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## **Managing the Genetic Diversity of an Arctic Char Broodstock**

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The goal of this project is to make permanent improvements to the Arctic char broodstock at the Icy Waters hatchery in Whitehorse, Yukon, through the implementation of marker-assisted selection. Eight microsatellite markers were chosen to obtain baseline data about the genetic diversity of a broodstock (n=850) and to estimate the genetic relationship of all pairs of individuals. This information has been used to avoid inbreeding between closely related individuals, maintain maximum levels of genetic variability in the hatchery and to genetically 'fingerprint' parents and offspring in order to establish pedigrees. Twelve different crosses were produced from two inbred lines (two purebred, two hybrid and eight backcross) to compare performance and to provide families for analysis of quantitative trait loci (QTL). Sixty microsatellite markers provided sufficient information to screen the mapped regions of the Arctic char genome for the location of genes responsible for commercially important traits such as growth and sex. Nine markers were found to have significant or near significant association with genes responsible for growth rate. These markers can be used to increase the frequency of fast growth genes in the overall population through marker-assisted selection, or to transfer fast growth genes from one purebred line to the other through marker-assisted introgression. Three genetic markers were found to be tightly linked to the male sex-determining factor. These markers can be used to cull unwanted males from cohorts of fish used in egg production. Other important traits under investigation include disease resistance, pigment uptake, upper temperature tolerance and coloration.