U.S Fish and Wildlife Service
Office of Subsistence Management
Fisheries Resource Monitoring Program

The Yukon River Sub-district 5A Test Fish Wheel Project

Final Report for Study 03-038

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Title: The Yukon River Sub-district 5A Test Fish Wheel Project

Study Number: 03-038

Investigators Affiliations: Bill Fliris, Tanana resident since 1973, project operator since 1993. David Daum, U. S. Fish and Wildlife Service, Fairbanks.

Geographic Area: Yukon River (Sub-district 5A), river-mile 695

Information Type: Stock Status and Trends

Issue Addressed: Run timing and relative abundance of Tanana River salmon stocks, 2003.

Study Cost: $32,850

Study Duration: June 14 to September 19, 2003.

Abstract: The Y-5A Test Fishwheel Project operated from June 14 to September 19 in 2003. Data were collected for Chinook, summer chum, fall chum and coho salmon entering the Tanana River. Video capture equipment was used throughout the season as the primary method of data collection.

Key Words: Alaska, catch patterns, Chinook salmon, *Oncorhynchus tshawytscha*, chum salmon, *Oncorhynchus keta*, coho salmon, *Oncorhynchus kisutch*, migration timing, Tanana River, video capture, Yukon River.

Project Data: *Description* - Data for this project are daily counts of all Tanana River salmon species caught by the fish wheel. *Format* – Catch-Per-Unit-Effort. *Custodians* - The Alaska Department of Fish and Game, Fairbanks, The U.S. Fish and Wildlife Service, Fairbanks, Bill Fliris, Tanana. *Availability* – Access to data available upon request to the custodians.

Report Availability: Please contact Bill Fliris to receive a copy of this report

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Introduction:

The information was collected in 2003 using the same "trigger switch" video capture equipment installed on the fishwheel and tested in 2001 (Fliris 2001).

The Project is located six miles downstream of Tanana, Alaska at approximately river mile 695, on the south bank of the Yukon River. The fishwheel is positioned about ½ mile downstream of the mouth of Corbusier Slough. The slough is the farthest downstream entrance to the Tanana River (Fig. 1). The salmon migrating past the site are considered to be primarily of Tanana River origin (Buklis 1981).

The operator accesses the fishwheel from Tanana by riverboat. ADF&G personnel from Fairbanks monitor the site in-season with a department riverboat.

Salmon species counted by the project are: chinook salmon, *Oncorhynchus tshawytscha,* chum salmon, *O. keta*, and coho salmon, *O. kisutch*. Other fish species, by common name, include: burbot, pike, grayling, sheefish and three species of whitefish. Comparatively, the numbers of these non-salmon species are very low.

Objectives:

The Sub-district Y-5A Test Fishwheel Project (the Project) has since 1993 provided catch-per-unit-effort (CPUE) data to managers of the Alaska Department of Fish and Game (ADF&G).

The Project gives the first indication of the run timing and relative abundance of salmon stocks entering the Tanana River. The information gathered is used in-season to help apportion the harvest on the Tanana and upper Yukon Rivers.

Methods:

The Project began counting on June 14. The fishwheel was set up in approximately the same location as in previous years and the same amount of under water lead was used as in the past. Counting was done 24 hours a day, seven days a week unless interrupted by river conditions; i.e., high debris load, freezing temperatures, fish wheel repairs, or by video equipment problems. Mean daily water temperatures were recorded with an archival logger (Table 1). Temperature data is missing for 5 days in June and July due to damage to the fishwheel caused by floating debris.

The video capture equipment used by the project was the same as in 2002 (Table 1) and was operated in a similar manner. The "trigger switch" capture method (Fliris 2001) was the primary method of data collection throughout the season. No live box counts were compared to video counts in 2003.

Video capture is the process of separating and storing only the frames that contain fish from the total number of video frames processed in a day. The video system utilized a 12-volt surveillance camera mounted above an enclosed chute. A door with a magnetic trigger switch attached to it, located at the bottom of the camera chute, opened whenever a fish passed through. The trigger switch in turn signaled a Panasonic Toughbook model portable computer to capture a set number of frames from the video camera and store them on the computers' hard-drive. The capture software used was Salmonsoft FishCap 1.4.0. The digital video files (avi format) were copied to a removable IBM micro-drive for transportation from the fishwheel. The files were then transferred to a computer in the

operator's home where the video frames were reviewed and the daily count of each salmon species was done using Salmonsoft FishRev 1.4.0.

The counts were recorded in a logbook and then transferred to a Microsoft Excel worksheet. The daily tallies of each species were adjusted for a 24-hour period. All the worksheets and video files were backed-up to Compact Disks (CD-R). The daily worksheet summary was forwarded by e-mail attachment to the Fairbanks office of the ADF&G. Periodic summaries and progress reports were forwarded by e-mail to the Office of Subsistence Management.

In the post-season, seasonal diel catch patterns for Chinook, summer and fall chum, and coho salmon were calculated from days with 24 hours of continuous data. First, hourly catch rates (fish/h) for each species were calculated for all hours in each day. These hourly catch rates were expressed in proportions (%) of the daily catch so high catch days did not bias results. Then mean catch rates (%) by hour were calculated for the season. Only days with catches of over 90 fish were used to minimize using hours with no fish captured.

Results:

This was the second year of gathering information on the timing and relative abundance of Chinook and summer chum salmon entering the Tanana River. Information for fall chum and coho salmon has been collected since 1993.

