

ALASKA DEPARTMENT OF FISH AND GAME DIVISION OF COMMERCIAL FISHERIES NEWS RELEASE



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2019 Preliminary Yukon River Summer Season Summary

The following is a summary of the 2019 Yukon River Chinook and summer chum salmon fisheries. All data reported here are considered preliminary. For management purposes, the Yukon River is divided into several fishing districts and subdistricts (Figure 1).

During the “summer season” (early May through July 15 in District 1) management and research staff are based in the Emmonak office and the focus is on assessing and managing summer chum and Chinook salmon runs. After July 15, in Emmonak, Chinook salmon are nearly done entering the river and fall chum start to replace summer chum as the dominant species. On July 16, management transitions to the “fall season” and assessment and management become focused on fall chum and coho salmon entering the mouth of the Yukon River. However, summer season management continues beyond this date in upper river districts as Chinook and summer chum salmon migration progresses upstream.

Data presented in this summary applies to “summer season” species only. While most summer season assessment and escapement projects have wrapped up by the date of this news release, subsistence harvest estimation is only now beginning; therefore, that data is not available and final run sizes cannot be estimated at this time.

The summer season management team consists of Alaska Department of Fish and Game (ADF&G) area management and research biologists, their assistants, subsistence resource specialists, and the manager and assistant manager from U.S. Fish and Wildlife Service (USFWS). The team met pre-season to form the management strategy based on public input and met daily in-season to discuss the summer chum and Chinook salmon assessment and escapement data, and subsistence and commercial fishery openings.

To more effectively reach fishermen, daily test fish counts and news releases were posted on a Facebook page called “Yukon River Fishing-ADFG” and magnets with the fishery hotline number were widely distributed. Updates were also provided via the YRDFFA weekly public teleconferences, the ADF&G News Release and assessment data list-serves, and the ADF&G web page.

2019 Preseason Outlook

Chinook Salmon

The 2019 drainage-wide Chinook salmon outlook was for a run size of 168,000 to 241,000 fish which would be similar to the 2018 run. Though a run of this size would be large enough to meet most escapement objectives, the surplus available for harvest could vary. Due to the uncertainty associated with the outlook, a cautious management approach was taken to ensure minimum escapement objectives would be met.

Summer Chum Salmon

It was expected that the 2019 summer chum run would be about average. The 2019 preseason outlook was for approximately 1.9 million summer chum salmon. A run of this size was anticipated to provide for escapements, an average subsistence harvest, and a surplus for commercial harvest. Based on the preseason outlook, it was expected that a commercially harvestable surplus of up to 1.2 million summer chum salmon would be available. Similar to last year, the commercial harvest of summer chum salmon in 2019 was anticipated to be limited by the management of a below average Chinook salmon run.

2019 Preseason Management Strategy

YR DFA facilitated a preseason planning meeting funded by the Yukon River Panel to provide managers, fishermen, tribal council representatives, and other stakeholders the opportunity to share information, provide input, and discuss management options available for the 2019 salmon fisheries. The purpose of this meeting was to cooperatively identify practical management strategies that would assist in getting adequate numbers of Chinook salmon to their spawning grounds in Alaska and Canada while also providing subsistence harvest opportunity and commercial chum salmon opportunity.

Fishermen from all districts gave feedback about the previous year's management actions and suggested improvements for 2019. Based on input from this meeting, a conservative preseason management plan was developed for the Yukon River summer season fishery. The preseason plan and publicly-distributed "Outlook Flier" included the following key management strategies:

- Before Chinook salmon enter the river, subsistence fishing will be open 24 hours per day, seven days per week with 7.5-inch or smaller mesh gillnets.
- As Chinook salmon enter each district, subsistence salmon fishing will be provided on a reduced regulatory schedule with 7.5-inch or smaller mesh gillnets.
- Commercial fishing for summer chum will begin with selective gear (dipnets, beach seines, live-release fish wheels).
- If inseason assessment indicates a poorer than anticipated run, subsistence fishing gear may be restricted to 6" or smaller and/or periods may be cancelled (similar to last year). If confidence is high that the Chinook salmon run is adequate and escapement goals are likely to be met, the use of 7.5-inch gillnets on a full regulatory schedule will be considered.
- The department may consider sale of Chinook salmon incidentally-caught in the commercial chum fishery. This would only be considered if: assessment indicates the Chinook salmon run size is near the upper end of the outlook range, goals are projected to be met, subsistence fishing opportunity has been provided and restrictions relaxed. Any sale would likely be after

the majority of Chinook salmon have passed upriver for escapement and subsistence harvest purposes.

- The sport fishery for Chinook salmon will begin the season closed (effective May 11) throughout the U.S. portion of the Yukon River drainage, excluding the Tanana River drainage. Chinook salmon may not be retained or possessed. Management actions for the Tanana River drainage will be announced in early June.

2019 Inseason Run Assessment Overview

The department monitored a suite of assessment projects operated by multiple agencies and cooperators. These provided critical information regarding salmon run timing, relative abundance, and stock composition. Inseason run assessments included test fisheries, sonar passage estimates, subsistence and commercial harvest reports, and age, sex, and length (ASL) data. Tissue samples were collected from Chinook and summer chum salmon at the sonar project near Pilot Station to determine stock contribution. Assessment of the salmon runs in the lower river was critical to implementing the drainage-wide inseason management plan. Managers used information from all inseason assessment projects and fishermen reports to make daily management decisions and adjustments to fishing schedules based on the best currently available data and projections.

Ice break-up at the mouth of the Yukon River (near Emmonak) occurred on May 8, which was 13 days earlier than the average break-up (based on the years 1999–2018). The first Chinook and summer chum salmon of the year were caught in the Lower Yukon Test Fishery (LYTF) on June 2 and June 3, respectively; the first Chinook salmon was later than the average date of May 30 (based on the years 1999–2018), and the first summer chum salmon was later than the average date of June 1 (based on the years 2001–2018). The department relied on subsistence harvest reports to guide initial management actions during the early portion of the salmon runs.

The LYTF program is primarily designed to assess salmon run timing and consists of two Chinook salmon test fisheries. An 8.5-inch mesh set gillnet operated in the Middle and South mouths of the Yukon River and an 8.25-inch mesh drift gillnet operated at Big Eddy in the South Mouth, near Emmonak. The LYTF also has a summer chum salmon-directed drift gillnet test fishery, which uses 5.5-inch mesh gear operated in the Middle and South mouths. The LYTF provides relative catch data and Catch Per Unit Effort (CPUE), which gives an index of abundance and indicates the presence of large groups of fish or “pulses” entering the mouths of the river.

The LYTF was fully operational at the South Mouth (Big Eddy) drift and set gillnet sites on May 25 and June 2, respectively, and at the Middle Mouth set gillnet site on June 6. The LYTF set gillnets concluded operations on July 9 in the South Mouth and July 13 in the Middle Mouth. The cumulative Chinook salmon CPUE for the set nets was 37.96, which was above the historical average CPUE of 24.51. The first quarter point, midpoint, and third quarter point were June 18, June 23, and June 28, respectively. The 8.25-inch drift gillnet project for Chinook salmon operated in Big Eddy until July 15 and provided valuable supplemental run timing information for Chinook salmon entering the South Mouth of the Yukon River. The LYTF drift gillnets for summer chum salmon concluded operations on July 15. The cumulative summer chum salmon CPUE was 7,822.42, which was above the historical average CPUE of 6,707.64. The first quarter point, midpoint, and third quarter point were June 25, June 27, and July 1, respectively.

