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2020 Preliminary Yukon River Summer Season Summary

The following is a summary of the 2020 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).

The Emmonak ADF&G field office remained closed for the duration of the 2020 season due to the COVID-19 pandemic. Operations of the Lower Yukon Test Fishery were conducted by Yukon Delta Fishery Development Association (YDFDA) under the remote guidance of ADF&G staff. Management and research staff who would normally be present in Emmonak were remotely based out of the Fairbanks and Anchorage offices. The public were served by phone from both offices, and the toll-free fishing hotline was kept up to date as usual.

The "summer season" refers to management of Chinook and summer chum runs (early May through July 15 in District 1). After July 15, 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 continued beyond this date in upper river districts as Chinook and summer chum salmon migration progressed upstream. Data presented in this summary applies to "summer season" species only. While summer season assessment and escapement projects have wrapped up by the date of this announcement, subsistence harvest estimation is only now beginning; final run sizes cannot be estimated until harvest estimates are complete.

The summer season management team consisted of Alaska Department of Fish and Game (ADF&G) area management and research biologists, their assistants, subsistence resource specialists, and the Federal inseason management staff from U.S. Fish and Wildlife Service (USFWS). The team met preseason to form the management strategy based on public input. Inseason, they met daily to consider and discuss daily updates of the summer chum and Chinook salmon assessment and escapement data, and plan subsistence and commercial fishery openings accordingly.

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 Yukon River Drainage Fisheries Association (YRDFA) weekly public teleconferences, the ADF&G News Release and assessment data list-serves, and the ADF&G web page.

2020 Preseason Outlook

Chinook Salmon

The 2020 drainage-wide Chinook salmon outlook was for a run size of 144,000 to 220,000 fish which was slightly smaller than the 2019 run outlook. Although 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.

Summer Chum Salmon

It was expected that the 2020 summer chum run would be about average. The 2020 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 1.1 million summer chum salmon would be available. Similar to last year, the commercial harvest of summer chum salmon in 2020 was anticipated to be limited by the management of a below average Chinook salmon run.

2020 Preseason Management Strategy

YRDFA facilitated a preseason planning teleconference in May funded by the Yukon River Panel. The purpose of this meeting was to present the preseason outlook and management strategies and answer questions from participants. Fishermen from throughout the drainage discussed management options and raised additional concerns about environmental factors, bycatch, fish diseases, food security, and project operations. Updates on COVID-19 contingency plans and changes to project operations and were also given. The preseason plan and publicly-distributed "Outlook Flier" included the following key management strategies:

- 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.
- As Chinook salmon enter each district, subsistence salmon fishing will be provided on a reduced regulatory schedule with 6-inch or smaller mesh gillnets (Table 1).

Table 1.–Yukon Area *Reduced* Regulatory Subsistence Salmon Fishing Schedule, 2020.

Area	Regulatory subsistence fishing periods	Open fishing times
Coastal District	7 days/week	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	7 days/week *not changed	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. Further reductions to the schedule for each Area may have been made inseason; see Table 2 for management actions.

- If inseason assessment indicates a poorer than anticipated run, subsistence fishing periods may be cancelled (similar to last year). If confidence is high that the Chinook salmon run is near the upper end of the outlook and escapement goals are likely to be met, the use of 7.5-inch gillnets will be considered.
- Fishermen in District 5 should expect to have gillnets restricted to 6-inch or smaller mesh throughout the summer season. This is an effort to provide harvest opportunity while protecting Chinook salmon bound for Canada.

- Subsistence fishermen may use dipnets during open subsistence periods in all districts. This gear allows fishermen to selectively harvest Chinook and chum salmon and may be an effective means for targeting higher quality chum and releasing unwanted fish.
- Dependent on the ability of the processor to operate safely, commercial fishing for summer chum salmon may begin with selective gear (dip nets and beach seine with required live-release of all Chinook). Openings in District 1 and 2 will be dependent on processor capacity.

2020 Inseason Run Assessment Overview

COVID-19 hindered the operations of many assessment projects statewide. However, key projects such as the Pilot Station Sonar and Eagle Sonar projects operated successfully and provided estimates of salmon passage for the entirety of the 2020 season. The Lower Yukon Test Fishery (LYTF) was operated at a reduced capacity and provided indices of relative abundance. 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 available data and projections.

Ice break-up at the mouth of the Yukon River (near Emmonak) occurred on May 14, which was 5 days earlier than the average break-up of May 19 (based on the years 1999–2019). In the LYTF, the first Chinook salmon was caught on May 30, which was earlier than the average first catch date of June 2 (based on years 1999-2019), and the first summer chum salmon was caught on May 31, which was earlier than the average date of June 3 (based on years 2001–2019). 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. 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. Operations of the LYTF project were modified in 2020 to reduce the harvest of Chinook salmon and comply with COVID-19 related mitigations. During the 2020 season an 8.5-inch mesh set gillnet and an 8.25-inch mesh drift gillnet operated at Big Eddy in the South Mouth, near Emmonak. Net length at the Big Eddy set gillnet site was shortened to reduce Chinook salmon mortality; therefore, data from 2020 will not be directly comparable to historic data. The summer chum salmon-directed drift gillnet test fishery used 5.5-inch mesh gear operated in the South Mouth. The Middle Mouth set and drift gillnet sites did not operate during the 2020 summer season.

