

Establishing baseline environmental conditions on the Unuk River to preserve subsistence Eulachon harvest and inform regulatory management

Progress Report



Prepared by:

Ketchikan Indian Community
429 Deermont St.
Ketchikan, Alaska 99901

Summary

The Ketchikan Indian Association (KIC) partnered with the US Geological Society (USGS), US Forest Service (USFS), Alaska Department of Fish & Game, and Central Council Tlingit & Haida Indian Tribes of Alaska to conduct two baseline water quality sampling events within the lower Unuk River watershed and to conduct daily eDNA sampling at five locations throughout

eulachon spawning in the Unuk River. This data will be used to expand upon baseline water quality sampling conducted by USGS and to provide additional eulachon population data for monitoring with the USFS. The 2022 eulachon run was observed to be lower than previously monitored. The Eulachon River, a tributary of the Unuk River, had the overall highest concentration in eulachon eDNA throughout the sampling period. Continued eDNA sampling of the annual eulachon spawning event will improve inference into eulachon spawning population trends on the Unuk River.

Introduction

The Unuk River is a large transboundary river that originates in British Columbia, Canada and flows into Southeast Alaska near the community of Ketchikan (Figure 1). The development of three large mineral extraction projects in British Columbia within the Unuk watershed and a declining eulachon population on the Unuk River threaten Tribal subsistence opportunities and way of life. The need to establish a baseline of current water quality conditions and assess the eulachon spawning population using a higher resolution method is critical to ensure sustainable access to traditional resources.

The Ketchikan Indian Community (KIC), Central Council of the Tlingit and Haida Indian Tribes of Alaska, US Geological Survey, US Forest Service, and Alaska Department of Fish and Game partnered in 2022 to develop a robust water quality baseline and utilize environmental DNA (eDNA) to expand monitoring of the eulachon spawning populations on the Unuk River to inform regulatory management and provide subsistence harvest opportunity. The outcomes of this partnership are (1) to expand the spatial and temporal span of water quality data available on the Unuk River to evaluate baseline



Figure 1: Unuk River watershed map. Source: ADFG

conditions and inform managers and project partners and (2) through utilizing the novel technique of eDNA KIC will monitor the annual eulachon spawning population on the Unuk River to inform subsistence harvest regulations and increase harvest opportunity for Tribal Citizens.

Accomplishments

Baseline Water Quality Monitoring

KIC followed the established USGS water quality sampling protocol and conducted two water quality sampling events; one in March 2022 and one in October 2022. We also collected samples in the spring of 2023. Samples were sent to the USGS Alaska Science Center for analysis. The data from these sampling events will be used to characterize water quality conditions and inform future assessment of potential impacts to the Unuk River watershed from upstream mining activity. We are still waiting on water quality data from USGS.

Eulachon Population Monitoring with eDNA

Environmental DNA (eDNA) sampling methods followed those used for eulachon population monitoring in northern Southeast Alaska from Pochardt et al., 2020. Samples were collected daily from March 18, 2022 through March 23, 2022 at five locations within the lower Unuk River watershed (Eulachon River, Upper Landing Slough, confluence of Lower Landing Slough and Mattney Slough, the Upper Unuk River, and the Unuk River mainstem). Triplicate 1L samples were collected from each location and filtered through a Nalgene 0.45um, 45mm diameter cellulose-nitrate membrane using a hand vacuum pump developed by Ostera Engineering (<https://www.ostreaengineering.com/>). Samples were preserved in 5ml cryovials with Longmire's buffer until being shipped to Dr. Taal Levi's lab at Oregon State University for extraction and digital droplet PCR analysis. A total of 211 eDNA samples were collected in 2022, including field blanks.

In 2022, Eulachon were already present in the Unuk River mainstem and Eulachon River at our initial sampling event on March 18th, 2022 (Figure 2 & 3). The Upper Unuk sampling location was added in on March 19th. The Eulachon River had the overall highest concentration of eulachon eDNA observed during the sampling period. Conversely, the Lower Landing & Mattney Slough sampling location had the overall lowest concentration in eulachon eDNA. US Forest



Service observations indicated that the 2022 eulachon run in the Unuk River was low compared to the previous 10 years of observations.

Results

Baseline Water Quality Monitoring

The water quality samples are still being processed and results are expected to be available in early 2023.