Chinook and summer chum salmon caught in the LYTF were either kept, sampled, and distributed to local community members or they were released alive. In 2019, 627 Chinook salmon were released alive from the LYTF while 1,597 Chinook salmon were distributed to local community

members, with emphasis given to elders and people who were unable to fish. For summer chum salmon, 298 fish were released alive, 4,353 fish were distributed with the community, and 230 were sold by the department as a means of offsetting the costs of LYTF program and/or because it can be hard to distribute fish when the community has already met their chum harvest needs. The fish donation program was coordinated with village tribal councils and with the assistance of Yukon Delta Fisheries Development Association.

The Pilot Station sonar provides abundance estimates and run timing information for Chinook and summer chum salmon. The test fishery at the sonar project is used to apportion the daily sonar counts by species and is also used to sample the salmon runs for ASL and genetic data. The department has endeavored to reduce Chinook salmon mortality in the Pilot Station sonar test fisheries by releasing all healthy Chinook salmon alive immediately after sampling. Any Chinook salmon mortalities were delivered to tribal councils in various nearby communities for distribution to elders.

The cumulative passage estimate at the Pilot Station sonar was approximately 219,500 Chinook salmon (with a 90% confidence interval of 199,000 to 240,000 Chinook salmon). This passage was above the historical average of approximately 181,600 fish. Most of the Chinook salmon entered the river in three pulses consisting of approximately 62,200 fish; 33,100 fish; and 84,900 fish. The first quarter point, midpoint, and third quarter point for Chinook at the Pilot Station sonar project were on June 20, June 26, and July 2, respectively. The 2019 Chinook salmon run appears to have been three days later than average based on the midpoint at the sonar project.

Approximately 1.4 million summer chum salmon were counted (with 90% confidence interval of approximately 1.3 million to 1.5 million salmon) at the Pilot Station sonar, which was below the historical median of 1.9 million fish for the project. Four pulses of summer chum salmon were detected at the sonar project; the largest group consisted of approximately 539,300 fish and passed by the sonar between July 2 and July 7. The 2019 summer chum salmon run was the latest on record. The first quarter point, midpoint, and third quarter point at the Pilot Station sonar were June 29, July 3, and July 5, respectively. This indicated that the summer chum salmon run was likely 6 days later than average based on the midpoint at the sonar project. Additionally, the first stratum (July 19 – July 26) of genetic samples taken during the fall season indicated the majority of chum passage were still considered summer chum. Consequently, summer chum salmon run timing was late at all salmon monitoring projects in 2019.

The Yukon River experienced extreme water conditions in 2019. Many projects were started late due to high water in the beginning, but later, water levels dropped to, or below, the lowest levels ever recorded for at least part of the season in most of the drainage. Water temperatures, however, were some of the highest observed at many projects. Sustained high water temperatures exceeded previous maximum daily temperatures at many projects in 2019, including the LYTF and Pilot Station sonar (Figures 2 and 3). From figures 2 and 3, one can see that high temperatures occurred beginning the second week of June which is during the peak of Chinook and summer chum salmon migration. In fact, there were 6 consecutive days at Pilot Station where water temperatures exceeded 70° F, though this period occurred during the fall season (when the majority of the Chinook and summer chum runs were through the lower river). Water temperatures above 70° F,

for prolonged periods, can cause salmon mortality (McCullough et al. 2001¹). Warm temperatures likely resulted in slower swim speeds for Chinook and summer chum salmon. There were reports of dead chum in the East Fork and West Fork of the Andreafsky River during the middle of July; however, the passage estimate at the weir and aerial surveys indicated escapement goals were achieved on that system. Similarly, 10 dead summer chum salmon were reported along the mainstem Yukon River above Russian Mission; all 10 had full egg skeins. Hundreds of dead chum salmon were reported along the banks of the Koyukuk River by several local fishermen in late July. During a short boat survey between Hughes and Huslia, researchers counted around 800 chum salmon carcasses, which was considered an underestimate. All carcasses that were examined had not spawned. Most of the Koyukuk River summer chum salmon (headed for their spawning grounds at Henshaw and Gisasa rivers) likely migrated through the mainstem Yukon during early June's maximum temperatures and in the Koyukuk river during a period of extremely warm days with likely critically warm water temperatures. The very low escapement in the Gisasa River and Henshaw Creek may have been partially attributed to salmon dying en route to the spawning grounds due to complications with heat stress. Despite these reports about summer chum salmon, there were very few reports of other species and no reports of Chinook salmon found dead in pre-spawn condition within the Yukon drainage.

2019 Subsistence Fishery Management Overview

In accordance with discussions at the fishermen's pre-season planning meeting, managers expected to provide some restricted subsistence harvest opportunity for Chinook salmon and liberal subsistence and commercial opportunity for summer chum salmon.

Due to much support at the 2019 Board of Fisheries meeting for the traditional and religious importance of harvesting the first salmon, the management strategy continued to allow fishing on the early trickle of Chinook salmon that come in prior to the first pulse in all districts. This also provides early opportunity to target sheefish when only a small percentage of Chinook salmon are in the area. Managers waited for increased Chinook salmon catches at LYTF (indicating the presence of the first pulse) before restricting the subsistence gillnet fishery to the reduced schedule with 7.5-inch or smaller mesh gillnets. In District 1 fishermen were placed on a reduced regulatory schedule of two 18-hour periods per week starting on June 10. Other districts went to their reduced schedules according to fish travel time.

During the 2018 Board of Fisheries meeting, the regulation requiring full fishing closures during the first pulse of Chinook salmon in Districts 1 and 2 was removed when projected run sizes are adequate to meet escapements. However, the management strategy has been to reduce fishing schedules to half the regulatory time in order to protect *part of each pulse* to account for inseason uncertainty about the size and timing of the Chinook salmon run. This management action, even in years when abundance appears to be above average, is a good inseason tool to spread the harvest across the run and the various stocks. This year's trickle of Chinook was much stronger than 2018, therefore early harvests were reported to be good for Chinook on the first weekly YR DFA teleconferences.

¹ McCullough, D. S. Spalding, D. Sturdevant, and M. Hicks. 2001. Summary of technical literature examining the physiological effects of temperature on salmonids. Issue Paper 5. U.S. Environmental Protection Agency. EPA-910-D-01-005.

The summer chum run often comes into the river concurrent with Chinook, though the peak of that run is slightly later than Chinook. In 2019, the summer chum run was almost a week late, giving managers concerns about the strength of the run. With the first half of the summer chum run assessing below average, no commercial fishing periods occurred during the month of June because it was not clear how much harvestable surplus would be available. The low abundance of summer chum salmon during the first half of the summer season may have increased the efficiency of fishermen in harvesting Chinook salmon despite management restrictions.

In most districts, the normal regulatory schedule consists of two fishing periods per week but varies by duration and days of the week (Table 1). This season, as Chinook salmon migrated into each district, districts were put on a reduced regulatory schedule in which each period was shorted by about half the usual fishing time. Based on fishermen feedback, these schedules were adjusted this season to provide weekend fishing days whenever possible. For all management actions by district, see Table 2.

Table 1.–Yukon Area *Reduced* Regulatory Subsistence Salmon Fishing Schedule, 2019.

