Northwest Fisheries Science Center

Fish Matters

Collaborative Fishery Research

the Tribes and the Northwest Fisheries Science Center

Introductory Note from the Science Director

Fisheries are important socially, economically, biologically, and culturally. Numerous fish stocks on the West Coast have significantly declined in recent years, impacting many communities in many different ways. Successfully conserving and managing fishery resources requires strong collaborations between Tribes, federal, state, and local governments, industry, and other organizations. Over the last several years, the Northwest Fisheries Science Center has increased its collaborations with Tribes to expand educational opportunities and conduct a wide range of scientific studies–from examining the reproductive success of steelhead to understanding the impacts of harmful algal blooms. As described in this newsletter, new information and techniques to help fishery managers better conserve and manage natural resources have been discovered. We are indebted to our Tribal collaborators for their hard work and dedication, and look forward to future cooperative endeavors.

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Aromatic hydrocarbons in the waters of northern B.C.

For almost half a century, the Alcan aluminum smelter at Kitimat, B.C., has been releasing polycyclic aromatic hydrocarbons (PAHs) into the marine environment. Kitimat is located in the nearly pristine historic fishing grounds of the Haisla Nation – and the sediments there now have PAH concentrations well above the levels that, in urban environments, have been associated with adverse effects on fish. But the process of smelting aluminum can make the PAHs unavailable to fish and other species. The challenge is to determine the fraction that is available and thus could be toxic.

At the request of both the Haisla Nation of Kitimat Village and Alcan Smelters, Inc., Dr. Tracy Collier of the NWFSC's Environmental Conservation Division is leading an assessment of fish health in the area.

This project, begun in 2000, will continue for several years and targets both juvenile salmon and flatfish. Goals involve looking at the prevalence of liver disease in English sole and assessing reproductive fitness in yellowfin sole.

The Kitimat site is a fascinating natural laboratory for these studies. As Collier notes, it combines high levels of PAHs with exceptionally low levels of other contaminants, making for especially clear indications of the factors affecting bioavailability of PAHs and their effects.

Beach seining for juvenile chinook salmon near Kitimat, B.C.

Hatchery management and the NE Oregon steelhead

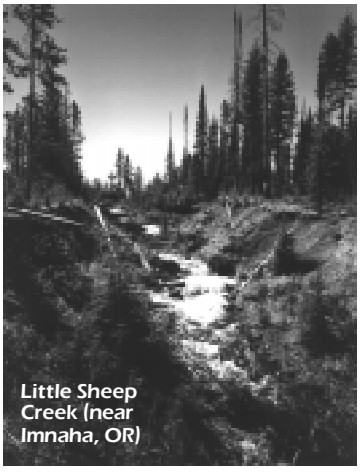
Dr. Paul Moran, a geneticist with the Conservation Biology Division, is working on two separate but linked studies of steelhead in Wallowa County, located in Oregon's far Northeast corner.

"Traditionally, we just didn't have much steelhead data," says Moran. That's about to change. In a study with Nez Perce field biologists – and also involving the U.S. Fish and Wildlife Service, Washington and Oregon Departments of Fish and Wildlife and the Idaho Department of Fish and Game – Moran has been working to describe the steelhead's complex population structure through genetic analysis.

The Wallowa hatchery study is motivated in part by a puzzle. The fish from this source have exhibited very high rates of straying, for example, into the Deschutes River system. Oddly, the Little Sheep Creek hatchery (see story below) has identical rearing procedures but no such straying problem.

This has led to a controversy about whether the Wallowa broodstock should be changed. "It's a non-endemic-stock, which may be part of the problem," says Moran. "But up to now we've had too little data to understand the population structure. Thanks to the Tribal field biologists, who have been very active, I'm getting great material. In fact they just gave me 5,000 more fin clips to analyze. And it's putting me in a position to return to them some very useful genetic information on which they can base management decisions."

Examining the reproductive success of steelhead in Little Sheep Creek



Little Sheep Creek (near Imnaha, OR)

Over in nearby Little Sheep Creek, Dr. Moran has also cooperated with Nez Perce biologists on a study of the relative reproductive success of naturally spawning hatchery and wild fish.

It's one of a whole new class of studies, involving a careful attempt to mark and identify *all* returning adult salmon at a particular site. "The big change here is in the use of the opercle punches; we used to do them just so as to mark each fish as having been passed over the weir, but now we save the punches and use them to do a genetic profile of each potential parent. This means we can sample their progeny (by taking a tiny fin clip) and actually determine the parentage of each juvenile. With this information we can get unprecedented accuracy in tracking mating patterns, whether wild-x-wild, hatchery-x-wild, or hatchery-x-hatchery."

