

Western Alaska Chum Salmon—New Effort to Improve Genetic Markers for Fishery Management

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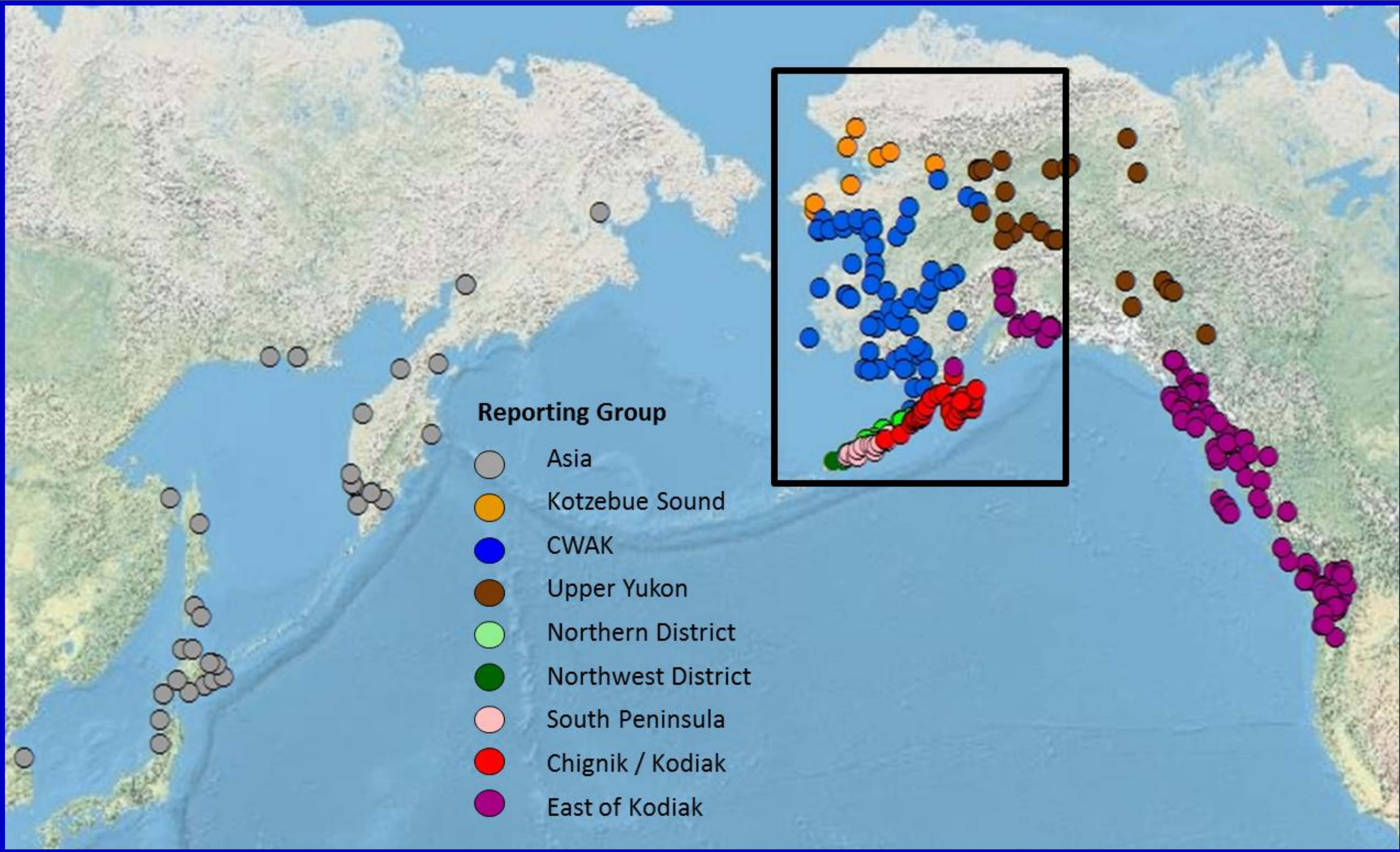
History

The difficulty in accurately determining the place of origin of chum salmon has impeded fisheries management in western Alaska, and the effects of fisheries on the various stocks of chum salmon in western Alaska has been debated for several decades.

