

Annual catch-per-unit-effort data collected by the Yukon River Sub-district Y-5A Test Fish Wheel Project, 2010

R&M# 06-10

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1. Introduction:

Summary:

Catch-per-unit-effort (CPUE) data were collected from Sub-district Y-5A Test Fish Wheel Project (the Project) in 2010. The operator accessed the fish wheel from Tanana by riverboat. Alaska Department of Fish and Game (ADF&G) and U.S. Fish and Wildlife Service (USFWS) personnel from Fairbanks monitored the site during the operating season. The project is located six miles downstream of Tanana, Alaska at approximately river mile 695, on the south bank of the Yukon River. The fish wheel is positioned about 1/2 mile downstream of the mouth of Corbusier Slough. The slough is the farthest downstream entrance to the Tanana River (Figure 1). The salmon migrating past the site are considered to be primarily of Tanana River origin (Buklis 1981). The information was collected in 2010 using the same “trigger switch” video capture equipment installed on the fish wheel and tested in 2001 (Fliris 2001). Salmon species counted by the project were: Chinook salmon *Oncorhynchus tshawytscha*, chum salmon *O. keta*, and coho salmon *O. kisutch*. Other fish species, by common name, included: burbot, longnose sucker, sheefish, northern pike, and three species of *Coregonus* whitefish (least cisco, humpback and broad whitefish). Comparatively, the numbers of these non-salmon species were very low.

Objectives:

The Project has provided CPUE data to managers of the ADF&G since 1993, with the exception of 2007. 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 salmon harvest on the Tanana and upper Yukon rivers.

2. Study Area:



Yukon River (Sub-district Y-5A), river-mile 695

3. Methods:

The Project began counting on August 13 and ceased operation on September 27, 2010 (due to severe icing of the fish wheel). The same fish wheel that was modified and used since the 2006 season was positioned in approximately the same spot as had been used in the previous seasons. The same length of underwater lead was used as in the past to guide salmon to the fish wheel. Dave Daum (USFWS) arrived prior to the project start up and assisted with computer and equipment setup on the wheel and the office in Tanana. Counting was done 24 hours a day, seven days a week, unless interrupted by maintenance or river conditions; i.e., high debris load, or freezing temperatures/icing. Mud flows that had intermittently interrupted the project's operation in previous years, although present in 2010, posed no problems with the operation of the project. An Onset StowAway TidbiT© water temperature data logger was installed at the fish wheel for the duration of the fishing season. The logger was installed on the fish wheel raft at about 1 m depth. Measurements were taken daily at 1 h intervals and mean, maximum, and minimum daily water temperature values were calculated from the hourly readings.

The video capture equipment used by the project was the same as in 2001 (Fliris 2001, Table 1) and was operated in a similar manner. The "trigger switch" capture method (Daum 2005) was the primary method of data collection throughout the season. 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 computer's hard-drive. The capture software used was Salmonsoft FishCap 1.4.0. The system was checked daily to ensure that video capture was functioning properly. The digital video files (avi format) were copied to a removable IBM micro-drive for transportation from the fish wheel site. 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 fish 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 salmon 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. A live box was kept on the wheel for the duration of the project for backup in case the electronics failed.

4. Results:

Timing and relative abundance data for fall chum and coho salmon has been collected at the site since 1993 with the exceptions of 2006 and 2007.

In 2010, 1,026, hours of the 1,104 sampling hours possible (46 days) were sampled from August 13 to September 27 (Table 2). Daily counts of less than 12 hours happened one time during the 2010 counting period. The causes of system shutdowns varied from high debris loads in the river to computer system failure. The total numbers of salmon counted were:

1. Chinook: 1
2. Chum: 17,255
3. Coho: 3,882

Whitefish species (*Coregonus*) counted were:

1. Least cisco: 254
2. Humpback: 110
3. Broad: 391

Other species and their numbers were:

1. Burbot: 1
2. Sheefish: 8
3. Northern pike: 5

During the fall season, chum salmon exhibited two peaks during the 2010 season, with the largest peak extending for nine days and reaching a daily count of 1,420 fish on September 6 (Figure 2). The fall chum salmon run did not start increasing in numbers until August 24. The coho salmon run showed five peaks during the counting season, with the largest peak extending over a six-day period and a maximum daily count of 296 fish on August 19 (Figure 3).

