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Quantifying abundance and recruitment in a re-establishing lake trout population by close-kin mark-recapture

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ABSTRACT:

Effective fisheries management and restoration requires reliable estimates of abundance and population trajectories through time. However, absolute population estimates are extremely difficult to obtain in large systems due to the prohibitively high sample sizes required by most approaches. Close-kin mark-recapture (CKMR) is a new technique that can obviate this hurdle by using the observed kinship within a sample to estimate the true adult population. We sought to develop a CKMR model for lake trout (*Salvelinus namaycush*) and apply it to understand the ongoing re-establishment of Lake Champlain's wild population by estimating the abundance of individuals contributing to wild recruitment as well as their stocking source. To accomplish this, we first developed an amplicon sequencing-based genotyping panel of 131 microsatellite loci capable of efficiently resolving complex relationships among kin. In the process of doing so, we tested protocol changes that allowed us to greatly reduce genotyping costs by using larger multiplexes and smaller PCR reaction volumes (Marcy-Quay et al. 2023 – attached). We then used this panel to genotype 2,649 wild-caught lake trout caught from 2015-2023. In combination with age estimates, we incorporated these data into a close-kin mark-recapture model that produced estimates of adult abundance and survival, as well as an indication of the proportion of adult fish contributing to the successful recruitment (Marcy-Quay et al. *in review* – attached). Our results suggest that adult survival is high, in line with previous estimates produced using non-genomic methods, but that fish stocked by New York State were overrepresented in the catch relative to those from Vermont. Abundance estimates indicated an adult density at the lower end of reported values for other populations at 0.32 fish/ha with only approximately 20% of adults contributing to the resurgence of wild recruitment noted during the past decade.