Drift locations are near Marshall, approximately 10 miles upstream, where there is a single channel (no islands; Figure 1). Test drifts are made on both sides of the river in the same general vicinity. Efforts are made to fish the designated sites as consistently as possible.

Exact times by the minute were kept for each drift starting with when the net is first set out, when it is fully out, when the net retrieval starts, and when the net is fully in. This information is used to calculate the exact CPUE for each drift. The net is retrieved prior to a full 20 minute drift if it is determined that the net is becoming saturated with large catches. The distance covered by the drift is dependent on the time the net is in the water as well as water and wind conditions. Nets were always be retrieved as quickly as possible as slow retrieval of the test net may affect the catch rate or the catch-per-unit-effort (CPUE). When possible, fish were picked from the web while retrieving the net, although at times of high catch rates, it was best to pull the entire net into the boat prior to removing the fish from the web.

Any problems encountered during the drift were noted in the rite-in-the-rain book. Problems may include snags, net saturation (extremely high catch rates), and alteration of the drift pattern because of conflicts with other nets, drift, etc. Fish were counted and released if only netted in the mouth. Any salmon that are netted in the gills were retained. The total number of salmon caught (catch), the number kept (harvest), and the number released alive by species were recorded.

Weather conditions (cloud cover, precipitation, wind direction), air and water temperatures, water clarity and pH measurements were taken prior to the first set of the day. In addition, any unusual water conditions were noted as well.

After the individual drifts are made, the catch of Chinook salmon were sampled for scales, sex, and length information. Once the catch is sampled, the fishermen returned to the village for transfer and distribution of the fish to local residents. The OTC will help publicize the availability of the fish. In the event that the subsistence needs are met, and there are commercial openings for Chinook salmon harvest and as directed by ADF&G, fish should be sold to Maserculiq Fish Processors, INC. (MFP). Test fishermen logged the delivery and make note of the dispersal of the fish (kept for subsistence use, given away to other households for subsistence use).

Scale Sampling Goals
A stratified systematic sampling design (Snedecor and Cochran 1977) was used to obtain samples for estimating age, sex, and length compositions from Chinook salmon. Strata were assigned as quartiles for test fish indices. Strata are adjusted depending on the number and

distribution of samples collected and an attempt will be made to include sufficient sample sizes within each stratum to estimate the proportion of each major age class with $\alpha = 0.05$ and $d = 0.1$ (Bromaghin 1993). A sample goal of up to 30 Chinook salmon per day was used and on days when the catch is less than 30, all Chinook salmon were sampled. When the catch is greater than 30, a random sample of only 30 were taken.

Fish Sampling Procedures
These procedures were completed before fish were distributed to local subsistence users:

1. Fill out the information for that day in the scale sampling data notebook (write-in-rain).
2. Fill out information on front of scale gum card (be careful not to get the cards wet as they will stick together). A new scale gum card should be used everyday regardless of the number of scales taken to prevent them from getting lost or damaged during subsequent sampling
3. Determine whether the salmon is a male or female and put either an M (male) or F (female) in the Sex column in the sampling data notebook.
4. Measure the salmon from the middle of the eye to the fork in the tail and record this in the Length column in the notebook. Measure to the nearest 0 or 5 mm (a 573mm measurement should be rounded to 570- or 575mm, whichever it is closest to). All lengths should end in either 0 or 5.
5. Take 3 scales per fish from the preferred area and attach them to the gummed scale card corresponding to the number of the sample (i.e. Scale #1 should be put directly on the 1 printed on the gum card, scale #2 on 11 and scale #3 on 21). Then fish #2 scales would correspond with the numbers 2, 12, and 22 on the gum card, and so forth. Taking three scales per fish only allows for putting 10 fish on a gum card. Important: the side of the scale facing up on the card should be the side of the scale that is facing outward on the fish. Try to orientate each scale on the card in the same direction.
6. Once sampling of the daily catch is done, put a piece of waxed paper over the side of the gum card with the scales stored pressed flat and in a safe place until the cards can be sent to Emmonak or Anchorage for aging.

Interpreting the Test Fish Index
The number of fish caught during each drift was expressed as a catch per unit effort (CPUE) statistic, which standardized catch reporting to the number of fish caught in 100 fathoms (f) of gear in one hour of fishing time. Calculating each drift CPUE for the test fishery was as follows:

$$CPUE_s = \frac{100\text{ f} \times 60\text{ min} \times \text{number of fish}}{\text{f of gear} \times MFT_s}$$

Where: $CPUE_s$ = CPUE for drift_s, and
MFT_s = mean fishing time for drift_s.

Mean fishing time (MFT_s) for each drift is calculated as:

$$MFT_s = (C - B) + \frac{(B - A) + (D - C)}{2}$$

Where: A = time net deployment started,
B = time net fully deployed,
C = time net retrieval started, and
D = time net fully retrieved.

Each day's daily CPUE statistic is then calculated by averaging the $CPUE_s$ by the number of sets made each day.