

Installation and Operation of Video Storage Equipment on the Yukon River Sub-district 5-a Test Fishwheel - 2000



A Final Report to the Yukon River Panel

By Bill Fliris

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Title

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Abstract. -, The Sub-district 5a Test Fishwheel has used a 'live box' to hold fish for counting by dip net. 'Live box' counting is laborious and not always accurate. Recent studies suggest that confining and crowding of salmon may reduce traveling rates after release and may even contribute to premature mortality. A stored video image system was needed to reduce fish handling and provide a more accurate and efficient method of obtaining the data. The operator installed the system over a two-week period, working part time. The system worked very well for counting but needs refinement to be useful for accurate sex and species apportionment of salmon. The results have indicated that the methodology used in this project, referred to as 'luminescence', is useful and superior to 'live box' counting. However, a system that uses a door with a magnetic 'trigger switch' in the chute and an on-board notebook style computer for digital storage would capture more frames per fish and eliminate problems caused by daytime shadows. It would also allow a lower and more lateral placement of the video camera. The lower camera position should give a view of the fish at an angle that will produce better images for more accurate identification of salmon.

Introduction

The Sub-district 5a Test Fishwheel is a common Yukon River 'two basket' style fishwheel (Cover Picture). The baskets are made of native spruce and tamarack poles that are fixed to a log axle with heavy nails and steel wire. The axle has round steel cylinders on each end held in polyethylene plastic stirrups. The plastic stirrups are each held by a chain fall that allows for height adjustments. The bottoms of the baskets are covered with a welded wire mesh of one-inch by two-inch holes. The basket sides are covered with nylon seine twine of two-inch mesh. The fishwheel is floated on a log raft that is positioned by a spar pole from the shore and held in place by a steel cable fastened to trees on the bank. The baskets are approximately twelve feet long, eight feet wide and three feet high. The normal fishing depth of the fishwheel is ten feet.

The Sub-district 5a Test Fishwheel has used a 'live box' in addition to its' normal holding box since 1993. A 'live box' is a submerged container that is attached to the fishwheel raft; it keeps fish caught by the fishwheel alive until counted. The fish so held are dip-netted, counted by species and sex, and returned to the river alive. Recent information (Underwood et al. 1999), & (Eiler, National Marine Fisheries Service, personal communication to Zuray concerning preliminary data) suggests that crowding and live box holding times longer than four hours can lead to reduced traveling rates, or premature mortality, possibly due to a disorienting affect produced by confinement. A decision to err on the side of caution when handling a valuable resource was the reason for utilizing the recently developed video technology to improve the Catch-Per-Unit-Effort (CPUE) data collection process on the Sub-district 5-a Test Fishwheel.

This project involved importing technology and equipment onto the Sub-district 5a Test Fishwheel (see Equipment List). Similar equipment was previously installed and tested successfully on the U.S. Fish and Wildlife Service (USFWS) 'Rapids' Test Fishwheel in 1999 (Zuray, Underwood, 1999).

Material and equipment was purchased in June of 2000. Construction of the equipment boxes and special camera chute with associated wiring began in the first week of August. The system was operational on the 18th of August, the third day of test fishing for the year. Although

there were many adjustments made for the best quality video recordings, it was obvious from the start that the system would work well. The equipment purchased was similar or identical to that used on the USFWS 'Rapids' Test Fishwheel in 1999 (Zuray, Underwood, 1999). The installation was modified to suit the particular fishwheel dimensions and site peculiarities of the Sub-district 5-A Test Fishwheel.

The 'live box' was used in order to verify the accuracy of the video system. There were many discrepancies between live box counts and captured video file counts. In most cases the error could be ascribed to problems in counting the fish in the 'live box,' or to fish escaping confinement before or during counting. In a small number of cases, problems with the lighting system were responsible for tapes being too dark for the video capture program to read. In no cases involving salmon was the computer capture program found to be in error when the lighting was correct.

Sex and species apportionment was found to be less accurate overall than by manual count because of the necessity to mount the camera directly over the chute looking down on the fish as they passed through. In cases where salmon passed through on their stomachs without rolling, the view of their backs was often not enough to reveal whether the fish was a chum or coho salmon (see Captured Frame Sheet – top row). The error seemed to accrue toward counting more female chums overall when compared to live box counts. Two persons (B.Fliris and D.Daum) were consistent in miscounting in this manner.

The overall results indicate that stored video images provide a more accurate, economical, and at the same time, less labor-intensive method of counting salmon compared to holding and counting them from a 'live box.' The fish caught are returned to the river unharmed in a matter of seconds. Also worth noting, is that the most accurate method of verifying the captured video computer files was found to be by viewing the raw unedited videotapes, rather than by 'live box' counts.

Study Site

The Sub-district 5-A Test Fishwheel is located approximately six miles downstream of the village of Tanana on the south bank of the Yukon River. It is positioned about ½ mile downstream of the mouth of Corbusier Slough (see map). According to the Alaska Department of Fish and Game (ADF&G), the salmon migrating past the test fishwheel site are considered to be predominately of Tanana River origin.

The site is normally accessed from the village of Tanana by means of a riverboat that is owned by the operator. ADF&G personnel from Fairbanks monitor the site occasionally by means of a department riverboat. Salmon species caught at this site during the test fishing period are mostly fall chum salmon, *Oncorhynchus keta*, and coho salmon, *Oncorhynchus kisutch*, although a few chinook salmon, *Oncorhynchus tshawytscha*, are sometimes caught early in the season. Other fish captured include, by common name, burbot, pike, grayling, lamprey eel and four species of whitefish. The numbers of these non-salmon species is usually very low comparatively.

Methods

The video capture method used on this project is called 'luminescence' because the computer software utilized (Salmon Soft Capture Ver.3) is sensitive to changes in luminosity. Once a base line of values is established, any frames that contain sudden and substantial changes in brightness or darkness will cause the program to capture and store those frames in a digital file. The level of sensitivity is user definable.

Raw analog video footage was obtained by monitoring a 'live chute' with a surveillance camera. The tapes used were standard VHS format. They were recorded in twelve-hour elapsed time mode on a twelve-volt video recorder. They were replayed on a matched time-lapse recorder in the operators' home. A computer with a video capture card was used to digitally acquire the video frames that contained the images of fish passing through the chute (see Captured Frames Sheet).

The system is efficient because it eliminates most frames that do not contain images of fish. Otherwise, it would be necessary to view an entire 'twelve hour' tape to get the same tally. However, because of the program's sensitivity to changes in light values, it is necessary to shield the chute area from extraneous shadows and sources of strong light (see View 1). The baskets of the rotating fishwheel can produce shadows on sunny days that will trigger the capture program.

The fishwheel is normally equipped with a holding box on top of the outboard side of the raft. This box is a 'dead box'; it is for holding fish used for subsistence and/or commercial purposes (see View1). The 'live box' is mounted adjacent to the raft and is supported by outrigger style poles (see View 6). It is a submerged box through which the river water flows at a reduced rate. Before the 2000 season, a removable plywood chute had been used to span the holding box and deliver fish to the 'live box.' It was necessary to re-build the chute so that a video surveillance camera could be mounted to view the area where the fish would pass through (see Equipment List for all references in this section).

The chute was made of ½ inch thick plywood (see View 1). It was covered with 3/16th inch thick white Ultra High Molecular Weight (UHMW) Polyethylene plastic sheeting on the inside to provide a smooth and even colored background (see View 4). A simple structure of 2"x2" lumber was fastened on top of the chute to mount the camera to and it also served for mounting the white plastic tarps to (see Views 2, 4 &6). The tarps prevent the shadows produced by the rotating baskets of the fishwheel from intruding into the area viewed by the camera. The white color of the tarps is advisable to ensure a natural color balance on the videotape.