Moran says the physical properties of the weir at Little Sheep Creek made it an especially good place for this kind of "all adults" study because upstream passage is virtually impossible except through the trap at the weir. Surprisingly, initial data showed juveniles collected above the weir that did not have two opercle-punched fish as parents. One hypothesis, now being tested, is that there are resident upstream fish contributing offspring to the sample of juveniles. It remains unclear if resident and anadromous fish are actually interbreeding, but we expect a preliminary answer by next year.

According to Moran, this is a long-term study, still in its early stages. "We need to see at least two complete steelhead generations – that's 10 years." But even the interim results will directly address urgent, practical issues in the management of hatchery fish.

Harmful algal blooms / National Indian Center for Marine and Environmental Research and Education

Harmful algal blooms (HABs) – a class of phytoplankton species explosions that are sometimes referred to as "red tides"– are common on the Washington coast. Algal blooms are not all harmful – but the risk of harm often forces authorities to close fisheries, with a significant economic and social impact on coastal communities. Unfortunately, it is extremely difficult to tell whether marine plankton harbor dangerous levels of a toxin – and these chemicals are *not* removed by washing or cooking. Moreover, the name red tide is doubly misleading: dangerous levels of contamination can occur with red, brown, yellow, milky or *no* water discoloration.

A relatively new version of the phenomenon, first seen on the West Coast in 1991, is the algal type *Pseudo-nitszschia,* which produces the powerful neurotoxin domoic acid. Domoic acid is one of several algal biotoxins that can accumulate in shellfish and wild and hatchery fish – and can cause brain damage and even death in marine mammals and humans.

Scientists know too little about the biology and ecology of HABs to predict their appearance and magnitude reliably, and raw data are difficult and expensive to obtain. NWFSC scientists are attempting to understand the devastating impacts HABs can have on marine species. The Quinault Tribe is helping with sample collections in the hope that the knowledge gained will protect Tribal health while making the unnecessary closure of shellfish beds less probable.

The NWFSC's Tribal Liaison Virginia Bill, an Upper Skagit Tribal member, and Dr. Vera Trainer from the

NWFSC Environmental Conservation Division, have developed a training class teaching Pacific coastal Tribes how to detect and identify HAB species. Sponsored by the National Indian Center for Marine and Environmental Research and Education (NICMERE), the training course was held in August on the Quinault Indian Reservation in Taholah, on the central Washington coast. Attendees learned to monitor phytoplankton in their coastal waters. A forum held on the last day of the class provided an opportunity for each Tribe to expand the exchange of information about HAB training opportunities with other Tribal communities, Tribal scientists, fishery managers and government scientists.
Participants from the Pacific Shellfish Institute, the

Julia Rosander, Quinault Indian Nation, and Rita Hornes, University of Washington, demonstrate phytoplankton nets tows to a class

Quinault, Makah, Lummi and Chippewa tribes and the Northwest Indian College attended the class. Representatives of the Washington State Department of Fish and Wildlife, Washington Department of Health, University of Washington and the NWFSC all made presentations during the program.

Monitoring engineered logjams on the Lower Elwha and Stillaguamish Rivers

Most people like to snorkel around coral reefs in the tropics. George Pess likes to snorkel around logjams in the Lower Elwha and Stillaguamish rivers. And they aren't ordinary logjams either: he helped design and build them.

Pess is a stream ecologist with the NWFSC's Watershed Program, part of the Environmental Conservation Division. A veteran of restoration initiatives with the Tulalip Tribe on the North Fork Stillaguamish, he engineers logjams that mimic natural ones, replacing lost spawning habitat until a more natural environment can be restored. He is currently working with Dr. Roger Peters of the U.S. Fish and Wildlife Service, Pat Stevenson from the Stillaguamish Tribe and Mike McHenry, a Lower Elwha fish habitat biologist, on a 5-year study to check the distribution and abundance of salmonids in "repaired" environments. Dr. Peter Kiffney of the NWFSC is co-leading the project.

The main goal is to compare engineered jams with the model we are seeking to imitate – the few remaining natural ones. Engineered jams that mimic the natural ones create large, deep pools in which the chinook like to congregate. Increasing the number of pools that are similar to natural ones also increases the amount of high quality habitats for juvenile salmonids. In the Stillaguamish, though, there is an additional goal. Low water levels in the summer result in many adults being trapped in pools, which makes poaching endangered fish way too easy. With the help of Kurt Beardslee, Executive Director of the non-profit Washington Trout, Pess has been redistributing adults in an attempt to reduce this effect.

"Juveniles and adults prefer the habitats we helped develop," says Pess. "Well, what they really prefer is natural habitat – but what we're giving them is way better than what they have now."

The last five miles of the Elwha, below the dam, now has nine engineered log jams. Part of the reason for them is to prepare the stream ecology for dam removal (see story below). Pess is also collecting related information on algae, insects and other biota.