Of the 2352 sampling hours possible, 2140 hours were counted during the 98 days of operation from June 14 to September 19. Counts of less than 12 hours occurred on seven days (Table 2), mostly due to fishwheel damage from high water. The total numbers of salmon counted were:

1. Chinook: adult male–1,506; immature male–392; female–671; Total: 2,569
2. Chum: male–5,585; female–7,703; Total: 13,288
3. Coho: male–2,588; female–2,048; Total: 4,636

The Chinook salmon run peaked on June 29 with a 24-hour adjusted count of 265 fish and experienced a second peak on July 7 of 193 fish (Figure 2). Chum salmon exhibited two peaks early in the season, July 16 with 169 fish and July 25 with 297 fish (Figure 3). During the fall season, chum salmon exhibited four peaks (Figure 4). The largest peak of 858 fish was on September 3. The coho salmon run showed three peaks, with the largest on September 4 of 494 fish (Figure 5).

Comparisons were made between the project's daily catch numbers by species and the data from the Lower Yukon Test Gill Net and Test Drift Net Projects. The information is useful to predict the arrival of pulses that had passed the lower river projects and to assess the contribution of the various components of the salmon run into the Tanana River. The two peaks for the Chinook salmon run were apparent at the mouth of the Yukon River, approximately 17 days before showing up at the fish wheel site (Figure 2). The two early season peaks of chum salmon took between 22 and 25 days to reach the fish wheel site (Figure 3). There was a large catch of chum salmon at the mouth on June 12 that did not show up in the fish wheel catch. For the fall season, the four peaks of chum salmon all were apparent in the catch at the Yukon River mouth, taking approximately 19 days to reach the fish wheel site (Figure 4). Coho salmon peaks all showed up at the site, taking between 20 and 21 days from the mouth (Figure 5).

Hourly catch rates for Chinook and fall chum salmon were strongly diel, with the highest catches occurring between 2200 and 0700 for Chinook salmon and between 1500 and 0300 for fall chum salmon (Figures 6 and 7). Summer chum salmon did not exhibit a diel catch rate and coho salmon were only slightly diel, with highest catches between 1500 and 2200.

The Alaska Department of Fish and Game and Dr. Richard Kocan simultaneously collected blood and tissue samples from Chinook salmon caught in July for their separate *Icthyophonous hoferi* studies.

Discussion:

The video equipment was generally reliable throughout the season, except for an occasional loss of synchronization between the captured video frames and the opening of the trigger door. When this event occurred the computer captured the correct number of video frames, but in advance of the actual opening of the trigger door, and consequently the passage of the fish through the video chute was not recorded. This effect only occurred when the capture software, Fish Cap V. 1.4.0, was closed and then restarted after transferring data to the micro-drive. Restarting the computer usually fixed the problem, but the only method to assure synchronization was to manually open the door while viewing the on-screen video display. Attempts were made to diagnose and fix the problem by checking all the video cable connections and by replacing various components of the video system with backup parts, but no real solution was found by the end of the season. The same or very similar events occurred in 2003 on the Rampart tag recovery fish wheel and on the Nenana CPUE fish wheel. Post-season, the software company helped in diagnosing the problem. The newer versions of the software require more computer memory, which may have caused the synchronization problem to occur. More memory (512 M), and a faster video capture card will be added to the notebook and hopefully this problem will be corrected.

The three-basket design of the new fishwheel (Fliris 2002) rotates reliably in all water conditions and the tapered baskets covered with nylon webbing are more fish-friendly than before. Additional rubber pads that were placed in the video chute bottom and in the basket ends in 2003 further reduced damage to the fish.

Extreme low water conditions at the site (late Sept. 2003) can lead to a situation where is difficult to operate the test fish wheel because it is no longer possible to push it far enough out to reach deep water. Operations may continue for a time by raising the fish wheel axle, but the higher the axle the further the fish fall into the video chute. At some point a judgment must me made in favor of not damaging the resource and fishing must be curtailed until water conditions change.

Conclusions:

Video-capture technology is more accurate than dip-net counting from a live box and less stressful to the salmon but it is nevertheless subject to hardware or software problems. Back-up equipment is essential, and maintaining a live-box is necessary for monitoring the run when the video equipment is down.

The storage batteries, during 2002, showed signs of reduced capacity, probably due to plate sulphation. Sulphite crystals form on the lead plates of the batteries through normal use and impede the transfer of ions between the plates and the electrolyte. During winter storage 2002-03 the batteries were held continuously at float voltage with a maintenance charger with a de-sulphator attached (Table 1). The de-sulphator periodically produces a high frequency pulse that shocks the sulphite crystals loose from the lead battery plates so they can be reabsorbed into the electrolyte. The treatment successfully rehabilitated the batteries and they were available for normal service in 2003.

Recommendations:

The June 15 start-up date should be early enough to record the beginning of the Chinook run into the Tanana River in most years.

Building a new and wider video chute with a movable bottom may possibly prevent harm to fish while counting in very low water conditions.

Acknowledgements:

The U. S. Fish and Wildlife Service, Office of Subsistence Management, provided $32,850 in funding support for this project through the Fisheries Resource Monitoring Program, under agreement number FIS 03-038.

Literature Cited:

1. L. Buklis. 1981. Yukon and Tanana River Fall Chum Salmon Tagging Study, 1976-1980. Alaska Department of Fish and Game, Informational Leaflet No. 194, Juneau, AK.
2. Fliris, B., 2001. Modification of Video Storage Equipment for Purposes of Providing Accurate Catch-Per-Unit-Effort Data from the Sub-district 5-A Test Fishwheel.
3. Fliris, B., 2002. Annual catch-per-unit-effort data collected by The Yukon River Sub-district 5A Test Fishwheel Project, 2002. A final report to the Yukon River Panel.

Figure 1.