Area	Regulatory subsistence fishing periods	Open fishing times
Coastal District	7 days/week *not changed	M/T/W/TH/F/SA/SU - 24 hours/day
District 1	Two 18-hour periods/week	Tue. 2 pm to Wed. 8 am / Fri. 2 pm to Sat. 8 am
District 2	Two 18-hour periods/week	Sat. 2 pm to Sun. 8 am / Wed. 2 pm to Thu. 8 am
District 3	Two 18-hour periods/week	Sat. 2 pm to Sun. 8 am / Wed. 2 pm to Thu. 8 am
District 4	Two 24-hour periods/week	Sat. 6 pm to Sun. 6 pm / Tue. 6 pm to Wed. 6 pm
Koyukuk and Innoko Rivers	Two 24-hour periods/week 7 days/week *not changed	Sat. 6 pm to Sun. 6 pm / Tue. 6 pm to Wed. 6 pm M/T/W/TH/F/SA/SU - 24 hours/day
Subdistricts 5-A, -B, -C	Two 24-hour periods/week	Tue. 6 pm to Wed. 6 pm / Fri. 6 pm to Sat. 6 pm
Subdistrict 5-D	3.5 days/week (84 hours)	Fri. 10 am to Monday 10 pm 84 hours/week
Subdistrict 6	Two 24-hour periods/week	Mon. 6 pm to Tue. 6 pm / Fri. 6 pm to Sat. 6 pm
Old Minto Area	5 days/week *not changed	Friday 6 pm to Wednesday 6 pm

Note: This schedule was adjusted preseason based on fishermen feedback to include weekend periods when possible. In the Upper Yukon, fishing times are longer by regulation to help account for longer travel times and lower numbers of fish available as they leave the mainstem Yukon River to spawn. Coastal District, Koyukuk and Innoko Rivers, and Old Minto schedules were not reduced due to the low abundance of available Chinook salmon.

The management strategies used for 2019 were formulated from lessons learned during previous seasons and were similar to actions taken in 2018. Even as projected counts at the sonar indicated the run might be upwards of 200,000 fish, management actions stayed conservative for two reasons: 1) the mainstem water temperatures were warm enough to indicate the salmon might experience heat stress and it was unknown if there would be increased mortality before fish made it to spawning grounds 2) Chinook salmon harvests can be limited by the high abundance of summer chum filling a fishermen's net. However, fishermen reported good harvests of Chinook and better harvests than the previous year, possibly due to the lack of chum salmon present during the first half of the season and favorable fishing conditions. For these reasons, despite relatively high Chinook counts at the sonar, managers felt that it was warranted to continue to manage conservatively. Therefore, in addition to the reduced fishing period length, the strategy of cancelling one fishing period per week in most districts to protect each pulse of fish and to spread the harvest across all pulses was implemented in all districts. To further protect Chinook salmon, fishing was also limited to 6-inch or smaller mesh gillnets at times. This was to allow fishermen

opportunity to harvest summer chum for subsistence while restricting the harvests of Chinook salmon. However, due to early concern for the summer chum run strength, the 6-inch mesh restriction was not used as much this season.

By around June 26 (the midpoint of the run) the projected season total at Pilot station was 220,000 Chinook salmon and using genetics, an estimated 95,000 Canadian-origin salmon would pass the sonar. These estimated run sizes should have provided a harvest similar to last year and met all escapement and harvest sharing goals with Canada. (For perspective, Alaskan fishermen harvested about 19,000 Canadian-origin salmon in 2018 with similar fishing restrictions). However, by July 24, the Eagle sonar had been going long enough to predict season total count for that project, and it was clear the fish weren't showing up in the numbers indicated by the Pilot Station sonar. So, the reduced schedule was implemented in Subdistrict 5-D with a 6-inch gillnet restriction. This was followed by a cancelled period. In Subdistrict 5-D, because the reduced schedule consists of a single 84-hour period per week, this resulted in a 10-day closure. This was commensurate with the restrictive actions taken in nearly all other districts.

As usual, the use of 4-inch or smaller mesh gillnets was allowed for the harvest of non-salmon species, such as sheefish, whitefish species, and Northern pike at all times during subsistence salmon fishing closures throughout the season, in all districts.

Over the last several years, Yukon River fishermen have exhibited incredible flexibility in complying with schedule changes and gear restrictions. The department acknowledges the continued commitment made by fishermen to conserve and share the Chinook salmon resource. Managers rely heavily on input from fishermen post-season about how management strategies worked and didn't work for their area.

Table 2: Management Actions by district including schedule reductions, cancelled periods and maximum allowed mesh size, 2019.

District or Subdistrict	Reduced ^a schedule with 7.5-inch	Reduced schedule with 6-inch	Cancelled subsistence period	Full Regulatory schedule with 7.5-inch mesh	Start fall season schedule ^b
South Coastal, Koyukuk and Innoko Rivers	Not implemented	Not implemented	Not implemented	Remained open 24/7 all season	Schedule is the same, summer and fall
District 1 and North Coastal ^c	June 10 to June 20 (3 periods) and July 2 to July 15 (4 periods)	June 21 to July 1 (2 periods)	June 25 (1 period)	N/A. Fishing remained on 1/2 regulatory schedule to allow closures around commercial periods (July 3-July 15)	July 16
District 2	June 13 to June 21 (2 periods) and July 3 to July 19 (5 periods)	June 22 to July 2 (2 periods)	June 26 (1 period)	N/A. Fishing remained on 1/2 regulatory schedule to allow closures around commercial periods (July 5-July 16)	July 19
District 3	June 16 to June 21 (1 period) and July 3 to July 4 (1 period)	June 22 to July 2 (2 periods)	June 26 (1 period)	July 5 until end of summer season (four periods)	July 21
Subdistrict 4-A	July 2 (1 period)	June 19 to June 28 (2 periods)	June 29 (1 period)	July 7 until end of summer season (five periods)	July 24

District or Subdistrict	Reduced ^a schedule with 7.5-inch	Reduced schedule with 6-inch	Cancelled subsistence period	Full Regulatory schedule with 7.5-inch mesh	Start fall season schedule ^b
Subdistrict 4-BC	Not implemented	June 23 to July 1 (2 periods)	July 2 (1 period)	July 3 until end of summer season (seven periods)	July 28
Subdistrict 5-A, 5-B, 5-C	Not implemented	June 26 to July 8 (3 periods)	Not implemented	July 9 to end of summer season (eight periods)	August 6
Subdistrict 5-D	Not implemented	July 24 to August 12 (2 periods)	August 2 (1 period: resulted in 10 day closure) ^a	August 12	August 12
District 6	Not implemented	June 29 to July 11 (3 periods)	Not implemented	July 12 until end of year (remains on schedule by regulation)	Schedule is the same, summer and fall

Note: Prior to the reduced schedule in each district, subsistence was open 24 hours a day, seven days a week with 7.5 inch or smaller mesh gillnets. When a mesh size is listed, any smaller mesh sizes may be used.

^a Reduced regulatory schedule was half the full regulatory schedule (see Table 1).

^b Fall season schedules are open 5 days per week, or 24 hours a day seven days a week unless closed around commercial openings.

^c The community of Kotlik remained unrestricted for one additional week at the start of the season (due to delayed Chinook arrival to North mouth), then from June 17 on was managed the same as Y1.