A curtain of heavy, coated nylon fabric was used to cover the area where the fish passed out of the basket and into the camera chute (see Views 3 & 4). The curtain allowed the fish to pass through and then returned to block light. A spring mechanism made of wooden fingers fastened to plastic tension springs functioned to return the entrance curtain to the closed position after the passage of each fish (see View 4). This return spring mechanism required some trial and error testing so that it would admit all fish, including those that were small and/or moving slowly. Another smaller curtain of the same material blocked light from entering through the exit hole that led to the live box (see View 6).

With the tarps in place and the curtains functioning properly, the main light in the camera viewing area came from directly above. The camera was mounted in a waterproof case in the same opening (see View 2). This construction diffused most sources of strong light and shadows. The only light that was troublesome, was a pulsing effect that occurred on sunny days, usually between the hours of 12 noon and 1:30 p.m. The pulsing light was related to the rhythmic passage of the baskets past the sun at that time of day. The position of the sun behind the trees on the bank caused the baskets passing through the beams of light to produce pulses strong enough to trigger the capture program. This resulted in some frames captured that had no fish in them. The short duration of this phenomenon made it more of an annoyance than a real problem. It was easy for the operator viewing the captured frames on the computer to scroll quickly through the empty frames to the next fish.

To provide illumination for night operation, two 90-watt flood lamps were mounted directly above the chute, about seven feet from the bottom (see View 5). Lamp # 1 was powered directly from the generator. A twelve-volt battery bank powered Lamp # 2. A voltage inverter was used to convert battery power to 120-volt power for lamp # 2. A common daylight-sensing switch was placed in line between the inverter and lamp # 2 to automatically control the lamp. After adjusting, the switch automatically turned on lamp # 2 at dusk.

A portable (1000-Watt) generator was placed on-shore. It was run during the night hours to power lamp # 1, and to re-charge the battery bank. It was necessary to attach a remote tank to the generator since its' built in tank was not large enough to contain enough fuel to run the generator for 12 hours. Five twelve-volt deep cycle batteries in series connection powered Lamp # 2, the video camera, the VCR and the voltage inverter. In the case of generator failure, lamp # 2, which was connected to the battery bank through the inverter, would provide adequate illumination for the camera. A LCD video monitor was attached to the recording VCR for aiming and focusing the camera. All of the on board equipment, with the exceptions of the camera and lights, was housed in a plywood box with a weather tight roof and a locking door (see Equipment List & Views 1 & 2.).

Normal procedure involved running the fishwheel twenty-four hours a day, seven days a week. In some cases the wheel was stopped for maintenance. Sometimes it was stopped by natural causes such as debris clogging or impact with the river bottom. On most days it ran continuously. In the first days of the project it was not possible to have twenty-four hour video coverage. The equipment was being tested daily. The lighting system for night fishing was the last component installed. The first twenty-four hour coverage occurred on the 25th of August.

The 'live box' was emptied every four hours in the daytime when the number of fish caught could produce a crowded live box, i.e. more than twenty-five fish in twelve hours. Comparisons of night catches were made when subsistence fishing was allowed, otherwise, the back door of the live box was opened so that fish could return to the river without confinement. The water levels during the 2000 season were often at record height. The fishwheel was not able to rotate at normal speeds (approx. 2 RPM) during the extreme high water because of an eddy that formed in the area. Also, the wheel was not able to fish near the river bottom until the water levels receded. Consequently, the CPUE data from the site is not considered representative of the actual run strength in 2000 (see Tables 3, 5 & 6).

Videotapes were changed at approx. twelve-hour intervals. The recorded tapes were brought to the operator's home and processed by running the tape on the playback VCR. The "Salmon Soft Capture Version 3." computer application ran simultaneously and saved only the frames that contained significant changes of luminosity.

The process of capturing a twelve-hour elapsed time tape takes approximately two hours. The video may be viewed on the computer monitor while the capture program is running. There are movable grid lines that contain the sensitive pixels. As many grid lines as are needed may be positioned by the operator and located in the best places for accurate capture. Grid lines were not positioned in the curtain area because sometimes the wind would cause the curtain to move. The sensitivity of the grid lines may be changed in the 'parameters' dialog of the program. When a fish passes through the grid lines the program makes a chime sound. This is useful for noting whether or not the program is successfully capturing frames. During the beginning of the processing of each tape, the operator monitored the program to ensure that the frames containing fish were being captured.

When the entire tape has been processed by the capture program the frames are saved to a target folder on the computer hard drive in a file named 'avi'. An additional 'dat' file is also created. The 'dat' file contains programming code and is not used for counting. The operator immediately re-named the 'avi' file, in this case with the appropriate times and date. The program will always save any additional captured frames to a file named 'avi' that exists in the target folder, so it is necessary to re-name the file before running another tape. The operator moved the re-named file to another folder and then made a back-up copy to a separate hard drive. Eventually a CD-R disc was 'burned' for archiving and it contained the total files for the season.

The operator viewed files by 'right clicking' on the icon and then selecting 'properties.' Under the 'preview' tab a screen allows for playing through the entire file or viewing one frame at a time by using the direction keys on the keyboard. The date and exact time of the recording is always visible in each frame (see Captured Frames Sheet).

Fish were counted by species and sex and recorded on a multiple tally denominator. The numbers were transferred to report sheets and finally to Microsoft Excel spreadsheets. The results were reported by telephone daily to the Alaska Department of Fish and Game, Commercial Fish Division, Fairbanks.

Results

Analysis was done on 27 days of catch information, beginning on August 25th through September 26th. August 25th was the first day when every component of the system was functional, and the first twenty-four hour recording was made. The season ended on September 26th, four days early, because of the arrival of freezing temperatures. The following days were excluded because of equipment problems:

9/3 and 9/6 – the original flood lamps burned out and were replaced temporarily with common household type bulbs. The household bulbs were inadequate for illumination at night.

9/9 – the entrance curtain between the baskets and the camera chute was torn loose. The viewing area was filled with shadows and bright light, causing the program to capture too many frames.

9/21 and 9/22 – a hole developed in the rear door of the live box so that quite a few fish escaped.

9/25 – the operator had outboard motor problems with the result that no daytime tape was recorded.

Methods:

Daily live box counts were compared to video captured counts for all salmon combined. Video counts were assumed accurate since all salmon were captured on VCR tape. Daily counting times varied from 4.5 to 24 hours. A total of 27 daily comparisons were made. Each day was standardized by using the percent difference between the daily live box and the daily video count. A one-tailed Wilcoxon one-sample test was performed to see if the median daily live box count significantly differed ($\alpha = 0.05$) from the video count. Also, daily counts of coho and chum salmon were compared using a Wilcoxon paired-sample test.

Results:

Daily counts of salmon from the live box differed significantly ($P = 0.001$) from the video counts with a daily median value of 97.6% of video counts (95% confidence interval of 95.5 to 98.9%; Table 1). Results from comparisons between daily live box and video counts for chum and coho salmon were mixed (Table 2). There was no significant difference ($P = 0.96$) between daily chum salmon counts from the two methods. But coho salmon counts were significantly higher ($P = 0.01$) using video compared to the live box. It was difficult to pin down the reason for this discrepancy between species. Misidentifying a higher proportion of chum compared to coho from the video and/or coho salmon having a higher probability of escaping from the live box may have influenced the results. Zuray (2000) showed that salmon do jump out of live boxes. Future improvements to the video system should allow more accurate identification of salmon species. A summary Video-Dip Comparisons for the whole season is found in Table 4.

Comparisons of numbers of fish recorded on videotape to numbers of fish video-captured for the same time period was done in order to demonstrate that 'live box' counts are not required to verify system accuracy (Table 7.). All species were considered as targets for purposes of this comparison. The results show that when the videotape was viewed carefully on a large screen television monitor the counts almost exactly matched the captured files. The one exception was on Tape #38b where a single cisco whitefish was observed on the videotape but was not captured by the "Salmon Soft" program. Counting on the computer monitor, however, produced errors as noted in Table 7.