Location of Y-5A Test Fish Wheel

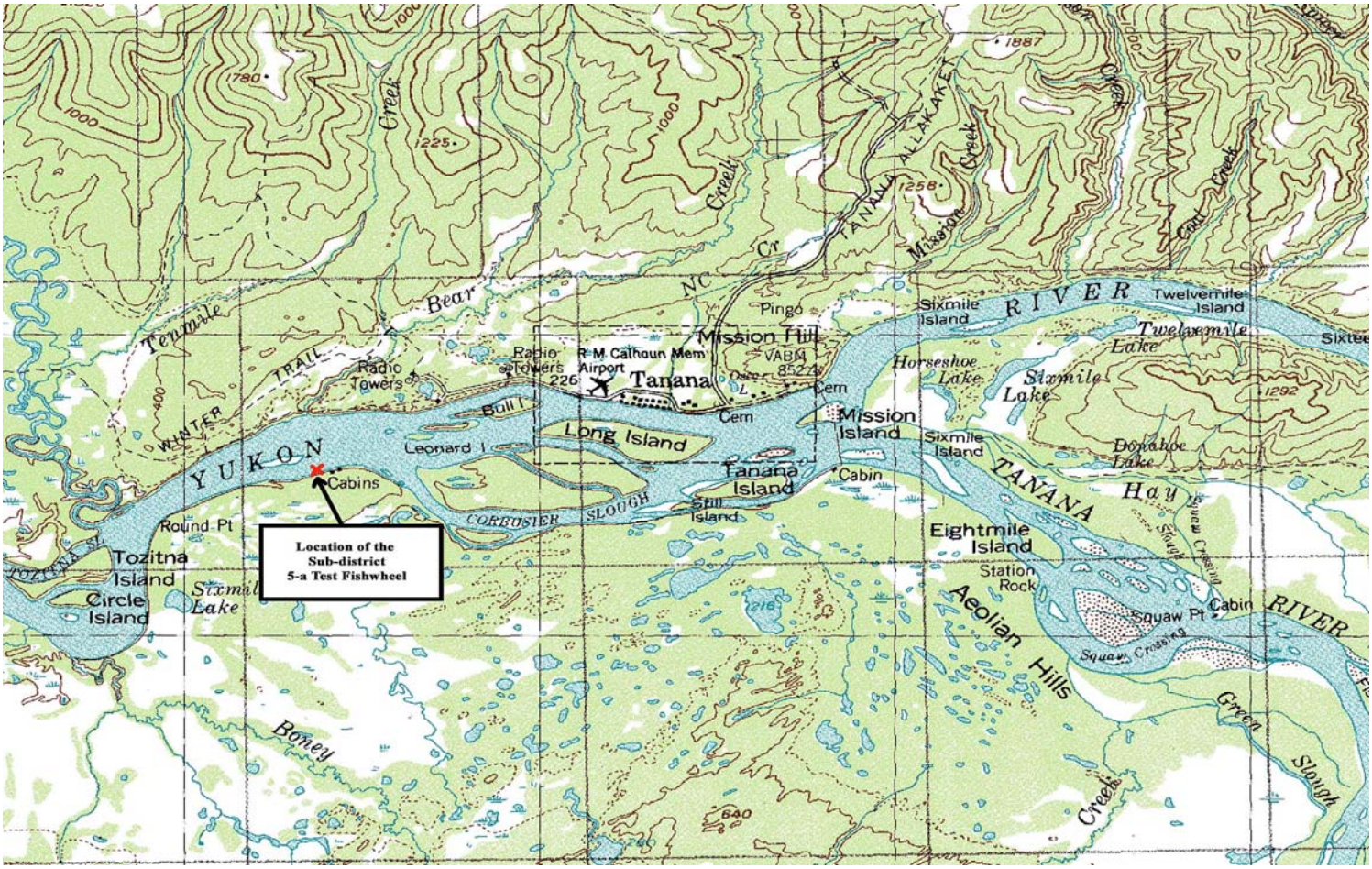


Figure 2.

