YUKON FISHERIES UPDATE

April 2006

A Publication of the Yukon River Drainage Fisheries Association

STATUS OF YUKON RIVER SALMON STOCKS

Yukon River salmon are significant cultural and economic resources for fishermen and women throughout the drainage. Salmon provide a primary source of food and income and play an important role in Native Alaskan and First Nations cultures. At the 2006 YRDFA Annual Meeting in Ruby, community elders, YRDFA board members, Yukon fisheries managers and researchers discussed the state of salmon stocks in the Yukon River. This fishery update will briefly review the status of Yukon River salmon, describe some of the current fishery issues, and discuss YRDFA's goal of working with all user groups to ensure sustainable management of fish stocks in the drainage.

Yukon River Salmon Stock Status

The Yukon River drainage provides spawning and rearing habitat to three native species of Pacific salmon. These include Chinook salmon (*Oncorhynchus tshawytscha*), summer and fall chum salmon (*O. keta*), and coho salmon (*O. kisutch*). There are also some pink salmon (*O. gorbuscha*) and sockeye salmon (*O. nerka*) in the lower part of the river. The various salmon species begin their journey up the Yukon River every year at different times of the summer (Figure 1).

Beginning in 1997, declines in the numbers of returning salmon and the lack of markets for salmon that followed caused severe hardship for fishery-dependent families and communities throughout the drainage. This prompted the Governor of Alaska to declare economic fish disasters in 1997, 1998, 2000, 2001, and 2002. A federal fisheries disaster was also declared in 2000.

The Alaska Board of Fisheries listed Yukon River Chinook and fall chum salmon as stocks of yield concern in 2000. These are defined as stocks that fail to produce expected harvestable surpluses. Yukon River summer chum were listed as a stock of management concern because they failed to meet established escapement goals. In other words, the number of summer chum salmon that reached spawning grounds was lower than the minimum threshold or range of the escapement goals.

The Alaska Department of Fish and Game (ADF&G), which manages salmon stocks throughout the state, has stated that Yukon River stocks are currently in a state of rebuilding.[1] Indeed, returns of Chinook and chum salmon since 2002 have provided reason for optimism. Escapement goals have been met or exceeded and Canadian border passage has been the highest on record in three of the four years.

Harvest Data

In each of the past four fishing seasons (2002-2005), ADF&G determined that the returns of Chinook salmon were large enough to provide for commercial fishery openings. Between 1987 and 1996 (before the fishery disaster declarations), an average 109,800 Chinook salmon were caught commercially and an average 50,700 Chinook salmon were caught for subsistence in the Alaska portion of the Yukon River each year.[3]

In 2000, just 8,500 Chinook salmon were harvested commercially, and in 2001 there was no commercial fishing. In 2002, ADF&G opened the commercial fishery based on sonar and test fishery data as well as subsistence catch reports that indicated a sufficient run size, and 24,000 Chinook salmon were harvested commercially. In 2003 and 2004, the commercial harvests were 40,000 and 56,000, respectively. In 2005, the commercial harvest dropped to 32,000 Chinook salmon, which is 71% below the 1987-1996 average commercial harvest.

Abundance estimates for 2004 and 2005 signal that chum salmon stocks are also in a period of rebuilding. In 2005, approximately 41,000 summer chum salmon were harvested commercially, which is

94% below the 1987-1996 average. According to ADF&G, the total run abundance for summer chum shows continued improvement, although lower river tributaries such as the Andreafsky and Anvik Rivers have not been as productive. The 2005 fall chum run was the largest recorded in the past 30 years, and 180,000 fish were commercially harvested.
In contrast to the Chinook and chum salmon stocks, coho salmon abundance did not decline dramatically in the late 1990's. The 2005 coho salmon run was above average, and both the commercial harvest (58,000 fish) and subsistence harvest (26,000 fish) were above recent 10-year averages (Table 1).[1]

Run Abundance Data

After the declines in run abundance between 1997 and 2002, salmon abundance appears to be on the road to recovery. Based upon the available information from harvest data and subsistence catch reports, it seems that subsistence needs for salmon are being met in most cases. In general, the number of Chinook salmon returning to the Yukon River is still slightly below average but showing signs of improvement. ADF&G's records indicate that 160,000 Chinook salmon passed the Pilot Station sonar in 2005, and escapement goals were met.

With the exception of this year, summer chum and fall chum salmon stocks are lower than they have been historically, but they are also improving. For summer chum, the total run estimate in 2005 was 2.4 million fish, and drainage-wide escapement goals were greatly exceeded. The preliminary run size estimate for fall chum in 2005 was 1.8 million fish, which is well above the long-term average, and the drainage-wide escapement goal was exceeded.

Coho salmon stocks in the Yukon River appear to be very healthy. The return of coho salmon in 2005 was above average – estimated at 184,000 fish at Pilot Station – and there was above average escapement within the upper Tanana River.[1] By achieving escapement goals for all salmon species in all tributaries in the Yukon River drainage, we are investing in the future sustainability of our salmon resources.