The LYTF was operational at the South Mouth (Big Eddy) drift and set gillnet sites on May 29 and June 3, respectively. The LYTF set gillnet for Chinook salmon concluded operations on July 13 in the South Mouth. The cumulative Chinook salmon CPUE for the South Mouth set net was 17.55 and is not comparable to historical averages since only one site and half a net was fished. The 8.25-inch drift gillnet 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 4,562.56, which was well below the historical average CPUE of 9,945.49.

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 2020, 223 Chinook salmon were released alive from the LYTF while 248 Chinook salmon were distributed. For summer chum salmon, 89 fish were released alive and 2,360 fish were distributed. 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 161,859 Chinook salmon (with a 90% confidence interval of 143,000 to 181,000 Chinook salmon). This passage was below the historical average of approximately 183,000 fish. Most of the Chinook salmon entered the river in four pulses consisting of approximately 28,000 fish; 36,200 fish; 26,600 fish; and 25,450 fish. However, the front end of the run had an unusually long and consistent flow of 'tricklers' that lasted for almost two weeks before the more distinctive first pulse arrived. The first quarter point, midpoint, and third quarter point for Chinook salmon at the Pilot Station sonar project were on June 23, June 27, and July 3, respectively. The 2020 Chinook salmon run appears to have been four days later than average based on the midpoint at the sonar project.

Approximately 690,991 summer chum salmon were counted at the Pilot Station sonar (with 90% confidence interval of approximately 654,000 to 728,000 salmon), which was below the historical median of 1.9 million fish for the project. Five pulses of summer chum salmon were detected at the sonar project; the largest group consisted of approximately 272,500 fish and passed by the sonar between June 23 and June 29. The first quarter point, midpoint, and third quarter point at the Pilot Station sonar were June 27, July 1, and July 9, respectively. This indicated that the summer chum salmon run was likely 4 days later than average based on the midpoint at the sonar project.

The Yukon River experienced extreme water levels in 2020 with many days of above average water levels through June and July at mainstem locations. However, water temperatures in 2020 were cooler than the high temperatures recorded in 2019 and managers were not concerned about heat stress effects on migrating salmon (Figures 2 and 3). During weekly teleconferences throughout the summer fishermen reported high water, debris, loss of eddies, cool wet weather that was poor for drying fish, and difficult fishing conditions. High water levels likely resulted in slower swim speeds for Chinook and summer chum salmon.

2020 Subsistence Fishery Management Overview

Based on preseason forecasts, managers expected to provide some limited 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 small numbers of Chinook salmon are in the area. Based on run timing, after the first fish were expected to reach most districts, fishing schedules with reduced time and 6-inch or smaller mesh gillnets were announced (Table 2). Yukon Area fishermen reported this early fishing opportunity did not result in good catches because of high water level, debris, poor weather, or not finding good numbers of fish. Similar reports of poor fishing conditions persisted throughout the summer season

By mid-June, it appeared that the first pulse of Chinook and summer chum salmon runs were late, and fishing in most districts was closed or restricted to selective gear types. The summer chum run often comes into the river concurrent with Chinook salmon, although the peak of that run is slightly later than the Chinook salmon run. In 2020, the summer chum run was a week late, giving managers concerns about the strength of the run.

The first pulse of Chinook salmon was counted at Pilot Station sonar starting June 23. Over the next two weeks, nearly 100,000 Chinook salmon were counted, and fishing was re-opened in most districts on reduced schedule with 6-inch mesh. Passage of summer chum salmon also increased, with the first day of counts over 20,000 fish also taking place on June 23. Summer chum salmon continued to enter the river during the first part of the fall

season, however, on July 18 (the cross over date between summer and fall seasons), less than 700,000 summer chum salmon had been counted at Pilot Station, which was well below the historical cumulative median of 1.86 million fish.

Table 2: Management Actions by district including schedule reductions, cancelled periods and maximum allowed mesh size, 2020.

District or Subdistrict	Reduced [a] schedule (1/2 reg.) with 7.5-inch	Reduced schedule (1/2 regulatory) with 6-inch [a]	Cancelled subsistence period	Selective Gear (live release of Chinook)	4-inch gear closed or restricted	Regulatory schedule with 7.5-inch mesh
South Coastal	N/A	June 26 to June 29 [c]	Closed 21 hours June 25	N/A	June 25	July 4 until fall (July 16)
District 1 and North Coastal	July 7 (1 period)	June 5-17 (4 periods), June 30-July 4 (2 periods)	June 19 (1 period)	June 23- June 30 (2.5 periods)	June 24-27 4" closed, June 27-29 restricted [d]	July 9 until fall (July 16)
District 2	N/A	June 6- June 18 (4 periods), July 1- July 5 (2 periods)	June 20 (1 period)	June 24- June 28 (2 periods)	June 24-27 4" closed, June 27-29 restricted [d]	July 5 until fall (July 19)
District 3	N/A	June 10- June 18 (4 periods), July 1- July 5 (2 periods)	N/A	June 24- June 28 (2 periods)	June 24-27 4" closed, June 27-29 restricted [d]	July 5 until fall (July 20)
Innoko River	N/A	N/A [c]	N/A	N/A	N/A	July 5 until fall (July 20)
Koyukuk River	N/A	N/A [c]	N/A	N/A	N/A	July 11 until fall (July 27)
4-A Lower	July 7 (1 period)	June 13-June 21 (3 periods); June 30-July 5 (2 periods)	June 23 (1 period)	N/A	June 24-27 4" closed, June 27-29 restricted [d]	July 12 until fall (July 27)
4-A Upper and 4-BC	July 11 (1 period)	June 13-June 21 (3 per. 4-A Upper, 2 per. 4-BC); June 30-July 8 (3 per.)	June 23 (1 period)	N/A	June 24-27 4" closed, June 27-29 restricted [d]	July 15 until fall (July 27)
5-A, 5-B, 5-C	N/A	June 30 to July 8 (3 periods), July 14-July 25 (4 periods)	June 23-June 30; July 10 (1 per.), July 28-Aug 8 (4 periods)	N/A	June 23-29 4" closed; July 28-Aug 4 4" closed	N/A. Fall season start August 11
5-D	N/A	July 3 to July 27 (4 periods, 1 shortened to 48 hrs)	Closed June 23-July 3; July 28-Aug 26	N/A	June 23-27 4" closed; closed July 28-Aug 11 (5D lower and middle) Aug 19 (5D upper)	N/A. Fall season start August 19 (5-D Upper)
District 6	N/A	July 3-7 (2 per.), Aug 7-15 (3 periods)	June 23- July 3 (closed)	July 20- Aug 5 (5 42-hr periods)	June 23-27 4" closed, June 27-29 restricted [c]	July 10-19 (3 periods)

