

## Lake Clark sockeye salmon population assessment

Recent declines in the number of sockeye salmon returning to Lake Clark caused economic hardship in the region and raised resource concerns among local subsistence users and Federal managers. This final report describes findings from a two year study with two primary objectives: 1) to identify sockeye salmon spawning areas using radio telemetry, and 2) to describe genetic variation within and divergence among spawning populations. *Radio Telemetry Research:* A lack of information regarding spawning habitat distribution in Lake Clark instigated this study. To determine spawning distributions, 332 adult sockeye salmon were radio tagged as they entered Lake Clark in 2000 and 2001. Fish were relocated every 5-10 days by boat, plane, or remote solar powered receiver. On average, a radio tagged fish was relocated 12.7 times (range, 3 - 33) and over 3,500 relocations were made. Thirty- five spawning areas were identified, including three sites downstream of the tagging area and five sites identified by visual observation or seining. Eighteen areas were newly identified. Most Lake Clark sockeye salmon spawn in the Tlikakila River, Kijik watershed and along beaches of Lake Clark and Little Lake Clark. Spawning habitat locations were mapped into the Geographic Information System for Lake Clark National Park and Preserve. Surprisingly, over 60% of radio tagged salmon spawned in turbid glacial waters; most of which were adjacent to an obvious clear water source. About 75% of identified spawning habitats are adjacent to privately owned lands, many slated for development. Proactive measures should be taken to conserve these habitats. *Genetics Research:* Prior to this study genetic information was lacking for Lake Clark originating sockeye salmon populations. Molecular genetic markers provide managers with more precise tools with which to identify and manage fish populations. Small clips of fin tissue (non-lethal) were obtained from 1,442 sockeye salmon representing 13 Lake Clark and 2 northeastern Lake Iliamna spawning populations in 2000 and 2001. Allele frequencies differed significantly across 11 microsatellite loci in 94 of 105 pair-wise population comparisons. Pairwise estimates of *F<sub>ST</sub>* ranged from zero to 0.089. There is significant genetic divergence between populations of Lake Clark and Sixmile Lake, the latter being more similar to fish of Lake Iliamna. The reduced numbers of alleles and strong divergence of most Lake Clark populations relative to Lake Iliamna/Sixmile Lake populations suggest a bottleneck or period of low population abundance, resulting in reduced genetic diversity. The greatest bottleneck effect detected and the most genetically distinct population was found in Sucker Bay Lake. Possible causes of these bottlenecks include reductions in effective population size associated with recent poor returns or colonization of new spawning habitats. Samples shared with the Alaska Department of Fish and Game for a Bristol Bay wide analysis indicate Lake Clark originating sockeye salmon are easily distinguished from other lake originating Bristol Bay stocks of sockeye salmon.

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