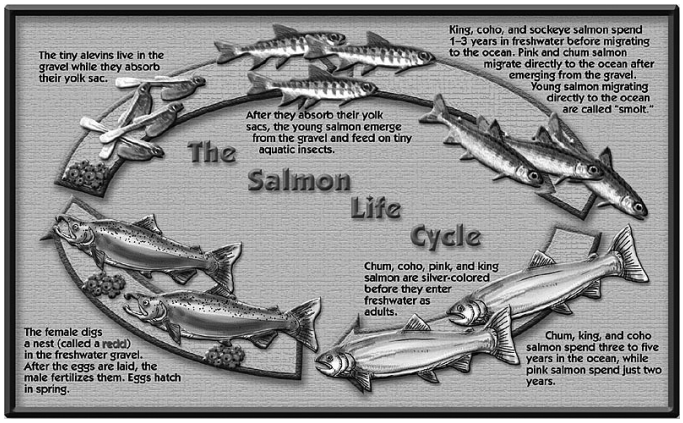

Figure 1. The life cycle of Pacific salmon.[2]

Salmon Fishery Issues

Two issues have been gaining attention in recent months: age, sex, and length trends among Yukon River Chinook salmon, and the effects of increasing ocean and freshwater temperatures on salmon stocks. Some fishermen and women on the river have noticed that the size of Chinook salmon they are catching is decreasing over time. Several elders from the middle and upper Yukon River areas who spoke at the Annual Meeting in Ruby said that Chinook salmon are smaller and thinner now than they used to be.

A recent study by the U.S. Fish and Wildlife Service showed that the proportion of Chinook salmon greater than 35 inches in length is decreasing through time in several tributaries in the drainage.[4] This study also found that the proportion of female Chinook salmon decreased in three tributary escapements, increased in one, and there was no change in two. Other researchers have found that these trends are not unique to the Yukon River; in fact, they found that all stocks of commercially-caught Pacific salmon, except Chinook salmon from California and British Columbia, are decreasing in size.[5]

In a related study, YRDFA found that in addition to a decrease in the proportion of large Chinook salmon and a decrease in the proportion of female Chinook salmon in spawning escapements, there is an increase in the proportion of jacks (age 3 and 4 males) on the spawning grounds. Smaller salmon carry fewer eggs[6], and jacks are more likely than older males to produce jacks as offspring.[7] As a result, greater numbers of jacks in combination with fewer females, fewer eggs, and smaller fish may lead to reduced productivity and thus fewer fish available for harvest. This would affect subsistence and commercial fishermen and women throughout the Yukon River drainage.

Some of the factors that may contribute to these trends are global climate change, increased hatchery production, and the effects of selective fishing gear. Further research into the specific causes of these trends and potential solutions is necessary. YRDFA takes this issue very seriously, and will continue to be involved in future projects and research on age, sex, and size trends.

In Ruby, the YRDFA board unanimously passed Resolution 2006-03, which requests "that all age, sex and length collected on Chinook salmon on the Yukon River include the addition of standardized girth and weight measurements and that all age, sex

and length and girth and weight data be compiled into a database available to the public for long-term studies and monitoring of Yukon River Chinook salmon".

The second issue that has been gaining attention recently is the effect of increasing ocean and freshwater temperatures on Yukon River salmon populations. Participants in the 2006 YRDFA Annual Meeting in Ruby discussed this and heard an interesting presentation on some effects of climate change in Koyukuk River communities. Many different data sources show that current ocean temperatures are warmer than they have been in the past.

Table 1. Yukon River subsistence and commercial harvests, 2005.[1, 3]

Salmon species	Chinook salmon	Summer chum salmon	Fall chum salmon	Coho salmon
Subsistence harvest	53,400	88,300	89,400	26,000
10-year average subsistence harvest	51,000	94,200	70,200	21,900
1987-1996 average subsistence harvest	50,700	136,600	162,000	44,900
Amounts necessary for subsistence*	45,500-66,704	83,500-142,192	89,500-167,100	20,500-51,980
Commercial harvest	32,000	41,000	180,000	58,000
10-year average commercial harvest	58,100	186,400	81,000	26,800
1987-1996 average commercial harvest	109,800	735,700	128,800	46,100

*Amounts necessary for subsistence were established by the Alaska Board of Fisheries in 2001.

In periods of warm ocean temperatures, the plankton community which makes up the food base for salmon in the ocean shifts towards smaller species.[8] As a result, there is an extra link in the marine food chain, which results in a loss of food available to salmon. Some scientists believe that this may be partially responsible for decreasing sizes of salmon, along with increased competition from hatchery fish and wild pink salmon in the ocean.

In addition, freshwater temperatures may have an effect on productivity. A recent study found that warmer air temperatures over freshwater were associated with fewer salmon returning to one tributary, while in another tributary, warmer temperatures were associated with more returning salmon.[9] Increasing freshwater temperatures are also associated with increasing *Ichthyophonus* disease rates in Chinook salmon, which in turn reduces upstream migration success and increases pre-spawning mortality.[10]

Thus, the changes in marine and freshwater habitats that are utilized by salmon at different life stages have significant impacts on salmon productivity. The productivity of the system ultimately shapes all management actions and decisions on the Yukon River, including escapement goal determinations, stock of concern designations, and harvest regulations.

