Chinook Salmon, *Ichthyophonus* Research, and Community Engagement

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We acknowledge and respect the Indigenous communities that continue to steward the lands across Alaska and the world. We are privileged to live and work with Indigenous peoples through this project.

Outline

Chinook and *Ichthyophonus* Research

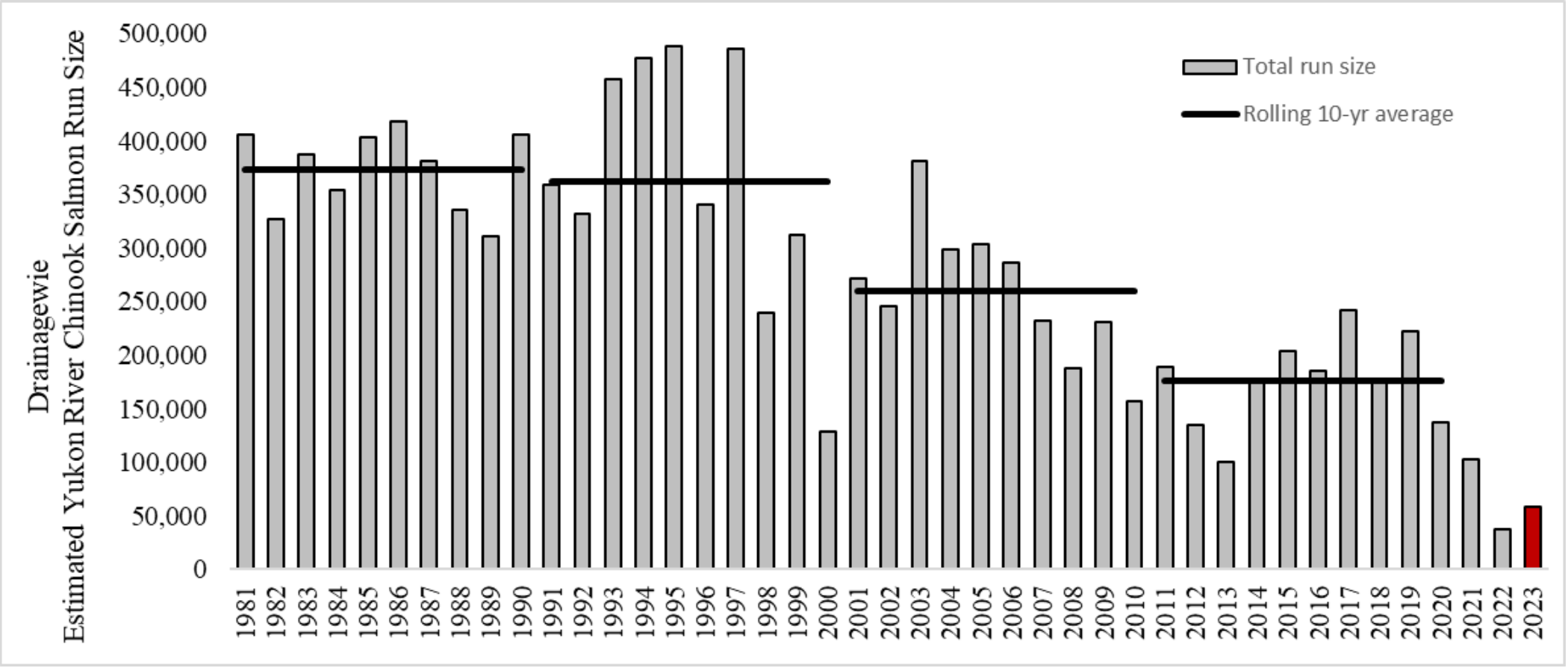
Community Engagement

2024 Plans

Questions for Yukon River Communities

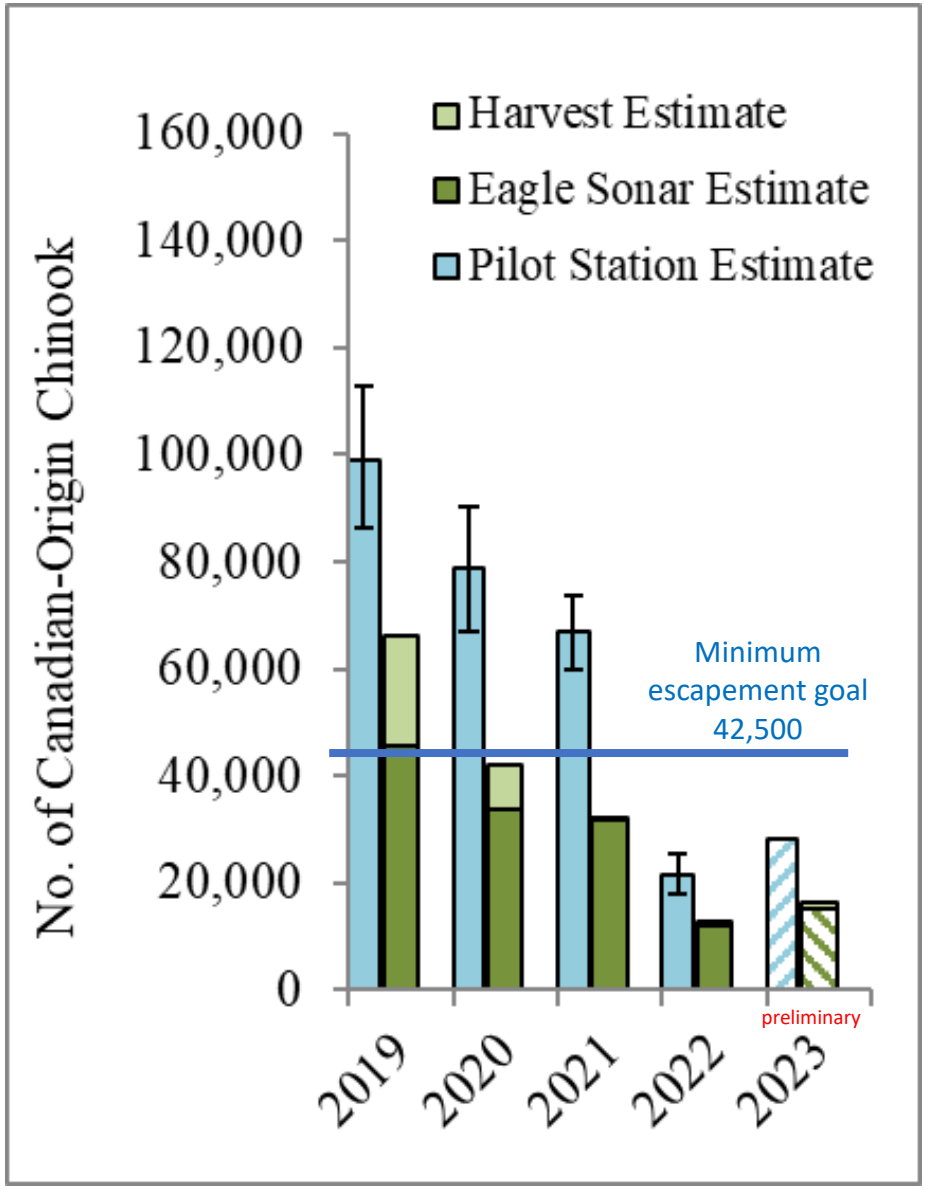
Ichthyophonus Research on Yukon River Chinook Salmon

Fish health has implications on management, survival of returning fish, and spawning success for Alaskan and Canadian Chinook salmon stocks. In extreme situations, poor fish health of can contribute to food insecurity and loss of cultural connections to salmon.



From 2019 to present:
Variable run sizes falling below lower bound of escapement goals throughout the drainage (most notable in 2021, 2022, and 2023 were record low runs.