Present genetic markers are insufficient to distinguish chum salmon populations from Norton Sound, the Lower Yukon River, the Kuskokwim River, and Bristol Bay for mixed stock analysis applications. We refer to these populations in aggregate as Coastal Western Alaska or “CWAk” (See blue dots on map to right).

The goals of this project are:

- I. To develop targeted genetic markers for improving stock identification of chum salmon stocks from coastal western Alaska (Norton Sound, Lower Yukon, Lower Kuskokwim, and Bristol Bay).
- II. To screen genetic markers in 144 individuals per 32 collections that represent the genetic diversity of coastal western Alaska chum salmon and flanking regions.
- III. To test the effects of marker characteristics on ability to correctly allocate a mixture to the four Coastal Western Alaska reporting groups.



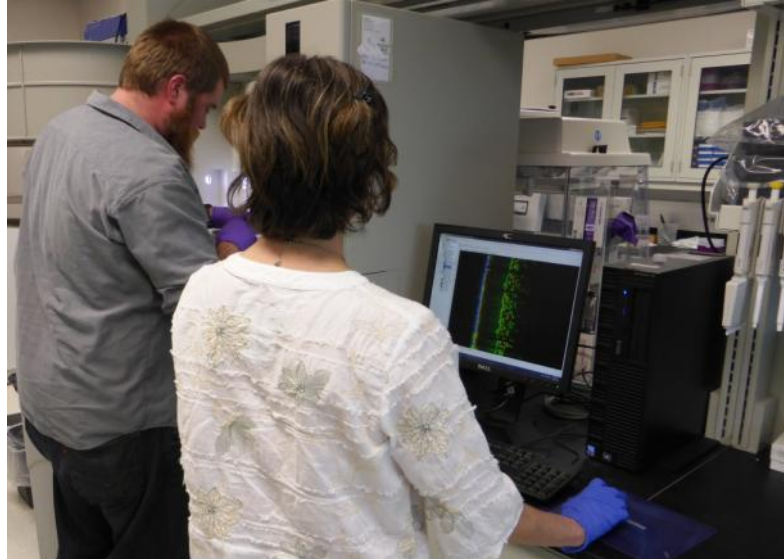
Chum salmon populations in the current Alaska Department of Fish and Game genetic baseline. The Coastal Western Alaska (CWAK) reporting group cannot be further divided for mixed stock analysis applications.

NOAA Fisheries

Goal II: Screening microsatellite markers

Pre-existing markers and new markers will be used to genotype:

1. Baseline samples from about 144 individuals from each of 33 locations.
2. Mixture samples from the lower Yukon and Kuskokwim rivers—about 200 individuals per mixture, 3 mixtures per river.



