

Annual catch-per-unit-effort data collected by the Yukon River Sub-district Y-5A Test Fish Wheel Project, 2011

R&M# 06-11

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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 2011. 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 2011 using the same “trigger switch” video capture system initially tested and installed on the fish wheel in 2001 (Fliris 2001). In 2011, salmon species counted by the project were: Chinook salmon *Oncorhynchus tshawytscha*, chum salmon *O. keta*, and coho salmon *O. kisutch*. Other fish species captured, by common name, included: burbot, longnose sucker, sheefish, northern pike, Arctic grayling, 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 ADF&G since 1993, with the exception of 2007. The Project gives the first indication of 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. An additional objective was added to the 2011 project proposal to sample age, sex, and length data (ASL) from fish wheel captured fall chum salmon throughout the season.

2. Study Area:



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

3. Methods:

The Project began counting on August 11 and ceased operations on September 30 2011. The August 11 date was 2 days earlier than contracted. 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 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 project start up and assisted with computer and equipment setup on the wheel and in the office in Tanana. Counting was done 24 hours a day, seven days a week, unless interrupted by maintenance or severe 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 2011, posed no problems with the operation of the Project, except to restrict water flow and fish wheel rpm. 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 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, 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. Live box counts (during low passage) and on-site manual counts (during high passage) were compared to the digitally produced files to ensure accuracy of the video system throughout the season. The digital video files (avi format) were copied to a removable IBM micro-drive for transportation from the fish wheel site. Files were then transferred to a computer in the operator's office 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.

Chum salmon were sampled from the fish wheel catch for ASL data. The sample was divided into three periods (180 fish per period) spread out over the counting season. Lengths were measured to the nearest cm from mid-eye to fork of the caudal fin and sex was visually determined by external morphological characteristics. Scales were collected for aging and placed on gummed scale cards provided by ADF&G. Aging will be done by the ADF&G scale lab and reported separately. Scales were collected from the preferred area, i.e., the left side of the fish, two rows above the lateral line on a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin.

4. Results:

In 2011, 1,151 hours of the 1,224 sampling hours possible (51 days) were sampled from August 11 to September 30 (Table 2). Daily counts of less than 12 hours happened three times during the 2011 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: 5
2. Chum: 17,390
3. Coho: 5,945

Whitefish species (*Coregonus*) counted were:

1. Least cisco: 199
2. Humpback: 196
3. Broad: 169

Other species and their numbers were:

1. Burbot: 7

2. Sheefish: 12
3. Northern pike: 1
4. Longnose sucker: 45
5. Arctic grayling: 1

During the fall season, the chum salmon run slowly increased to a peak count on September 13 of 825 fish and subsequently decline through the end of the counting season (Figure 2). The coho salmon run exhibited similar characteristics to the chum salmon run; a slow increase to a peak on September 18 of 417 fish, followed by a general decline in numbers through the end of the counting period (Figure 3).

Daily mean water temperatures during the 2011 project varied from a high of 13.6°C on August 18 to a low of 5.2°C on September 29 (Figure 4). The maximum hourly reading was 14.4°C on August 17. Within a day, hourly water temperatures varied by an average of around 1.0°C. The lowest readings were generally between 0800 and 1100 hour each day and the highest between 1900 and 2200 hour.

The target of 540 ASL samples from fish wheel captured chum salmon was accomplished during the 2011 season (divided over three sample periods of 180 fish each). Data were sent to ADF&G for processing. The first collection was on August 27 and 28, the second on September 9 and 10, and the final on September 18.

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, except to slow the test wheel's rpm for two periods in August. A new boat-mounted fish finder, purchased the prior season, was used to monitor the formation and depth of the mud flows. Depth recordings were also taken daily from the inside and outside of the fish wheel raft, and at no time during the operating period were mud flows detected at the site. Water levels at the site were slightly higher than normal during the entire Project's duration, with a debris event causing the wheel to stop for a portion of September 5.

Prior to the start of the Project's 2011 season, a new log flotation raft was built. All the Project's components perfectly fit on the newly constructed raft. This endeavor cost the Project's operator approximately \$2,500 in materials, \$700 in equipment, and 130 man hours in labor. This work was completed in a timely manner and the test wheel was moved into place two weeks prior to the Project's contractual start-up date of August 13. With the technical assistance of Dave Daum (USFWS, RM-07-11) the video equipment and power supply were installed on the fish wheel and became operational two days prior (August 11) to the contract start date.