Discussion

This system has now been used successfully on two test fishwheels. Stan Zuray designed it in 1999 on the USFWS 'Rapids' Test Fishwheel. It was used there again for chinook salmon in 2000 (Zuray and Underwood 1999 and Zuray 2000). The Sub-district 5a Test Fishwheel proved to be a good transfer site for this technology, even though the fishwheel is significantly different in size and operational characteristics. The USFWS 'Rapids' Test Fishwheel is in sight of the operators' camp and can be tended frequently. The Sub-district 5a Test Fishwheel is approximately 3 road miles plus 6 river miles from the operators' home in Tanana. During the initial installation and testing period, it was not possible to make more than one significant change per day due to long travel times and expense. When a problem arose it was not usually addressed until the following day. Nevertheless, the system delivered useful information almost immediately.

'Live box' counts were thought to be necessary to confirm the accuracy of the video system. However, the video system revealed the inadequacies of the 'live box' system very quickly. Errors tend to accrue in 'live box' counting, especially if 'live box' duties are split between individuals when it is necessary to empty the box every 4 hours. It was found that fish escaped from the 'live box' far more frequently than previously assumed. Coho salmon seemed to be more capable of escaping than chums, in general. Also, during the 2000 season, a bald eagle was observed stealing fish from the live box.

A better method of certifying the video capture count is to review the raw videotapes (Table 7). Since the video is always on, nothing passes unrecorded unless there is a lack of illumination. A 'two hour' time period for reviews is sufficient. This can be done on the computer monitor, but the viewing area in the most capture programs is small. The frames go by rapidly and it is easy to miss fish by blinking or from other distractions. A better way is to view the tape on a large screen television monitor while it is played on a standard VCR.

The problem that most needs correcting on the Sub-district 5-a Test Fishwheel installation is that of species and sex identification. The overhead position of the camera does not give an adequate view of all fish. Chum and coho salmon are of similar size, and if they pass through the chute sliding on their bellies, the view of the back of the fish is not enough to know with certainty what species or sex it is (see Captured Frames Sheet – top row). It may be possible to force the fish on their side by some mechanical means, but then the possibility of harming them would increase. There is little room to move the camera to obtain a better view of the sides of salmon without putting the camera too close to the active fish.

The 'luminescence' system has three handicaps: 1. The requirement to have a shadow free viewing area. 2. The overhead camera position. 3. The automatic compression of twelve-hour tapes reduces the number of frames available for capture. An average of 3 to 5 frames captured per fish was normal. This is minimal for good identification.

A system that uses a lightweight hinged door in the chute with a 'trigger switch' was already being developed on the USFWS 'Rapids' Test Fishwheel in 2000. Shadow interference will not be a concern in such a system because a notebook style computer on-board can store a predetermined number of video frames per event (i.e., opening of the switch). This will eliminate the need to process the raw videotapes. Only frames with fish will be stored. The camera can then be placed lower to view the fish more laterally; it can also be mounted more distantly because there will no need for the tarps surrounding the chute.

The operating procedure would be somewhat as follows: The video camera would run continuously while twelve-hour videotapes are recorded. The computer will capture and hold in a buffer a set amount of video time as it is being recorded. When an event occurs, the software will write a predetermined number of frames from the buffer to a removable disk. Old data will dump from the buffer as new data is recorded to avoid filling the hard drive and thus slowing the performance of the computer. Every twelve hours, the videotape will be changed. The removable disk will be exchanged at the end of twenty-four hours and the count will be made. The disk should contain only frames captured as a result of the action of the 'trigger switch.' All videotapes will be kept for periodic review to determine whether the capture system is functioning well or not.

Software development and additional computer equipment are the most costly factors involved in developing this improved system. The "Salmon Soft" program, according to recent information, can most likely be updated to include this capture method. The other changes

necessary are simple, low-tech, mechanical ones. The benefits would be improved accuracy in species and sex apportionment and a reduction in processing time of the video information.

Acknowledgements

This project was funded by grant #701810G044 from the U.S. Fish and Wildlife Service through the Restoration and Enhancement Fund provided through the U.S. Salmon Treaty Negotiations. The U.S. Fish and Wildlife Service, Fisheries Resource Office, Fairbanks provided manpower, and consultation in computer operation and statistics, as well as purchasing of some of the major equipment.

Stan Zuray, who originated this project design and has operated a similar system on the USFWS 'Rapids' Test Fishwheel since 1999, provided expert guidance and advice. Fisheries biologist Dave Daum (USFWS, Fisheries Resource Office, Fairbanks, Alaska) provided on-site assistance and invaluable technical support and consultation. He was available during the design and installation phase and also during testing and review. He was very helpful in troubleshooting since he was active on both of the sites that used this system in 2000. Dave contributed the statistical analysis found in the 'results' section of this report.

References

Zuray, S., and T.J. Underwood. 1999. Development of Video Technology to Measure Catch-Per-Unit-Effort on a Fishwheel on the Yukon River, Alaska. A Report to the Yukon River Panel, Anchorage, Alaska.

Zuray, S., 2000. Stored Video Images as an Alternative to Fishwheel Live Boxes for the Collection for Chinook Catch-Per-Unit-Effort Data using a Fishwheel on the Yukon River, Alaska. A final report to the Yukon River Panel, Anchorage, Alaska.

Equipment List

POWER SUPPLY AND LIGHTS:

- 1 Honda EU1000I, portable one thousand watt generator.
- 5 Trojan SCS200 115 amp hour, deep cycle batteries
- 1 Todd Engineering PC30b power supply/battery charger
- 1 Portawattz 300 voltage inverter
- 2 90 Watt, General Electric Halogen Floodlights. (plus spares)
- 1 Electripik Surge Suppressor (power surges during generator start-up can blow out lights)

VIDEO EQUIPMENT:

- 1 Panasonic 1070dc Video Recorder (on the fishwheel)
- 1 Panasonic AG-6124 Time Lapse Video Recorder (in the operator's home)
- 1 Panasonic WV-CP450/WV-CP454 Video Camera
- 1 Computar Vari-Focus Lens TG272814FCS-2
- 1 Pelco Waterproof Surveillance Camera Housing

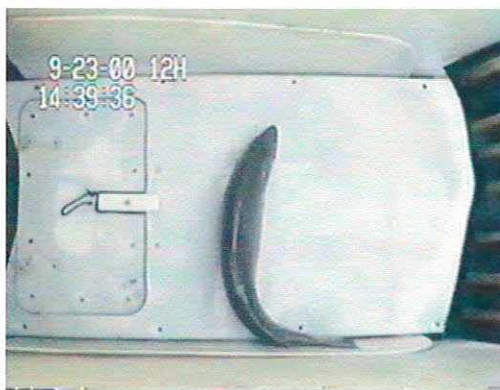
COMPUTERS AND SOFTWARE:

- 1 Gateway GP7-600 computer (Video processing, storage, data analysis and archiving)
- 1 Macintosh Power PC 9600-300 (property of the operator, used for photo scanning and printing)
- 1 Intel Smart Video Recorder 3 capture card and software
- Salmon Soft Capture Version 3 (from Columbia River Intertribal Fish Commission)
- Microsoft Windows '98 (Operating system compatible with the Salmon Soft application)
- Microsoft Office 2000 Small Business Edition (for reports, spreadsheets, etc.)
- Adobe Photoshop 5.5 (photo processing)

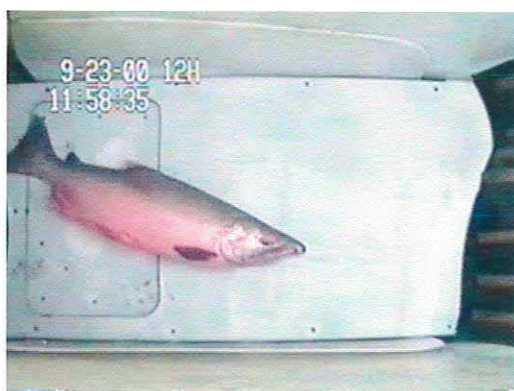
MISCELLANEOUS:

- 2 Pelican 1600 watertight storage cases (used on the wheel to house the recording VCR and for sending both VCR's to Fairbanks for cleaning)

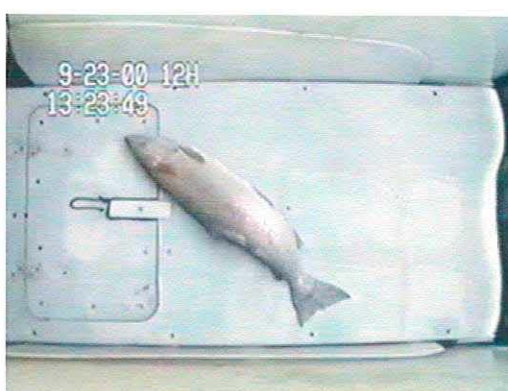
Captured Frames Sheet



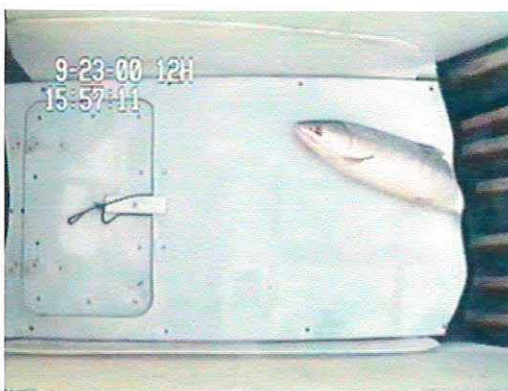
These three Views of the backs of salmon show how uncertain identification can be from this viewpoint.



Male Coho Salmon



Female Coho Salmon



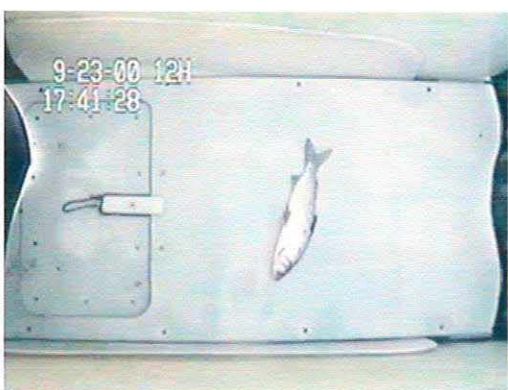
Female Fall Chum Salmon



Male Fall Chum Salmon



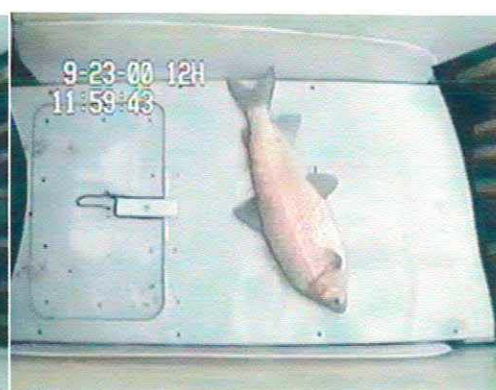
Female Fall Chum Salmon at night



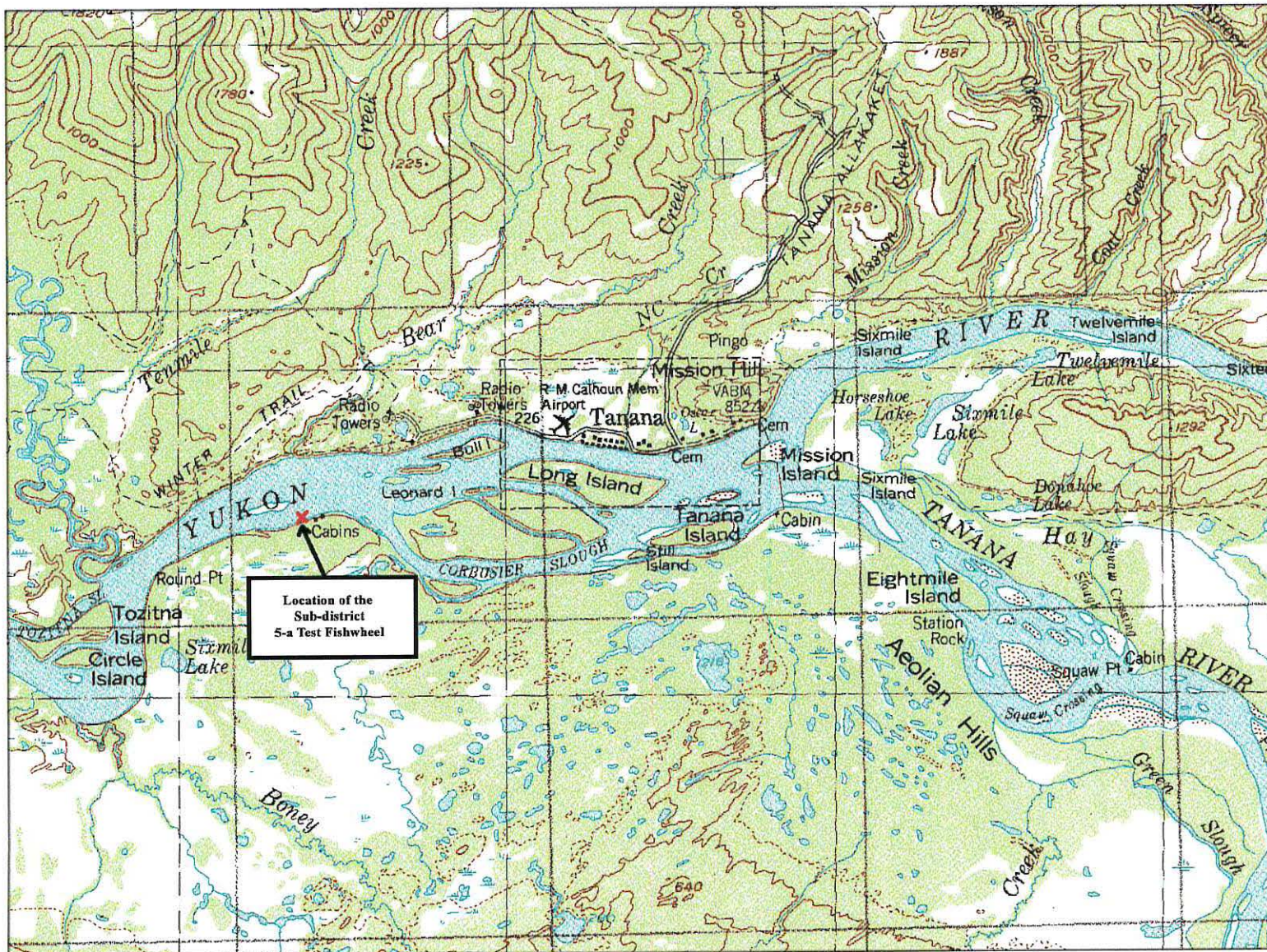
Cisco Whitefish



Humpback Whitefish



Broad Whitefish



The salmon caught by the Sub-district 5-a Test Fishwheel are predominately of Tanana River origin.