Daily mean water temperatures during the 2010 project varied from a high of 13.0°C on August 13 to a low of 2.0°C on September 30 (Figure 4). The temperature logger was kept in the water three days after the fish wheel stopped because of ice build up. The maximum hourly reading was 14.0°C on August 13. Within a day, hourly water temperatures varied by less than 2.5°C. The lowest readings were generally between 0800 and 1100 hour each day and the highest between 1900 and 2200 hour.

5. Discussion:

The wheel began operation approximately in the same site used in previous years. Mud flows that had hampered the fish wheel's operation during some previous years were present but did not interfere with the counting operation. Compared to previous years, system down days during high water events (one day under 12 hours operating time) were caused by high debris loads in the wheel and not by mud flows stopping the wheel from turning. Depth recordings were taken daily from the inside of the fish wheel raft and also frequently checked on the outside of the raft. At no time during the season were mud flows detected at the wheel site, though on August 27 mud flows were detected approximately 25 m offshore of the wheel. Water levels at the site were high with accompanied drifting debris from August 13 – 19.

The video equipment was fairly reliable throughout the season. On three occasions a portion of the daily count files were lost because of computer malfunctions, though only on September 11 were a significant amount of data lost (20.5 h). Daily checks of the video trigger function were effective in correcting potential video sync errors. Dave Daum's (USFWS) technical skills and troubleshooting ability, specific to this video system, contributed to this project's success.

6. Conclusions:

It is always challenging to operate a fish wheel near the mouth of the Tanana River. The unusually large amounts of silt and sand discharged out of the Tanana River can cause changes to the contour of the channel bottom and actively erode river banks. At times, high amounts of drift exiting the Tanana River during high water events can hamper fish wheel operations in this area of the Yukon River. Despite these obstacles, the Project in 2010 was successful in accurately estimating the fall passage of fall chum and coho salmon entering the Tanana River.

Recommendations:

The Project has operated for 17 years in the same approximate location and has been a reliable indicator of fall chum and coho salmon run timing and abundance. Every year there is a potential for weather conditions to produce water conditions that will be nonconductive to fish wheel operate, but this holds true for any fish wheel site, as well as any net or sonar site. One should expect a set of trying circumstances while operating a Yukon River test fish wheel project. It is recommended to set up and operate the wheel in the same manner and location as in previous years.

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References:

Buklis, L. 1981. Yukon and Tanana River Fall Chum Salmon Tagging Study, 1976-1980. Alaska Department of Fish and Game, Informational Leaflet No. 194, Juneau, AK.

Fliris, B. 2001. Modification of Video Storage Equipment for Purposes of Providing Accurate Catch-Per-Unit-Effort Data from the Sub-district 5A Test Fishwheel. A final report to the Yukon River Panel.

Daum, D. W. 2005. Monitoring fish wheel catch using event-triggered video technology. North American Journal of Fisheries Management 25:322-328.

Table 1. Video system equipment list.

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 Panasonic 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

Table 2. Video summary, Tanana, Y-5A, 2010.