The video equipment was fairly reliable throughout the season. On two occasions (September 26 and 27), a portion of the daily count files was lost due to generator and timer switch malfunctions, but were quickly troubleshot and rectified. Dave Daum's (USFWS) technical skills and troubleshooting ability, specific to this video system, contributed to this project's success. The Project ceased operation on the specified contract stop date of

September 30.

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 2011 was successful in accurately estimating the passage of fall chum and coho salmon entering the Tanana River. The 2011 totals for fall and coho salmon were the highest counts on record since the starting year for this operator in 2005.

Recommendations:

The Project has operated for 18 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 non-conducive to fish wheel operations, but this holds true for any fishwheel 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.

Acknowledgements:

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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, 2011.

Counting Date	Start Time	End Time	Total Run Time (hr)	Chum Salmon	Coho Salmon	Cisco	Humpback	Broad	Sheefish	Sucker	Other	Chum	Coho	Comments	Depth Off
				Total	Total	Whitefish	Whitefish	Whitefish	Sheefish	Sucker		per 24 hr	per 24 hr		Bottom (feet)
TOTALS			1151.41	17390	5945	199	196	169	12	45					
8/11/2011	0:00:00	23:59:59	23.03	39	0	2	1	1	2	0		40.64	0.00	rpm every 45 seconds, nice day	2.0
8/12/2011	0:00:00	23:59:59	23.40	26	0	3	1	0	0	0		26.67	0.00	1.33 rpm., but wheel stops every now and again mud flow above wheel	2.0
8/13/2011	0:00:00	23:59:59	23.92	28	0	4	2	0	1	3		28.09	0.00	1.33 rpm., but wheel stops every now and again mud flow above wheel	1.8
8/14/2011	0:00:00	23:59:59	23.97	28	1	1	0	0	2	0		28.04	1.00	a revolution every 1.5 seconds pushed wheel out to try and catch more current	1.5
8/15/2011	0:00:00	23:59:59	23.94	24	0	2	2	1	0	0		24.06	0.00	nice day 1 rpm. mud flow about 600 feet above wheel	1.6
8/16/2011	0:00:00	23:59:59	17.52	29	1	1	1	0	0	1		39.73	1.37	1.33 rpm, mudflow moving at me, but speed is up, lost one file???	1.6
8/17/2011	0:00:00	23:59:59	23.87	85	6	1	1	0	0	1	2 kings	85.46	6.03	2 rpm, another nice day, mudflows moving closer	1.5
8/18/2011	0:00:00	23:59:59	23.93	141	15	3	2	1	1	1		141.41	15.04	boat hit the mud flow as it creeps downriver, photo eye not working right, 2 rpm	1.5
8/19/2011	0:00:00	23:59:59	23.95	183	11	9	1	0	2	2		183.38	11.02	2 rpm, hot and windy, mud still moving toward the wheel, boat hit again tonite	1.2
8/20/2011	0:00:00	23:59:59	23.96	240	23	1	1	0	1	1	1 burbot	240.40	23.04	2 rpm, rain returns and the mud is still there, whirlpools off to the outside of the wheel and a little above	1.0
8/21/2011	0:00:00	23:59:59	23.96	254	24	1	0	4	0	2	1 burbot	254.42	24.04	2 rpm, mud is almost at the wheel, afternoon and evening turned nice	0.5
8/22/2011	0:00:00	23:59:59	23.94	291	33	1	0	0	0	0		291.73	33.08	2 rpm, partly cloudy	0.5
8/23/2011	0:00:00	23:59:59	23.93	298	30	12	1	0	1	2		298.87	30.09	2.66 rpm strong wind from the west, judging by the waves some mud has made it by the wheel	1.0
8/24/2011	0:00:00	23:59:59	23.96	215	22	2	1	0	0	0		215.36	22.04	2 rpm foggy in the am then was a nice day, mud seems to be decreasing, or going away	0.5
8/25/2011	0:00:00	23:59:59	23.96	176	30	3	0	0	0	0		176.29	30.05	3 rpm, mud almost gone, wheel spinning very quickly, nice day for drying fish	5.0
8/26/2011	0:00:00	23:59:59	23.95	232	51	1	0	0	0	1	1 burbot	232.48	51.11	3 rpm when I left, after pulling wheel in 12 feet, close to 5 rpm prior to that	5.0/ 1.5
8/27/2011	0:00:00	23:59:59	23.92	252	27	1	2	2	0	2	1 burbot	252.84	27.09	nice day, 1st day for ast. Y5a chums2 rpm	1.5
