

Development and application of microsatellites to population structure and mixed-stock analyses of Dolly Varden from the Togiak River drainage

Abstract: Dolly Varden *Salvelinus malma* in the Togiak River support a large subsistence fishery for communities in Bristol Bay. Population assessment and management for anadromous Dolly Varden are challenging because populations overwinter and are harvested in mixtures. We used genetic data to test whether population subdivision exists among spawning aggregates of Dolly Varden in three tributaries of the Togiak River drainage and if genetic methods could be used to estimate the stock composition of Dolly Varden sampled from subsistence catches and overwintering aggregates in the Togiak River. Tissue samples were collected from Dolly Varden in prespawning condition from three tributaries to the Togiak River in 1998 and 2000: Trail Creek (N=116), Kashaik River (N=51), and Ongivinuck River (N=119). Young-of-the-year Dolly Varden from Cobblestone River (N=298), north of Norton Sound, and Kivalina River (N=200), in Kotzebue Sound, were used for comparison at a larger spatial scale. Seven species specific microsatellite loci were developed specific to Dolly Varden of which six were polymorphic. The number of alleles observed at variable loci ranged from 3 to 38 and mean expected heterozygosity ranged from 0.521 to 0.941. F_{ST} for the Togiak River populations was 0.009 and for all populations was 0.046; both values were significantly greater than zero. Genetic differences were detected among all possible pairwise comparisons of the five collections. Multidimensional scaling analysis demonstrated large spatial differences between the three Togiak River drainage collections and those from the Cobblestone and Kivalina Rivers. A simulation analysis was used to test whether these genetic data could be used in mixed-stock analysis. Mean contribution estimates for artificial mixtures composed 100% from a given population were 81% (Kashaik River), 93% (Ongivinuck River), 97% (Trail Creek), 99% (Cobblestone River), and 99% (Kivalina River). The levels of population subdivision observed in this study will likely permit estimation of population contributions to subsistence catches and overwintering mixtures in the Togiak River drainage. However, larger sample sizes and greater representation of Togiak River tributaries and rivers in western Alaska will be needed. Future management actions should take into account the fine spatial scale of population structure for Dolly Varden in the Togiak River drainage in order to maintain genetic diversity and productivity.

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