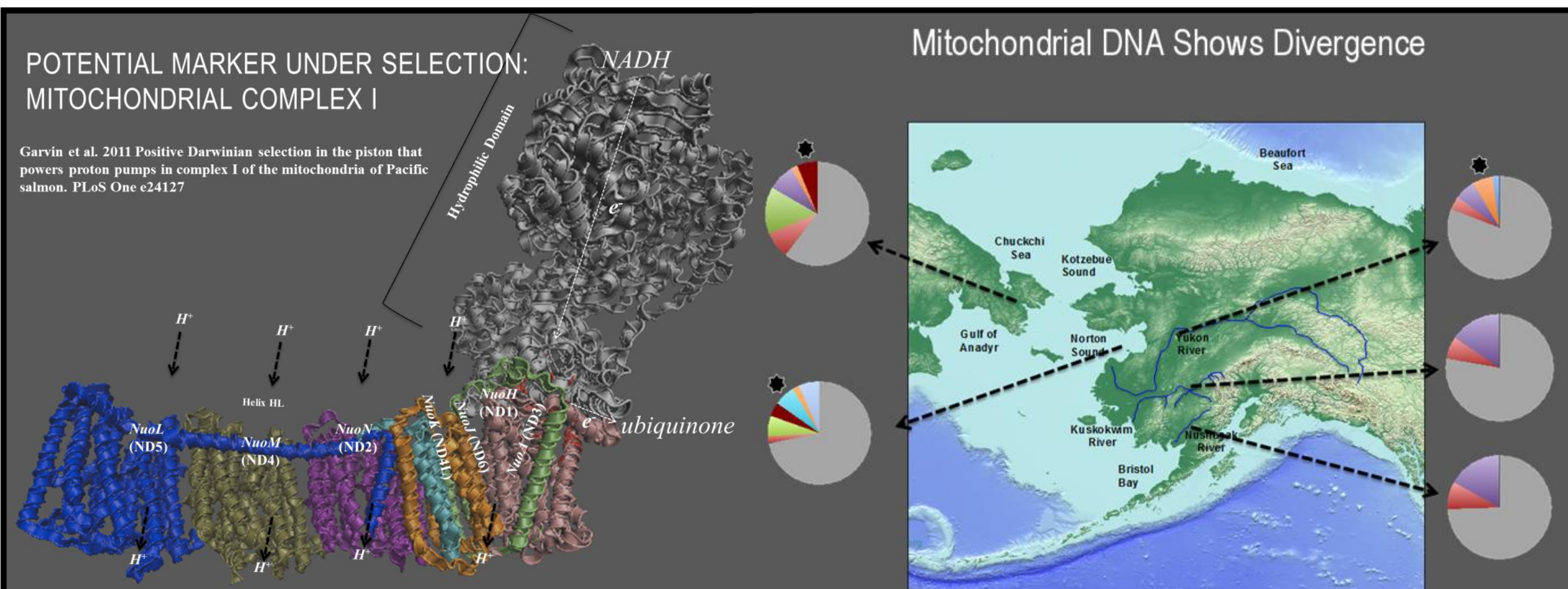
52 new microsatellite markers have been evaluated; about 12 will be used with the 12 pre-existing markers to complete Goal II.

Principal participants: Jeffrey Guyon, Christine Kondzela, Jackie Whittle, Colby Marvin, Scott Vulstek

The recommendations and general content presented in this poster do not necessarily represent the views or official position of the Department of Commerce, the National Oceanic and Atmospheric Administration, or the National Marine Fisheries Service.

University of Alaska Fairbanks

Goal I: Developing SNPs



With a novel approach, variation observed in mitochondrial DNA is being used to find associated nuclear SNPs. High throughput RAD sequencing allows screening thousands of potential SNPs.