8/28/2011	0:00:00	23:59:59	23.95	281	29	1	1	0	1	0		281.59	29.06	rain in am turned into a nice day, finished ist 180 asl samples	1.6
8/29/2011	0:00:00	23:59:59	23.96	339	26	3	0	2	0	0		339.57	26.04	2 rpm nice day after fog cleared	1.5
8/30/2011	0:00:00	23:59:59	23.93	269	16	2	0	1	0	4		269.79	16.05	2 rpm, 4 suckers? Nice day mud may be making a come back	1.5
8/31/2011	0:00:00	23:59:59	23.95	291	34	3	2	2	0	0	1 pike	291.61	34.07	overcast nice day, 2 rpm	1.5
9/1/2011	0:00:00	23:59:59	23.94	349	26	1	0	2	1	1		349.87	26.07	overcast giving way to partly cloudy 2 rpm	1.3
9/2/2011	0:00:00	23:59:59	23.94	367	50	2	0	2	0	0		367.92	50.13	threaten rain but never did, 2 rpm	1.0
9/3/2011	0:00:00	23:59:59	23.93	383	61	0	2	3	0	0	1 burbot	384.12	61.18	rainy day, out dog fish	1.0
9/4/2011	0:00:00	21:47:56	21.74	423	76	5	5	10	0	1		466.97	83.90	fog burned off to reveal a nice day, 2 rpm	0.9
9/5/2011	17:58:36	23:59:59	6.02	131	23	1	0	0	0	0		522.26	91.69	log in the wheel damage control, stuff happens, 2 rpm	0.8
9/6/2011	0:00:00	23:59:59	23.76	613	123	0	5	3	0	5		619.19	124.24	2 rpm, overcast light sprinkle	0.3
9/7/2011	0:00:00	23:59:59	23.99	541	180	9	6	4	0	0		555.11	184.69	overcast, pushed wheel out 8 feet, mud be gone, gravel bottom	1.5
9/8/2011	0:00:00	23:59:59	23.94	622	179	5	5	5	0	1		623.56	179.45	mud is gone, gravel bottom, rain in p.m., 2 rpm	1.5
9/9/2011	0:00:00	23:59:59	23.90	723	213	1	3	3	0	1	1 king	726.03	213.89	cold and rainy in am, then just cold and overcast, 2 rpm	1.2
9/10/2011	0:00:00	23:59:59	23.91	713	243	0	1	0	0	1		715.68	243.91	a rather nasty cold miserably wet day, second installment of asl done today, 2 rpm	1.0
9/11/2011	0:00:00	23:59:59	23.89	788	300	7	21	13	0	2		791.63	301.38	nicer day, but on the cool side, 2 rpm	1.0
9/12/2011	0:00:00	23:59:59	23.87	779	320	4	9	9	0	2		783.24	321.74	nice fall day, 2 rpm	0.8
9/13/2011	0:00:00	23:59:59	23.28	800	313	7	8	8	0	1		824.74	322.68	nice fall day, 2 rpm	1.0
9/14/2011	0:00:00	23:59:59	23.80	744	404	6	10	13	0	0		750.25	407.39	nice fall day, 2 rpm	0.5
9/15/2011	0:00:00	23:59:59	23.86	588	318	6	10	12	0	1		591.45	319.87	another nice day, 2 rpm	0.4
9/16/2011	0:00:00	23:59:59	23.46	615	368	20	12	6	0	2	1 king	629.16	376.47	overcast a couple of showers and cool, pushed wheel out 5', 2 rpm	1.0
9/17/2011	0:00:00	23:59:59	23.91	503	268	5	8	3	0	1		504.89	269.01	one of the worst, rainy, cold fall days ever, 2 rpm, lots of junk in the river	1.0
9/18/2011	0:00:00	23:59:59	23.90	510	415	10	14	5	0	1	1 king	512.13	416.74	nicer day, a little sun, 2 rpm last installment of the asl	1.0
9/19/2011	0:00:00	23:59:59	23.90	461	343	4	10	5	0	0		462.93	344.44	cool fall day with a stiff downriver breeze, 2 rpm,	1.0
9/20/2011	0:00:00	23:59:59	23.87	410	139	9	2	5	0	0		412.23	139.76	fairly stiff wind	1.1
9/21/2011	0:00:00	23:59:59	23.92	450	177	3	7	2	0	0		451.51	177.59	nice day, wind died down	1.1
9/22/2011	0:00:00	23:59:59	23.91	444	204	1	9	4	0	0		445.67	204.77	2 rpm	1.1
9/23/2011	0:00:00	23:59:59	23.93	299	173	13	4	5	0	1	1 burbot	299.87	173.51	partly cloudy, 2rpm	1.1
9/24/2011	0:00:00	23:59:59	23.94	305	165	4	2	6	0	1		305.76	165.41	cloudy and cool, feels like a season change, water temp 44 f. 2 rpm	1.0
9/25/2011	0:00:00	23:59:59	23.93	325	139	1	5	6	0	1		325.95	139.41	a little rain, a little snow, a little cold 2rpm	0.8
9/26/2011	0:00:00	9:11:32	9.19	108	36	1	0	1	0	0		282.05	94.02	grey fall day, generator and computer problems, 2 rpm	0.5
9/27/2011	17:26:30	23:59:59	6.56	70	57	0	2	3	0	0		256.10	208.54	same as day before, the end is near, 2rpm	1.0
9/28/2011	0:00:00	23:59:59	23.82	280	127	11	12	8	0	0	1 grayling	282.12	127.96	another cool autumn/winter day	1.0
9/29/2011	0:00:00	23:59:59	23.94	219	65	5	3	4	0	2	1 burbot	219.55	65.16	24 degrees in the a.m. cold fall day	0.5
9/30/2011	0:00:00	17:09:45	17.16	106	61	1	2	5	0	0	1 otter	148.25	85.31	partly cloudy calm, 2rpm, bye bye, I'm outahere	0.2