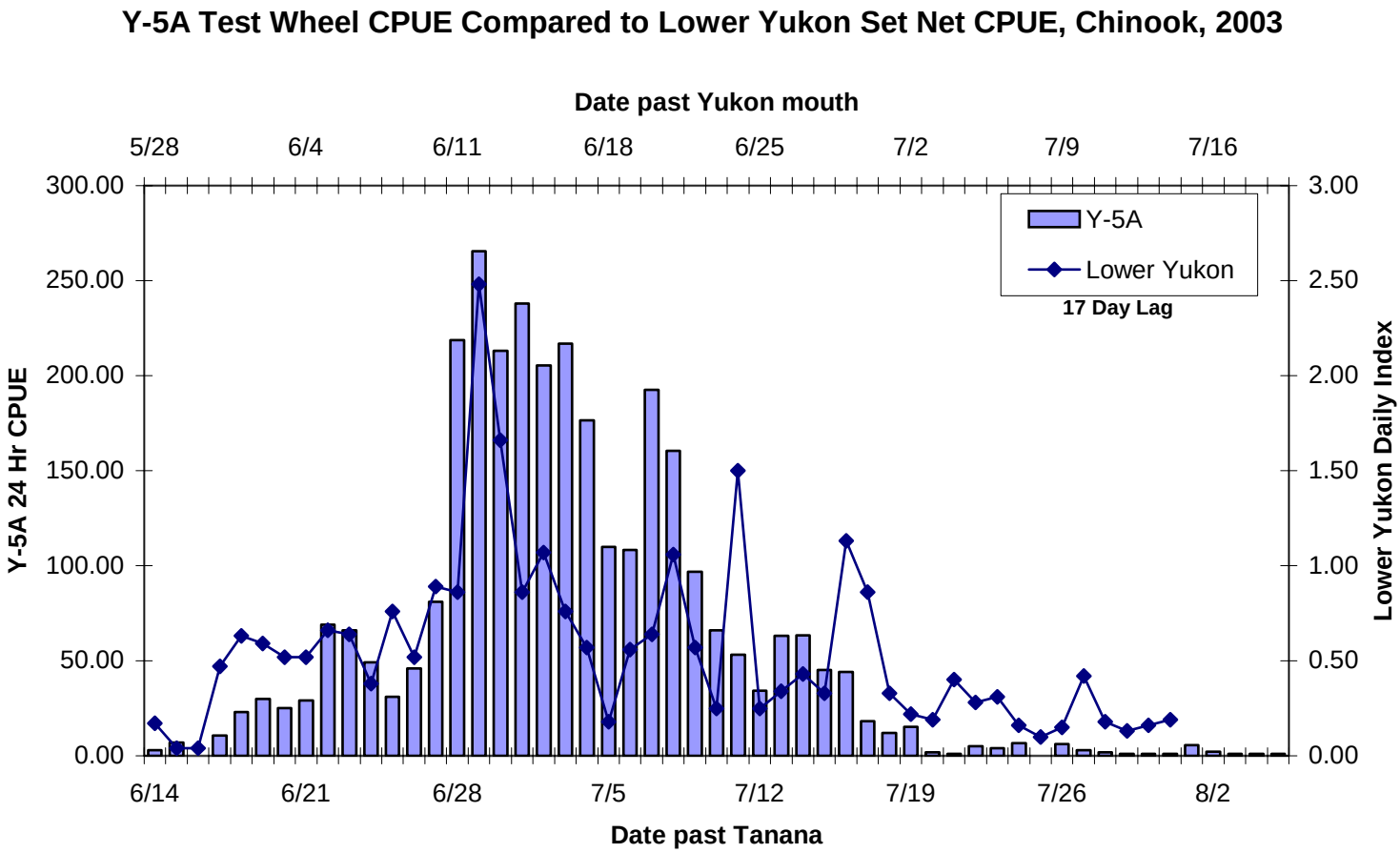

Y-5A Test Wheel CPUE Compared to Lower Yukon Set Net CPUE, Chinook, 2003
Date past Yukon mouth
5/28
6/4
6/11
6/18
6/25
7/2
7/9
7/16
300.00
250.00
200.00
150.00
100.00
50.00
0.00
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Y-5A
Lower Yukon
17 Day Lag
Y-5A 24 Hr CPUE
Lower Yukon Daily Index
6/14
6/21
6/28
7/5
7/12
7/19
7/26
8/2
Date past Tanana

Figure 3.

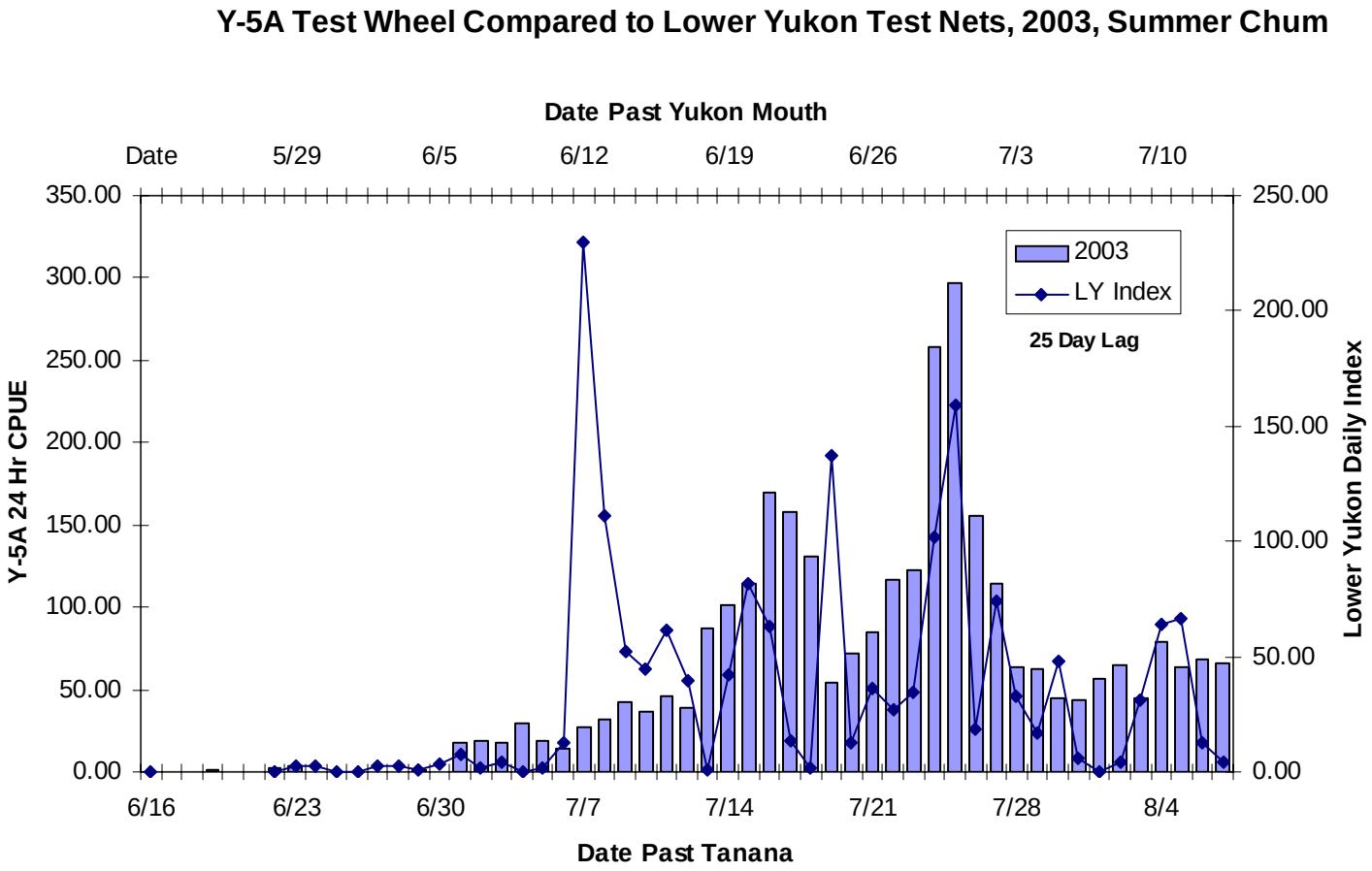

Y-5A Test Wheel Compared to Lower Yukon Test Nets, 2003, Summer Chum
Date Past Yukon Mouth
Date
5/29
6/5
6/12
6/19
6/26
7/3
7/10
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
250.00
200.00
150.00
100.00
50.00
0.00
2003
LY Index
25 Day Lag
Y-5A 24 Hr CPUE
Lower Yukon Daily Index
6/16
6/23
6/30
7/7
7/14
7/21
7/28
8/4
Date Past Tanana

Figure 4.