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 consisted of two 18-hour periods per week in Districts 1-3, and two 24-hour periods per week in Districts 4, 5-ABC, and 6, and one 84-hour period per week in Subdistrict 5-D, except and noted.

[b] Fall season schedules were reduced or restricted more than usual this season and are not detailed here.

[c] Restricted to 6-inch mesh (not on schedule) in the South Coastal District from June 5-25 and June 30-July 3; and in the Innoko and Koyukuk Rivers from June 24 to July 4 and July 10 respectively.

[d] During fishing closures, 4-inch gillnets were not allowed. During restrictions, 4-inch gillnets were restricted to a max length of 60 ft, required to be set from shore, and in Districts 1-4 were limited to sloughs and side channels in order to avoid incidental harvest of salmon

The management strategies used for 2020 were formulated from lessons learned during previous seasons and were similar to actions taken in 2018 and 2019. With a drainage-wide Chinook salmon run estimated at about 160,000 fish and the Canadian-origin run estimated to be about 77,000 fish, it was determined that there should be a harvestable surplus of Chinook salmon available to provide most households with about half the harvest taken last year. However, despite very conservative management and widespread reports of poor harvests, the early run passage counts at the Eagle sonar project started to indicate that, similar to 2019, fewer Canadian-origin Chinook were going to make it to the border than predicted by the Pilot Station sonar genetic estimates.

Historically, the midpoint of late Chinook salmon runs at Eagle Sonar is around July 28. In 2020, Chinook salmon passage was only 16,300 fish on this date, which was well below average. Projections indicated it was unlikely the escapement goal at the border (42,500-55,000 fish) would be met. Fishing for salmon in District 5 closed on July 28 and remained closed for the rest of the summer season. Additional closures of 4-inch mesh were implemented throughout the drainage to avoid any harvest of Chinook salmon in this gear. This action caused considerable hardship for dog mushers and other subsistence users that rely on 4-inch or smaller mesh to target non-salmon species. Harvest opportunities for summer chum salmon were quite limited due to the late and weak run, persistent high-water levels, and closures to protect Chinook salmon (Table 2, Figure 3).

2020 Commercial Fishery

Assessments of the first half of the summer chum salmon run were below average, therefore no commercial fishing periods occurred until late June because it was not clear how much harvestable surplus would be available. Three commercial periods with selective gear were opened in Districts 1 and 2 starting on June 27 (Appendix A). Three periods with 6-inch gillnets were announced in District 1 in the first week of July, however the final period was cancelled due to low summer chum salmon abundance, poor harvest in previous openings, and poor fishing conditions due to high water. This season there was one processor purchasing chum salmon in Districts 1 and 2. For the thirteenth consecutive year, no commercial periods targeting Chinook salmon were allowed in the Yukon Management Area during the summer season.

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 salmon were retained for personal use from July 3 to July 8. The cumulative summer chum salmon commercial harvest for Districts 1 and 2 combined was 13,956 fish (Appendices A and B). Also sold during the summer season were 4,845 pink salmon. The summer chum harvest was 96% below the recent 5-year (2015–2019) average harvest of 388,183 fish and was the lowest harvest since 2003 (Appendix B).

Upper Yukon Districts Commercial Fishery

Similar to 2011, 2015, 2016, and 2019 the commercial processor in District 4 did not operate in 2020. In District 6 there was no commercial season due to the low return of summer chum salmon.

2020 Fishing Effort and Exvessel Value

A total of 183 permit holders fished in the Lower Yukon Area (Districts 1–3) in 2020, which is below the recent 5-year (2015–2019) average of 402 permits fished in the summer season. Lower Yukon Area fishermen received an average $0.60 per pound for summer chum salmon with a total value of $51,022 (Appendix C). Pink salmon in the Lower Yukon were sold for $0.04 per pound with a total value of $373. No Chinook salmon were sold. The estimated average income for Lower Yukon Area fishermen in the 2020 summer season was $280.85 per fisherman, which was well below the recent 5-year average (2015–2019) income of $3,862 per fisherman from commercial sales during the summer season.