Counting Date	Start Date/Time	End Date/Time	Run Time (h)	Chum salmon		Coho salmon		Glisco	Humpback	Broad	Sheefish	ker	Other	Chum ber 24 h	Coho ber 24 h	Comments	Del-h Bottom (ft)
				Total	Total	Whitefish	Whitefish	Whitefish	Whitefish	Whitefish	Whitefish						
TOTALS				102	92	1255	3882	254	110	39	18		39				
an312010	21:00	1a45	21.25	20					0					22.59	0.00	dave arrived on thurs. today was a dip count water rising accompanied by drift	4.0
an412010	1a:45	23:59	29.70	14					0					11.31	0.00	water high drift flowing into the tanana river side dip video count	5.0
8n512010	000	23:59	13.3a	2				6						359	0.00	drift stopped the wheel	5.5
an612010	0:00	23:59	23.a8					14						2.01	0.00	water high drift flowing into the tanana river side wheel stops from time to time	5.5
an712010	0:00	23:59	23.63					12						2.03	0.00	dave left	5.3
an s12o1o	0:00	20:17	20.29											3.55	0.00	lost boat...	5.0
an 912010	000	23:59	23.92											7.02	0.00	water dropping	4.8
al2012010	000	23:59	23.a9	22			12							22.10	0.00	nice calm day	3.8
al2112010	000	23:59	23.95	18										18.04	1.00	nice calm day	3.0
a/2212010	000	23:59	23.97	15										15.02	3.00	potlatch over all guests gone boat still missing	2.3
al2312010	000	23:59	23.a9	21										21.10	3.01	nice day not as dry or calm but nice none the same	1.8
al2412010	0:00	23:59	23.96	43						10				43.07	6.01	nice day water rising and mud flows showing up	1.8
al2512010	0:00	23:59	23.95	64						6				64.13	9.02	nice day	1.0
al2612010	0:00	23:59	23.96	77		32		1a		1a				77.13	32.05	mud flows coming down nice calm day back up to 2 rpms	1.3
al2712010	000	23:59	23.9a	164		68		10		34				164.4	68.06	mud flows off the outside of wheel about 75 feet nice day	1.3
al2812010	000	23:59	23.a1	256		51		2a		19				258.04	51.41	almost 1" of rain 3 rpm mud flows still present	1.1
al2912010	000	23:59	23.a2	307		126		29		36				309.32	126.95	rain in am then a nice day mud flows still there 3 rpms	1.0
al3012010	000	23:59	23.83	368		130		21		32				370.63	130.93	mud flows are out and down from wheel 3 rpm nice day with fog in am	0.8
813112010	000	23:59	23.91	434		90				29				435.63	90.34	mud flows out and down stream from test wheel now there a gravel bottom	0.5
9n12o1o	0:00	23:59	23.90	462		83		10		28				463.93	83.35	mike and sky were here 2 rpm nice day	0.2
91212010	0:00	23:59	23.93	418		92				18				419.22	92.27	2 rpm raised wheels it was scrapping bottom	0.2
9142Q1Q1	000	59	23.92	536		46								537		nasty foggy rainy day	
91312010	0:00	23:59	23.31	457		42			7	17				470.53	43.24	moved wheel out 7 feet in the pm nice cloudy day	0.0
91512010	000	23:59	23.90	821		58				13				537			1.5
91012010	000	23:59	23.71	1403		95				10				824.44	58.24	weather wise a little improvement	1.4
91712010	000	23:59	23.74	1388		83				6				1420.16	96.16	chute extension came off the live chute so therefore large# onratt nice day	1.2
9a12010	000	23:59	23.a9	1090		70								1403.20	83.91	weather improving	1.1
91912010	0:00	23:59	23.a1	931		55								1095.02	70.32	rain showers	0.8
9M12010	0:00	20:35	20.59	1082		a5								938.43	55.44	repaired 2 holes in the baskets nice	0.8
9n 112010	20:36	23:59	3.39	123		17								1261.19	99.08	forgot to turn the computer on therefore only 2 files to count but it was a nice day	0.2
9n 212010	000	23:59	23.a7	949		199								870.80	120.35	2 missing or this day possible equipment malfunction	0.2
9n 312010	000	23:59	19.35	614		169								954.7	200.08	2 rpm everything good water up a bit drift starting to raise its ugly head again	0.3
9n412010	000	23:59	23.83	430		172								761.55	209.6	computer locked up and lost a file cleaned up computer per daves instructions 2 rpm	0.5
9n 512010	000	23:59	23.92	439		146								433.07	173.23	everything good including the weather	0.7
9n 612010	0:00	23:59	23.92	428		123								440.47	146.49	good day	0.8
9n712010	0:00	23:59	23.93	444		174								429.43	123.41	pats gone huntin'	0.8
9n s12o1o	0:00	23:59	23.79	542		197								445.30	174.51	sunny with a little down river breeze	0.8
9n 912010	000	23:59	23.91	600		295								546.78	198.74	sunny with a little down river breeze	0.7
912012oVWJ	000	59	23.a7	586		261								602.26	206.11	sunny with a little down river breeze	0.4
91212010	000	23:59	12.18	195		92				2		1		589.5	262.4	sunny with a little down river breeze	0.1
912212010	000	23:59	23.92	421		161								384.24	181.28	maintenance on wheel 3 strips back and forth to town forgetting things pushed wheel out	1.5
912312010	000	23:59	14.08	185		74								422.41	161.54	windy ice on the wheel	1.0
912412010	000	23:59	23.83	306		153								315.34	126.14	wheel hit bottom twice today raised wheel on its axle stand for first time ever cold and windy	0.5
912512010	0:00	23:59	23.94	25a		166								308.8	154.0	cold windy clear ice didn't melt off the wheel	0.5
912612010	0:00	23:59	23.a9	22a		182								258.65	166.42	lots of ice on the wheel 2 rpm wind out of the north colder	0.5
12010	000	12:37	12.63	ao		73								229.05	182.84	pic wind switched from the northwest	0.5
														152.02	138.72	7 degrees F this am 1:00 pm 25 degrees F parties over wheels pulled to shore so much ice on the chute door fish were suffering sometimes taking 2 to push the door open don't think all were alive when they made the escape	0.5