Eulachon Population Monitoring with eDNA

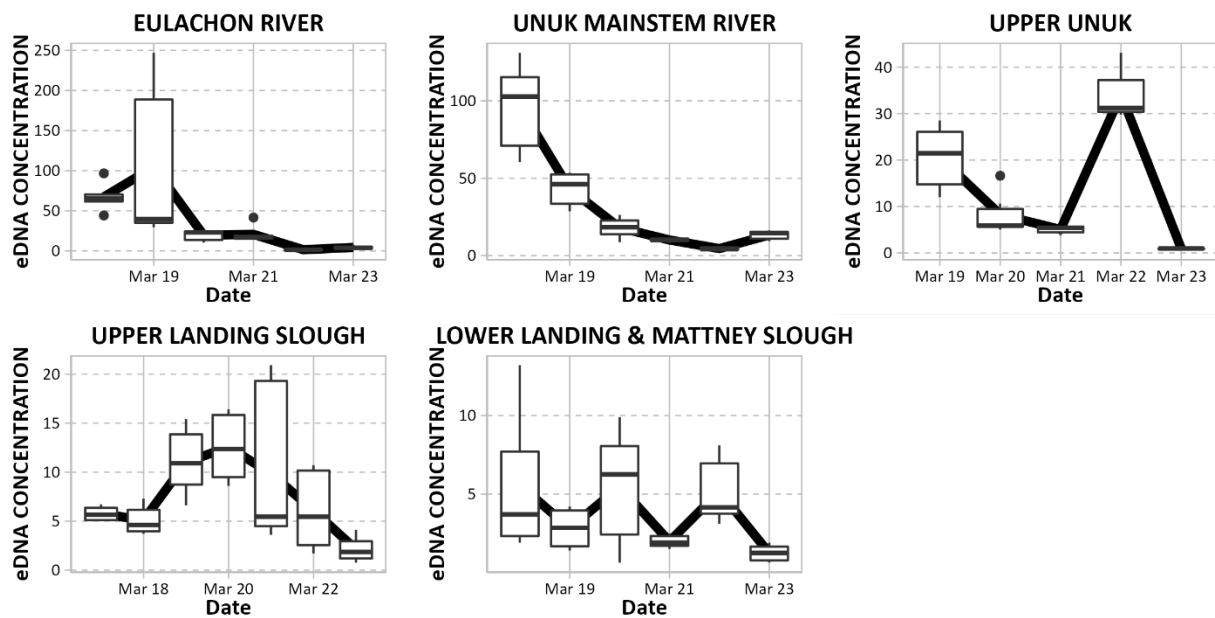


Figure 2: eDNA concentration at five sampling locations during 2022 sampling events. Bars indicate the spread in sample replicates for that sampling date.

