

Conservation Through Genetic Research

Conservation Genetics Laboratory, Alaska Region

Assisting the Service in meeting its Mission through the use of conservation genetics expertise and modern technology is the primary function of the Alaska Region's Conservation Genetics Laboratory (CGL). The sophisticated laboratory techniques and analytical methods used in conservation genetics are increasingly being applied to a variety of species in a conservation context. The CGL was established in 1987 in Anchorage, Alaska, as the first conservation genetics laboratory in the Service, continues to be the Service's largest facility and serves as a model for a Service "Center of Excellence" in conservation genetics.

We work with biologists and managers to design and conduct genetic research and provide expertise to address conservation and management issues. The CGL also plays a major and formative role in the Service's newly sanctioned Conservation Genetics Community of Practice. In addition to multiple projects within Fisheries and Ecological Services, the CGL actively collaborates with several internal partners.

Key Service partners include:

- Kenai Fish and Wildlife Field Office
- Fairbanks Fish and Wildlife Field Office
- Juneau Fish and Wildlife Field Office
- Anchorage Fish and Wildlife Field Office
- Togiak National Wildlife Refuge
- Selawik National Wildlife Refuge
- Kenai National Wildlife Refuge
- Office of Subsistence Management
- Regions 1, 2, 4 and 5

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Male Dolly Varden sampled in northwest Alaska prior to release.

Collaboration with agencies and organizations outside the Fish and Wildlife Service is also critical to our success, and helps us to successfully compete for hundreds of thousands of dollars annually from external sources.

Key external partners include:

- Alaska Department of Fish & Game
- U.S. Geological Survey
- U.S. Forest Service
- N.O.A.A.
- Canadian Department of Fisheries and Oceans
- Pacific Salmon Commission
- Multiple Alaskan Native Organizations
- University of Alaska
- Several other academic institutions in the U.S., Canada and Russia.

Projects in the CGL focus on dozens of species, from salmon to sea otters, from Russia to the Lower 48. The CGL is equipped to perform multiple types of genetic research, from microsatellite analysis to direct DNA sequencing – and almost everything in between.

Results of CGL research allow fish and wildlife professionals to integrate genetics into their management and conservation efforts. In addition to dozens of Service reports, CGL staff have published over 40 scientific articles in the peer review literature since 2000.



Hook and line sampling for coho salmon.

Two areas of emphasis in CGL research are the characterization of Population Structure and Mixed-Stock Analysis:

Population Structure

Sound management of any species necessitates knowing the scales at which its natural genetic diversity is structured. Identification of even basic biological parameters, such as population size, cannot be made without this information. Variations in life history traits and breeding strategies often lead to the formation of genetic population structuring that is unique to a given species. While various types of traditional research methods (e.g., radio telemetry, mark-recapture, fish weirs, etc.), yield valuable information about physical movements of organisms, they cannot determine the true geographic boundaries of populations or detect genetic exchange among them.

Population structure analysis allows us to define populations (how they are structured spatially and temporally) and quantify genetic exchange between them; it is one of the most fundamental and useful techniques in conservation genetics and is the basis for the informed designation of conservation units for any species. We are currently characterizing population structure in more than a dozen species throughout Alaska.



Adult steelhead caught in a sport fishery prior to release.

Mixed-Stock Analysis

Many species form aggregations consisting of multiple populations at various stages in their life history. For example, multiple salmon populations often migrate together in both fresh and salt water. Estimating the populations contributing to these aggregations, and their proportions, is performed through genetic mixed-stock analysis (MSA) - an extremely powerful management tool.

We use MSA to provide managers with information on specific patterns of salmon migration and harvest allowing regulation of subsistence, commercial, and sport fisheries. We are currently using MSA across the Arctic-Yukon-Kuskokwim region to provide managers vital information for chum, coho and Chinook salmon, as well as for Dolly Varden from Southeast Alaska to Russia.

One high profile example using MSA to inform complex management decisions involves chum salmon on the Yukon River. We are providing stock-of-origin allocation estimates to State and Federal managers from chum salmon samples collected at the Pilot Station test fishery - less than 48 hours after receiving them in the lab. By combining this information with the sonar abundance estimates, we are able to provide critical run strength and timing information - weeks to months ahead of other sources of stock specific information, such as weir and escapement projects.

The cost of providing this type of genetic information is minimal when compared to the cost of many traditional fisheries projects, such as weirs mark-recapture studies, especially in remote locales. In fact, some projects have been eliminated due to our ability to replace and enhance the information they provided with genetic analysis, for tens or even hundreds of thousands of dollars less.

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Summary

Our research not only allows us to evaluate patterns of natural genetic diversity for species in Alaska, it may often be extrapolated to other regions where anthropogenic factors may have obscured native patterns. Fish, wildlife, plants and their habitats remain in pristine and healthy condition throughout most of Alaska, allowing us to evaluate natural mechanisms that create and maintain genetic diversity. This information is often applicable to conservation efforts outside Alaska, such as those presently occurring for the multitude of Pacific salmon stocks that have been extirpated or are in decline along the West Coast of the U.S.

The need for genetic information to inform conservation efforts for North America's fish and wildlife species will continue to increase into the foreseeable future. The CGL is uniquely positioned to continue providing genetics expertise for the Service in Alaska, and throughout the United States, in order to enhance its conservation efforts.



Togiak National Wildlife Refuge lake trout prior to release.

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<http://alaska.fws.gov/fisheries/genetics>

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