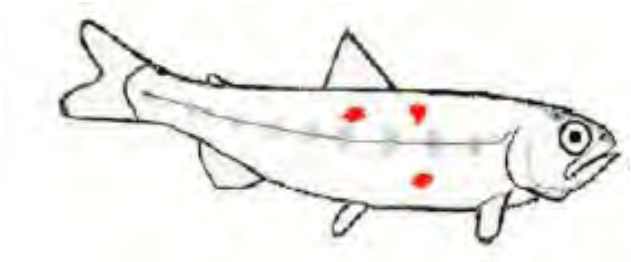
Escapement Goal Performance



- Failure to meet spawning escapement goals starting in 2019, coincided with discrepancy between inseason estimates of abundance at Pilot Station sonar and estimates at Eagle sonar.
- *Ichthyophonus* – associated *en route* mortality is the leading hypothesis to explain the recent-year differences between Canadian-origin run size estimates.
- It is imperative to quantify potential loss of fish in-river across run sizes and environmental variables for future and current management of Chinook salmon

Local and Western Knowledge

Salmon infected in the marine environment



Infected fish enter river, but most are not yet diseased (sick). Only lab tests can detect lightly infected fish in the lower river.

No visible infection

Fish sickness appears to peak midriver and hearts and flesh may show visible signs.