2019 Commercial Fishery

The commercial summer chum season was unusually late in beginning. Usually harvest begins with selective gear, to avoid retention of Chinook salmon, but the chum commercial season started so late that the fleet was able to begin with 6-inch or smaller mesh gillnets and retention of Chinook salmon for personal use. Catches of Chinook salmon were low, since the bulk of the run had passed the lower river. This season there was one processor purchasing chum salmon in Districts 1 and 2 and a single processor in District 6. For the twelfth consecutive year, no commercial periods targeting Chinook salmon were allowed in the Yukon Management Area during the summer season. However, sale of incidentally-caught Chinook salmon was allowed, beginning July 9 because it was determined that with over 200,000 Chinook salmon counted at Pilot Station, escapement goals were likely to be met, and most fishermen in the lower river had met their needs for Chinook salmon, so allowing fishermen the choice of sale or retention of incidentally harvested fish was warranted.

Lower Yukon Districts Commercial Fishery

The use of gillnets in the summer chum commercial fishery was delayed until approximately 94% of the Chinook salmon run had passed through District 1. Commercial fishermen were required to report any Chinook salmon caught but not sold on fish tickets and a total of 1,148 Chinook were retained for subsistence from July 3 to July 8. During the summer chum salmon commercial season in Districts 1 and 2, a preliminary total of 2,582 Chinook salmon were incidentally harvested and sold. During the fall season an additional 523 Chinook salmon were sold for a total of 3,105 fish. The total number of Chinook salmon harvested incidentally in the chum commercial fisheries (4,253 fish) in 2019 was slightly larger than the recent 5-year (2014–2018) average of 3,694 fish, but lower than the over 5,400 Chinook salmon harvested incidentally in 2016 and 2017.

The cumulative summer chum salmon commercial harvest for Districts 1 and 2 combined was 225,493 fish (Appendices A and B). Also sold during the summer season were 10,962 pink salmon.

The summer chum harvest was 47% below the recent 5-year (2014–2018) average harvest of 428,554 fish and was the second lowest harvest since 2009 (Appendix B). Though genetic information indicates that many of the chum harvested during the first fall season commercial openings were summer chum salmon, the standard reporting practice is to call all chum “fall chum” beginning July 16 in District 1 and July 18 in District 2. Therefore, the harvests of summer chum are considered conservative estimates for 2019.

Upper Yukon Districts Commercial Fishery

Similar to 2011, 2015 and 2016, the commercial processor in District 4 did not operate in 2019. In District 6 the first summer chum salmon-directed commercial fishing period was on July 26 (Appendix A). Gear restrictions were not implemented during the commercial fishery; fishermen could use 7.5-inch or smaller mesh gillnets and fish wheels, however only fish wheels were used in 2019. Chinook salmon could not be sold but could be retained for personal use. The preliminary cumulative harvest was 1,596 summer chum salmon and 31 Chinook kept for personal use (Appendix A). The 2019 District 6 commercial harvest was 66% below the recent 5-year (2014–2018) average of 4,686 summer chum salmon (Appendix B). High water and large woody debris hampered fish wheel operations, reducing harvest considerably.

The total 2019 commercial harvest for the Yukon Area was 227,089 summer chum salmon, which was 55% below the recent 5-year (2014–2018) average harvest of 509,705 fish (Appendix B).

2019 Fishing Effort and Exvessel Value

A total of 335 permit holders participated in the summer chum salmon commercial fishery, approximately 20% below the recent 5-year (2014–2018) average of 423 permit holders. The Lower Yukon Area (Districts 1–3) and Upper Yukon Area (Districts 4–6) are separate Commercial Fisheries Entry Commission (CFEC) permit areas. A total of 334 permit holders fished in the Lower Yukon Area in 2019, which is below the recent 5-year (2014–2018) average of 416 permits. In the Upper Yukon Area, only 1 permit holder fished, which was below the recent 5-year (2014–2018) average of 7. In 2019, summer chum salmon run returned with late run timing and did not exceed 650,000 fish past Pilot Station sonar until June 25.

Lower Yukon Area fishermen received an average \$0.60 per pound for summer chum salmon and \$820,650 for their summer chum harvest in 2019 (Appendix C). Pink salmon in the Lower Yukon were sold for \$0.10 per pound with a total value of \$3,380. Fishermen received an additional \$210,079 for Chinook salmon harvested during the summer season (an additional \$41,216 worth of Chinook salmon were sold during fall season). The estimated average income for Lower Yukon Area fishermen in the 2019 summer season was \$3,096 per fisherman, which was below the recent 5-year average (2014–2018) income of \$3,862 per fisherman from commercial sales during the summer season. Despite the relatively low harvest of summer chum salmon compared to recent years, the average value of harvest per fishermen remained near the average due to fewer fishermen participating and value from Chinook and pink salmon sales.

Upper Yukon Area fishermen received an average of \$0.29 per pound for summer chum salmon for a total value of \$2,819. The estimated average income for upper Yukon Area fishermen in the 2019 summer season was \$2,819, which was below the recent 5-year average (2014–2018) income of \$13,820 per fisherman. This average includes years when the commercial fishery also occurred in District 4.

2019 Age, Sex and Stock Composition

Age and Sex Composition in LYTF

The Chinook salmon age composition from the 8.5-inch mesh LYTF set nets (Big Eddy and Middle Mouth sites combined) was 6% age-4, 33% age-5, 58% age-6, and 3% age-7 fish. The sample size was 833 fish and females comprised 55% of the samples. The age-5 percentage was slightly below average; the age-6 and age-7 percentages were near average; and females were slightly above average based on the years 2009–2018. It is important to note that while mesh sizes have been consistent across years, catch in the large mesh gear used at LYTF is biased toward older, larger fish.

The summer chum salmon age composition from the 5.5-inch mesh LYTF drift nets was 62% age-4, 37% age-5, and 1% age-6 fish. The sample size was 729 fish and females comprised 57% of the samples. The age-4 percentage was above average, and the age-5 percentage was below average based on the years 2009–2018. The percent female was average.

Age and Sex Composition in Commercial Harvest

The age composition of incidentally caught and sold Chinook salmon during the District 1 summer chum commercial fishery was 53% age-5, 26% age-6, and 21% age-4 fish. Fewer than 1% of the fish sampled were age-3 or age-7 fish. The sample size was 242 fish and females comprised 44% of the fish sampled. The summer chum salmon age composition from the District 1 gillnet commercial fishery was 79% age-4, 20% age-5, and 1% age-6 fish. The sample size was 393 fish and females comprised 43% of the gillnet harvest. A total of 180 summer chum salmon from the District 6 fishwheel commercial fishery were sampled for sex and length in 2019. About 48% of the summer chum salmon sampled were female and they had an average length of 574 mm.

Age and Sex Composition in Pilot Station Sonar test fishery

The Chinook salmon age composition from the 691 samples that were aged from the test fishery at the Pilot Station sonar project (all mesh sizes combined) was less than 1% age-3, 12% age-4, 48% age-5, 39% age-6, and 2% age-7 fish. Females comprised 50% of the fish sampled. The age composition was near the 2009–2018 average for all age classes while percent female was above average. It is important to note that while the project uses a wide range of mesh sizes, and likely captures a representative sample across sizes and age classes, the sex is determined visually, and this method has reduced accuracy compared to internal inspection.