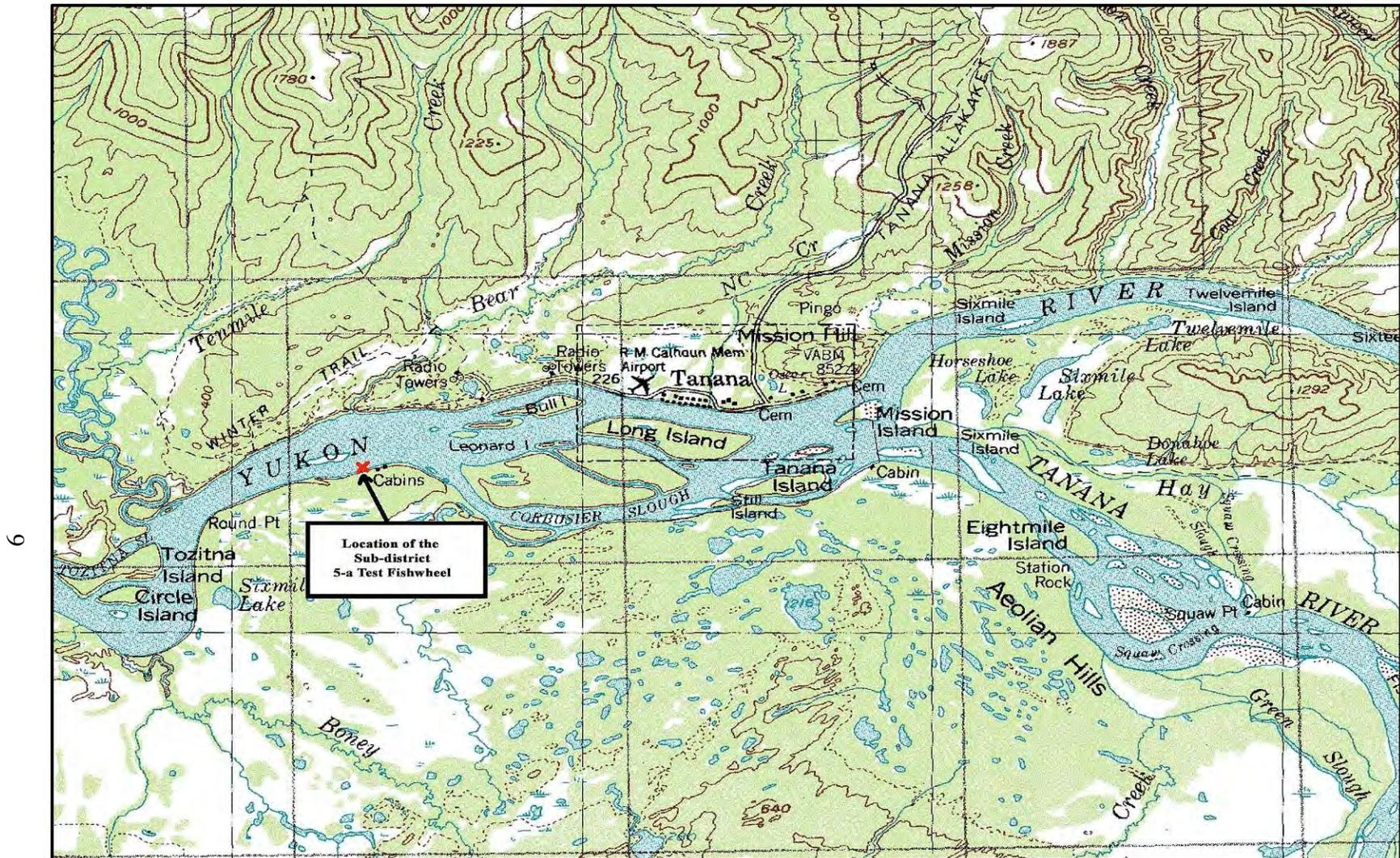


Figure 1. Map and location of the Sub-district Y-5A Test Fish Wheel Project, 2011.