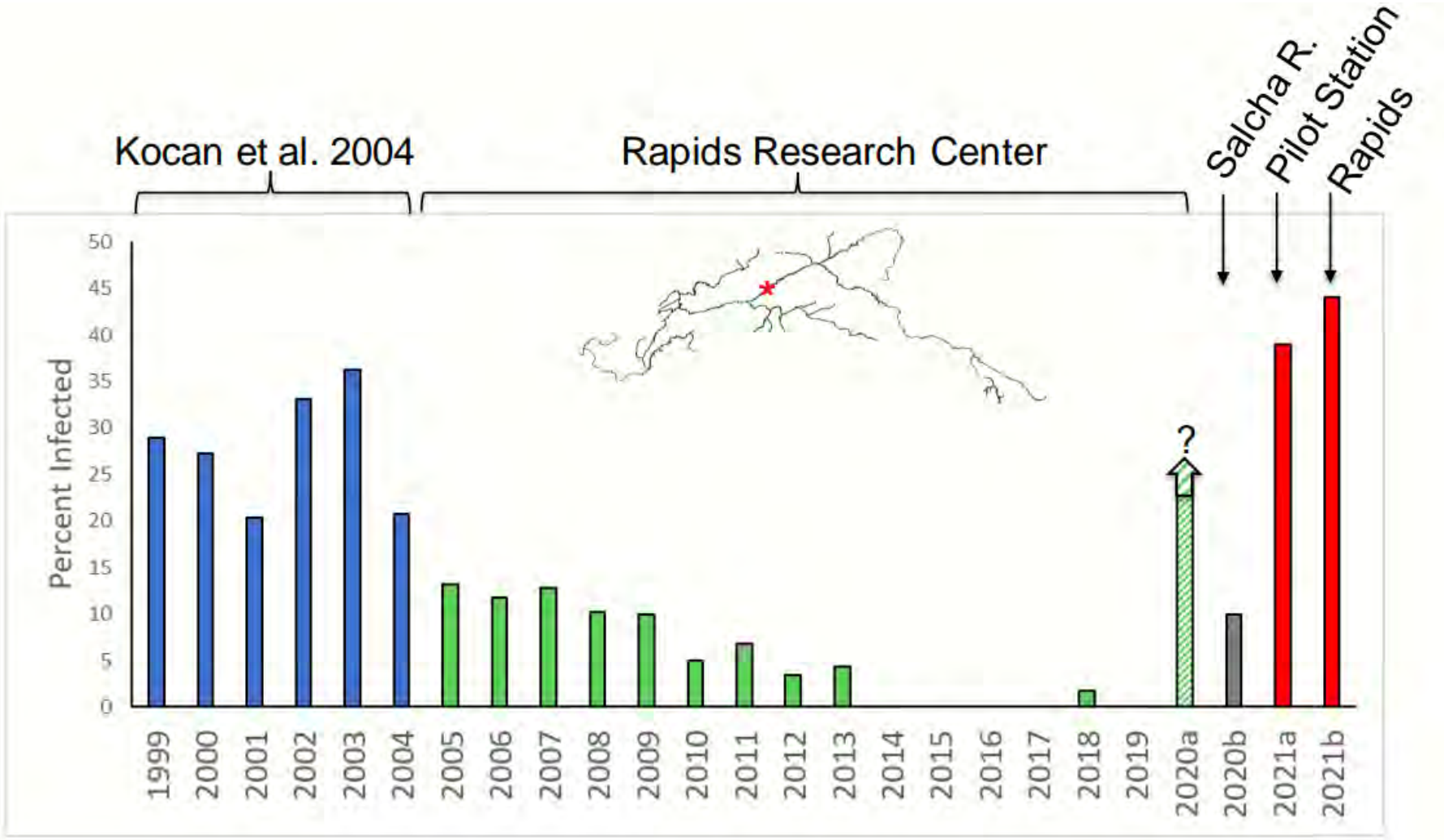
Fish sickness increases throughout the migration and progress faster when fish are under stress. Fates of sick Chinook are variable.

Visible infection

Upriver fishermen report harvested Chinook rarely have visible signs of Ichthyophonus in heart or flesh

Lack of heavily infected fish in the upper river suggest en route mortality occurred downriver.

Historical *Ichthyophonus* infection prevalence



- 2020: Stan Zuray noted disease infection exceeding 25% and “many” 1,000-spot hearts in subsistence harvests. ADF&G confirmed Ichthyophonus in a sample of 10 Salcha River carcasses.
- 2021: ADF&G sampled 200 representative fish from Pilot Station test fish harvest and USFWS sampled Chinook salmon harvested opportunistically in small mesh gillnets near Rapids.