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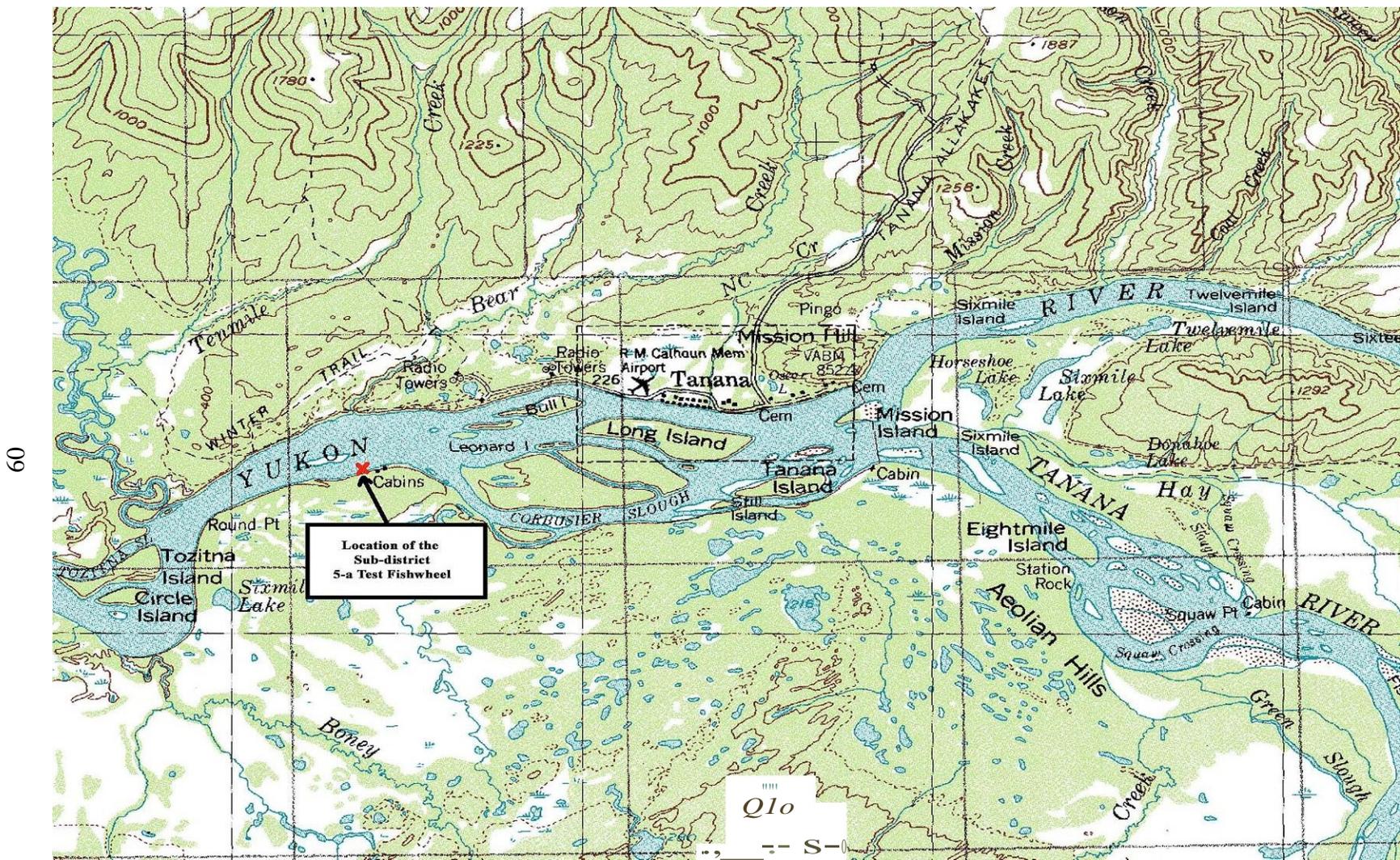