Stock identification in Pilot Station test fishery

Genetic information was collected from Chinook and summer chum salmon at the Pilot Station sonar throughout the summer season. Genetic mixed stock analysis (MSA) on the early group and first pulse of Chinook salmon sampled at the Pilot Station sonar (June 2 to June 23) indicated that 56% of the fish sampled were of Canadian-origin. Genetic MSA on the second pulse, and part of the third pulse of Chinook salmon sampled at the sonar (June 24 to June 30) indicated that 42% of the fish sampled were of Canadian-origin. Genetic MSA on the remaining fish from the third pulse of Chinook salmon sampled at the sonar (July 1 to July 7) indicated that 36% of the fish sampled were of Canadian-origin. The total percentage of the run estimated at Pilot Station sonar (weighted based on passage estimates) was 45% Canadian-origin, which is slightly above the average of 41%

for this stock. For more background information on genetic MSA for Yukon River Chinook salmon, please refer to the department's Gene Conservation Laboratory webpage².

Four strata of chum salmon genetic samples have been processed to date in 2019. The strata from June 4–June 24 consisted of 99% summer chum salmon, of which 80% were lower river stocks and 19% were bound for the middle Yukon River. The strata from June 25–July 7 also consisted of 99% summer chum salmon, of which 71% were lower river stocks, 20% were bound for the middle Yukon River, and 8% were bound for the Tanana River. The third summer strata from July 8–18 consisted of 99% summer chum salmon, of which 88% were lower stocks, 8% were bound for the middle Yukon River, and all other stocks were negligible. The Tanana River summer component was extremely weak in the third stratum, while the lower river component was the highest on record (years 2004–2018). Additionally, the strata from July 19–26, which has historically been predominately fall chum salmon, was determined to be 88% summer chum salmon, of which 64% were lower stocks, 11% were middle stocks, and 13% were bound for the Tanana River. While the Tanana component of this strata was normal, the lower river component of summer chum salmon was the highest on record (years 2004–2018). Even though genetic testing indicated a high proportion of summer chum salmon were present during the first week of the fall season, the administrative cut-off date for summer and fall chum is July 16 in Y1 and July 18 at Pilot station sonar and for Y2 commercial harvests. These dates are used to maintain consistency with historical data sets, and in any given year the proportions of summer chum still passing in the fall season varies. Therefore, the 2019 season end total of summer chum is an underestimate, as are the 2019 commercial harvests of summer chum.

Age and Sex Composition in Eagle Sonar test fishery

The Chinook salmon age composition from the 551 samples that were aged from the test fishery at the Eagle sonar project (all mesh sizes combined) was 9% age-4, 49% age-5, 42% age-6, and 1% age-7 fish. All ages were similar to the 2014–2018 averages. Females made up 48% of the fish sampled, which was above the 2014–2018 average of 41%. This project has used a consistent suite of mesh sizes since it began in 2005. The smallest mesh used at the project is 5.25-inch, so the smallest fish may be underrepresented in the samples.

2019 Escapement

Chinook Salmon Escapement

In 2019, all but one Alaskan Chinook salmon escapement goals were met (Table 2). The upper end of the escapement goal at the East Fork Andreafsky weir was exceeded. The passage that occurred at the border was much lower than expected based on inseason abundance estimates of approximately 95,000 Canadian-origin salmon, an above-average abundance for that stock. The cumulative passage estimate at the Eagle sonar was approximately 45,560 Chinook salmon, (with a 90% confidence interval of 45,110 to 46,010 Chinook salmon). However, this is not considered a true escapement estimate as it does not account for harvest in Eagle or Canada. This passage may meet the lower end of the Interim Management Escapement Goal (IMEG) for Canada of 42,500–55,000 salmon (but this will be determined once harvest estimates are available). In the last 2 years under similar run sizes and management actions, Alaskans have harvested an average of 20,000 Canadian-origin salmon. It is too early to speculate why so few fish made it to the border without

² http://www.adfg.alaska.gov/index.cfm?adfg=fishinggeneconservationlab.yukonchinook_baseline

harvest data, however it seems unlikely in light of the many restrictions in place inseason, that harvests of the Canadian-origin stock alone could have doubled in Alaska.

Table 2.—Escapement goals and preliminary passage estimates for Chinook salmon at selected Yukon River tributaries, 2019.

Project	Current Goal	Type of Goal	Historical Average ^a	2019 Escapement
Eagle Sonar	42,500–55,000	IMEG	57,165	45,560*
East Fork Andreafsky Weir	2,100–4,900	SEG	3,933	5,111
Gisasa River Weir	-	-	1,939	1,328
Henshaw Creek Weir	-	-	1,131	438
Chena River Tower	2,800–5,700	BEG	6,381	2,018
Salcha River Tower	3,300–6,500	BEG	9,157	4,678
Anvik River Aerial	1,100–1,700	SEG	1,206	1,432
West Fork Andreafsky Aerial	640–1600	SEG	1,118	1,004
Nulato River Aerial	940–1,900	SEG	1,305	1,141

*Note: The passage estimate at Eagle Sonar is not an escapement estimate. There is some harvest that occurs between the project and the border, and harvest that occurs in Canada. En dash indicates no goal at the project.

^a Historical average include all years the projects operated and excludes years the projects operated poorly.

Summer Chum Salmon Escapement

Three escapement goals exist for summer chum salmon: a drainage-wide goal of 500,000–1,200,000 fish (established in 2016) and goals at the East Fork Andreafsky River and the Anvik River (Table 3). The drainage-wide escapement goal and the East Fork Andreafsky River goals were exceeded; however, the Anvik River goal was not met. While they don't have summer chum salmon escapement goals, passage estimates at the Gisasa and Henshaw Creek weirs in the Koyukuk River drainage were well below average. Temperatures in the lower Yukon and Koyukuk rivers were warmer than previously recorded for an extended period in 2019. Thus, en route mortality related to heat stress may have contributed to the exceptionally low passage in the Koyukuk River. Passage estimates at the Chena and Salcha river towers were below average, but were incomplete because the summer chum salmon run was the latest on record and the projects stopped operating before most of the summer chum salmon run was expected to arrive at the projects.

Table 3.—Escapement goals and preliminary passage estimates for summer chum salmon at selected Yukon River tributaries, 2019.

Project	Current Goal	Type of Goal	Historical Median ^a	2019 Escapement
Drainage-wide	500,000–1,200,000	BEG	1,799,740	1,398,605 ^b
East Fork Andreafsky River Weir	> 40,000	SEG	55,955	49,881
Anvik River Sonar	350,000–750,000	BEG	545,720	249,013
Gisasa River Weir	-	-	46,257	19,099
Henshaw Creek Weir	-	-	189,319	34,342
Chena River Tower	-	-	6,594	2,704 ^c
Salcha River Tower	-	-	16,429	2,117 ^c

Note: En dash indicates no goal at the project.

^a Historical average include all years the projects operated with the exclusion of years the projects operated poorly.

^b Estimate of abundance at the Pilot Station sonar. After accounting for commercial harvest in District 6 (1,596 fish) and the 2009–2018 average subsistence harvest above the sonar (27,700 fish) it is assumed the upper end of the goal was exceeded.

^c Tower stopped operating before most of the summer chum salmon run was expected to arrive.