Annual Sample Sizes

Totals

2022: **452**

2023: **426**

Fort Yukon:

2022: NA

2023: 90

Eagle:

2022: 50

2023: NA

Rapids:

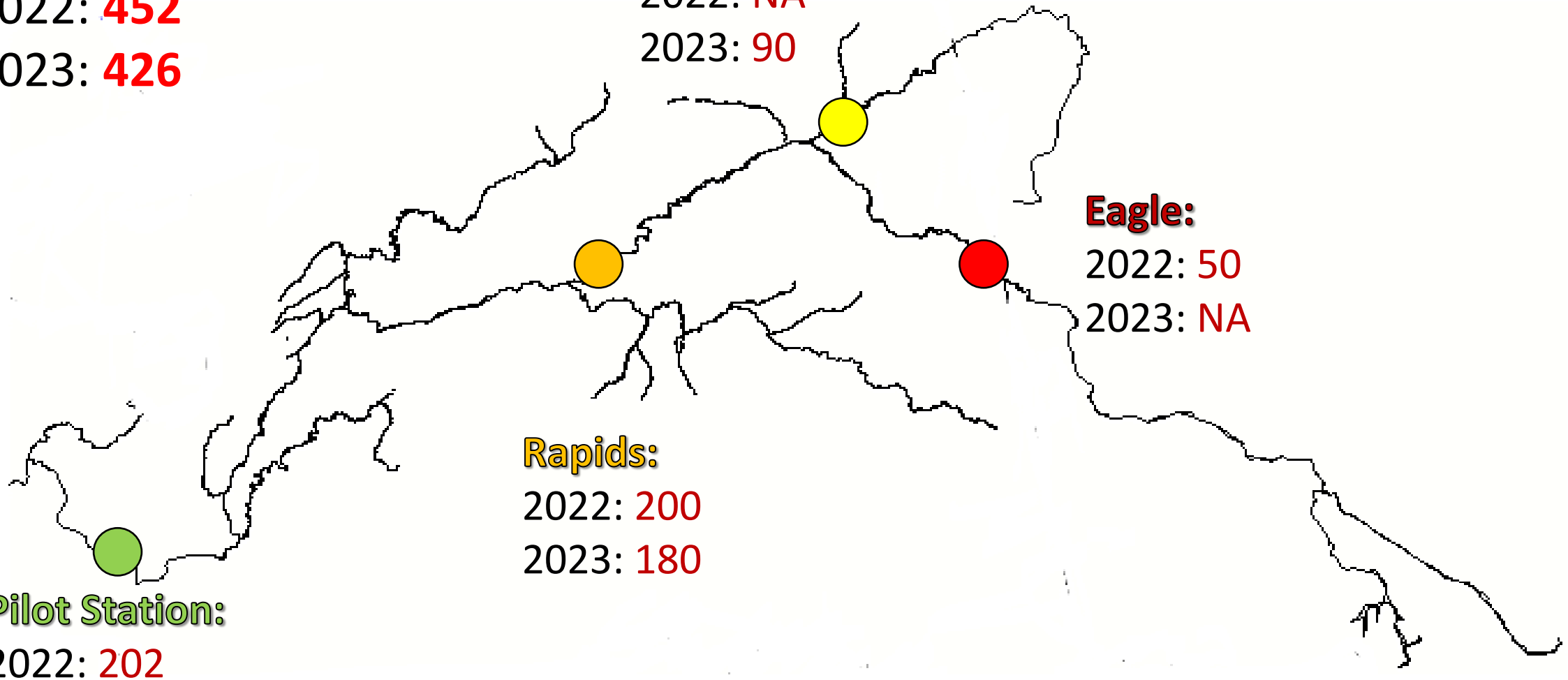
2022: 200

2023: 180

Pilot Station:

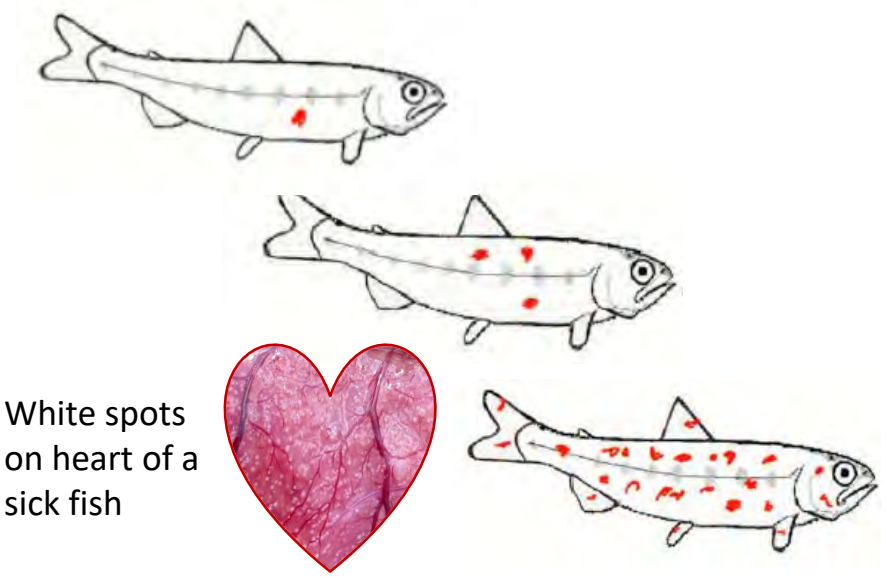
2022: 202

2023: 156



very Preliminary Results

- 2023 samples are currently being tested, and results are not yet available.
- Summaries of 2022 and 2023 results are anticipated by spring of 2024, and we are open to sharing these results with YDRFA through handouts, presentations, or special meetings.
- *Ichthyophonus*-associate *en route* mortality remains the **most likely hypothesis** to explain why some Chinook salmon observed entering the Yukon River are not making it to their spawning grounds in Alaska or Canada.



White spots on heart of a sick fish

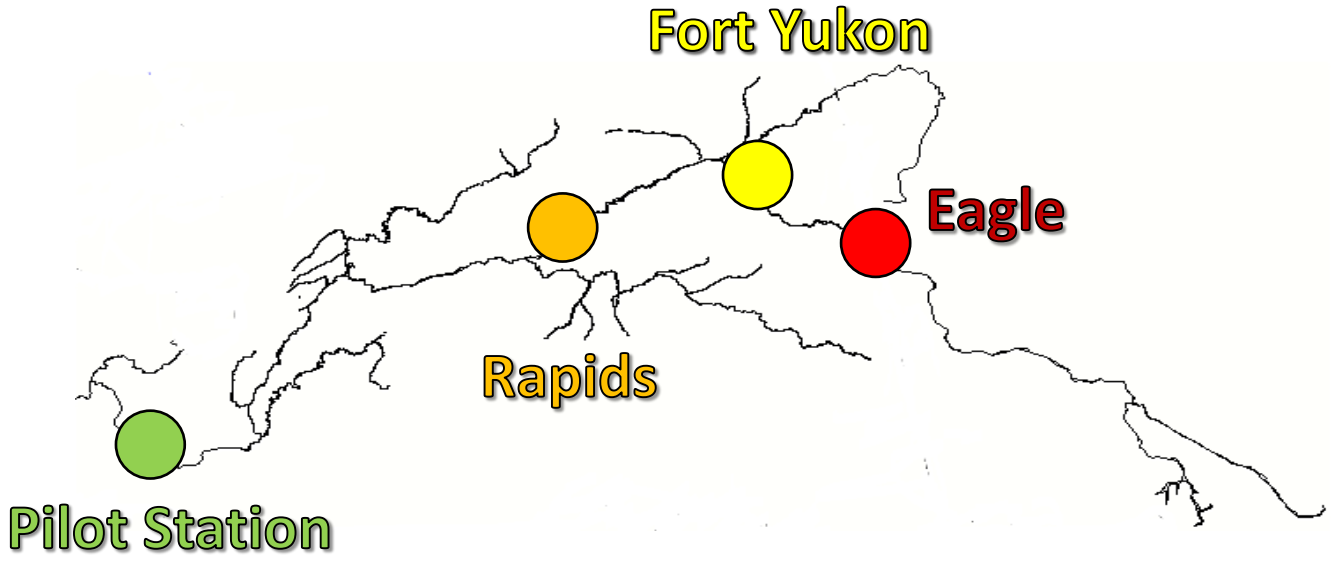
In both study years we have seen evidence of fish with light, moderate, and severe infection at all locations. Many researchers have united to help determine the biological impact of these infections, how infection interacts with other health stressors, and what we can do to effectively monitor and address this issue in the future.

Next Steps

- 2023 samples will be processed in the lab during the upcoming fall and winter.
- 2022 and 2023 data analysis will occur, and preliminary findings will be summarized.