Working Together for Sustainability

In addition to working to ensure the sustainability of salmon stocks and improve the health and abundance of salmon stocks, YRDFA aims to improve the livelihood of Yukon River fishermen and women. YRDFA's work with the Yukon River Fisheries Marketing Association, which brings together fish processors on the Yukon River, has made great strides in recent years and months in helping bring Yukon River wild salmon to consumer markets. In 2004, YRDFA initiated a river-wide Wild Salmon Campaign with all Yukon River processors. These efforts help to increase awareness of the importance and value of our wild salmon resources and will most certainly serve to improve the price paid to Yukon River fishermen and women for salmon.

The YRDFA Board also voted to support a proposal to have a limited Chinook salmon commercial opening in District Y-1 or Y-2 near the first quarter point of the run. The purpose of this opening would be to provide managers with an in-season indicator of run strength, to more evenly distribute the commercial harvest throughout the run, and to help get better quality fish from the early part of the run to markets in the Lower 48. It is important to note that this opening would not open the commercial season and would be postponed if the run projection for the season is not strong before the quarter point.

By having a set date for an early commercial opening, retailers can advertise more and increase demand for Yukon River wild Chinook salmon, even if only one thousand salmon can be commercially harvested at that early date. The more consumers are willing to pay for Yukon River wild salmon, the more processors can pay fishermen and women for their fish. There was consensus among YRDFA Board Members from different areas of the drainage that this would be a significant step in helping to develop and secure markets for Yukon River salmon, although the date of the opening was not decided.

YRDFA was created to protect and restore the river and its salmon runs and the communities that depend on them. We are committed to connecting people from all areas of the Yukon River drainage and working with management agencies to maintain the sustainability of salmon stocks. We will continue in our efforts to protect the health and abundance of Yukon River salmon stocks and the habitats they thrive in.

YRDFA will also continue to work with management and regulatory agencies to ensure that the salmon fishery in Yukon River is well-managed in order to secure a future for people who are dependent on the fishery. Through pro-active and conservative measures we can work together to ensure that our wild Chinook, summer and fall chum, and coho salmon stocks will continue to meet the needs of current and future generations of fishermen and women throughout the Yukon River drainage.

This update prepared by Kristin Mull, Fisheries Biologist with the Yukon River Drainage Fisheries Association. Kristin can be reached at (907) 474-7066 or via e-mail at kristin@yukonsalmon.org.

[1]Note that harvest numbers and total run size estimates are preliminary. Alaska Department of Fish and Game. 2006. 2005 Yukon River preliminary fisheries summary. Presented to the Yukon River Drainage Fisheries Association 2006 Annual Meeting, February 13-16, 2006, Ruby, Alaska.

[2]USDA Forest Service. 2005. The salmon life cycle. Available from http://www.fs.fed.us/r10/tongass/districts/mendenhall/fishcam/lifecycle.shtml.

[3]Joint Technical Committee (JTC) of the Yukon River US/Canada Panel. 2005. Yukon River salmon 2004 season summary and 2005 season outlook. Fisheries and Oceans Canada, Stock Assessment and Fisheries Management Section, Yukon and Transboundary Area, Whitehorse, Yukon Territory.

[4]Hyer, K.E., and C.J. Schleusner. 2005. Chinook salmon age, sex, and length analysis from selected escapement projects on the Yukon River. Alaska Fisheries Technical Report Number 87. U.S. Fish and Wildlife Service, Office of Subsistence Management, Anchorage, Alaska.

[5]Bigler, B.S., D.W. Welch, and J.H. Helle. 1996. A review of size trends among North Pacific salmon (*Oncorhynchus* spp.). Can. J. Fish. Aquat. Sci. 53: 455-465.

[6]Healy, M.C., and W.R. Heard. 1984. Inter- and intra-population variation in the fecundity of Chinook salmon (*Oncorhynchus tshwaytscha*) and its relevance to life history theory. Can. J. Fish. Aquat. Sci. 41: 476-483.

[7]Hankin, D.G., J.W. Nicholas, and T.W. Downey. 1993. Evidence for inheritance of age of maturity in Chinook salmon (*Oncorhynchus tshwaytscha*). Can. J. Fish. Aquat. Sci. 50: 347:358.

[8]K. Coyle, University of Alaska Fairbanks, personal communication.

[9]Shotwell, S.K. 2004. Utilizing multi-source abundance estimation and climate variability to forecast Pacific salmon populations. Ph.D. Thesis. University of Alaska, Fairbanks, Alaska.

[10]Kocan, R., P. Hershberger and J. Winton. 2003. Effects of *Ichthyophonus* on survival and reproductive success of Yukon River Chinook salmon. Federal Subsistence Fishery Monitoring Program, Final Project Report No. FIS 01-200. U.S. Fish and Wildlife Service, Office of Subsistence Management, Fishery Information Services Division, Anchorage, Alaska.

Yukon River Drainage Fisheries Association
725 Christensen Dr., Suite 3-B
Anchorage, AK 99501