

WorldfishNEWS

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A genetic blueprint for rebuilding Clayoquot Sound sockeye

Clayoquot Sound, on Vancouver Island's west coast, is a place of spectacular natural beauty and global conservation importance. The sockeye fishery in Clayoquot Sound, once the largest on the coast, virtually disappeared in the 1970s as a result of overharvest and habitat loss. Now, in the last decade of the century, these stocks are facing new threats, including climate change that drastically reduces ocean survival, and competition from stickleback introduced into rearing lakes. Commercial fishing for sockeye was halted in 1970, and the Tla-o-qui-aht First Nations shut down their own food fishery in 1982.

Kennedy Lake is the most important nursery lake for Clayoquot sockeye. Up to a dozen different sockeye stocks return to the lake or its tributaries to spawn. Enhancement - using hatcheries or portable, instream incubators - is one way to kick-start the rebuilding of a salmon stock. But in Kennedy Lake, where there are so many different stocks, which ones do you enhance? How many of our assumptions about uniqueness are really correct? Which ones can you afford to overlook - especially when several of them appear threatened by extinction?



Tla-o-qui-aht crew at Hatchery Beach

Drawing the map

In 1997, World Fisheries Trust and its partners in Clayoquot Sound took on the challenge of creating a road map for balanced enhancement of Kennedy Lake sockeye. Our goal was to provide local stakeholders with a "genetic who's who" for Kennedy sockeye, and we did this using the powerful new tool of **microsatellite DNA fingerprinting**. All that's needed is a tiny sample of tissue from a living fish, or even a scale, from which the unique genetic signature of the stock can be determined. DNA fingerprinting tells us which stocks are closely related, and which ones are genetically distinct.

Sample collection and gene banking

Over the past two years, WFT has travelled to Clayoquot Sound during salmon spawning season. Using beach seines and electrofishing equipment we collected more than a thousand tissue samples from ten sockeye stocks that spawn in different locations in and around Kennedy Lake (see map). Five of these stocks were already so depressed that the Nuu-chah-nulth Tribal Council asked WFT to **gene bank** them - an "insurance policy" for threatened stocks that is being increasingly used to ensure that there is still some genetic raw material when enhancement programs get underway.

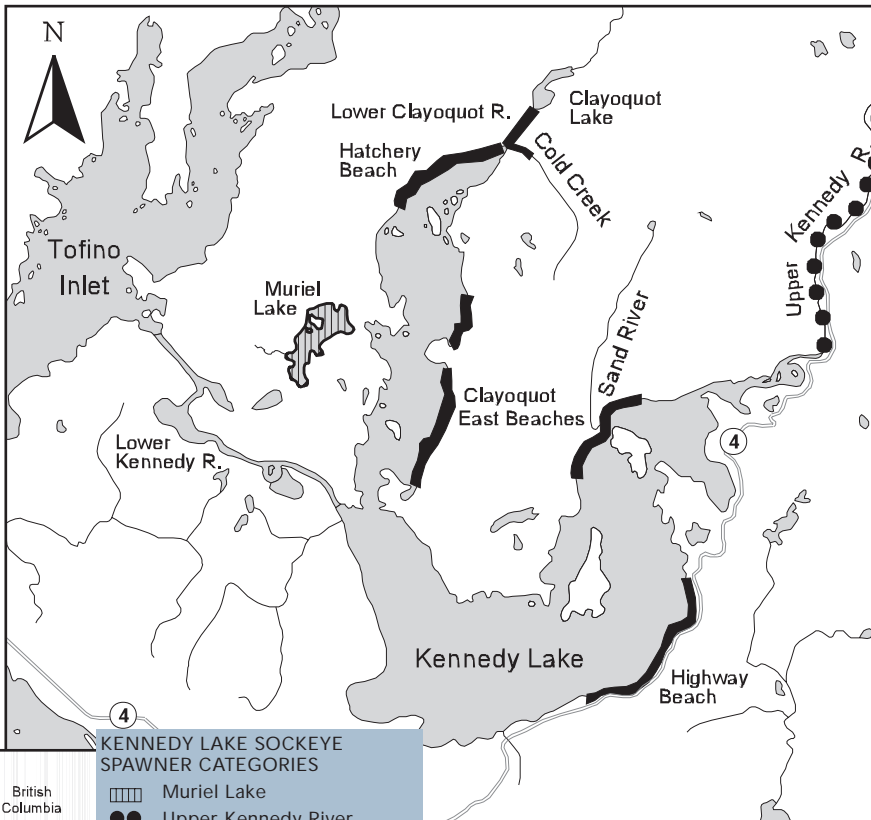
What we learned about the Kennedy sockeye stocks