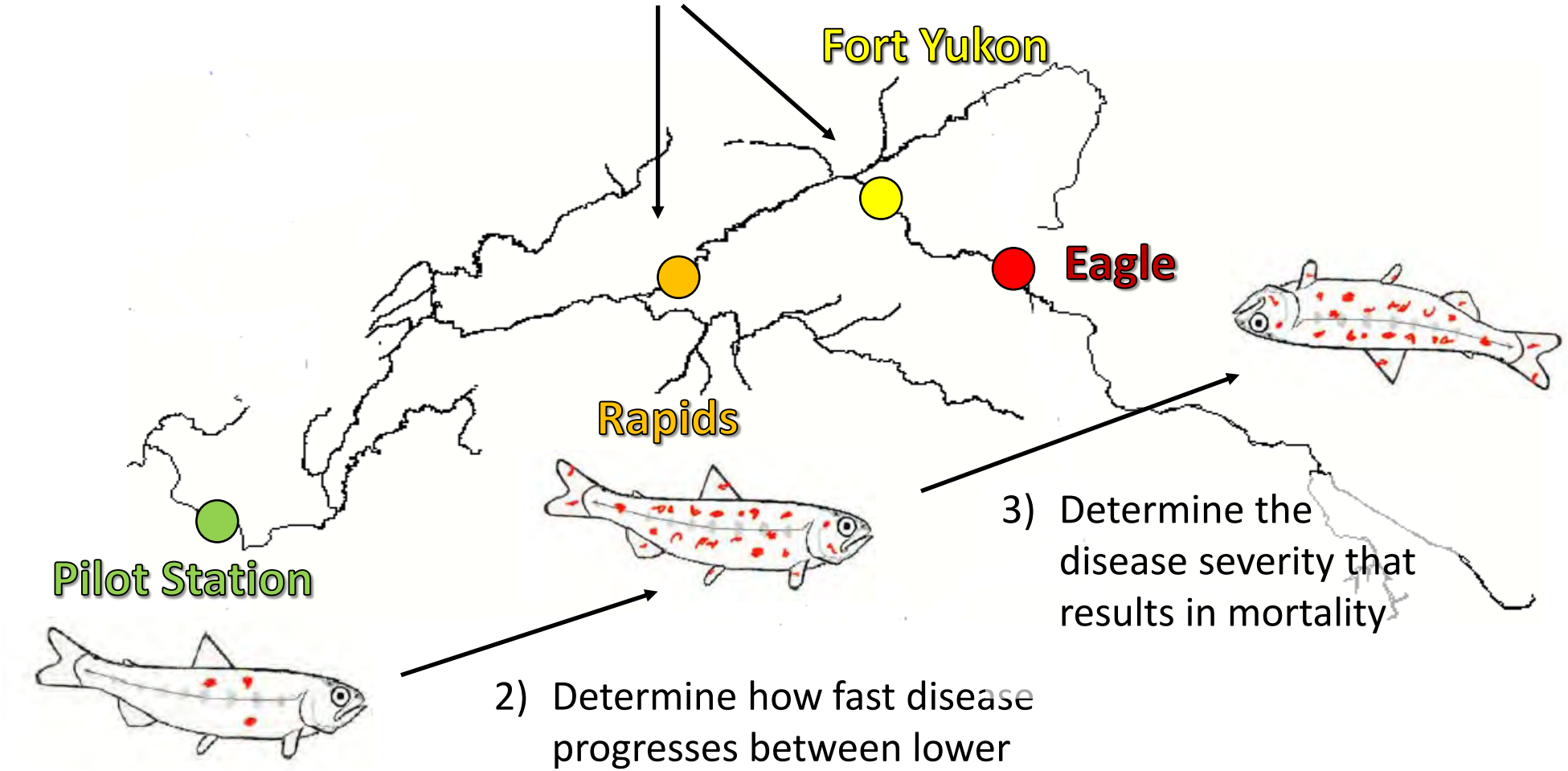
2024 is the final year of the current three-year study

Preparations for 2024 field season will include extensive community outreach and coordination.
We plan to attempt sampling at all four locations pending local support and partnerships



Important Future Analyses

1) Evaluate for evidence of mortality due to Ichthyophonus, by comparing results from middle and upriver sites



2) Determine how fast disease progresses between lower and middle river sites

3) Determine the disease severity that results in mortality

Community Engagement

Tribal Council Coordination

Tanana Tribal Council	Rampart Village Council	Fort Yukon Gwichyaa Zhee Tribal Government