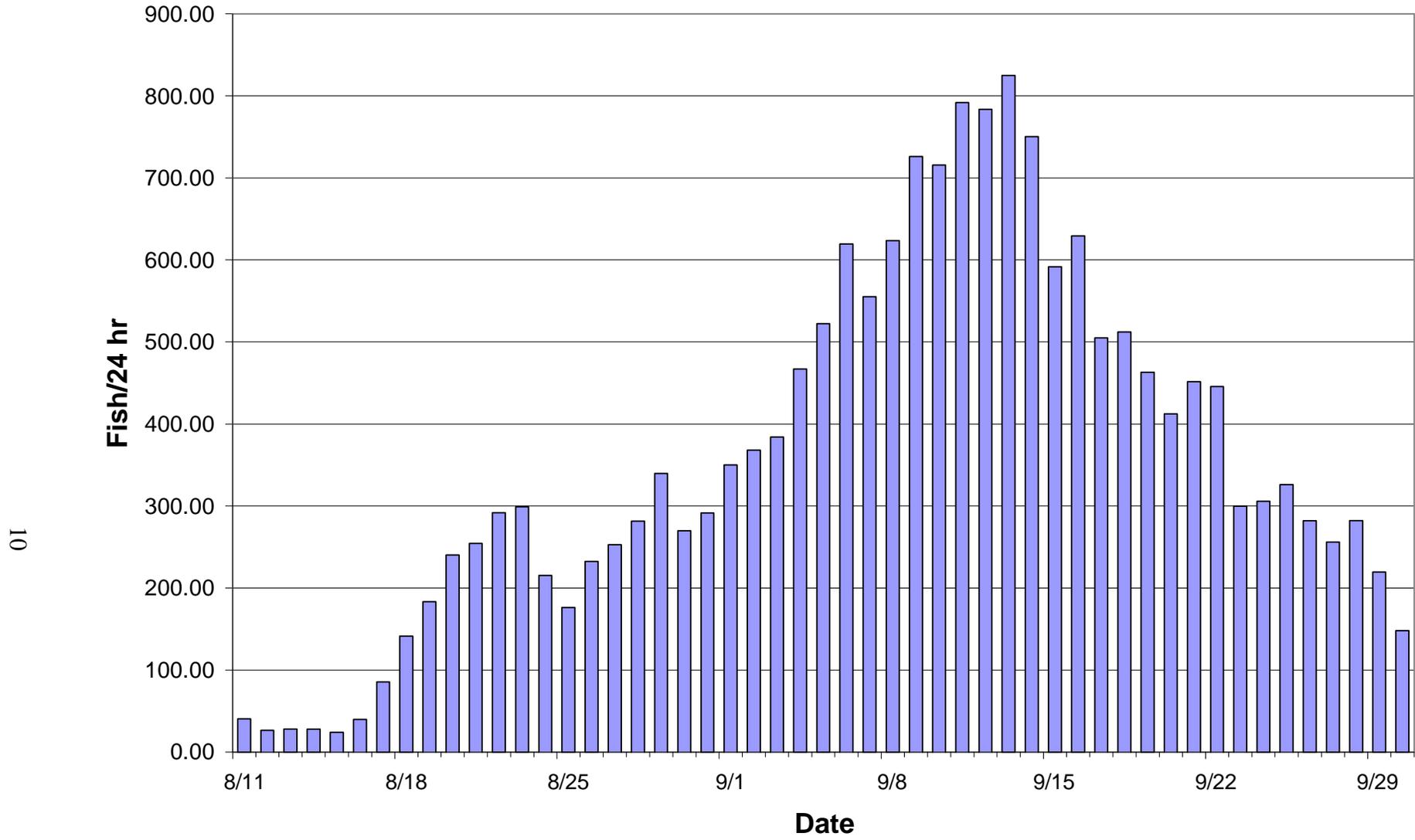


Figure 2. Chum salmon per 24 hours (video), Tanana, Y-5A, 2011.