One way to interpret DNA fingerprinting for fisheries stock separation is to look at the number of migrants between the stocks. This tells you how much genetic mixing there is. The greater the exchange, the more closely two stocks are related - and, in a practical sense, the more easily one could be substituted for the other in enhancement. Using this method, we found that there are really only **three main genetic groups** of Kennedy Lake sockeye:




- **Muriel Lake**
- **Upper Kennedy River**
- **Kennedy Lake and tributaries** (includes Highway Beach, Hatchery Beach, Clayoquot East Beaches, Cold Creek, Sand River, Lower Clayoquot River and Clayoquot Lake).

These results mean that there must be separate management, conservation and enhancement strategies for each of the three groups. Muriel and Upper Kennedy stocks are genetically unique, and their enhancement should only be

Maps produced by EcoTrust Canada 1999. Information on spawning sites courtesy Northwest Ecosystems Institute.



KENNEDY LAKE SOCKEYE SPAWNER CATEGORIES

-  Muriel Lake
-  Upper Kennedy River
-  Kennedy Lake & Tributaries

attempted using the original stocks. In contrast, there is high gene flow between all of the stocks in

the third category (those spawning in the tributaries and beaches of Kennedy and Clayoquot Lakes) - not too surprising given the deliberate seeding of Hatchery Beach fish throughout the area by the sockeye hatchery that operated there between 1910 and 1935. The key lesson is that enhancement, rehabilitation and harvest of any one of the three genetic groups must be pursued so as not to adversely affect the others.

Is this just "more research"?

Definitely not. Enhancement with the "wrong" salmon stock doesn't usually work, and there are endless examples of transplanting stocks into different areas and having them fail to become established. Kennedy sockeye have their own wrinkles: for example, some are beach spawners and some are river spawners. Put either of these in the wrong place and they'll probably fail. Yes,

the results of DNA research are interesting for fish biologists, but the real practical application is in rebuilding the fishery.

Who will use the results of our study - and how?

Rebuilding the Kennedy Lake sockeye fishery of Clayoquot Sound is an important goal of community groups and government agencies working together to develop a management plan for the area. All of these stakeholders can now have access to the genetic roadmap that WFT and its partners have developed, and can work with us to make the best, informed choices for enhancement that will eventually pay dividends in the form of more fish for the people of the area.

For a list of stakeholder contacts in Clayoquot Sound, contact the Nuu-chah-nulth/West Coast Vancouver Island Regional Aquatic Management Society (RAMS) in Ucluelet at 250-726-7083. WFT and its partners will be pleased to provide a full Technical Report on the project, as well as in depth interpretation of the results, to all interested parties.

Next step - using the genetic tags to promote selective fishing

Now that we have the genetic "tags" for each stock, we can use them to find out which stocks migrate together. This is vitally important if the enhanced stocks are to be fished selectively - there's no point in enhancing a weak stock if you end up catching it along with a stronger one. In 1999, WFT hopes to accomplish this by sampling returning adults at a fish wheel being built by local groups on the Lower Kennedy River.

Partners

- Tla-o-qui-aht First Nations and Nuu-chah-nulth Tribal Council** (project design, priority setting and sample collection)
- Department of Fisheries and Oceans** (project design, life history information, sample collection)
- Seastar Biotech Ltd** (DNA analysis and interpretation)
- MacMillan Bloedel Ltd** (project design and funding, logistic support)
- M.C. Wright and Associates** (sample collection)

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