Requested support of study

Orchestrated distribution of study fish to communities

Discussing results with tribal councils in 2024

Local Fisher
Knowledge, Expertise, and Involvement

Joe Zuray

Josh Cadzow

Earl Cadzow

Stan Zuray

Charlie Campbell

Ruth Althoff

Fish Distribution for Subsistence Use

Fish with *Ichthyophonus* SAFE for human and dog consumption

Distributed to: *Pilot Station, Tanana, Rampart, Fort Yukon, Eagle City and Tribe, Canadian First Nations (via Canada Dept. of Fisheries and Oceans)*

YRDFA Spring 2023 News Article

A Disease that May Limit Yukon River Chinook Salmon from Successful Upriver Migration

WRITTEN BY: KEITH HERRON IVY IN COLLABORATION WITH THE ADF&G AND THE USFWS

Positionality Statement: My name is Keith Herron Ivy. I am a Yup'ik biologist and scholar. My family comes from Bethel, Alaska; however, I grew up in the communities of Wrangell, Seward and Kenai, Alaska. I work for the U.S. Fish and Wildlife Service as a Fishery Biologist, Assistant Subsistence Fisheries Manager, and Tribal Liaison for Fisheries on the Yukon River. Part of the information collected by this research will be utilized for my Masters of Fisheries degree at the University of Alaska Fairbanks supported by the Tamamta program (NSF # 2022190). I am honored to live and work on the traditional homelands of the lower Tanana and Dena' peoples in Fairbanks, Alaska.

In 2022, I was one of the fishery biologists out on the river gathering samples to investigate the impacts of the fish parasite *Ichthyophonus* on Yukon River Chinook salmon. I witnessed firsthand the pain and suffering of the people without fish along the Yukon River, and it felt like the entire ecosystem was suffering because of the current fishery collapse. The Yukon River Chinook salmon drainage wide run in 2022 was the worst on record with approximately 45,000 Chinook salmon passing Pilot Station sonar. In the middle Yukon River, the number of Chinook salmon with visual signs of disease caused by *Ichthyophonus* was appalling. While sitting on the bank of the river, the river's unwell state reiterated a deep feeling of empathy for the wellbeing of the people, the land, and the salmon. I felt compelled to write this article to help introduce this important fish health issue, provide a brief history of *Ichthyophonus* within the Yukon River, and explain some of the approaches that are being taken to learn more about overall Yukon River Chinook salmon health. On behalf of the large research and management team that is supporting this work, we look forward to sharing more information and research findings in the coming months.

What has caused such low numbers of spawning Chinook salmon in the Yukon River in recent years? While many factors likely contribute to the salmon declines, we suspect that the resurgence of the parasitic pathogen *Ichthyophonus* may be a significant factor adding stress on Yukon River Chinook salmon and might prevent them from successfully reaching their spawning grounds. Understanding the impacts of *Ichthyophonus* on migrating Chinook salmon and whether it causes mortality before they spawn is essential for effective fisheries management.

Some of the factors contributing to the Chinook salmon decline are outside of our control as stewards and managers. However, we can influence the information that is collected to enable effective management actions designed to protect Yukon River Chinook salmon. That is why starting in the spring of 2021, the Alaska Department of Fish and Game (ADF&G) and the U.S. Fish and Wildlife Service (USFWS) brought together many experts, Alaska Native Tribes, and communities to work collaboratively to address growing concerns about *Ichthyophonus* and other fish health related issues. Through this fish health research, we aim to develop an annual *Ichthyophonus* monitoring program, build support to increase community-based (or Tribal-led) *Ichthyophonus* monitoring, improve tools to estimate annual disease-associated mortality, and provide a more complete assessment for the fate of Chinook salmon migrating up the Yukon River mainstem. Our anticipated results will allow fishery management agencies to better account for potential disease-associated mortality during future runs while still allowing for sustainable harvest levels assuming, and hoping, the run rebounds.

Ichthyophonus infects Chinook salmon while at sea rather than in freshwater. The infection is not believed to kill many ocean-phase salmon, but infection can cause disease within spawning-phase freshwater salmon that may progress to lethal levels resulting in en route mortality. Current information suggests en route mortality may be associated with high levels of *Ichthyophonus* and may have limited many Yukon River Chinook salmon from successful upriver migration in 2020, 2021, and 2022.