2020 Age, Sex and Stock Composition

Age and Sex Composition in LYTF

Due to unusually high water conditions and reduced LYTF sampling discussed above, catches of Chinook salmon were much reduced from previous years in the test fishery. The number of samples aged in 2020 was 163 fish, which was the lowest recorded since 2000, and less than a third of the sample size of the next lowest year.

The Chinook salmon age composition from the 8.5-inch mesh LYTF Big Eddy set net was 4% age-4, 38% age-5, 53% age-6, and 4% age-7 fish. Females comprised 48% of the samples. The age-4, age-5, and age-6 percentages were slightly below average; the age-7 percentages were above average; and females were slightly below average based on the years 2010–2019. 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 19% age-4, 80% age-5, and 1% age-6 fish. The sample size was 483 fish and was the lowest since 2007. Females comprised 70% of the samples, which is well above the average of 57%. The age-4 percentage was well below the average of 52%, and the age-5 percentage was well above the average of 45% based on the years 2010–2019. The age-4 and age-5 percentages were the lowest and highest observed since sampling began in 1964. This suggests very poor survival of the age-4 summer chum salmon from the 2016 parent year. Other regions of the state also experienced a below average return of age-4 chum and more evaluation needs to be done to determine whether survival was affected more in the freshwater or ocean environment.

Age and Sex Composition in Pilot Station Sonar test fishery

The Chinook salmon age composition from the 614 samples aged from the test fishery at the Pilot Station sonar project (all mesh sizes combined) was less than 1% age-3, 11% age-4, 44% age-5, 41% age-6, and 4% age-7 fish. The age-5 percentage was below average, and the age-6 and age-7 percentages were above average; females comprised 53% of the fish sampled, which is above average based on the years 2010–2019. The project uses a wide range of mesh sizes, and likely captures a representative sample across sizes and age classes. It is important to note that sex was determined visually, and this method has reduced accuracy compared to internal inspection.

Stock identification in Pilot Station test fishery

Chinook and summer chum salmon were sampled for genetics at Pilot Station sonar throughout the summer season. Genetic mixed stock analysis (MSA) on the early group of Chinook salmon (June 7 to June 22) indicated that 62% of the fish sampled were of Canadian-origin. Genetic MSA on the first and second pulses of Chinook salmon sampled at the sonar (June 23 to June 28) indicated that 50% of the fish sampled were of Canadian-origin. Genetic MSA on the third and a portion of the fourth pulse (June 29 to July 5) indicated 43% Canadian-origin fish. Analysis of the remaining 2020 samples is ongoing at this time and total contribution of Canadian-origin will be estimated postseason. For more background information on genetic MSA for Yukon River Chinook salmon, please refer to the department's Gene Conservation Laboratory webpage[1].

Seven strata of chum salmon genetic samples were processed in 2020. The strata from June 7 to June 28 consisted of 99% summer chum salmon, of which 94% were lower river stocks and 5% were bound for the middle Yukon River. The strata from June 29 to July 9 also consisted of 99% summer chum salmon, of which 81% were lower river stocks, 19% were bound for the middle Yukon River, and 6% were bound for the Tanana River. The third summer strata from July 10 to July 18 consisted of 98% summer chum salmon, of which 80% were lower stocks, 17% were bound for the middle Yukon River, and 4% were bound for the Tanana River. The strata from July 19 to August 2, which has historically been predominately fall chum salmon, was determined to be 55% summer

[1] http://www.adfg.alaska.gov/index.cfm?adfg=fishinggeneconservationlab.yukonchinook_baseline

chum salmon, of which 37% were lower stocks, 18% were middle stocks, and 11% were bound for the Tanana River. Even though MSA indicated a high proportion of summer chum salmon were present during the first two weeks of the fall season, the administrative cut-off date for summer and fall chum is July 16 in District 1 and July 18 at Pilot Station sonar. 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 2020 total summer chum salmon run abundance is likely be a conservative estimate.

Age and Sex Composition in Eagle Sonar test fishery

The Chinook salmon age composition from the 553 samples that were aged from the test fishery at the Eagle sonar project (all mesh sizes combined) was 5% age-4, 38% age-5, 53% age-6, and 3% age-7 fish. The age 6 component was above average, the age-7 component was average, and the age-4 and age-5 components were below average compared to recent 10-year (2010–2019) averages. Females made up 54% of the fish sampled, which was above the 2010–2019 average of 44%. 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.

2020 Escapement

Chinook Salmon Escapement

The East Fork Andreafsky weir, Gisasa River weir, Henshaw Creek weir, and Salcha River tower/sonar did not operate in 2020 due to COVID-19 travel restrictions or funding concerns. Aerial surveys were conducted on the East and West Forks of the Andreafsky River, Anvik River, Nulato River, Gisasa River, and Henshaw Creek. Chinook salmon escapements into systems with escapement goals failed to meet those goals and were below average for those rivers without established goals (Table 3). Chinook passage at Chena River tower are considered partial, as counts were delayed and had missed periods due to high water levels. Visual counts weren't possible so fish were apportioned by size and not species from July 20 to July 22. The project was ended on July 22 due to high water levels just as summer chum were arriving. Estimates of passage for Chinook salmon will likely be revised post season, but passage was well below average for the days fish were being counted.