Figure 1. Map and location of the Sub-district Y-5A Test Fish Wheel Project, 2010.

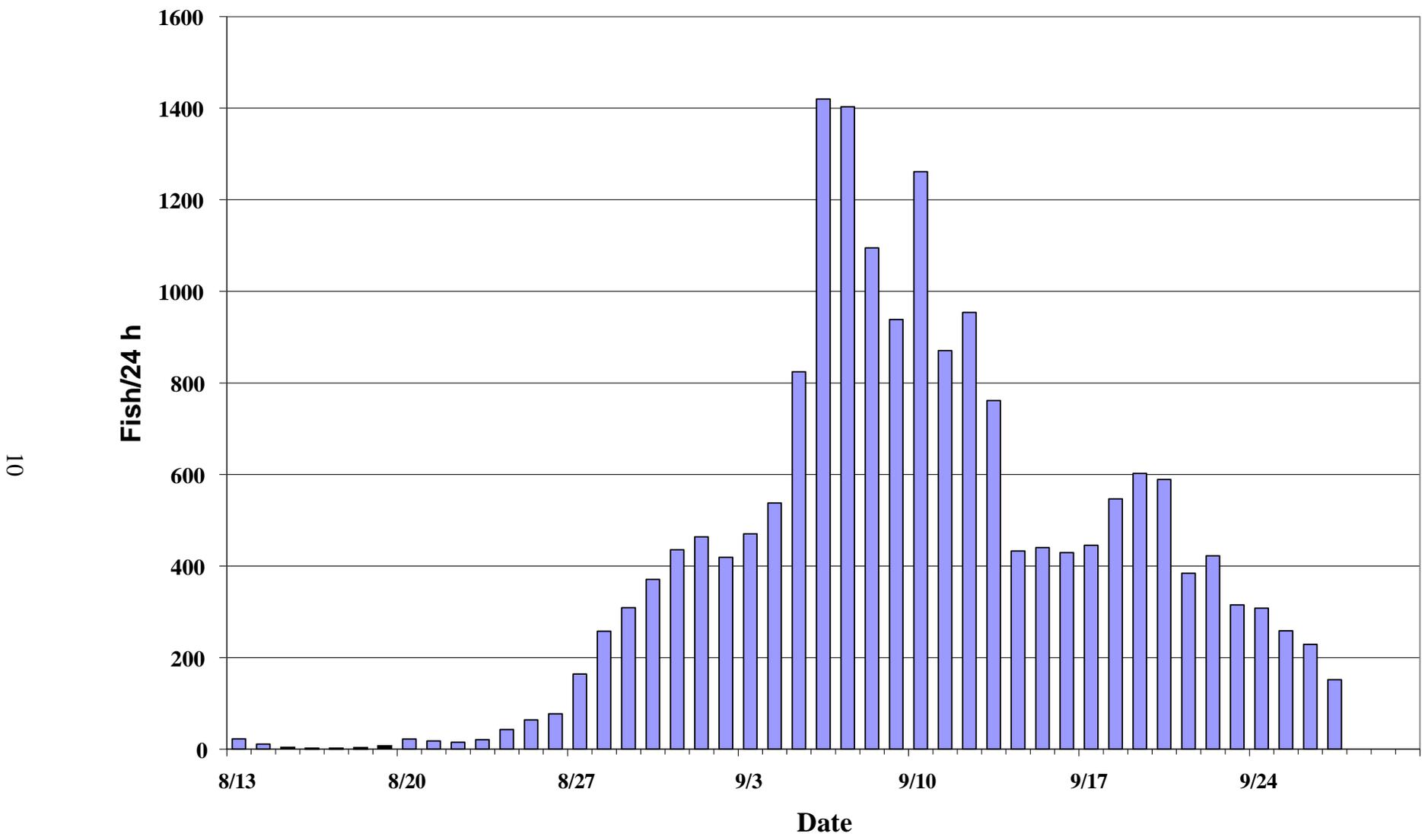


Figure 2. Chum salmon per 24 hours (video), Tanana, Y-5A, 2010.