Florigenex RAD-SEQ Output

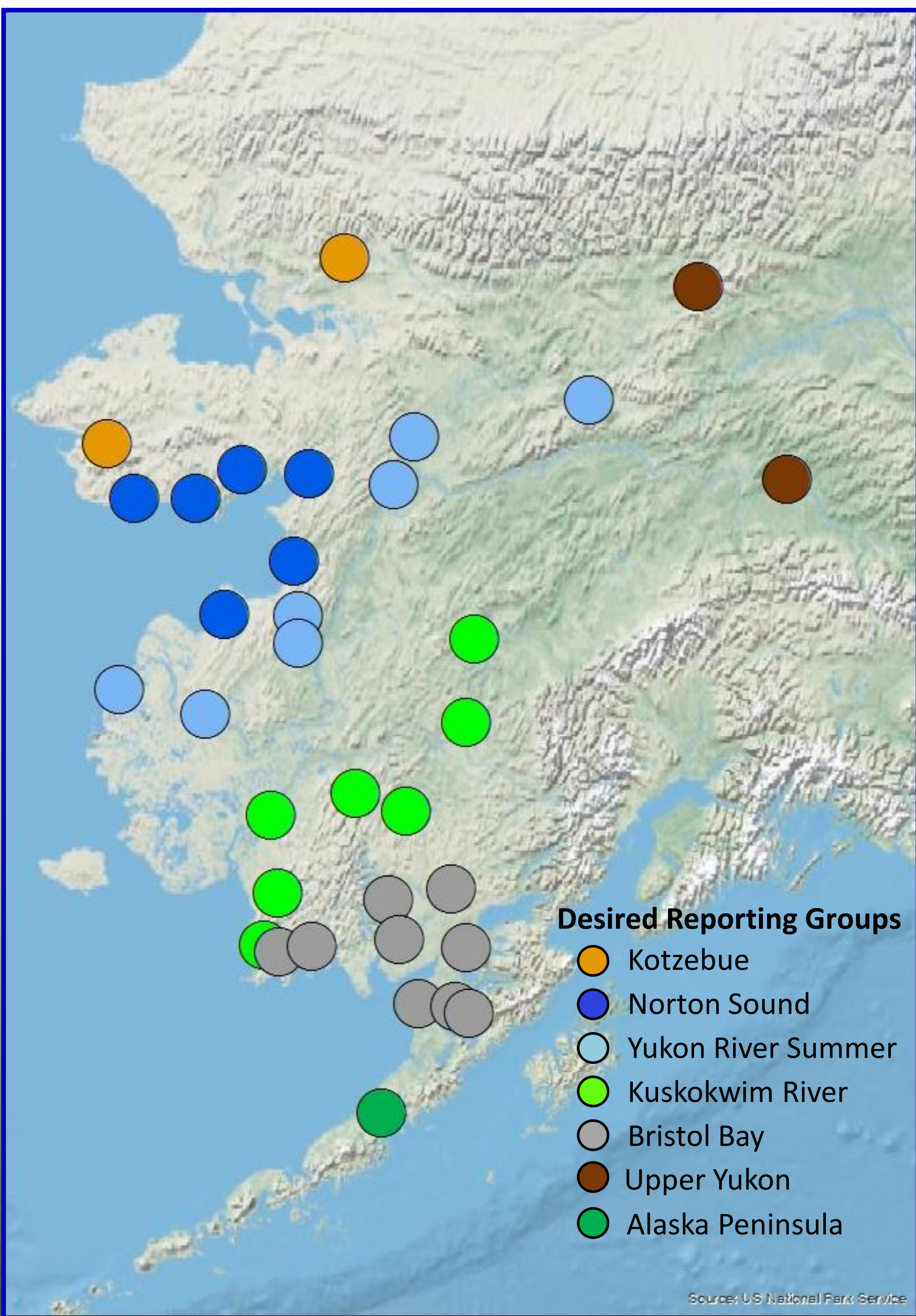
Mean reads per sample = 7.8 Million

Total sequence reads = 413 million
Total potential SNPs = 19,098

Reduce to hundreds from thousands of potential SNPs

- | | |
|---|--------------------------------------|
| 1. Does 200 bp RAD-tag amplify? | Yes -> go to slide 2
No -> Repeat |
| 2. Perform Eco-TILLING – Is locus duplicated? | Yes -> Repeat
No -> go to slide 3 |
| 3. Design Taqman assay – Test for HWE | Yes -> go to slide 4
No -> Repeat |
| 4. Is SNP informative for 8 Western AK populations? | Yes -> go to slide 5
No -> Repeat |
| 5. Send to ADF&G – to evaluate for MSA | |

Principal participants: Michael Garvin, Megan McPhee



Chum salmon collections from these locations will be used by NOAA and ADF&G to screen genetic markers for this project.