Canadian Fisheries

The pre-season outlook was for a run size of approximately 69,000 to 99,000 Canadian-origin Chinook salmon. Fishery Managers at the Department of Fisheries and Oceans Canada (DFO) implement Canadian Chinook fisheries according to International (i.e. Pacific Salmon Treaty; Yukon River Salmon Agreement) and Domestic allocation provisions outlined in the Yukon River Integrated Fisheries Management Plan (IFMP). Based on the pre-season information and the in-season estimate of 95,000 Canadian-origin Chinook salmon passage at Pilot Station and taking into consideration escapement goals, harvest shares, and the IFMP, the Chinook Salmon run was considered to be of sufficient abundance to provide for a full allocation to the First Nation Fishery (i.e. “Green” zone). The recreational, commercial and domestic Fisheries were closed. When confident that the passage at Eagle sonar would be less than 50,000 Chinook salmon, DFO changed the First Nation Fishery Harvest zone to “Yellow” and advised First Nation Governments to implement a precautionary approach to harvest. DFO maintained the closures in the recreational, commercial and domestic fisheries throughout the 2019 Chinook run. While not all information is currently available, preliminary data indicates that First Nation harvest on the Mainstem Yukon River is likely to be less than 50% of historical average.

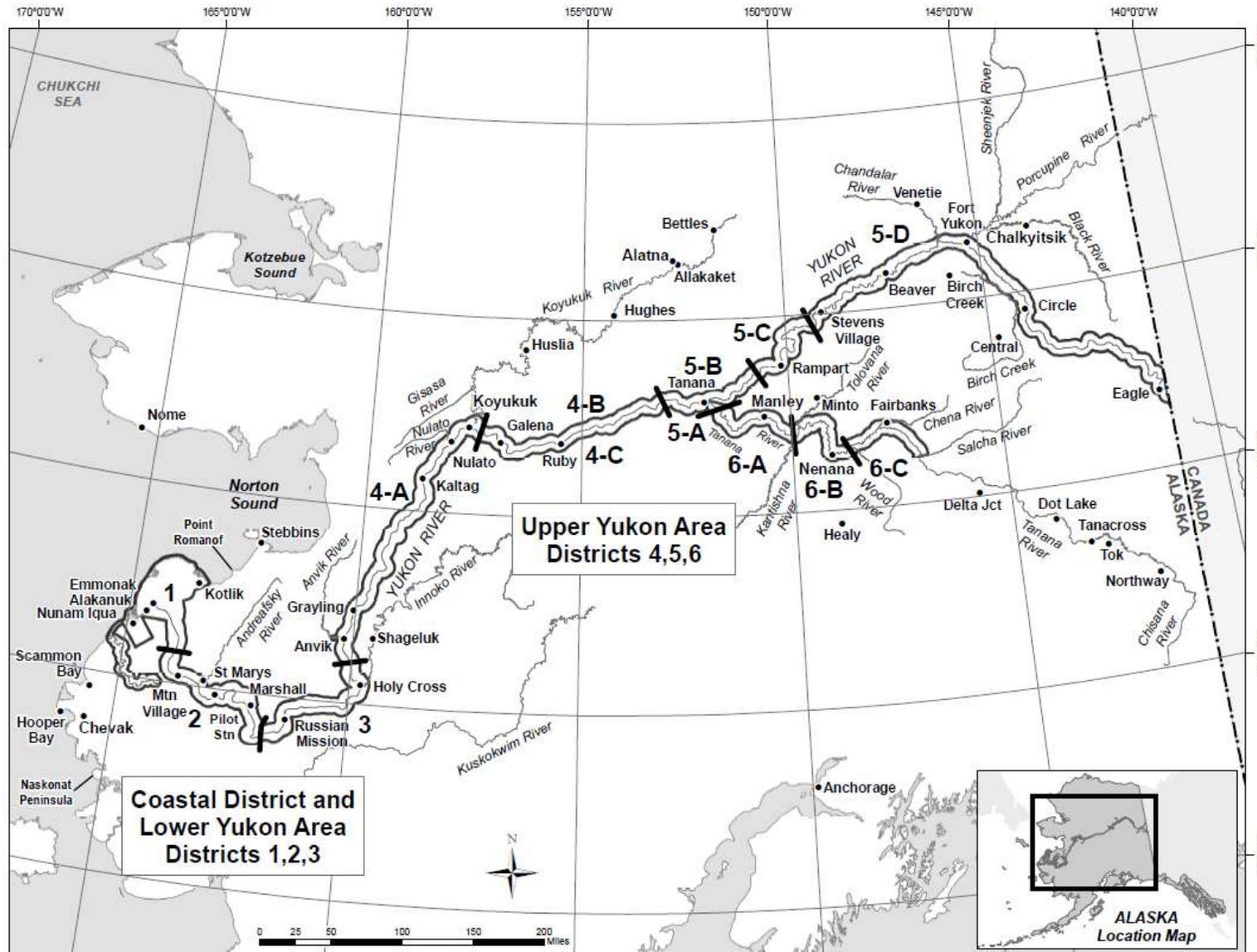


Figure 1.—Yukon Area communities and fishing districts.