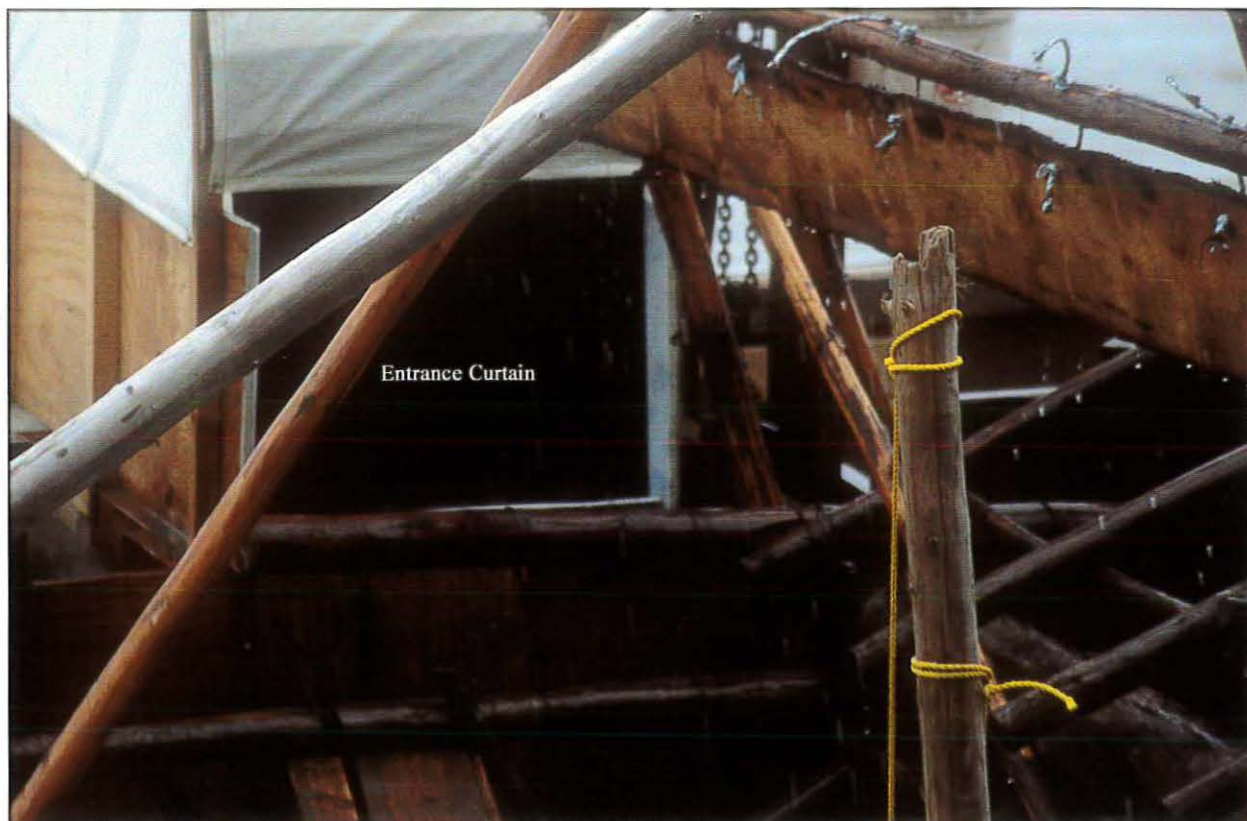
View 1

All on-board equipment is shown. The genertor is located on the shore.
The power cord is tied along the lead spar and routed into the back of
the equipment box.



View 2

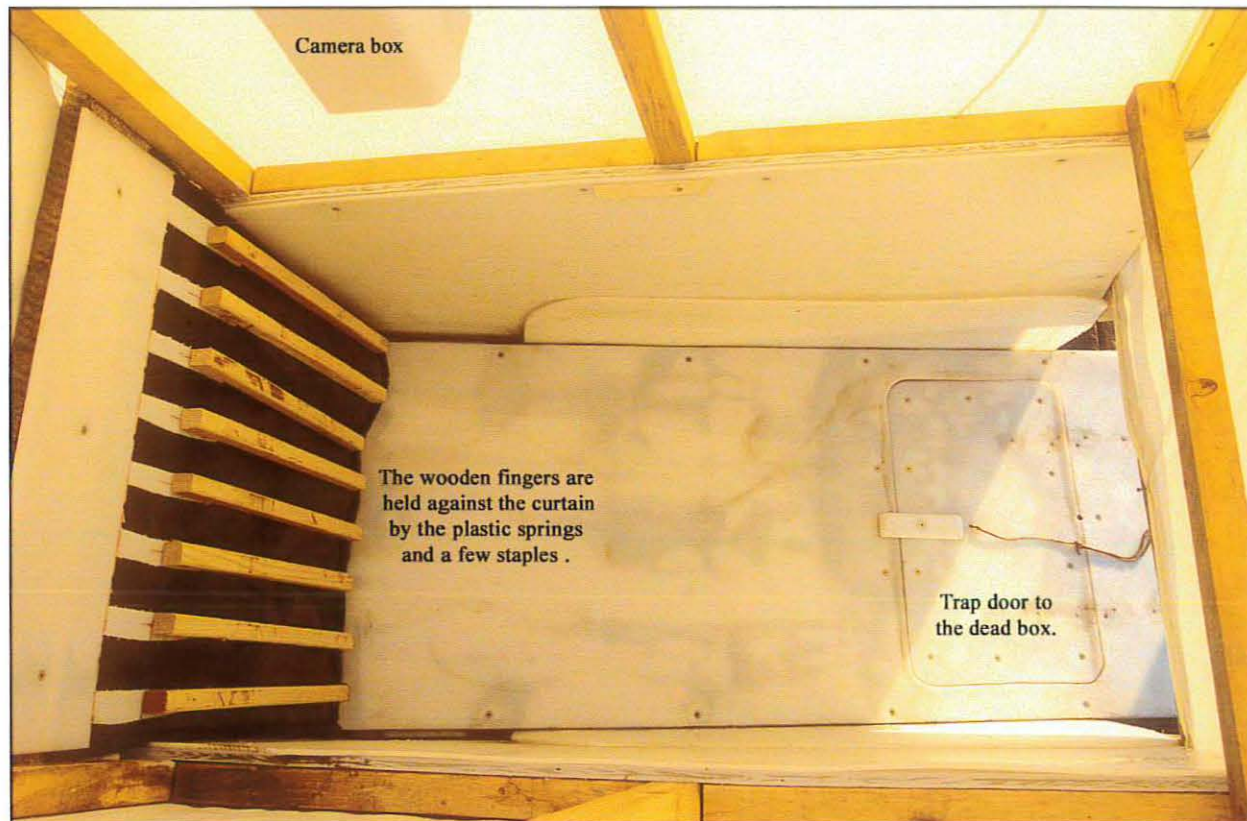
The light entering the observation area from the sides must be filtered by the tarps to reduce shadows.
The camera views straight down at a height sufficient to avoid splashing of water on the front lens by the fish.



Entrance Curtain

View 3

The entrance curtain required the most adjustment of any of the components of the system. It must allow the free passage of any size fish and then return to the closed position to block shadows.