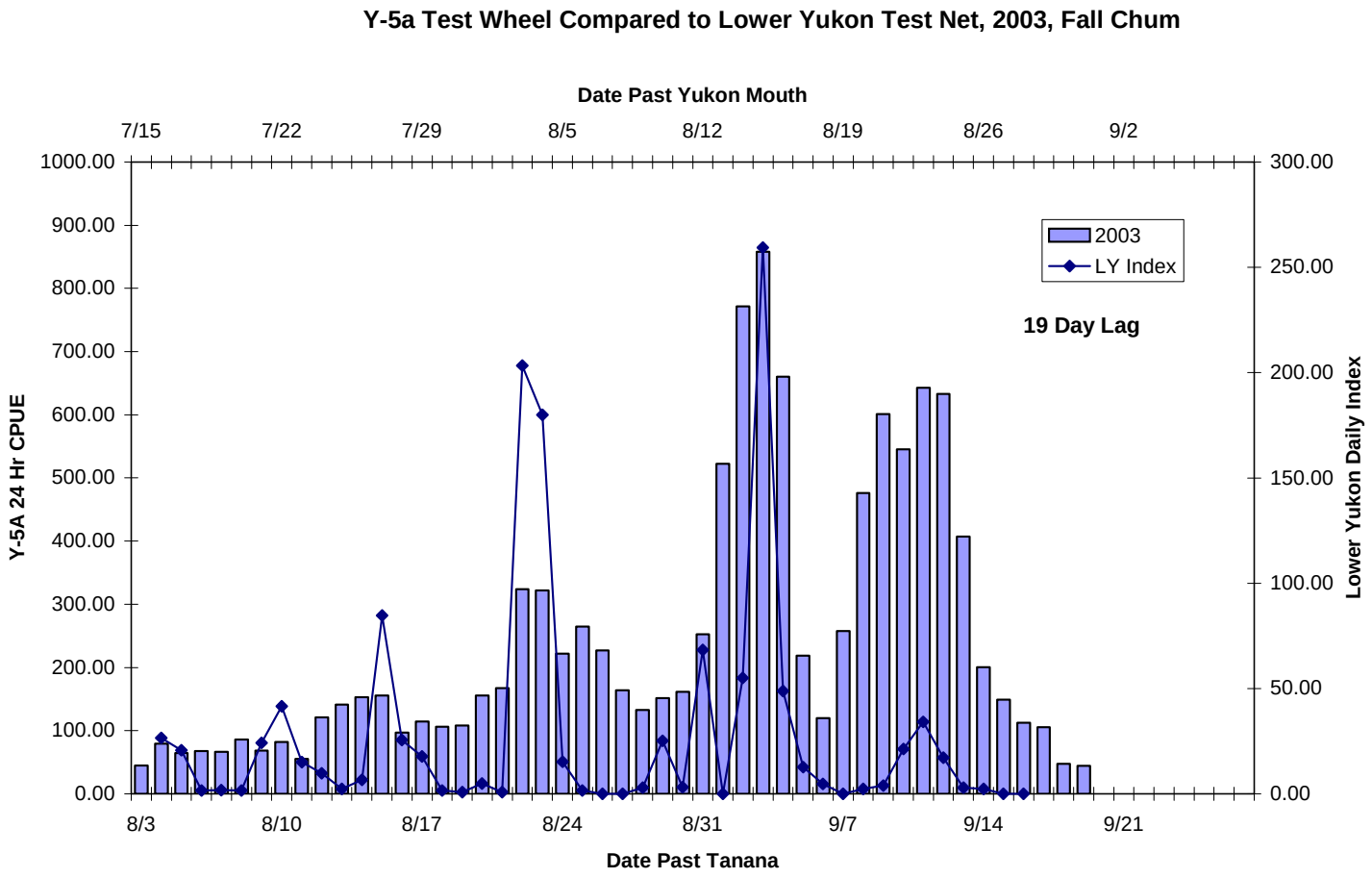

Y-5a Test Wheel Compared to Lower Yukon Test Net, 2003, Fall Chum
Date Past Yukon Mouth
7/15
7/22
7/29
8/5
8/12
8/19
8/26
9/2
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Y-5A 24 Hr CPUE
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Lower Yukon Daily Index
2003
LY Index
19 Day Lag
8/3
8/10
8/17
8/24
8/31
9/7
9/14
9/21
Date Past Tanana

Figure 5.

