Comparing Ice-Breakup Dates Along the Yukon River with Chinook Salmon populations

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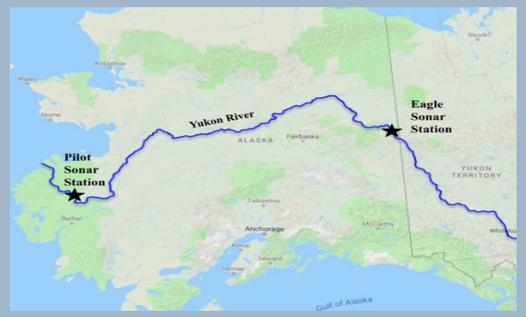

Figure 1: Map of Yukon River and locations of Pilot and Eagle Sonar Stations.

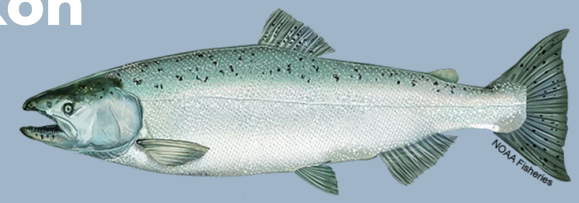

Figure 2:: Chinook Salmon, also called 'King Salmon'. Scientific name *oncorhynchus tshawytscha.*

Introduction

"Ice breakup date" is the date on which ice melts and begins to break into pieces. For communities living on or nearby rivers, the date of ice breakup is incredibly important, as it dictates the ability to commute, work, and mode of travel (Kealy et al., 2022). Ice breakup date is also indicative of environmental factors that can also impact marine life in watersheds, such as water or air temperature. Our research investigates to what extent, if at all, the dates of ice-breakup, impacted by climate change, affect the population of returning Chinook salmon. The decrease in return of Chinook salmon not only poses a threat to the ecological system of the rivers they inhabit but will also directly affect the culture and lifestyle of the tribal communities that have lived there for thousands of years.

Methodology

We compared our fish count data from Eagle, spanning the years 2006- 2021, and the Pilot Sonar Station, spanning the years 1996-2021, to that of the date of ice breakup: hoping to determine a relationship between the two data sets.

For our project, fish count data was collected from the Yukon River Joint Technical Committee end-of-year season reports. We analyzed data collected from two different sonar stations that utilize sonar transducer technology:

- The Pilot sonar station near the mouth of the upper Yukon river (ADF&G)
- The Eagle sonar station ~18 miles upstream of Eagle in the lower Yukon river (ADF&G)

Ice Breakup data was collected from the National Weather Service from both the Pilot station and from Eagle (NOAA).

Both datasets were graphed over time to see how they interacted with each other.

Figure 5: DIDSON transducer and split-beam transducer, respectively, used to detect fish at the Eagle sonar station. Provided by ADF&G

Figure 3: Map of Yukon River in Alaska with arrow showing location of Pilot sonar station. Provided by ADF&G.

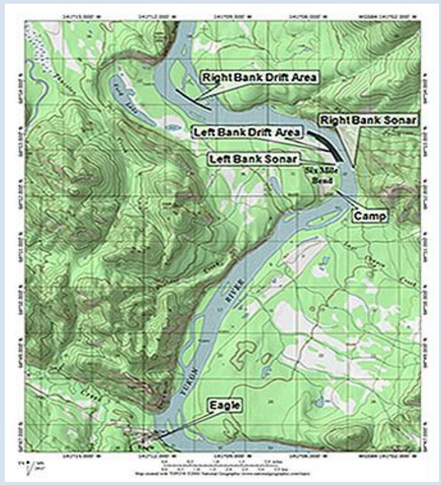

Figure 4: Map of Eagle area of Yukon River. Provided by ADF&G.

Figure 6: Partial weir at Eagle sonar station ensuring salmon are detected by transducers. Provided by ADF&G.