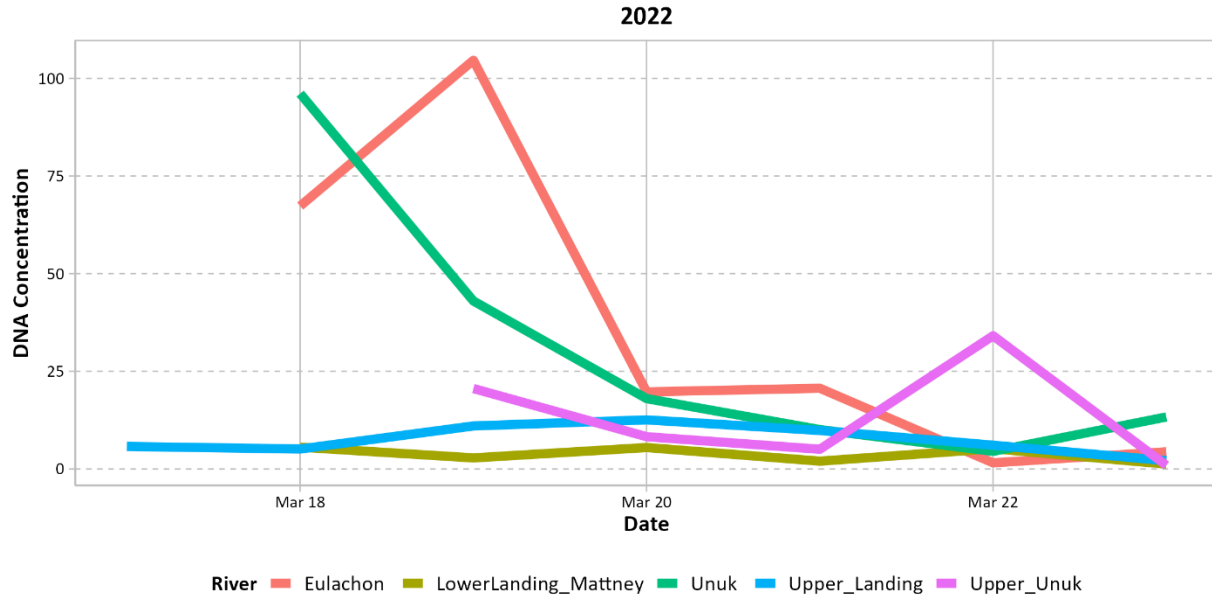


Figure 3: eDNA concentration among all sampling locations for 2022.

We are still awaiting data from the 2023 sampling efforts. In 2023 the run arrived on March 8 while the river was locked in ice. Surveyors were unable to assess overall numbers of live fish during the beginning of the run, due to extensive ice cover, however new spawn (eggs) were observed each day on the gravel bars, from the 13th to the 19th along multiple channels. With the most significant amount of new spawn (eggs) observed on March 15, covering about 2.8 miles of channels, and approximately 18 acres of total area spread out along multiple channels. After channels were free of ice live fish were observed in several channels in low densities. Based on the escapement (eggs) observations and numbers of live and dead fish observed by biologists and reports from local subsistence users the 2023 run appeared moderate season

High winds, and heavy ice buildup and snowfall delayed field surveys in 2023. Attempts to reach the Unuk River early by boat were made on February 27, March 6, and March 10. Surveys were cancelled due to heavy ice on the river and high winds and seas at Burroughs Bay/North Behm Canal. Seas on March 6 exceeded six feet with 35+ knot winds and forecasted to remain all week. Gale warning on March 10 with winds out of NE. Crews turned around at Claude Point.

On March 8 a local landowner called and reported “*the Ooligan have just arrived and are present under the ice*”. Because of ice the landowner was unsure of how many fish were present but noted at least 20 dead Ooligan visible.

March 10 local landowner reported “*seeing dead fish in slough in front of cabin. Females are spawned out along with half males. Fish on top of ice after tide froze*”.

Field personnel arrived on the Unuk on March 13 and stayed onsite until March 27. Fish appeared to have concentrated in the lower channels this year, primarily within the lower portion of Upper Unuk, Lower Landing (LL), LL-Side Channel, lower portion of Upper Landing, and Eulachon River. Ice cover along Upper Unuk, Eulachon River, and Upper Landing Slough's prevented observation of fish during the majority of the peak of the run, however new spawn (eggs) was observed each day on the gravel bars, from the 13th to the 19th along multiple channels. With the most significant amount of new spawn (eggs) observed on March 15, covering about 2.8 miles of channels, and approximately 18 acres of total area spread out along multiple channels.



KIC staff filtering eDNA sample

Challenges

Two main challenges for this project have been staff turnover and weather delays. At the end of year one, the KIC Environmental Specialist resigned, and the position was vacant for a few months while the KIC HR department released the job description. The new KIC Environmental Specialist was hired shortly after and trained by existing KIC staff and Ocean & Earth Environmental staff. Training included YSI, eDNA sampling, and water sampling.

Weather was also a challenge in the spring of 2023 as the Unuk remained ice covered during the Eulachon run. We were delayed in getting up to the sites and missed the initial eDNA sampling prior to the run starting.

Conclusion

The initial two years of water quality baseline monitoring and eulachon eDNA population monitoring was successful in collecting the necessary samples to help KIC establish baseline conditions on the Unuk River. These efforts will be continued annually through 2025. These additional years will build upon the initial sampling effort to continue to develop the baseline conditions assessment.

References

- Pochardt, M., Allen, J. M., Hart, T., Miller, S. D. L., Yu, D. W., & Levi, T. (2020). Environmental DNA facilitates accurate, inexpensive, and multiyear population estimates of millions of anadromous fish. *Molecular Ecology Resources*, 20(2), 457–467. <https://doi.org/10.1111/1755-0998.13123>