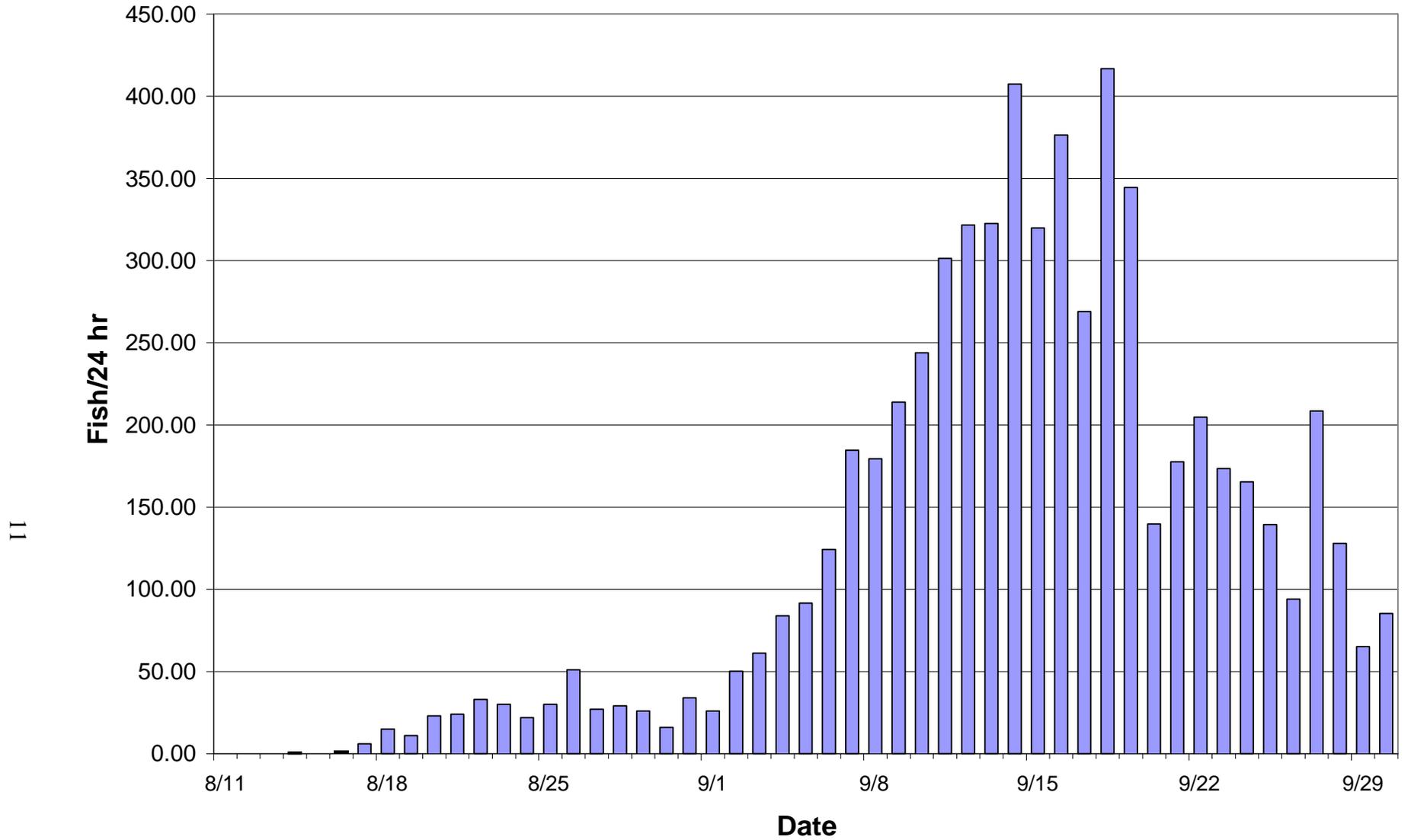


Figure 3. Coho salmon per 24 hours (video), Tanana, Y-5A, 2011.