Passage at the border was much lower than expected based on inseason abundance estimates of approximately 77,000 Canadian-origin salmon. The preliminary cumulative passage estimate at the Eagle sonar was 33,005 Chinook salmon, (with a 90% confidence interval of 32,649 to 33,361 Chinook salmon). This is not considered an escapement estimate as it does not account for harvest in Eagle or Canada. This passage is not enough to meet the lower end of the Interim Management Escapement Goal (IMEG) of 42,500–55,000 salmon and does not provide the Canadian harvest share as outlined in the Salmon Agreement with Canada (the escapement estimates and harvest shares will be determined once harvest estimates and total run sizes are available). We don't know why, for the last two years, far fewer Canadian fish are making it to the border than we expect based on the inseason Pilot Station sonar counts. Last year we wondered if heat stress was causing more salmon to die before they made it to spawning grounds. This year the water wasn't unusually warm, but it was at record-high levels for nearly the entire season (Figures 2 and 3). Having to navigate high water may fatigue fish. Thanks to citizen science by Stan Zuray, we were also alerted to a much higher than normal infection rate of Ichthyophonus in Chinook salmon caught near Rapids in the upper river. Could the combination of high/fast water and higher disease load cause increased mortality we don't usually see? We don't have the answer to these questions. But we will be expanding our research on Ichthyphonus to better monitor the situation in coming seasons.

Table 3.–Escapement goals and preliminary passage estimates for Chinook salmon at selected Yukon River tributaries, 2020.

Project	Current Goal	Type of Goal	Historical Average [a]	2020 Escapement
Eagle Sonar	42,500–55,000	IMEG	56,892	33,005*
East Fork Andreafsky Aerial	-	-	1,317	335
Gisasa River Aerial	-	-	711	419
Henshaw Creek Aerial	-	-	-	99
Chena River Tower	2,800–5,700	BEG	6,149	502 [b]
Salcha River Tower	3,300–6,500	BEG	8,440	-
Anvik River Aerial	1,100–1,700	SEG	1,225	675
West Fork Andreafsky Aerial	640–1600	SEG	1,101	508
Nulato River Aerial	940–1,900	SEG	1,287	862

**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 or unable to evaluate goal at the project in 2020

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

[b] Partial estimate. The tower was unable to operate due to high water and poor visibility. Sonar counts were affected by high water and only operated for part of the season.

Summer Chum Salmon Escapement

As noted above, the East Fork Andreafsky weir, Anvik River Sonar, Gisasa River weir, Henshaw Creek weir, and Salcha River tower/sonar did not operate in 2020 due to COVID-19 travel restrictions or funding concerns. However, aerial surveys were conducted on the East Fork Andreafsky River, Anvik River, Gisasa River and Henshaw Creek (Table 4).

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 4). The drainage-wide escapement goal appears to have been met; however, the East Fork Andreafsky and Anvik River goals could not be evaluated because projects did not operate. Although there are no aerial survey-based escapement goals, survey estimates at the East Fork Andreafsky River, Anvik River, Gisasa River and Henshaw Creek indicated escapements were well below average. The Chena River tower started counting late due to high water levels and fish were apportioned by size, not by not species, from July 20 to July 22. The project ended early on July 22 due to high water levels. Passage estimates at the Chena project were well below average and considered incomplete as the project stopped operating before most of the summer chum salmon run was expected to arrive.

Table 4.–Escapement goals and preliminary passage estimates for summer chum salmon at selected Yukon River tributaries, 2020.

Project	Current Goal	Type of Goal	Historical Median [a]	2020 Escapement
Drainage-wide	500,000–1,200,000	BEG	1,786,311	719,073 [b]
East Fork Andreafsky River Aerial	-	-	12,349	10,628
Anvik River Aerial	-	-	35,641	8,461
Gisasa River Aerial	-	-	7,457	754
Henshaw Creek Aerial	-	-	-	2,270
Chena River Tower	-	-	6,594	155 [c]
Salcha River Tower	-	-	16,429	-

Note: En dash indicates no goal or unable to evaluate goal at the project in 2020.

[a] Historical median include all years the projects operated with the exclusion of years the projects operated poorly. Historical averages of aerial survey estimates are the recent 10 years.

[b] Estimate of abundance at the Pilot Station sonar. After accounting for commercial harvest above the sonar (1,455 fish in 2020) and the 2019 subsistence harvest above the sonar (13,800 fish) as a guess for this year's harvest, it is assumed the upper end of the goal was exceeded.

[c] Incomplete estimate. Project stopped operating before most of the summer chum salmon run was expected to arrive. Operations throughout the season were affected by high water.

Canadian Fisheries

The preseason outlook was for a run size of approximately 59,000 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 near 77,000 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. As the season developed and it became progressively apparent that the passage at Eagle sonar would be insufficient to achieve spawning escapement objectives, DFO asked First Nations to manage their fisheries accordingly as no harvest share was available (i.e. "Red" zone). DFO maintained the closures in the recreational, commercial and domestic fisheries throughout the 2020 Chinook run. While not all information is currently available, due to low numbers of Chinook salmon and measures taken by First Nations, the indication is that First Nation harvest on the Mainstem Yukon River is expected to be minimal.