Fishers on the Yukon River have been able to observe *Ichthyophonus* in diseased Chinook salmon and recognize trends over time in the Yukon River. This knowledge led fishers to suggest *Ichthyophonus* could be a significant source of en route mortality. Not all Chinook salmon are infected with *Ichthyophonus*, but those infected may show visual signs of disease such as white spots on the heart (Picture 1) and elsewhere in the body. The filets from infected fish can have an unusual "sweet" or "tangy" smell and do not dry well, which can impact common fish preservation practices. By measuring

Fall 2023 News Article

Yukon River Drainage Fisheries Association

Working Together to Monitor Health of Yukon River Salmon

Community engagement

Ichthyophonus

Egg condition

Kidney disease

Thiamine vitamin deficiency

Paralytic shellfish toxins

Heart stress

Heat stress

Juvenile locations

Ichthyophonus laboratory trials

2024 Plans

Community Visits

Spring 2024 – Tanana, Rampart, Fort Yukon

Co-interpret and discuss preliminary results

Foundation for respect and incorporation of Indigenous, Koyukon, and Gwich’in knowledge and priorities

Multiple Views

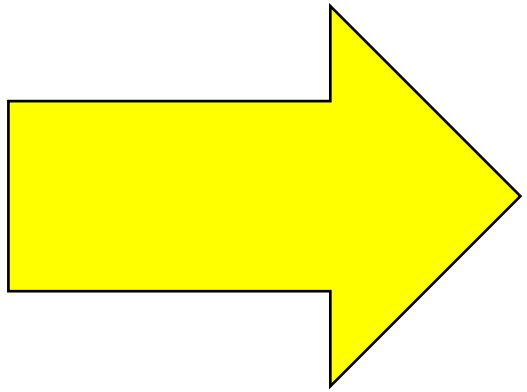
Indigenous

+

Local

+

Western



Greater understanding of **fish health**, **populations**, and **preservation**

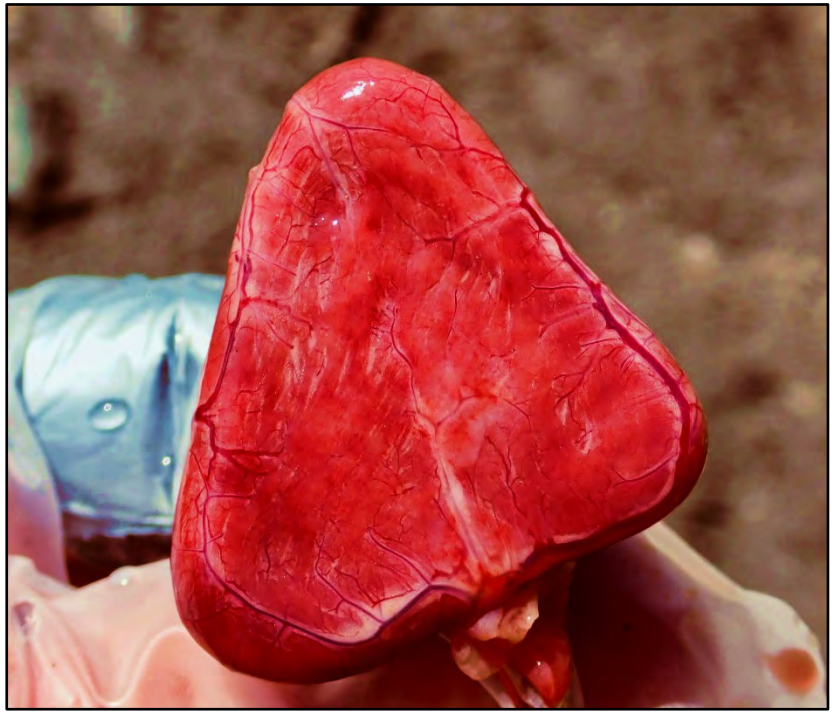
Community-Based Fish Health Monitoring

Fish condition, *Ichthyophonus*, symptoms

Local monitoring exists for over 2 decades

Picture-based detection of *Ichthyophonus*?

Photo credit: ANSEP Allison Heaslet



Questions to Communities

Questions to Yukon River Communities

How would you like to hear results in 2024?

Interest in an *Ichthyophonus* workshop at the spring YRDFA meeting?

Interests and ideas for collaborating with FWS and / or ADF&G in fish health and monitoring?

Thanks!

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EXTRA SLIDES

How to Report Sick Fish

Alaska Department of Fish and Game

Fish Pathology Laboratory

About Us | Diagnostic Testing | Disease Management | Hatchery Support | Applied Research | Education | Publications

The ADF&G Fish Pathology Section monitors and controls fish disease statewide – **Contact the lab directly to report sick or diseased fish.**

Anchorage Fish Pathology Lab
ADF&G, CFMD Division
333 Raspberry Road
Anchorage, AK 99518-1599
907-267-2244
Attention: Dr. Jayde Ferguson