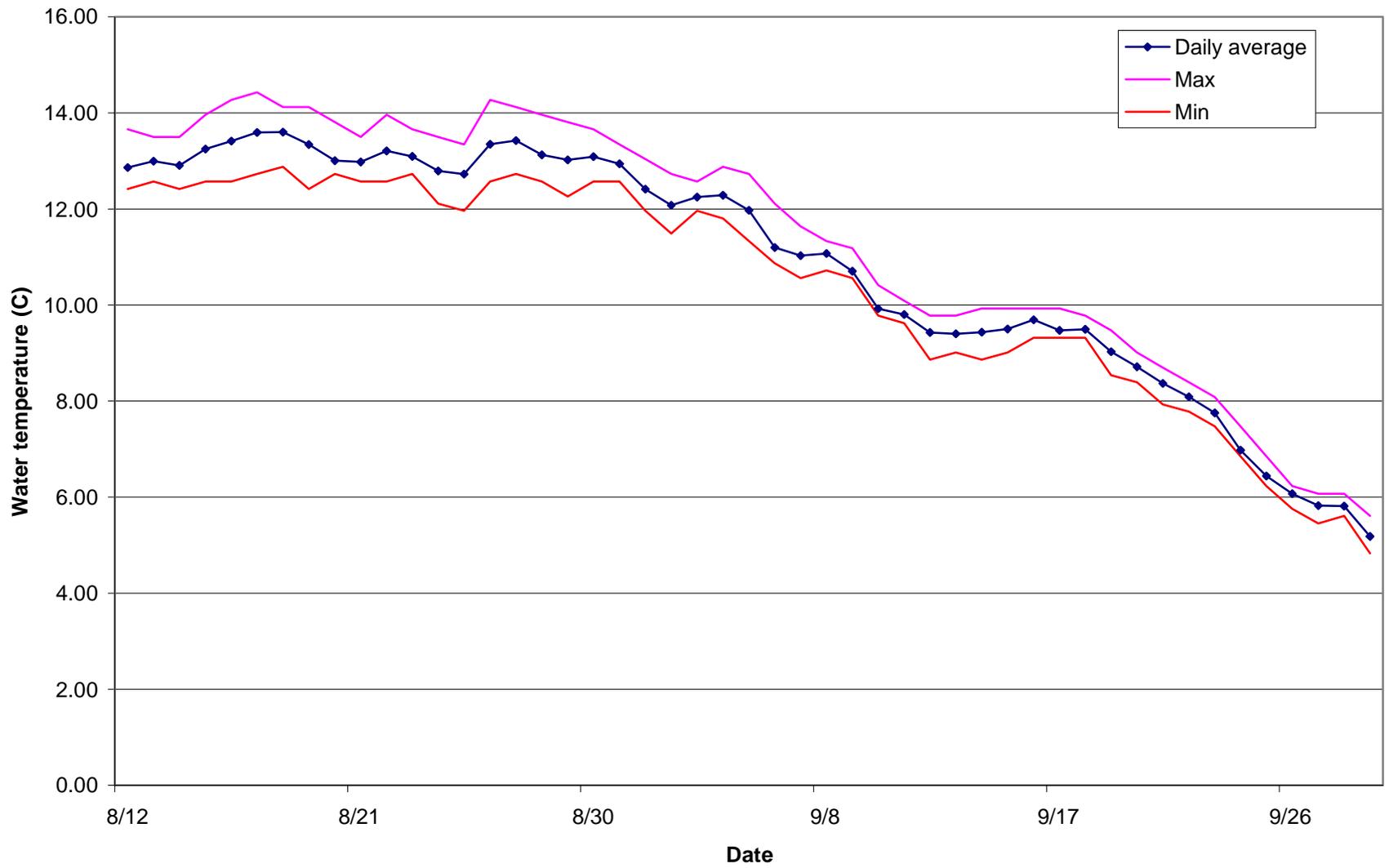


Figure 4. Daily water temperature readings at the Y-5A fish wheel site, 2011.

12