Alaska Department of Fish and Game

Goal II: Screening SNPs

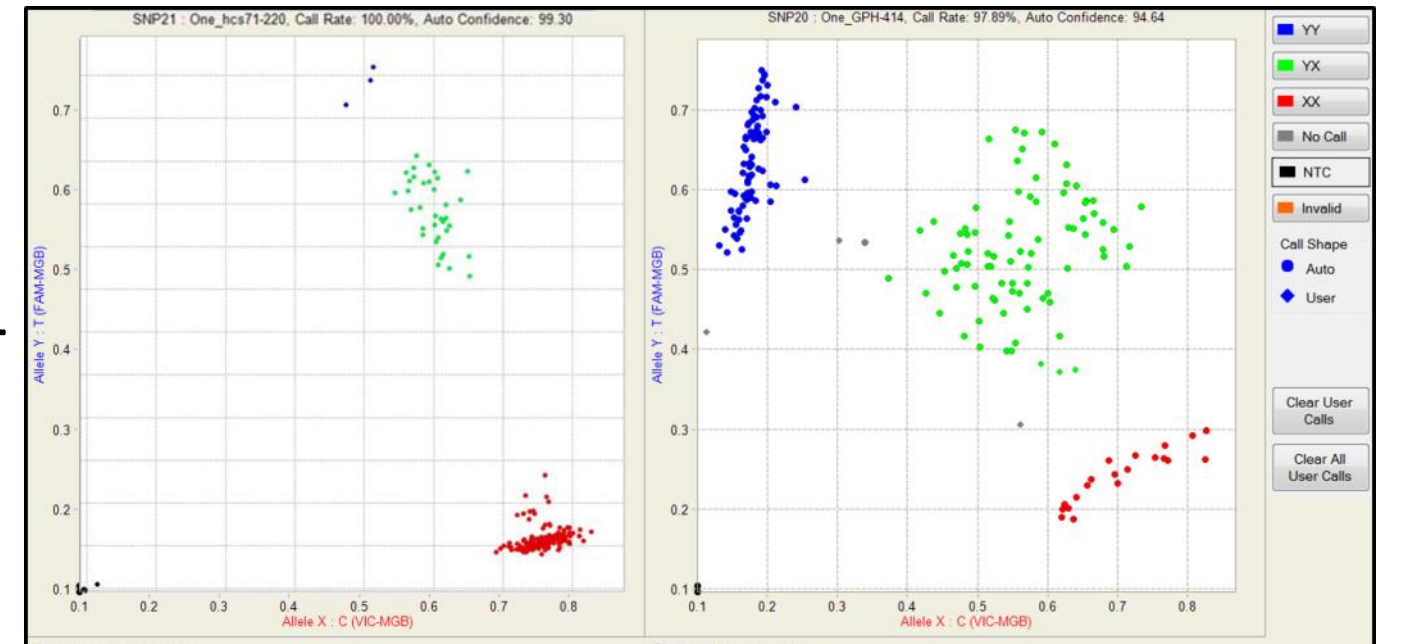


The Alaska Department of Fish and Game, Gene Conservation Laboratory, will screen SNPs developed under Goal I at 33 locations (See map to left). Additionally, ADF&G has supplied DNA for 32 of the 33 locations to NOAA for microsatellite screening.



Goal III: Testing Markers

ADF&G will partner with UAF and NOAA to test the markers developed by this project for their utility in separating the four CWAK groups in mixed stock analysis (MSA) applications. Marker allele frequency differences among reporting groups is one key factor in optimizing a marker panel for MSA. The dots on the plots at right are allele calls for individual fish.



Stakeholders

The Western Alaska Salmon Coalition (WASC) is an association of four regional Alaska Native non-profit organizations: the Bristol Bay Native Association (BBNA), the Association of Village Council Presidents (AVCP), the Tanana Chiefs Conference (TCC), and Kawerak, Inc. Collectively the WASC represents 149 villages in Western and Interior Alaska.