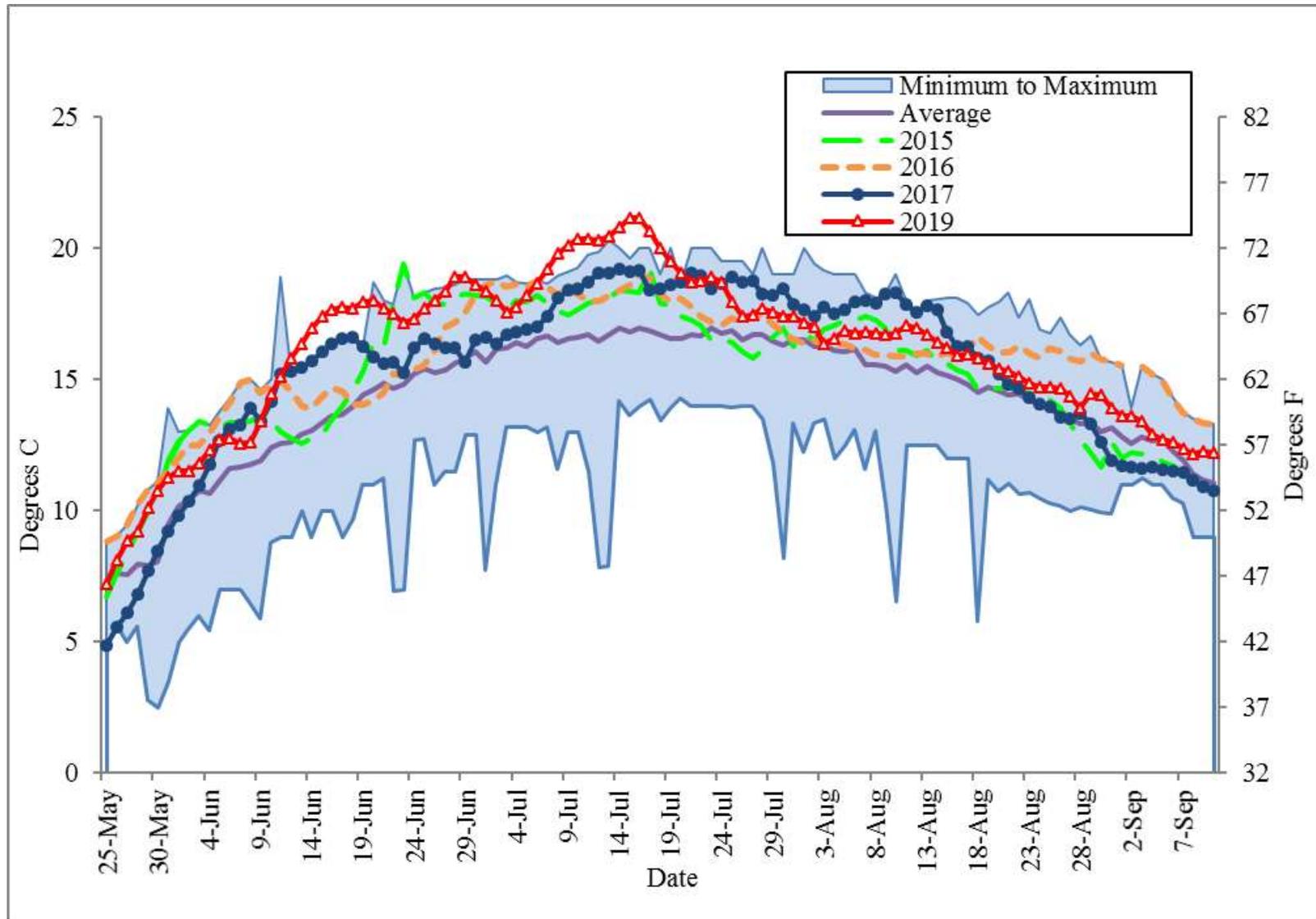


Figure 2.— Average daily water temperatures collected (from both manual 1984–present and loggers 2004–2018) in the Yukon River near Emmonak, comparing 2019 and select years to historical minimum, maximum, and average temperatures.

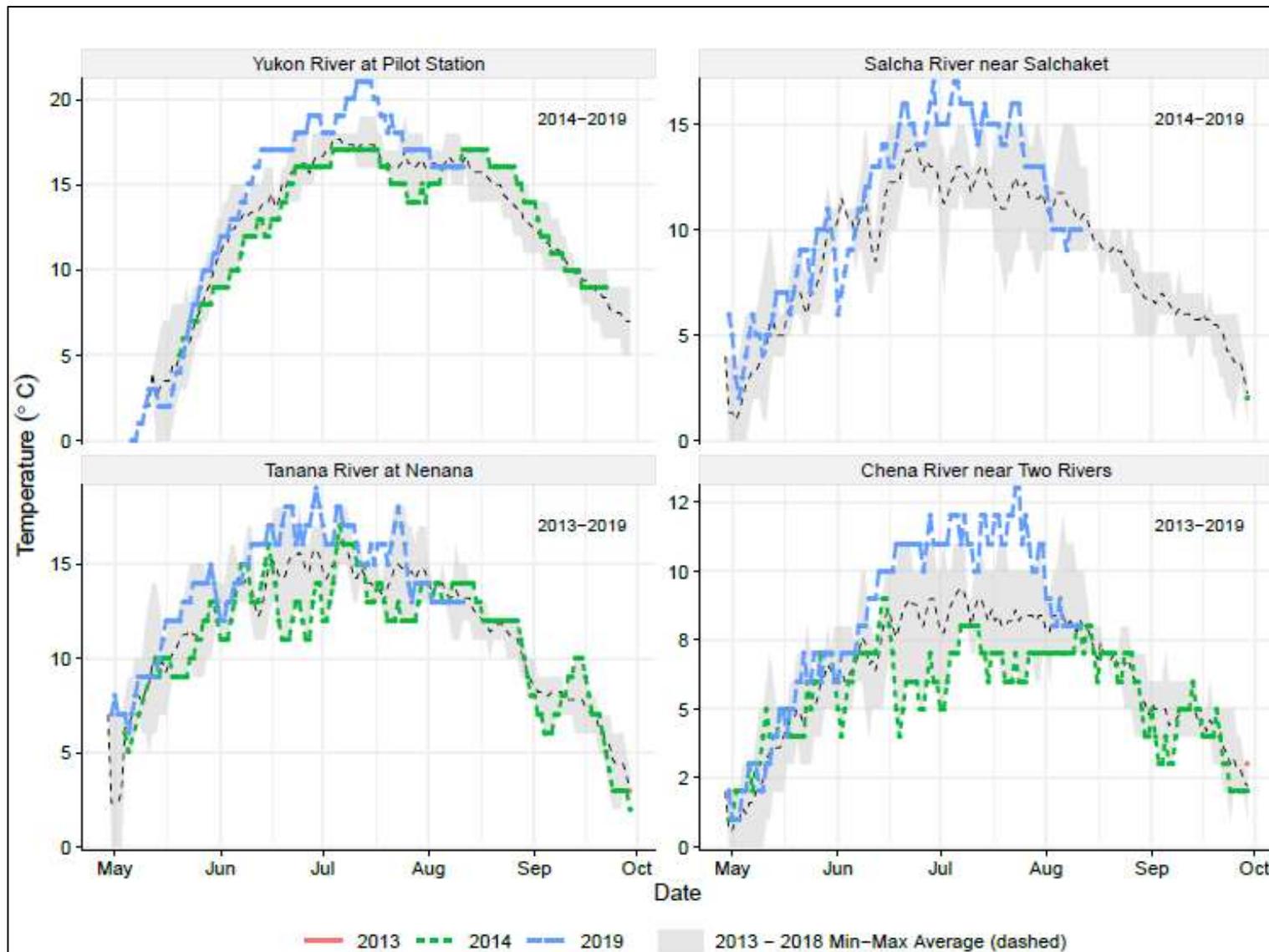


Figure 3.– Average daily water temperatures collected (from both manual 1984–present and loggers 2004–2018) in the Yukon River drainage at select locations, comparing 2019 and select years to historical minimum, maximum, and average temperatures.

Appendix A.–Preliminary summer season commercial harvest summary, Yukon Area, 2018. Page 1 of 3.

District 1																
Period	Start Time	Start Date	Hours Fished	Gear Type	Mesh Size	Number of Fishermen	Chinook Salmon				Summer Chum Salmon			Pink salmon		
							Number caught but not sold	Incidental sale		Avg. wt.	Number	Pounds	Avg. Wt.	Number	Pounds	
1	4:00 PM	3-Jul	8	DGN	6	175	486	0	0		35,208	222,115	6.3	327	1,276	
2	6:00 PM	4-Jul	8	DGN	6	170	215	0	0		28,304	174,075	6.2	344	1,296	
3	4:00 PM	6-Jul	8	DGN	6	135	141	0	0		6,197	37,253	6.0	702	2,424	
4	6:00 PM	8-Jul	8	DGN	6	115	250	0	0		11,970	70,137	5.9	2,153	6,681	
5	6:00 PM	10-Jul	12	DGN	6	189	0	618	7,486	12.1	11,298	65,740	5.8	3,717	11,176	
6	6:00 PM	12-Jul	12	DGN	6	180	0	563	7,009	12.4	49,952	303,764	6.1	3,393	9,978	
7	2:00 PM	13-Jul	16	DGN	6	172	0	344	4,335	12.6	32,234	192,044	6.0	11	37	
8	4:00 PM	14-Jul	14	DGN	6	66	0	107	1,246	11.6	4,344	25,070	5.8	0	0	
9	2:00 PM	15-Jul	10	DGN	6	100	0	81	1,049	13.0	4,151	24,597	5.9	0	0	
Fall Season							0	382	4,378	11.5						
District 1 Subtotal:																
Summer season only:			96				249	1,092	1,713	21,125	12.3	183,658	1,114,795	6.1	10,647	32,868
District 1 Subtotal summer and fall season Chinook salmon:								1,092	2,095	25,503	12.2					

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Appendix A.–Preliminary summer season commercial harvest summary, Yukon Area, 2018. Page 2 of 3.