Results

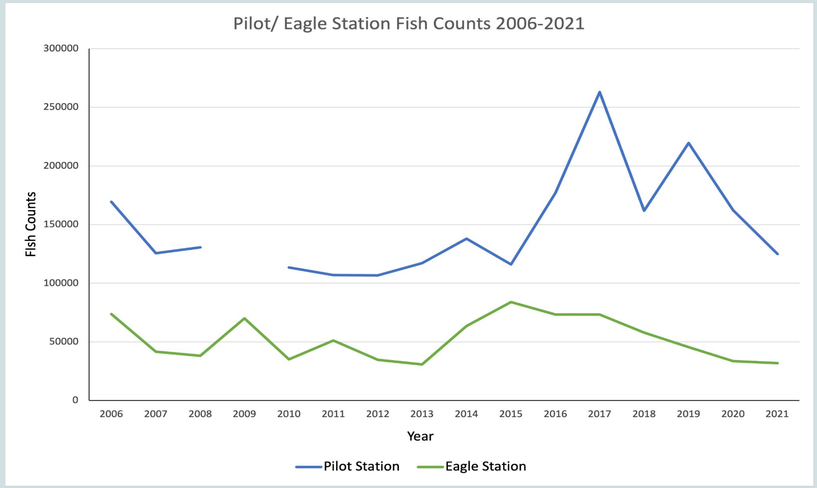

Figure 7: Graph showing Chinook salmon run counts for both Pilot and Eagle Sonar Stations from the years 2006-2021, excluding data from the Pilot Station for the year 2009..

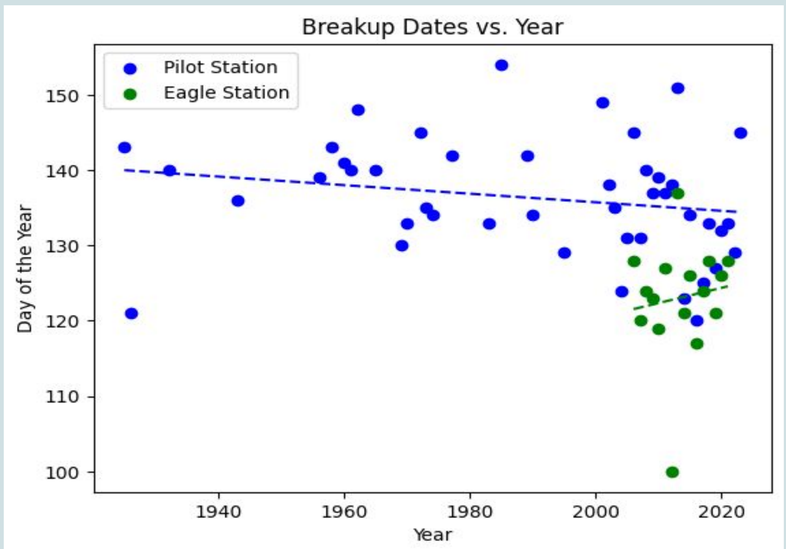

Figure 8: Graph showing dates of ice breakup at Pilot and Eagle sonar stations from the years 1920-2021.

Discussion

Comparing the fish count data with the breakup data, we conclude that there is no apparent direct correlation between the date of river ice-breakup and population of Chinook salmon returning in the fall from the years 2006 to 2021. However, we acknowledge that our access to data on fish counts in the Yukon and Tanana is limited and the data-span of 15 years does not accurately how climate change impacts ice break-up and Chinook salmon population over time.

Though our dataset is limited, research from the Environmental Protection Agency suggests that ice breakup in the Tanana River has shifted earlier and earlier by a factor of 8-9 days on average due to climate change (EPA). Additionally, NOAA research indicates steep declines in the population of Chinook salmon returning to the Yukon River for a number of factors, one of which being climate change (NOAA). It is clear that although our data is too limited to clearly show a correlation between ice break-up and salmon population, the increasingly warm river temperatures and environmental phenomena caused by climate change is impacting both the dates of ice break-up and the abundance of Chinook salmon.

Additionally, existing interviews suggest that Indigenous communities are indeed impacted by this decrease in salmon. Whereas salmon were once the focal point of day-to-day life for many local communities, this population decrease impacts not only subsistence activities, but also the cultural relevance and community building that necessarily involves salmon (George, 2023).

Future Work/ Next Steps

Our next steps include continuing research on how changes to Chinook populations impact Alaska Native communities directly through conducting interviews.

Shortened Bibliography

ADF&G. "Yukon (Eagle) River". *ADF&G.*
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George. "A young leader fights for Yukon River salmon" *Alaska Public Media*, 2023
Kealy et al. *Fresh Eyes on Ice: Assessment of the River Ice Information Needs of Alaskans.* Goldstream Group Inc, 2022.
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Scan for full works cited and figures:

Acknowledgements

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