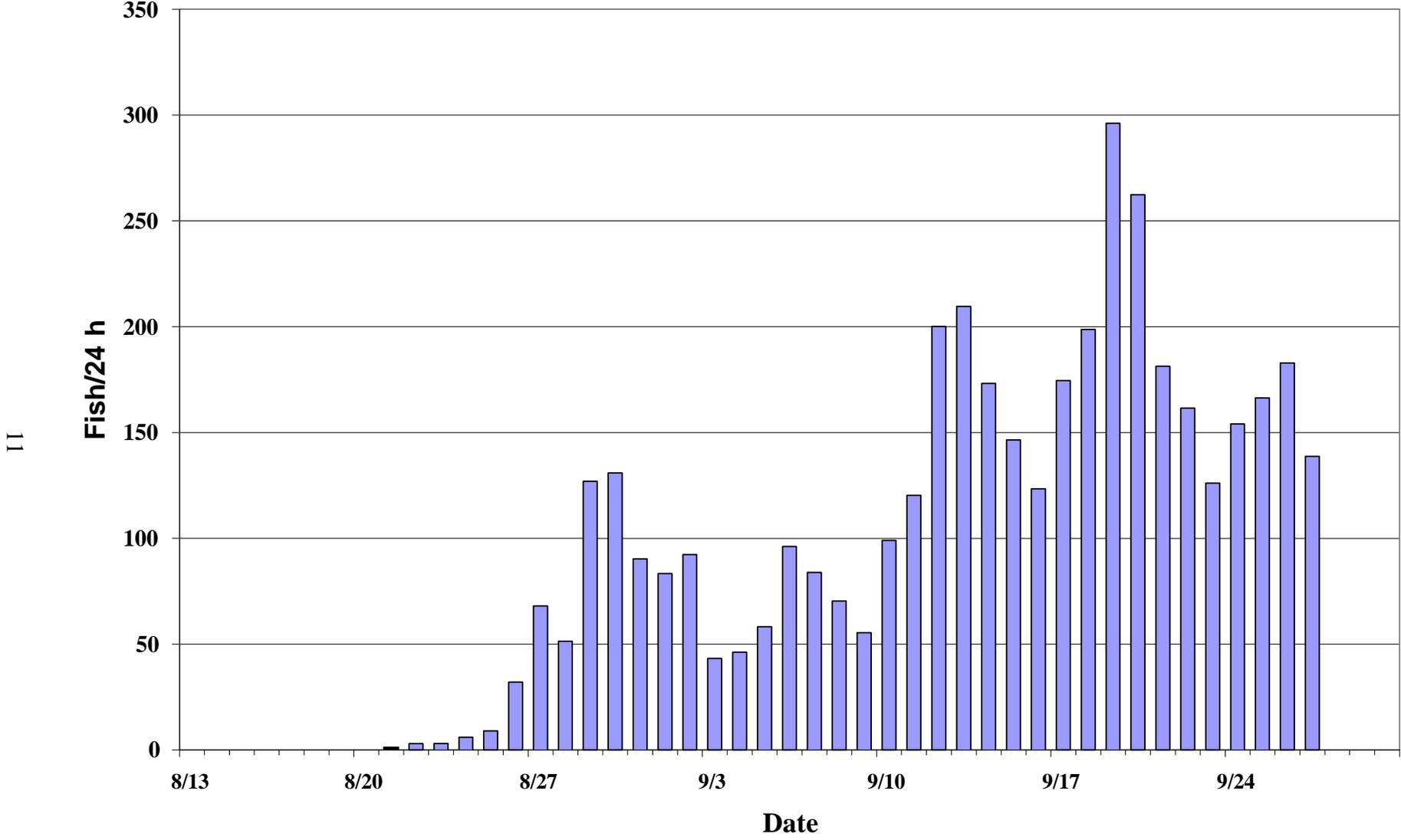


Figure 3. Coho salmon per 24 hours (video), Tanana, Y-5A, 2010.