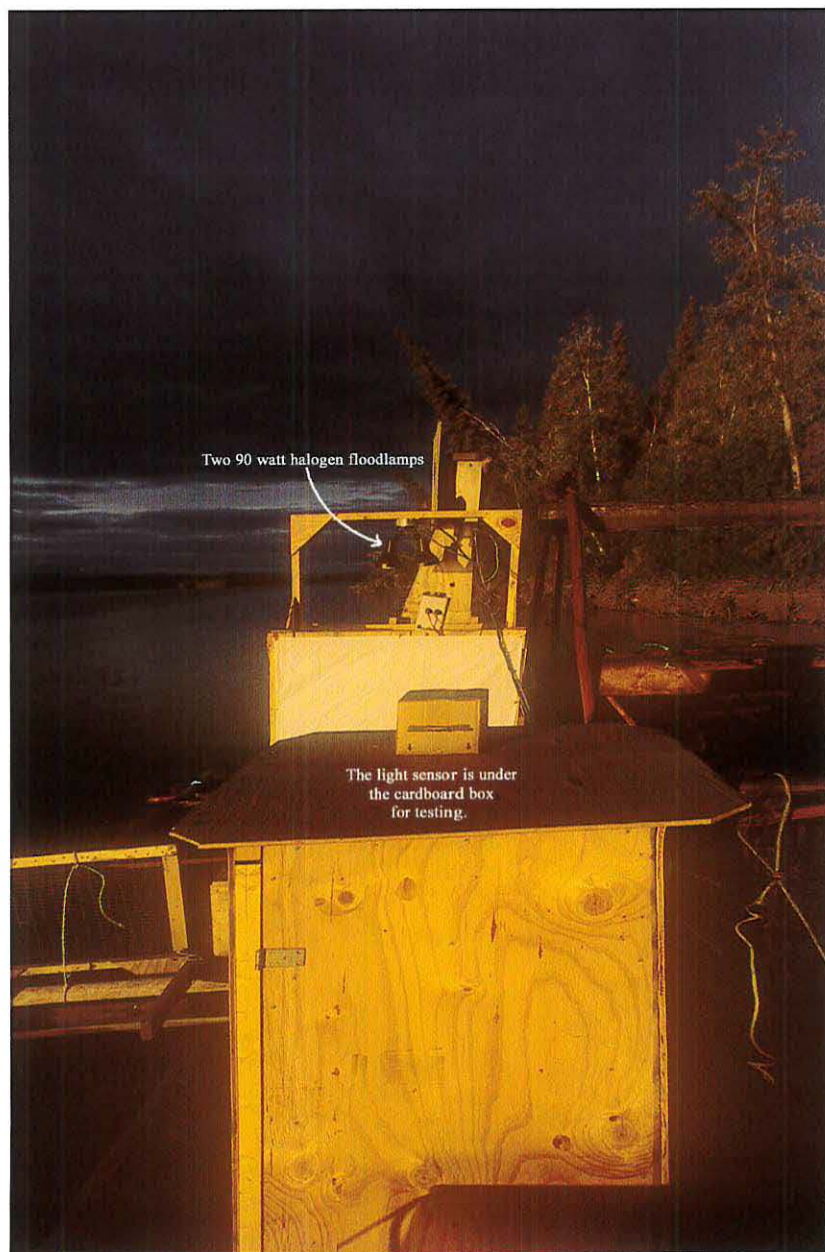
Camera box

The wooden fingers are held against the curtain by the plastic springs and a few staples .

Trap door to the dead box.

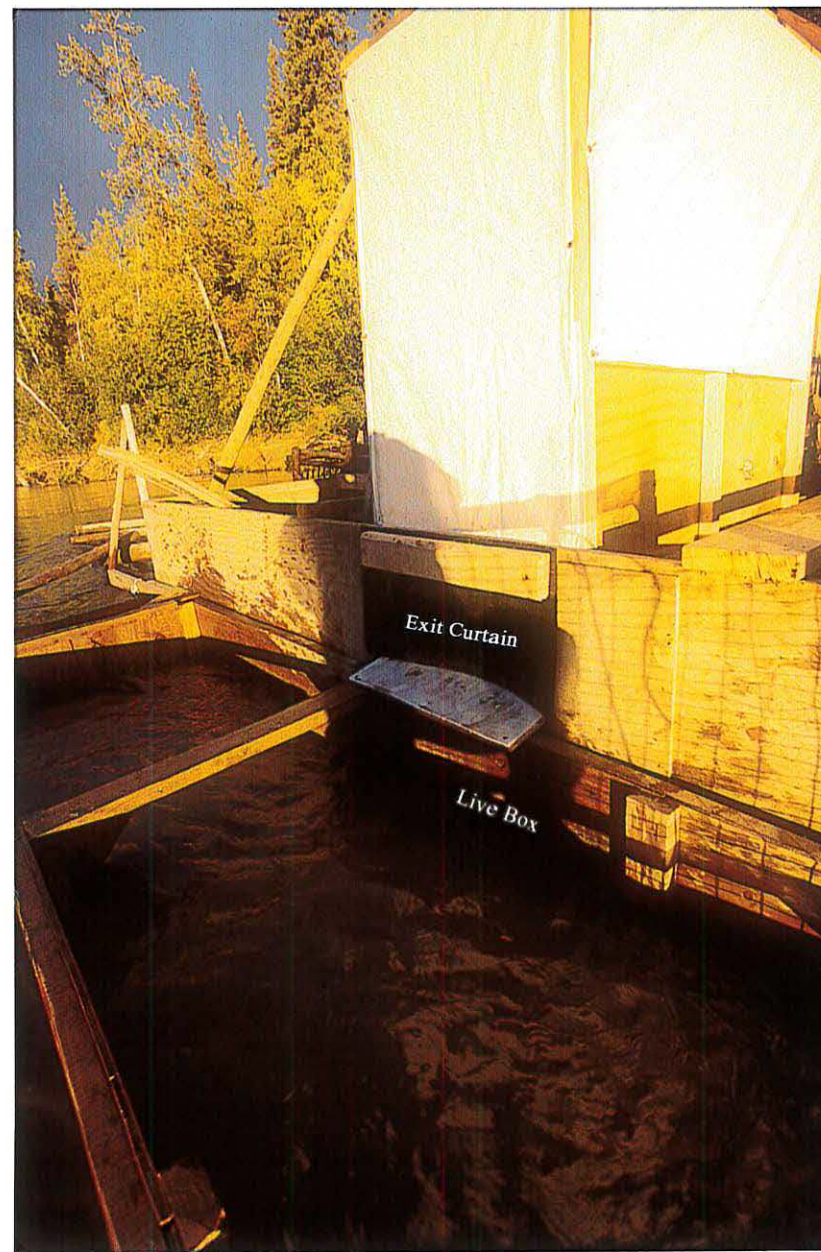
View 4

The height of the curtain and the tension of the plastic springs are critical for good performance. Trial and error is the only solution. The bottom of this chute may be raised to block the exit. The trap door may be opened then to let fish into the dead box for subsistence uses.



View 5

One lamp ran directly from the generator, the other was powered by the batteries through a voltage inverter. The light sensor controlled the battery operated lamp.



View 6

The live box has numerous 2 inch holes in the front panel and a removable wire mesh rear panel. The current flow is diminished but still positive enough to ensure adequate oxygen for the fish.

Table 1 . Daily comparisons between salmon counted from live box
video capture program.

Date	Live box count	Video count
8/25/00	6	7
8/26/00	10	11
8/27/00	11	11
8/28/00	13	13
8/29/00	9	9
8/30/00	17	18
8/31/00	11	11
9/1/00	13	13
9/2/00	43	46
9/4/00	9	14
9/5/00	42	41
9/7/00	148	148
9/8/00	69	71
9/10/00	262	262
9/11/00	356	374
9/12/00	273	279
9/13/00	103	110
9/14/00	63	62
9/15/00	60	59
9/16/00	30	30
9/17/00	36	36
9/18/00	25	26
9/19/00	77	83
9/20/00	112	112
9/23/00	41	43
9/24/00	49	51
9/26/00	22	23

Table 2 . Daily comparisons between chum and coho salmon counted from live box and counted from video capture program.

