Diversity of Chars (*Salvelinus* spp.) in the Central Canadian Arctic

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Introduction

- Canadian Arctic is warming at ~3x global rate [1].
- *Salvelinus* fishes represent a critical subsistence food source in remote northern communities, and are especially vulnerable to climate-induced changes due to their life stage-specific use of multiple habitats [2,3].
- Mackenzie River is believed to be a boundary between Arctic char (ARCH) and Dolly Varden (DVCH; Figure 1; [4]). However, community reports and anecdotal scientific data suggest that Dolly Varden may be present in the Coppermine and Tree rivers, hundreds of kilometers east of their purported range [5].
- Project developed in response to community concerns: Coppermine River supports a subsistence Arctic char fishery – understanding the diversity of chars will help inform habitat restoration and management plans.

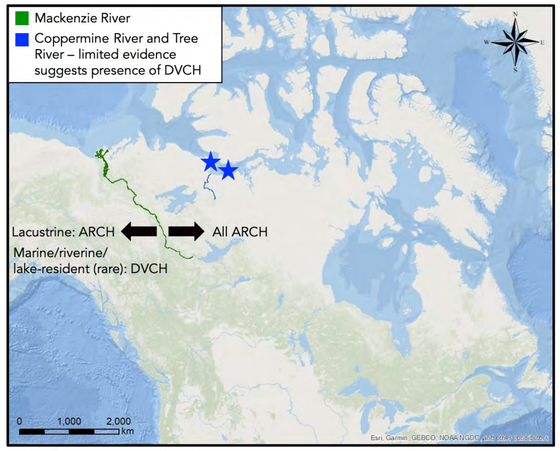

Figure 1: Purported distribution of chars in the Canadian Arctic.

Objectives

- To determine the species composition of *Salvelinus* fishes in the Coppermine and Tree rivers.
- To establish the extent of species introgression and hybridization in the Coppermine River.

Methods

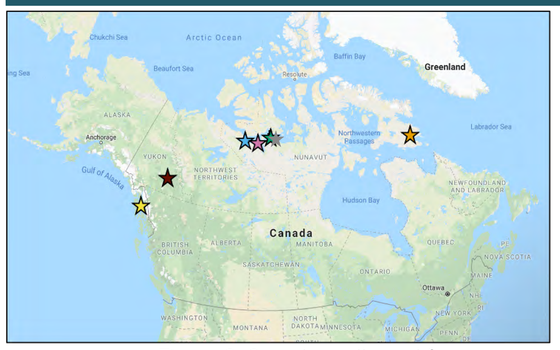

Figure 2: Samples collected from:

- *Reference DVCH: Sashin Creek, AK, Stella Lake & Unnamed Creek, YT*
- *ARCH, DVCH, potential hybrids: Coppermine River, NU*
- *Purported DVCH: Tree River, NU*
- *Reference ARCH: Nauyuk Lake, Hope Bay, Sylvia Grinnell River, NU*

- 289 samples from across the Arctic (Figure 2) genotyped using 87K Arctic char SNP genotyping assay [6].
- Plink and STRUCTURE used to perform PCA and examine population structure and presence of hybrid individuals.

Results and Discussion

- 69,949 SNPs were retained for analysis after filtering for missing genotypes and minor allele frequency.
- Fish in the Tree River are distinct from both the reference Arctic char and Dolly Varden populations (Figure 3), and may be genetically similar to northern form Dolly Varden. Reference Dolly Varden populations shown here are all southern form (*S. m. lordi*), and future work includes genotyping northern form (*S. m. malma*) individuals.
- The Coppermine River appears to support Arctic char, Dolly Varden, and probable hybrid individuals (Figure 3). Future work will assess whether this variation is associated with differences in spawning and/or overwintering habitat. These data, as well as the Tree River data, suggest that the Mackenzie River is not as definitive a boundary as has long been believed.
- Preliminary analyses suggest that Arctic char in the Coppermine River have a similar population structure to the reference Arctic char populations (Figure 4, shown in green). While Coppermine River probable-Dolly Varden share some genetic similarities with the purported Tree River Dolly Varden, both groups also have genetic influence from elsewhere (Figure 4). This may, again, reflect similarity with northern form Dolly Varden.