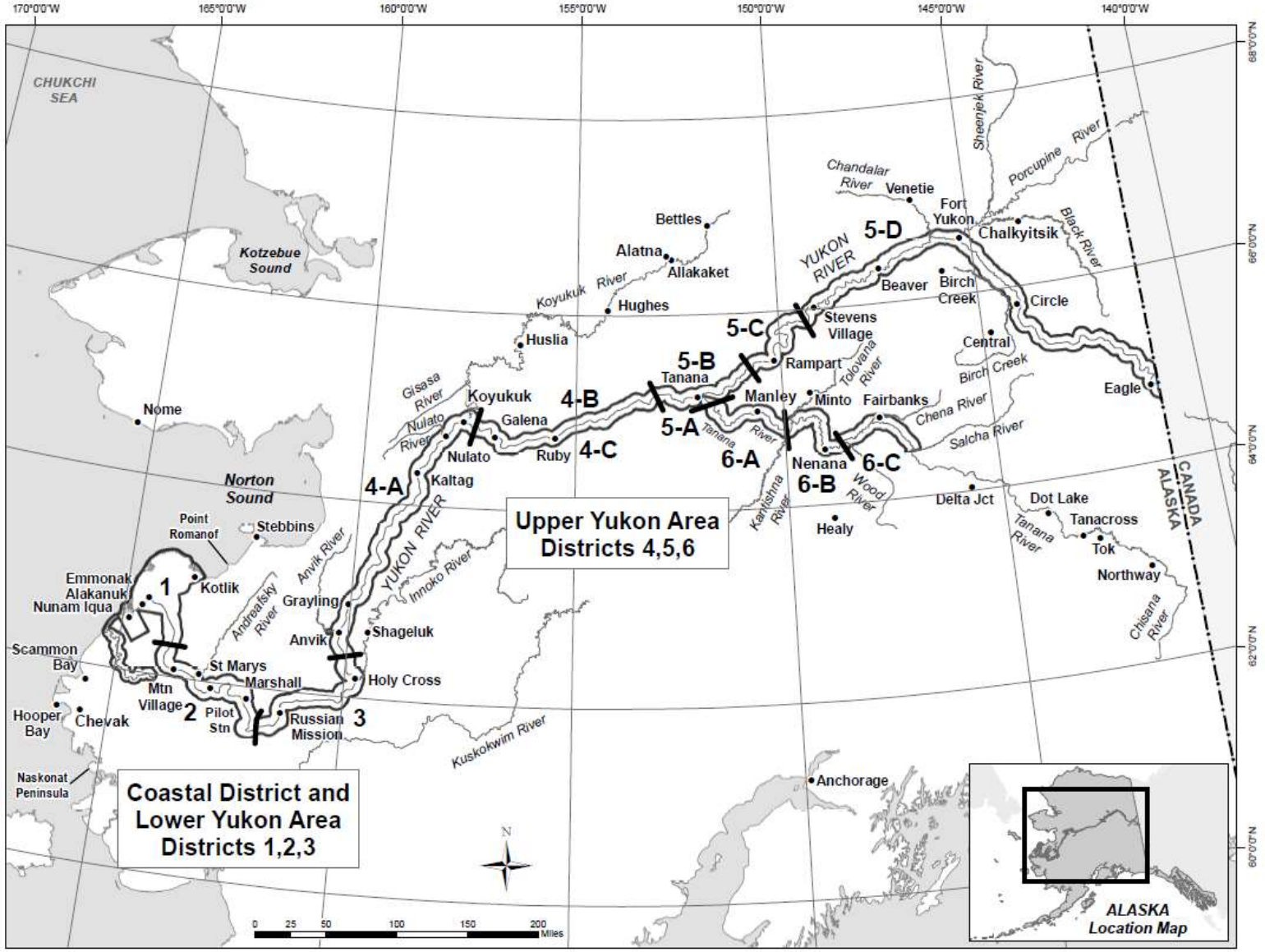

Figure 1.–Yukon Area communities and fishing districts.