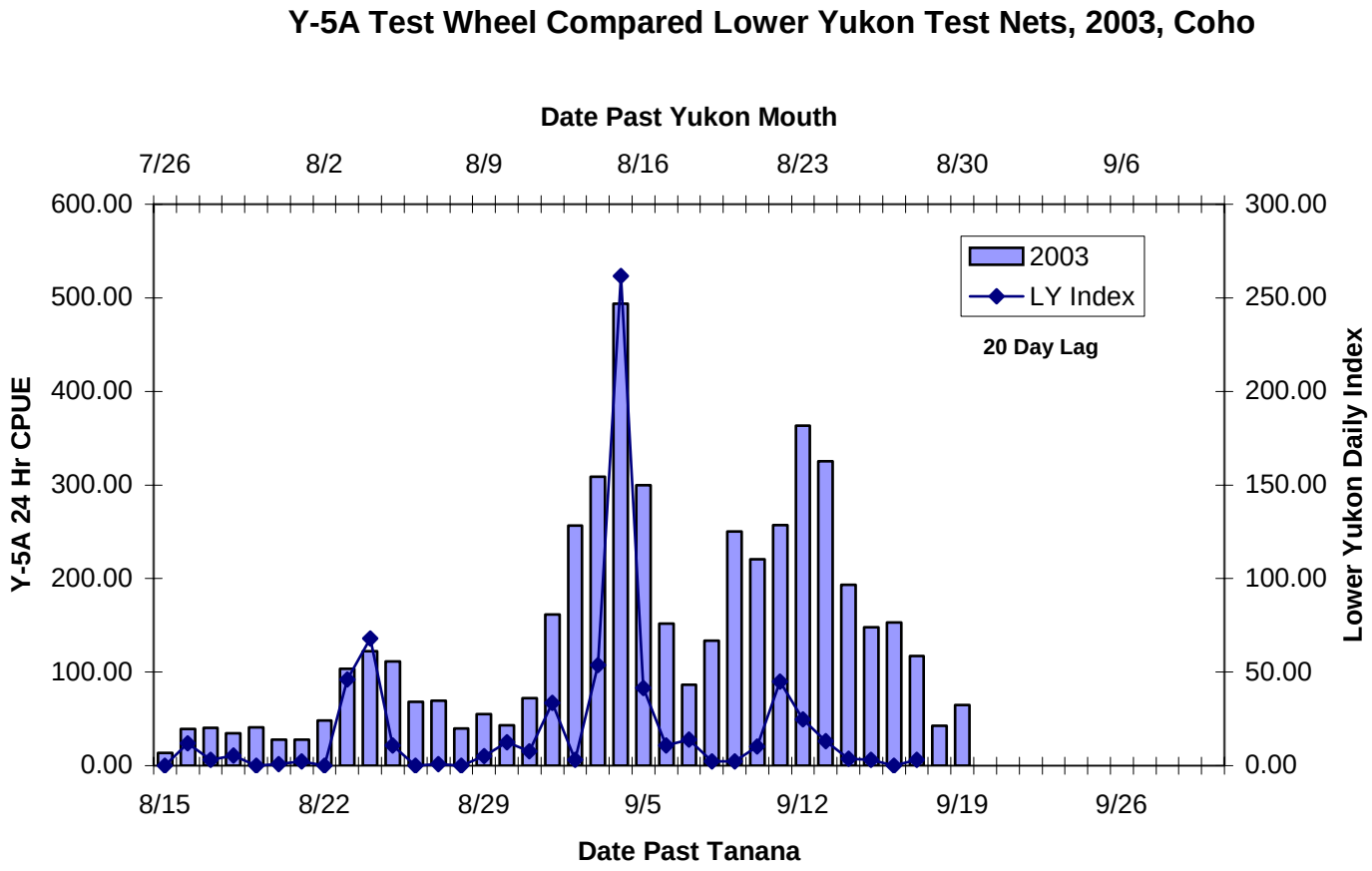
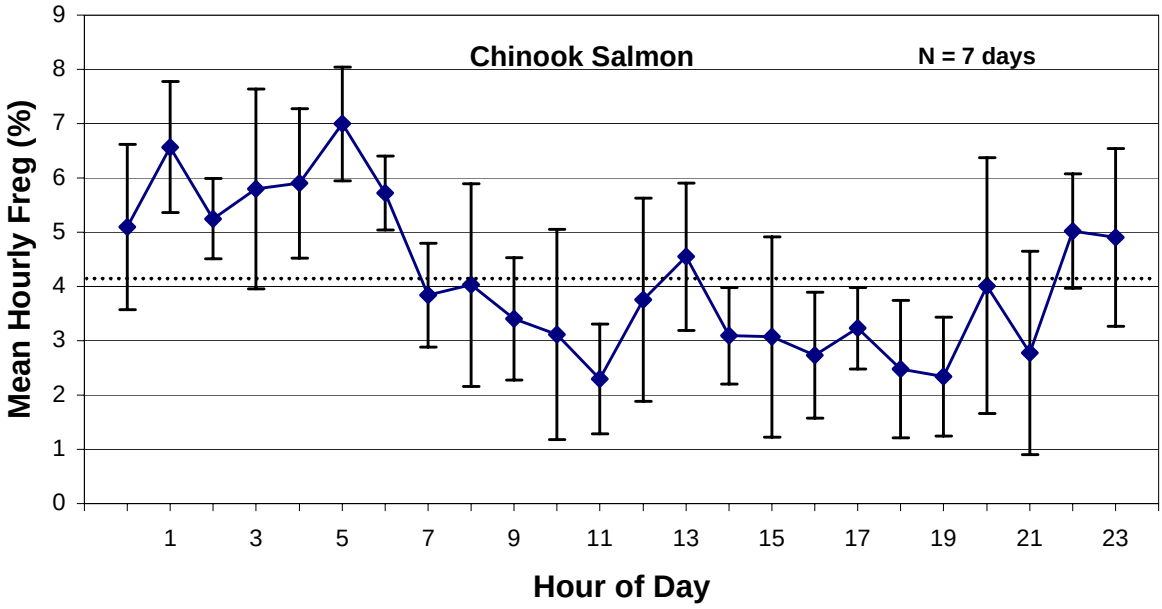

Y-5A Test Wheel Compared Lower Yukon Test Nets, 2003, Coho
Date Past Yukon Mouth
7/26
8/2
8/9
8/16
8/23
8/30
9/6
600.00
500.00
400.00
300.00
200.00
100.00
0.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
2003
LY Index
20 Day Lag
Y-5A 24 Hr CPUE
Lower Yukon Daily Index
8/15
8/22
8/29
9/5
9/12
9/19
9/26
Date Past Tanana

Figure 6.