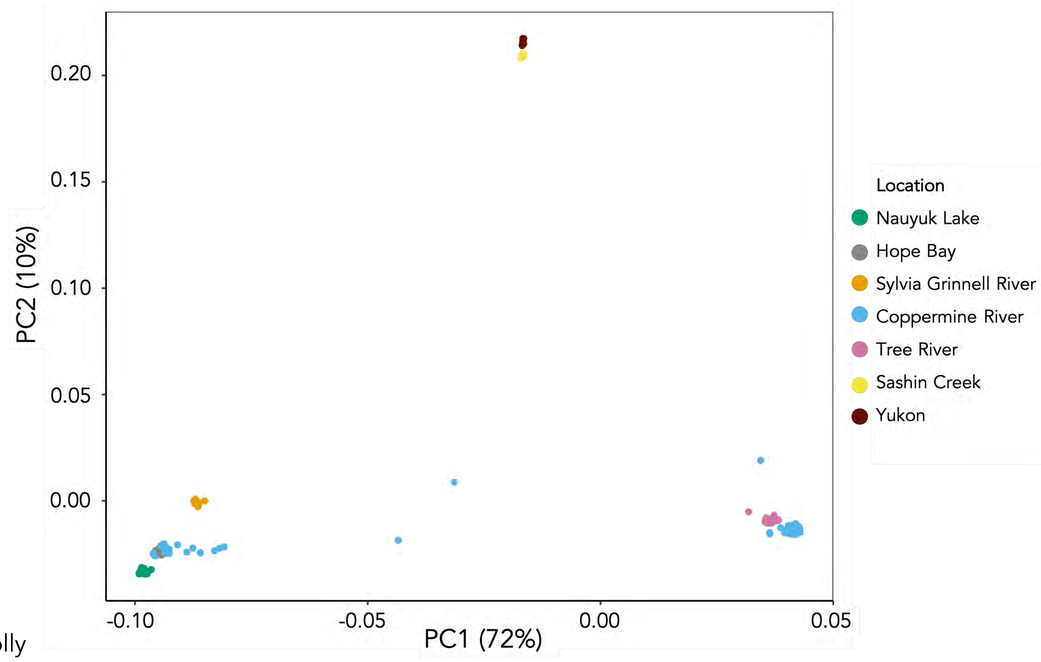

Figure 3: Principal Component Analysis of 289 Arctic char and Dolly Varden from across the Arctic. PC1 separates individuals by species or sub-species, while PC2 differentiates between glacial refugia.

- These data will contribute to the understanding of char diversity in the Canadian Arctic and will be used to inform a habitat management plan. Continued work will combine genomic data, morphometric and meristic analyses, and Traditional Knowledge to increase our understanding of the effects of climate change on a critical subsistence fishery.

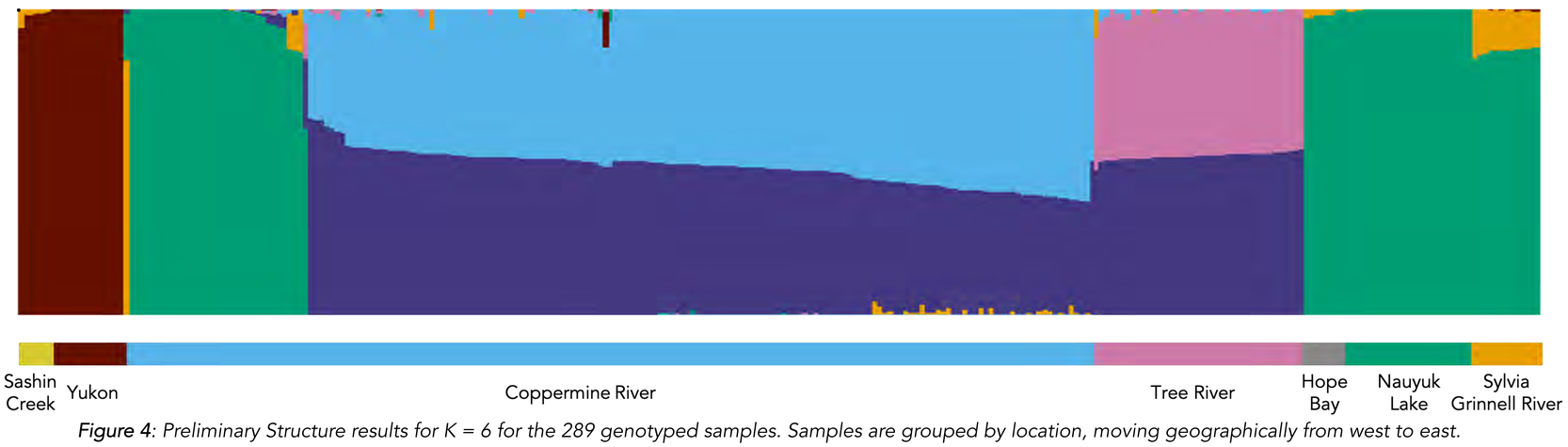

Figure 4: Preliminary Structure results for K = 6 for the 289 genotyped samples. Samples are grouped by location, moving geographically from west to east.

Acknowledgments

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