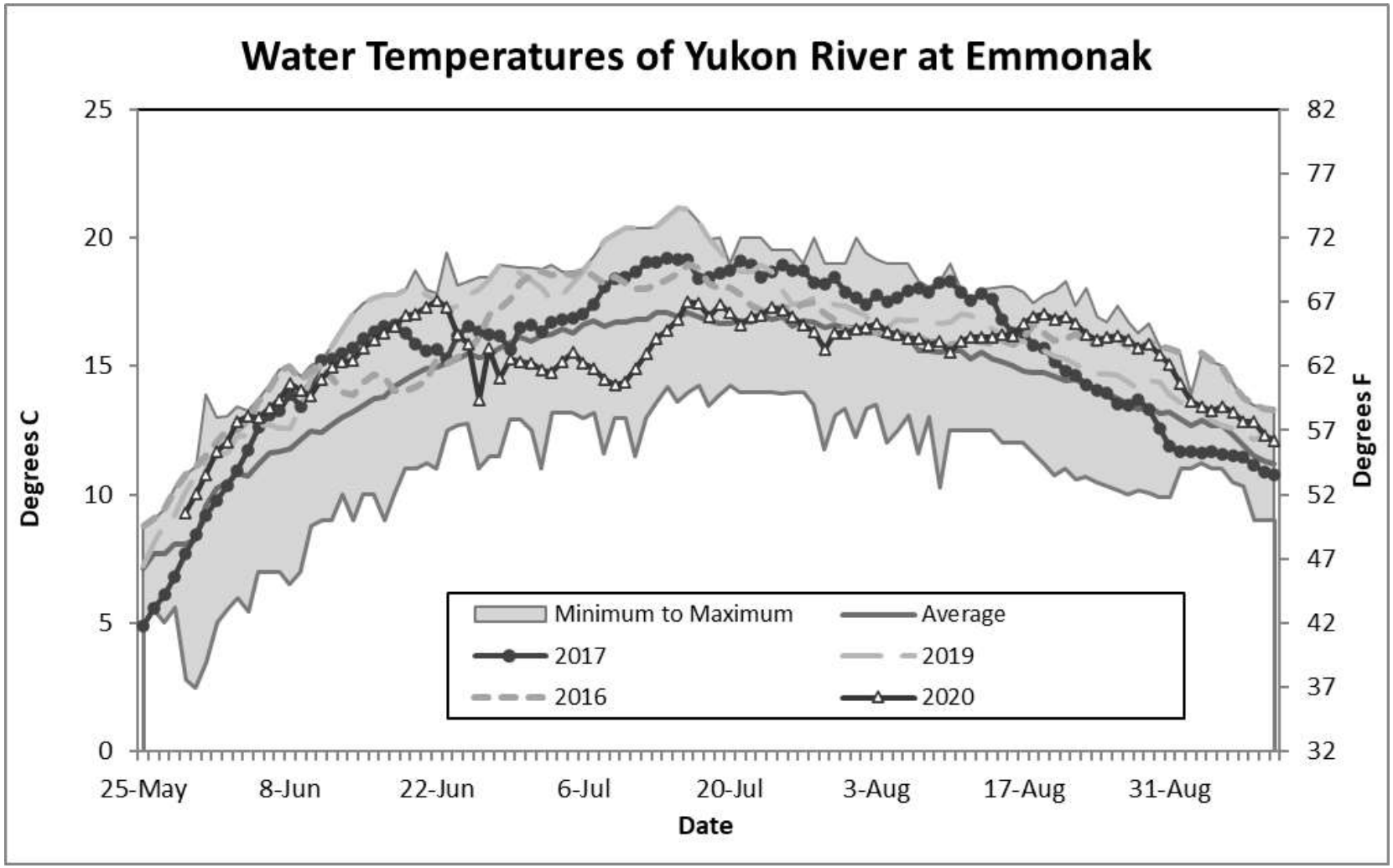

Figure 2.–Average daily water temperatures collected (from hand-held thermometers 1984–present and loggers 2004–2019) in the Yukon River near Emmonak, comparing 2020 and select years to historical minimum, maximum, and average temperatures. Measurements from 2020 were taken with a handheld thermometer and are preliminary.