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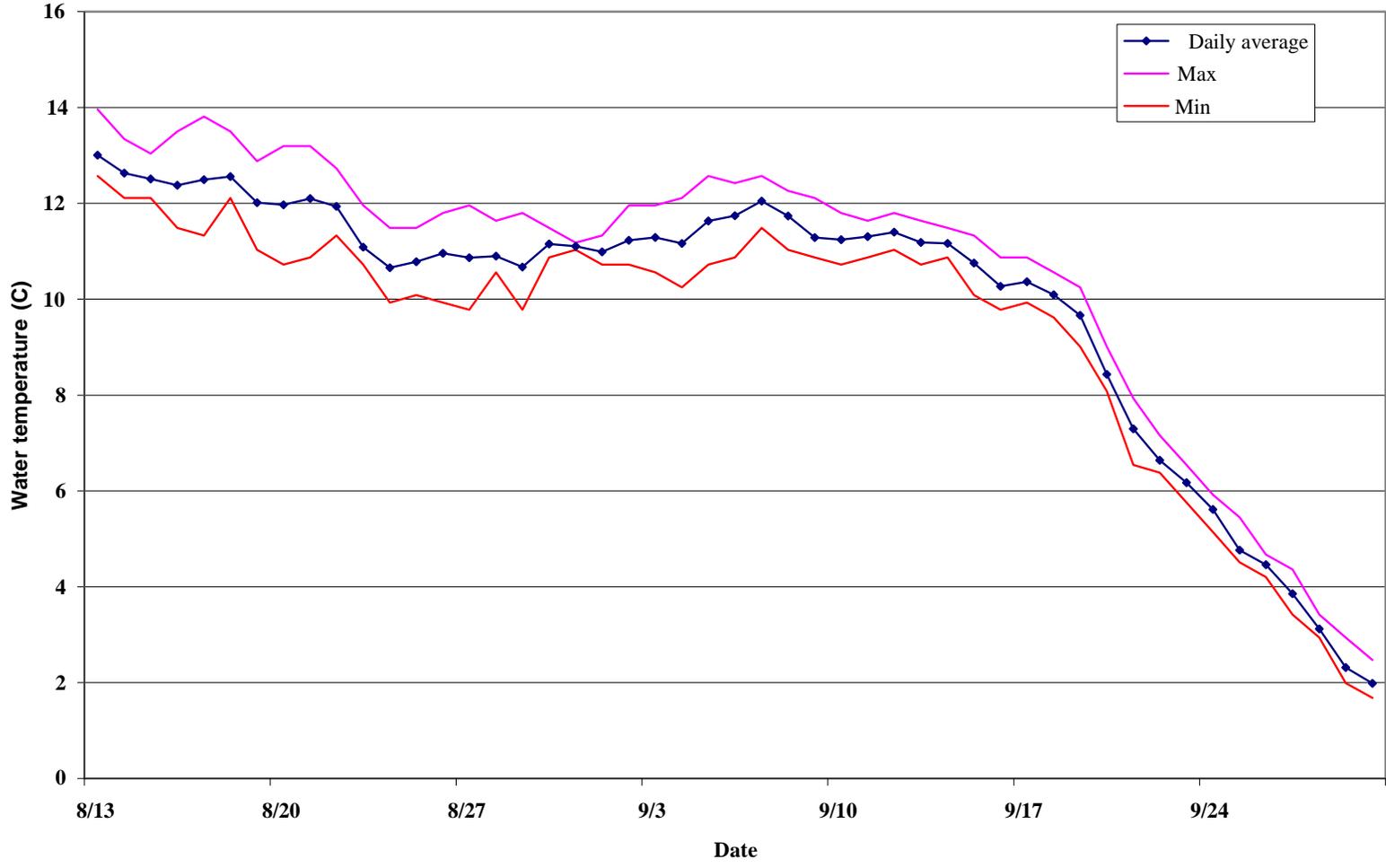


Figure 4. Daily water temperature readings at the Y-5A fish wheel site, 2010.