Mean (± 2SE) hourly frequency of Chinook and summer chum salmon caught at the Y5A test wheel, Tanana, 2003. Dashed line represents the average hourly catch (4.16%). Data include only days with 24 h of continuous records and a daily capture of over 90 fish.



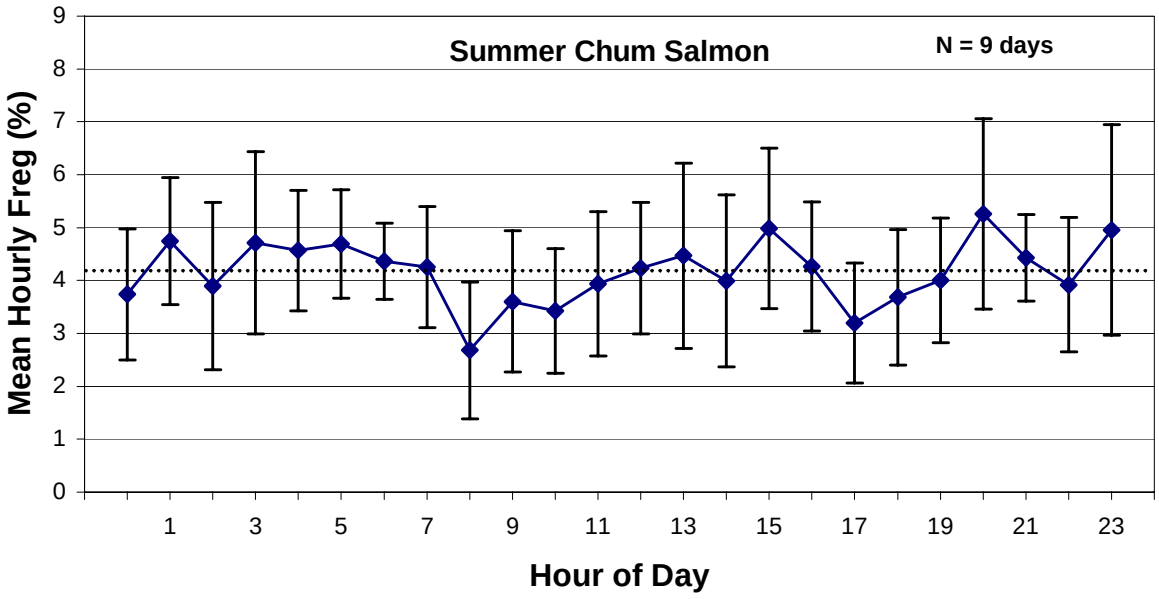


Figure 7.

Mean (± 2SE) hourly frequency of fall chum and coho salmon caught at the Y5A test wheel, Tanana, 2003. Dashed line represents the average hourly catch (4.16%). Data include only days with 24 h of continuous records and a daily capture of over 90 fish.

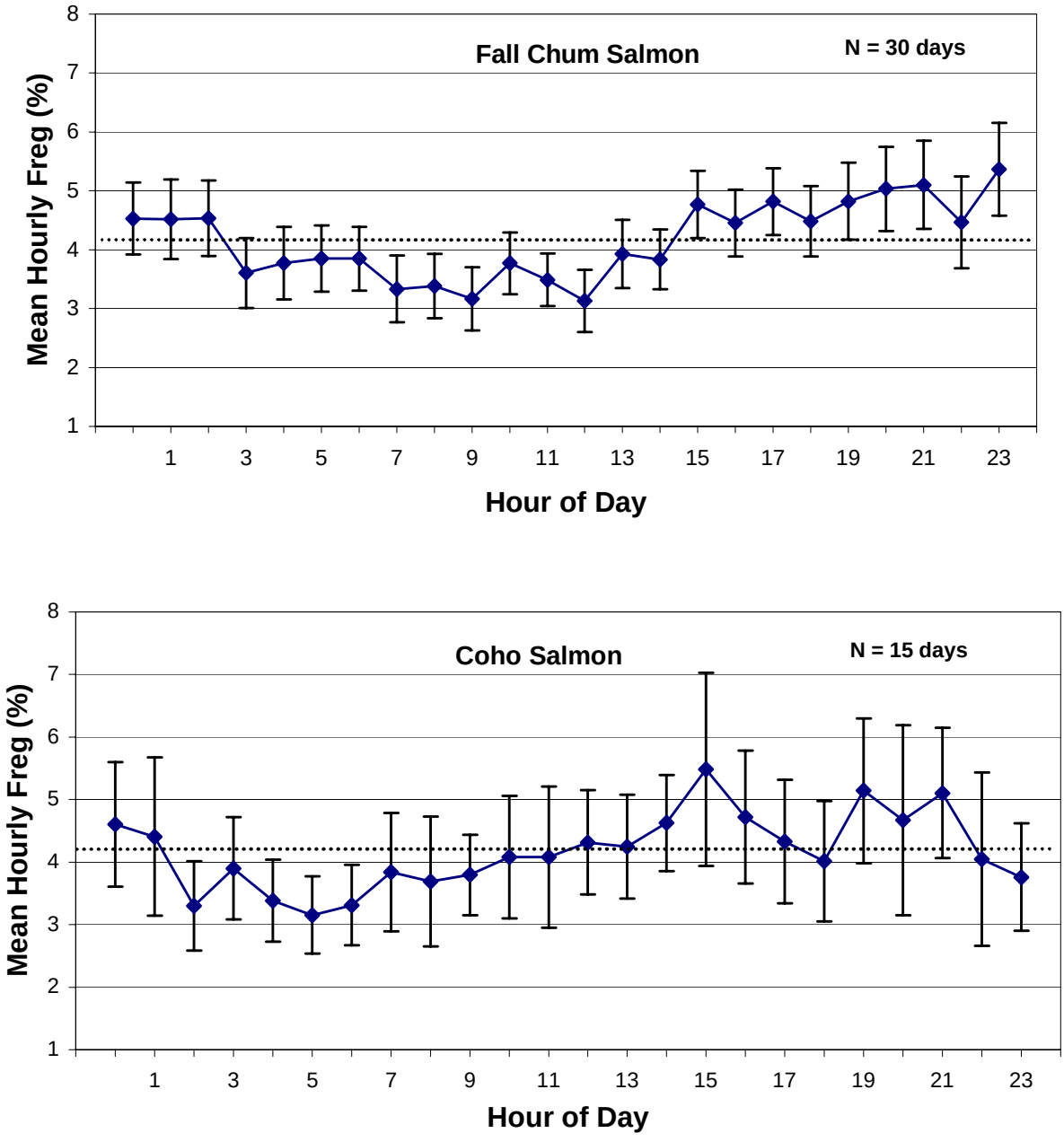


Figure 8.