Date	Chum salmon		Coho salmon	
	Live box count	Video count	Live box count	Video count
8/25/00	5	5	1	2
8/26/00	8	9	2	2
8/27/00	10	10	1	1
8/28/00	9	9	4	4
8/29/00	8	8	1	1
8/30/00	15	15	2	3
8/31/00	10	10	1	1
9/1/00	7	7	6	6
9/2/00	32	37	11	9
9/4/00	9	14	10	11
9/5/00	32	30	40	40
9/7/00	108	108	15	19
9/8/00	54	52	178	181
9/10/00	84	81	293	307
9/11/00	63	67	214	227
9/12/00	59	52	55	65
9/13/00	48	45	35	34
9/14/00	28	28	23	23
9/15/00	37	36	10	13
9/16/00	20	17	20	19
9/17/00	16	17	9	9
9/18/00	16	17	38	39
9/19/00	39	44	66	66
9/20/00	46	46	6	10
9/23/00	35	33	29	30
9/24/00	20	21	15	15
9/26/00	7	8		

CPUE 2000.xls
Summary tab

Table 3. SUMMARY OF CHUM/COHO CPUE, FALL, 2000				
		Chum CPUE		Coho CPUE
Date	Chum Count	(per 24 hr)	Coho Count	(per 24 hr)
8/14/00	0	#DIV/0!	0	#DIV/0!
8/15/00	3	3.35	0	0.00
8/16/00	15	13.58	0	0.00
8/17/00	0	0.00	0	0.00
8/18/00	16	14.49	0	0.00
8/19/00	19	19.01	0	0.00
8/20/00	38	37.87	2	1.99
8/21/00	47	46.84	1	1.00
8/22/00	3	8.09	0	0.00
8/23/00	4	8.00	1	2.00
8/24/00	7	7.01	1	1.00
8/25/00	5	4.98	1	1.00
8/26/00	8	7.98	2	2.00
8/27/00	10	9.88	1	0.99
8/28/00	9	9.08	4	4.04
8/29/00	8	8.11	1	1.01
8/30/00	15	14.89	2	1.98
8/31/00	10	9.92	1	0.99
9/1/00	7	7.13	6	6.11
9/2/00	32	32.52	9	9.15
9/3/00	94	94.13	22	22.03
9/4/00	9	48.54	0	0.00
9/5/00	32	76.93	11	26.44
9/6/00	112	111.92	33	32.98
9/7/00	108	108.53	40	40.20
9/8/00	121	121.34	33	33.09
9/9/00	152	151.68	233	232.52
9/10/00	179	179.25	347	347.48
9/11/00	160	159.78	495	494.31
9/12/00	137	138.83	499	505.67
9/13/00	124	123.49	185	184.23
9/14/00	106	105.71	89	88.75
9/15/00	70	71.09	44	44.68
9/16/00	63	63.22	23	23.08
9/17/00	48	48.10	37	37.08
9/18/00	59	58.59	24	23.83
9/19/00	56	55.92	51	50.93
9/20/00	103	106.94	124	128.74
9/21/00	102	103.36	102	103.36
9/22/00	120	117.39	102	99.78
9/23/00	78	79.94	85	87.12
9/24/00	61	61.56	64	64.58
9/25/00	36	60.07	43	71.75
9/26/00	26	26.04	48	48.07
9/27/00	7	12.31	16	28.13
9/28/00	0	#DIV/0!	0	#DIV/0!
9/29/00	0	#DIV/0!	0	#DIV/0!
9/30/00	0	#DIV/0!	0	#DIV/0!
Totals	2419		2782	

Video-Dip Comparison.xls

Summary tab

Table 4. SUMMARY OF DIP/VIDEO COMPARISONS, FALL, 2000

	DIP	VIDEO	DIP	VIDEO
Date	Chum Count	Chum Count	Coho Count	Coho Count
8/14/00	0	0	0	0
8/15/00	0	0	0	0
8/16/00	0	0	0	0
8/17/00	0	0	0	0
8/18/00	6	6	0	0
8/19/00	8	8	0	0
8/20/00	22	22	3	3
8/21/00	26	24	2	0
8/22/00	3	4	0	0
8/23/00	4	4	1	1
8/24/00	3	3	1	1
8/25/00	5	5	1	2
8/26/00	8	9	2	2
8/27/00	10	10	1	1
8/28/00	9	9	4	4
8/29/00	8	8	1	1
8/30/00	15	15	2	3
8/31/00	10	10	1	1
9/1/00	7	7	6	6
9/2/00	32	37	11	9
9/3/00	94	87	22	21
9/4/00	9	14	0	0
9/5/00	32	30	10	11
9/6/00	112	119	33	30
9/7/00	108	108	40	40
9/8/00	54	52	15	19
9/9/00	54	55	138	111
9/10/00	84	81	178	181
9/11/00	63	67	293	307
9/12/00	59	52	214	227
9/13/00	48	45	55	65
9/14/00	28	28	35	34
9/15/00	37	36	23	23
9/16/00	20	17	10	13
9/17/00	16	17	20	19
9/18/00	16	17	9	9
9/19/00	39	44	38	39
9/20/00	46	46	66	66
9/21/00	54	58	17	27
9/22/00	23	50	15	50
9/23/00	35	33	6	10
9/24/00	20	21	29	30
9/25/00	0	0	0	0
9/26/00	7	8	15	15
9/27/00	0	0	0	0
9/28/00	0	0	0	0
9/29/00	0	0	0	0
9/30/00	0	0	0	0
Totals	1234	1266	1317	1381