District 2																
Period ^a	Start Time	Start Date	Hours Fished	Gear Type	Mesh Size	Number Fishermen	Chinook Salmon			Summer Chum Salmon			Pink salmon			
							Number caught but not sold	Incidental Sale Number	Pounds	Avg. wt.	Number	Pounds	Avg. Wt.	Number	Pounds	
1	6:00 PM	5-Jul	6	DGN	6	40	56		0			9,086	57,251	6.3	7	28
2	-	-	-	-	-	-			-			-	-	-	-	-
3	6:00 PM	9-Jul	8	DGN	6	49	0	265	3,365	12.7	4,082	25,543	6.3	78	249	
4	6:00 PM	11-Jul	12	DGN	6	41	0	245	3,016	12.3	4,197	25,049	6.0	120	365	
5	6:00 PM	12-Jul	12	DGN	6	35	0	109	1,445	13.3	4,374	25,788	5.9	110	325	
6	6:00 PM	14-Jul	12	DGN	6	65	0	160	1,837	11.5	13,009	77,516	6.0	0	0	
7	-	-	-	-	-	-	0		-		-	-	-	-	-	
8	6:00 PM	16-Jul	12	DGN	6	49	0	90	1,108	12.3	7,087	41,815	5.9	0	0	
Fall Season:							0	141	1,510	10.7						
District 2 Subtotal:																
Summer season only:			62				89	56	869	10,771	12.4	41,835	252,962	6.0	315	967
District 2 Subtotal																
summer and fall Chinook salmon:							56	1,010	12,281	12.2						
Lower Yukon Area, Summer Season, Districts 1-2																
subtotal: ^b			158				334	1,148	2,582	31,896	12.4	225,493	1,367,757	6.1	10,962	33,835
Districts 1 and 2 Summer and Fall season Chinook salmon																
subtotal: ^b							417	1,148	3,105	37,784	12.2					

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Appendix A.–Preliminary summer season commercial harvest summary, Yukon Area, 2019. Page 3 of 3.

Subdistricts 6-A, 6-B, and 6-C

Period	Start Time	Start Date	Hours Fished 6-AB	Gear Type	Mesh Size	Number Fishermen	Chinook Salmon			Summer Chum Salmon		
							Number Caught and Released	Number Caught but Not Sold		Number	Pounds	Avg. Wt.
1	6:00 PM	26-Jul	42	FW	6.0	1	0	17		217	1,302	6.0
2	6:00 PM	29-Jul	24	FW	6.0	1	0	10		529	3,368	6.4
3	6:00 PM	2-Aug	42	FW	6.0	1	0	0		240	1,493	6.2
4	6:00 PM	5-Aug	42	FW	6.0	1	0	0		77	431	5.6
5	6:00 PM	9-Aug	42	FW	6.0	1	0	4		533	2,984	5.6
District 6 Subtotal:			192			1	0	31		1,596	9,578	6.0
Upper Yukon subtotal:			192			1	0	31		1,596	9,578	6.0
Yukon Area, Summer Season, Districts 1-6 Total: ^{b, c}							Chinook salmon			Summer Chum Salmon		
							Released	Not sold	Sold	Number	Pounds	Ave.
							0	1,179	2,582	227,089	1,377,335	6.1

Note: Due to the late opening of the summer chum salmon commercial fishery relative to Chinook salmon run timing, Chinook salmon caught in gillnets were allowed to be sold throughout the summer and fall seasons.

^a There was no buyer during some District 2 periods.

^b The number of fishermen is the unique number of permits fished. Some fishermen may fish multiple areas or during only one season, therefore the subtotals will not necessarily add up by district.

^c There was no buyer operating in District 4 in 2019. Commercial fishing did not occur in District 3, or in District 5 during the summer season.

Appendix B.–Summer chum salmon commercial harvests by district for 2009–2019.

District/ Subdistrict	Guideline harvest range	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	5-yr Average (2014–2018)
District 1		71,335	102,267	163,439	150,800	207,871	198,240	172,639	293,522	345,395	250,958	183,658	252,151
District 2		86,571	80,948	103,071	57,049	171,272	229,107	181,447	228,267	47,770	195,423	41,835	176,403
Subtotal Dist. 1–2	251,000– 755,000	157,906	183,215	266,510	207,849	379,143	427,347	354,086	521,789	393,165	446,381	225,493	428,554
Subdistrict 4-A	113,000– 338,000	4,589	44,207	–	108,222	100,507	96,385	–	–	159,051	126,892	–	127,443
District 6	13,000–38,000	7,777	5,466	8,651	3,504	5,937	6,912	4,770	4,020	4,300	3,427	1,596	4,686
Total Districts 1-6	400,000– 1,200,000	170,272	232,888	275,161	319,575	485,587	530,644	358,856	525,809	556,516	576,700	227,089	509,705

Note: Commercial harvest only includes summer chum salmon sold in the round. The guideline harvest ranges for District 3 and District 5 are 6,000–19,000 fish, and 1,000–3,000 fish. No summer chum salmon were sold in Districts 3 and 5 from 2009–2019.

Appendix C.–Value of commercial salmon fishery to Yukon Area fishermen, 2009–2019.

Year	Chinook		Summer Chum			Value by Species (dollars)		Value by Area (dollars)		Total dollars			
	Lower Yukon		Lower Yukon		Upper Yukon	Chinook	Summer Chum	Lower	Upper				
	\$/lb	Value (\$)	\$/lb	\$/Roe	Value (\$)						\$/lb	\$/Roe	Value (\$)
2009	5.00	20,970	0.50		514,856	0.26	3.00	20,430	20,970	535,286	535,873 ^a	20,430	556,303
2010	5.00	639,230	0.70		823,967	0.23		61,534	639,230	885,501	1,463,226 ^a	61,534	1,524,760
2011			0.75		1,301,008	0.26		12,966		1,313,974	1,301,103 ^a	12,966	1,314,069
2012			0.75		980,424	0.37		137,817		1,118,241	980,424	137,817	1,118,241
2013			0.75		1,721,524	0.30		152,110		1,873,634	1,721,552 ^a	152,110	1,873,662
2014			0.60		1,648,866	0.29		154,959		1,803,825	1,662,634 ^b	154,959	1,817,593
2015			0.60		1,259,908	0.23		7,166		1,267,074	1,262,034 ^b	7,166	1,269,200
2016			0.60		1,903,490	0.26		6,030		1,909,520	1,958,311 ^b	6,030	1,964,341
2017			0.60		1,470,353	0.34		276,682		1,747,035	1,470,353 ^c	276,682	1,747,035
2018			0.60		1,679,448	0.33		217,064		1,896,512	1,695,468 ^b	217,064	1,912,549
2019	6.59	210,079	0.60		820,654	0.29		2,819	210,079	807,367	1,034,117 ^{c,d}	2,819	1,036,936
2009–2018 Average	5.00	330,100	0.65		1,330,384	0.29	3.00	104,676	330,100	1,435,060	1,405,100	104,676	1,509,775

Note: Blank cells indicate no sales occurred or harvest level was insufficient to generate summary information.

^a Includes sales of coho salmon in Districts 1 and 2.

^b Includes sales of pink and coho salmon in Districts 1 and 2.

^c Does not include value from Chinook salmon sold during fall season. Value of Chinook salmon sold in fall season was \$9,922 in 2017 and \$41,216 in 2019.

^d Includes sales of pink salmon in Districts 1 and 2.