Mean daily water temperature from Y5A Test wheel, Tanana, 2003.

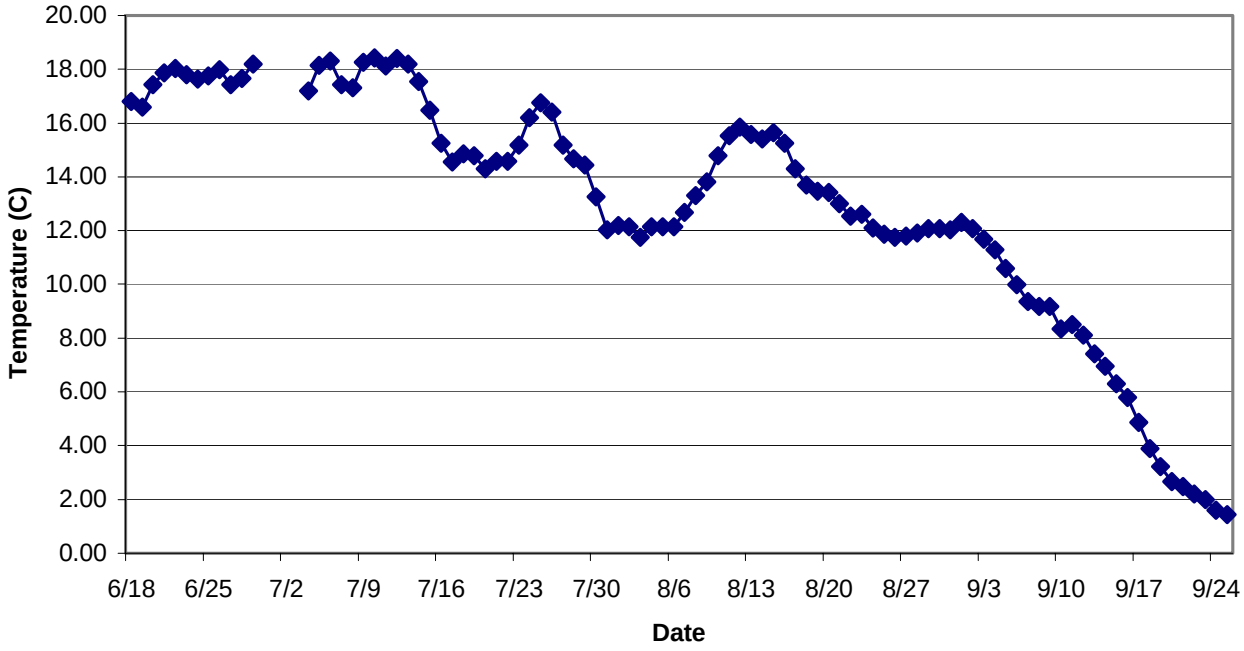


Table 1.

POWER SUPPLY AND LIGHTS:

- 1 Honda EU2000I and 2 Honda EU1000I, portable generators (for recharging batteries and running night lights – 2 spares).
- 5 Trojan, SCS200, 115 amp hour, deep cycle batteries (1 spare)
- 1 Schumacher, Model SE-1-125, 1.5 amp automatic maintenance charger (use off-season)
- 1 Solar Converters Inc., Model BD-2 battery de-sulphator (use off-season)
- 1 Todd Engineering PC30b power supply/battery charger (fish wheel)
- 1 Portawattz 300 voltage inverter
- 2 90 Watt, General Electric Halogen Floodlights. (+ spares)
- 1 Electripik Surge Suppressor
- 2 Max serial interfaces (1 spare)
- 2 Radio Shack auto DC adaptor 273-1815 (1 spare)
- 2 Belkin F5U208 power supply (1 spare)

VIDEO EQUIPMENT:

- 2 Panasonic 1070dc Video Recorders (1 spare)
- 2 Panasonic AG-6124 Time Lapse Video Recorders (1 spare)
- 2 Panansonic WV-CP450/WV-CP454 Video Cameras (1 spare)
- 1 Computar Vari-Focus Lens TG272814FCS-2 (1 spare)
- 1 Pelco Waterproof Surveillance Camera Housing

COMPUTERS AND SOFTWARE:

- 1 Gateway GP7-600 computer (Video processing, storage, data analysis and archiving)
- 1 Intel Smart Video Recorder 3 capture card and software
- Salmon Soft Video Capture(Fish.Cap) version 1.4.0 and Fish Rev. version 1.4.0 (from Columbia River Intertribal Fish Commission)
- Microsoft Windows ’98 second edition
- Microsoft Office 2000 Small Business Edition (for reports, spreadsheets, etc.)
- Adobe Photoshop 6 (photo processing)
- 2 Panasonic CF-48 Toughbooks (for direct video capture via trigger switch - 1 spare)
- 3 IBM Microdrives, 1 Gbyte capacity, with PC Card adaptors (for data transfer)

MISCELLANEOUS:

- 2 Pelican 1600 watertight storage cases (used on the fishwheel to house the recording VCR and for sending both VCR’s to Fairbanks for cleaning and maintenance)
- Stowaway Tidbit, model TBI32-05+37, water temperature data logger