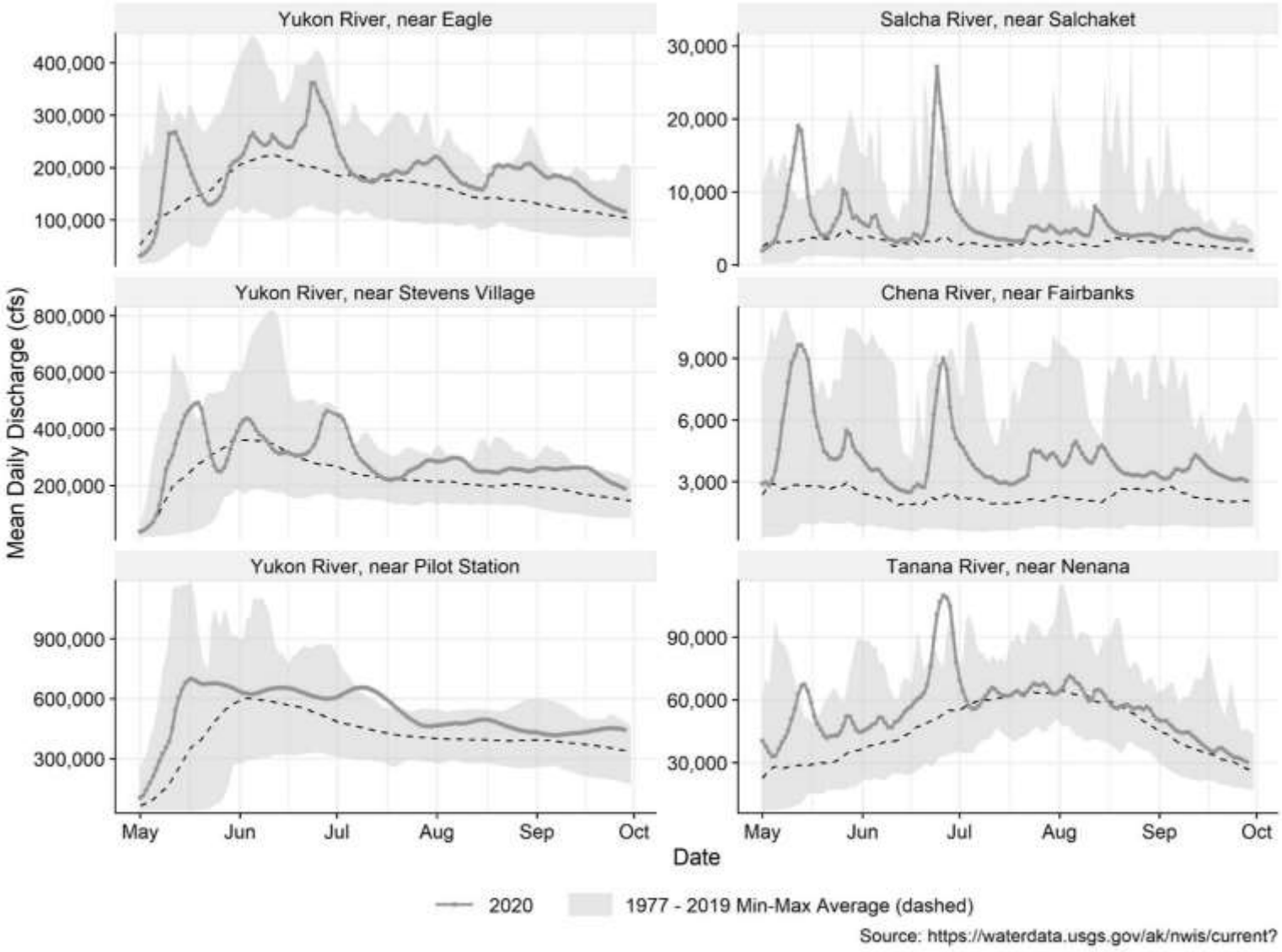

Figure 3.– Water levels from USGS gauging stations in the Yukon River drainage at select locations, comparing 2020 to historical minimum and maximum (shaded area), and average water levels (dashed line).

Appendix A.–Preliminary summer season commercial harvest summary, Yukon Area, 2020.

District 1															
							Chinook Salmon		Summer Chum Salmon			Pink salmon		
Period	Start Time	Start Date	Hours Fished	Gear Type	Mesh Size	Number of Fishermen	Released alive	Number caught but not sold	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
1	8:00 PM	27-Jun	24	DN/BS		91	371		3,577	21,649	6.1	938	2,502	2.7
2	8:00 PM	1-Jul	42	DN/BS		47	32		804	4,737	5.9	3,120	5,263	1.7
3	8:00 PM	4-Jul	6	GN	6	101		217	3,412	21,426	6.3	209	406	1.9
4	8:00 PM	5-Jul	6	GN	6	84		132	1,820	11,404	6.3	578	1,152	2.0
5 [a]	Cancelled	6-Jul	-	GN	6	-								
District 1 Subtotal: Summer season:			78			151	403	349	9,613	59,216	6.2	4,845	9,323	1.9
District 2														
							Chinook Salmon		Summer Chum Salmon			Pink salmon		
Period	Start Time	Start Date	Hours Fished	Gear Type	Mesh Size	Number Fishermen	Released alive	Number caught but not sold	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
1	8:00 PM	29-Jun	24	DN/BS		36	392	-	4,355	25,895	6.3	0	0	-
District 2 Subtotal: Summer season:			24			36	392	0	4,355	25,895	5.9	0	0	-
Lower Yukon Area, Summer Season, Districts 1-2 subtotal: [b]			102			183	795	349	13,968	85,111	6.1	4,845	9,323	1.9

Salmon harvested and released from dip net and beach seine gear		Summer chum harvest			Pink salmon harvest		
	Chinook released	Number	Pounds	Avg. Wt.	Number	Pounds	Avg. Wt.
District 1	403	4,381	26,386	6.0	4,058	7,765	1.9
District 2	392	4,355	25,895	5.9	-	-	-

Note: Due to the low summer chum salmon run, only a few periods were announced. Commercial fishing did not occur in the fall season, or in Districts 3-6 in 2020. DN/BS = dip net and beach seine; GN = gillnet.

[a] Period cancelled by the buyer.

[b] The number of fishermen is the unique number of permits fished. Some fishermen may transfer between areas, therefore the subtotals will not necessarily add up by district.

Appendix B.–Summer chum salmon commercial harvests by district for 2010–2020.

District/ Subdistrict	Guideline harvest range	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	5-yr Average (2015–2019)
District 1		102,267	163,439	150,800	207,871	198,240	172,639	293,522	345,395	250,958	183,658	9,613	249,234
District 2		80,948	103,071	57,049	171,272	229,107	181,447	228,267	47,770	195,423	41,835	4,355	138,948
Subtotal Dist. 1– 2	251,000–755,000	183,215	266,510	207,849	379,143	427,347	354,086	521,789	393,165	446,381	225,493	13,968	388,183
Subdistrict 4-A	113,000–338,000	44,207	–	108,222	100,507	96,385	–	–	159,051	126,892		–	142,972
District 6	13,000–38,000	5,466	8,651	3,504	5,937	6,912	4,770	4,020	4,300	3,427	1,596	–	3,623
Total Districts 1-6	400,000–1,200,000	232,888	275,161	319,575	485,587	530,644	358,856	525,809	556,516	576,700	227,089	13,968	448,994

Note: Commercial harvest only includes summer chum salmon sold in the round. No summer chum salmon were sold in Districts 3 and 5 from 2010–2020.

Appendix C.–Value of commercial salmon fishery to Yukon Area fishermen, 2010–2020.

	Chinook		Summer Chum				Value by species (dollars)		Value by area (dollars)		Total
	Lower Yukon		Lower Yukon		Upper Yukon						Yukon Area
Year	$/lb	Value ($)	$/lb	Value ($)	$/lb	Value ($)	Chinook	Summer chum	Lower	Upper	(dollars)
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	0.3	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
2020			0.60	51,067				51,067	51,440 [d]		51,440
2015-2019 Average	6.59	210,079	0.60	1,426,771	0.29	101,952	210,079	1,525,502	1,484,057	101,952	1,586,012
2010–2019 Average	5.80	424,655	0.66	1,360,964	0.29	102,915	424,655	1,462,268	1,454,922	102,915	1,557,839

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 $41,594 in 2019.

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