Table 5. Chum per day,2000

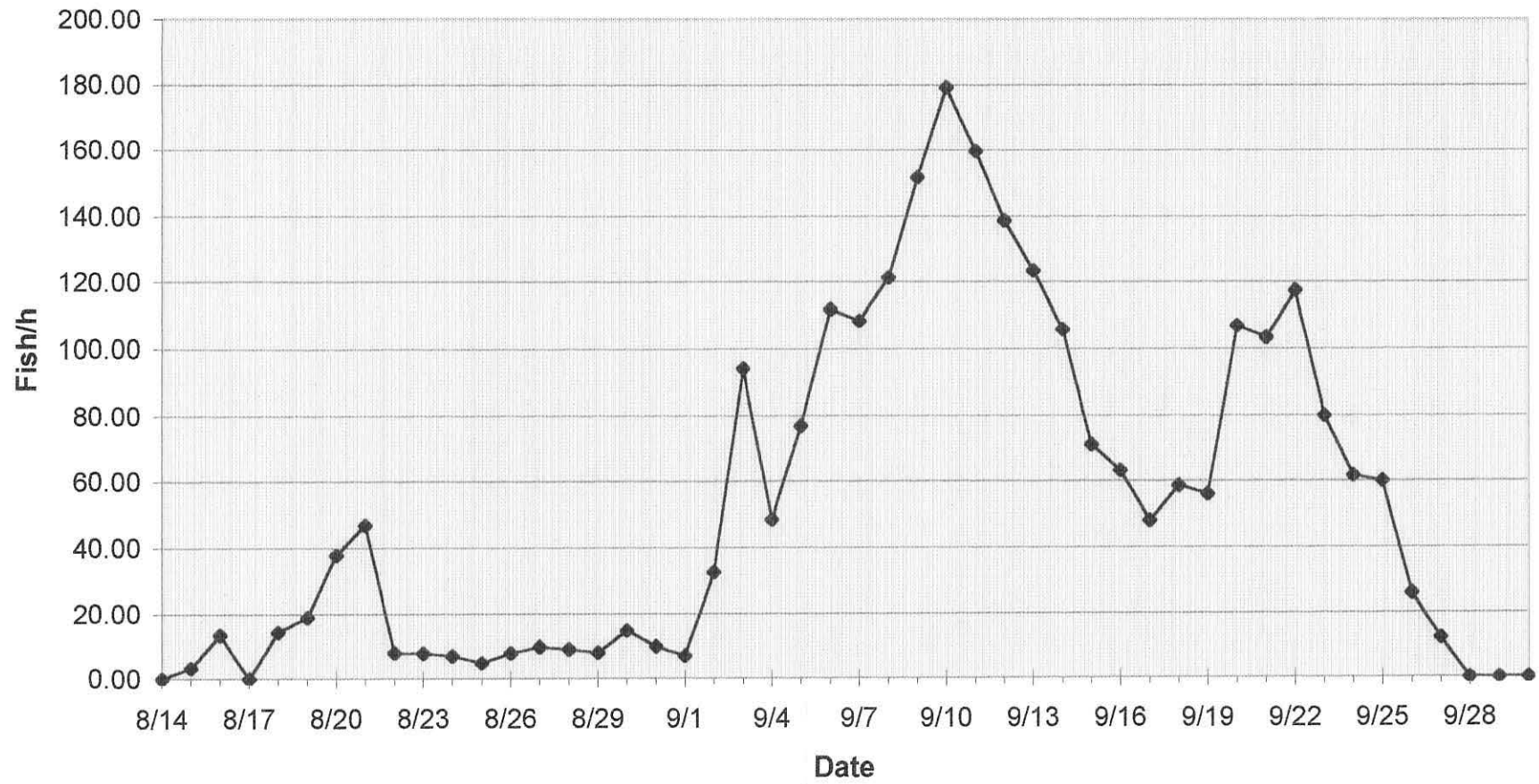


Table 6. Coho per Day, 2000

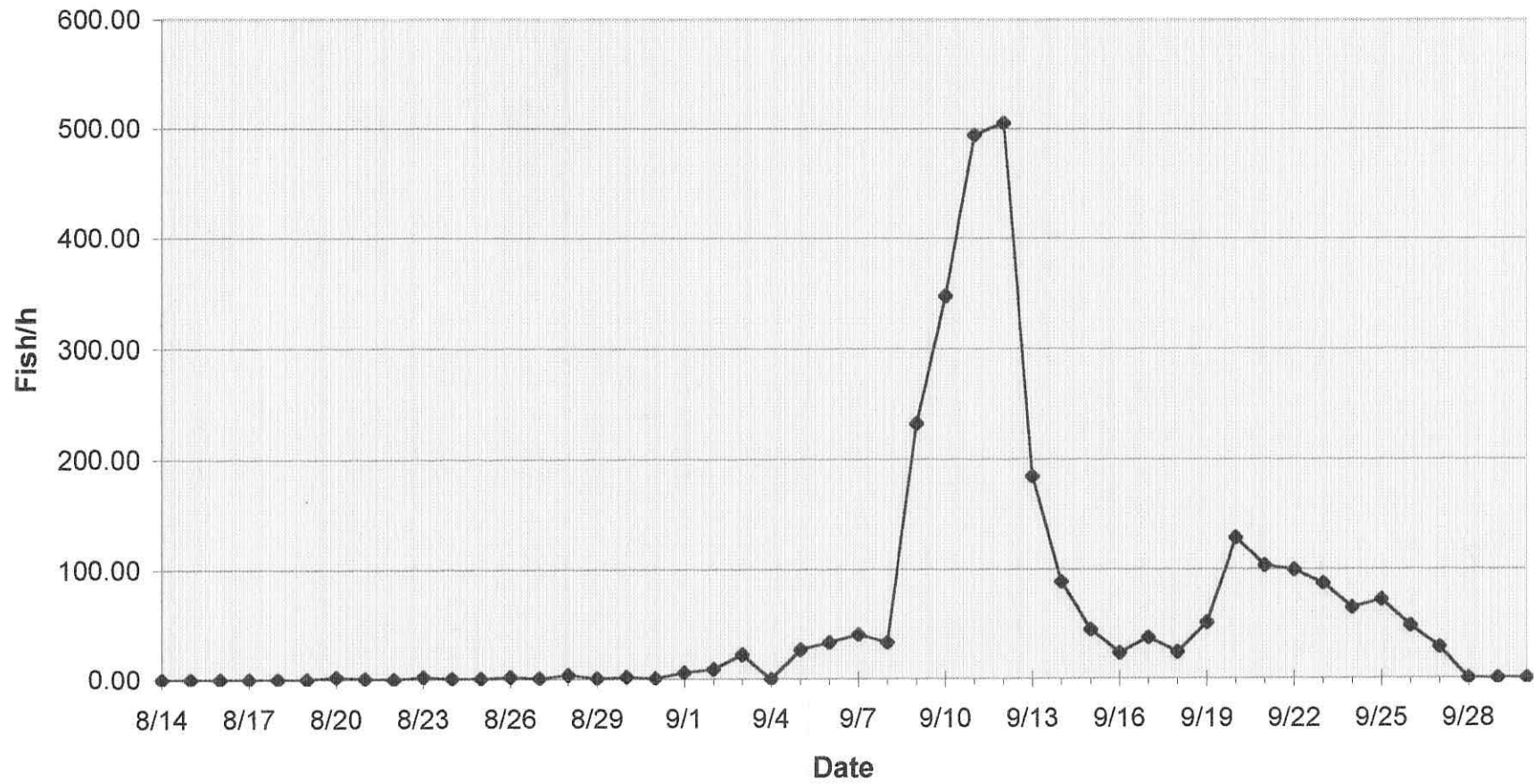


Table 7. Comparison of Counts of all Species on Selected Videotapes and Captured Files

<u>Tape #</u>	<u>Date</u>	<u>Review Time</u>	<u>Method (see Note 1.)</u>	<u>Video Count</u>	<u>Captured Count</u>	<u>Comments</u>
24b	09/10/00	09:02-20:53	Computer	256	263	Entire tape (see Note 2.)
24b	09/10/00	09:02-11:03	TV	39	39	First two hours
24b	09/10/00	18:53-20:53	TV	35	35	Last two hours
27b	09/13/00	09:26-11:26	TV	29	29	First two hours
31b	09/17/00	18:35-20:39	TV	8	8	Last two hours
35b	09/21/00	09:55-19:45	Computer	88	85	Entire tape (see Note3.)
35b	09/21/00	09:55-11:55	TV	23	23	First two hours
38b	09/23/00	10:04-12:04	TV	14	13	First two hours (see Note 4)

Notes –

1. Two methods of counting fish on the raw videotapes were used: ‘computer monitor’ and ‘television monitor.’ The computer monitor method was found to be difficult because the program that was used (Intel Smart Video) could not be made to fill the screen. Also, the replay speed is approx. 6x normal, so it is easy to blink and miss fish or mistake movements of the entrance curtain caused by the wind for fish. Another error can be the counting of two fish passing at the same moment as one. The television monitor method, using a standard VCR, produced much larger images that resulted in counting with less error. Counting fish on the saved avi. computer files, was accurate because almost all of the frames contain fish and they can be viewed one at a time. The time record in the frame makes it easy to distinguish between similar looking fish. The frames can also be viewed in reverse order for further examination if necessary. A ‘two hour’ portion of the file can be counted quickly with minimal distraction.

2. Tape 24b was counted on the computer monitor first. The entire tape was viewed and the entire corresponding captured file was counted. The deviation was substantial. Tape 24b contained a relatively high number of fish and it seemed easy to miscount them. Two sections (the first and last two hours) of tape 24b were viewed again on a ‘27 inch’ television monitor using a standard VCR. The results then were the same as the captured counts for the same periods.

3. Tape 35b was viewed first in its’ entirety on the computer monitor. The discrepancy in the first count seemed due to sudden movements of the entrance curtain being mistaken for fish. The second viewing of this tape on the TV monitor for two hours gave the same results as the captured count.

4. Tape 38b showed the only discrepancy that can be assigned to the “Salmon Soft” capture program that was found in these comparisons. One small white fish was observed on the videotape during the ‘two hour’ review that was not found in the captured file.

January 15, 2001

Bill Fliris
P.O. Box 169
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toziriver@aol.com

Dear Reviewer,

This report details the on-going operation and modification of video storage equipment on the Yukon River Sub-district 5A Test Fishwheel.

The project was successful in 2001 in providing Catch-Per-Unit-Effort (CPUE) data of Tanana River fall chum and coho salmon to managers of the Alaska Department of Fish and Game using a new "trigger switch" capture method. The video equipment now produces very accurate information that is acquired with less impact on salmon than live-box counting.

The project plan for 2002 includes adding 45 days to gather chinook and summer chum salmon CPUE and a re-design of the fishwheel to further reduce any adverse impact on fish.

The project has been funded since 1993 from grants from the Restoration and Enhancement Fund of the U.S./Canada Treaty. I would appreciate your support for funding of this and other important seasonal management projects on the Yukon River.

Thank you for your time and consideration.

Sincerely,



Bill Fliris