Dam removal on the Lower Elwha River

In a related move, Dr. Pess hopes to be involved with Lower Elwha and Sklallum Tribal members in studying the slated removal of the Lower Elwha Dam. The project isn't yet funded, but Pess thinks it will go ahead around 2004-2005. "Compared to the Snake River dams, which raise very complex issues, this is something of a no-brainer." Pess says that the Elwha dam isn't important for power generation, and the upstream habitat is "in great condition" for salmon reintroduction or natural recolonization. Which of those two strategies to employ remains an issue.

Restoring freshwater habitat for Puget Sound chinook: what works?

"It's easy. All you have to do is catch several hundred thousand 25-millimeter juvenile chinook. Then tag every single one. Then feed data about them into a computerized life-cycle model capable of juggling multiple variables and risk factors in such a way that you get clear advice on restoration management out the other end."

Dr. Tim Beechie, of NWFSC's Watershed Program, is, of course, joking about "easy." But, in a collaboration with Eric Beamer, Director of the Research Program of the Skagit System Cooperative, Beechie and other Center Scientists are beginning to piece together a

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way of seeing what restoration actions are most and least effective for the threatened Puget Sound chinook. It's an essential part of the recovery planning mandated by the Endangered Species Act.

First comes the life-cycle model, a piece of software now being crafted. It's expected completion date is around September 2002. Then comes data. "The problem," says Beechie, "is that we just don't have good numbers for the survival rates of ocean-type chinook at various stages of the life-cycle. And you need that if you're going to see clearly what a particular restoration action does to the numbers in the next life-cycle."

The project originated in an initiative by the Skagit System Cooperative, the natural resources consortium of the Swinomish, Upper Skagit and Sauk-Suiattle Tribes**.** There is now a Memorandum of Understanding (MOU) describing what Beechie hopes will be a 5 to 10-year study. As that document shows, building the life-cycle model involves various investigations. A close look at the effect of flooding on the freshwater survival of juvenile chinook, for example, is just one of two dozen research projects listed in the MOU as needed to set up the life-cycle model.

Genetic identification of kelts at Lower Granite Dam

Loading juvenile salmon at Lower Granite Dam

A Tribal collaboration in the pipeline, according to Conservation Biology geneticist Paul Moran, is a study of kelts (salmon that have already spawned) at the Lower Granite Dam. Informal discussions have taken place between the Center and the Columbia River Inter-Tribal Fish Commission (CRITFC). Moran praised CRITFC's depth of expertise in genetics, as well as field biology, and says he hopes such a study may enhance our understanding of population dynamics in anadromous fish by assigning individuals to scarce populations.

Yakima River adult coho radiotelemetry study

The Fish Ecology Division has provided technical assistance to the Yakima Nation Fisheries Department (YNFD) to aid its coho reintroduction program in the Yakima sub-basin. The main job of Fish Ecology scientists and technicians has been to help set up and maintain 12 radiotelemetry monitoring stations, which generate data on salmon spawning distribution. James L. Dunnigan of the YNFD says that "this information is critical for assessing the potential for project success and identifying limiting factors for the species." The field work for the project was scheduled to wrap up in the Fall.

Siletz and Salmon River estuaries: testing different sampling methods

Dr. Dan Bottom, of the Fish Ecology Division, is based at Newport, Ore. He has been doing collaborative estuarine research with Stan van de Wetering, a biologist from the Confederated Tribes of the Siletz Indians. They are testing alternative sampling methodologies as well as evaluating the use of large wood debris by juvenile salmon in the Siletz River estuary. "Stan has also been helping us in our ongoing research in the Salmon River estuary," says Bottom.

A recently awarded SeaGrant project will expand the Salmon River Study to other Oregon estuaries, comparing conditions that affect the use of natural and restored marsh habitats by juvenile salmon. This research would include several cooperators, including the Siletz Tribe for portions of the work in the Siletz River estuary and possibly also the Nestucca River estuary.

MSI tribal initiative

The NWFSC continues to work with the Northwest Indian College on the development of the National Indian Center for Marine Environmental Research and Education (NICMERE). In May, NICMERE sponsored a meeting with representatives from the nation's Tribal Colleges and Universities. Representatives from Lac Court Oreilles Ojibwa Community College, Salish Kootenai College, Crownpoint Institute of Technology, Northwest Indian College and the NWFSC attended the meeting. Participants discussed the progress of NICMERE, shared information about one another's programs and identified opportunities for collaboration. In August, NICMERE sponsored a credit class on Washington Coast Harmful Algal Blooms, which took place on the Quinault Indian lands (see the article on Harmful Algal Blooms on the inside). NWFSC scientists also met with Northwest Indian College staff to discuss areas of scientific cooperation and assistance, including the development of additional mini-courses like the Washington HABs class.

In support of NICMERE-related activities and the promotion of diversity, the NWFSC provided training to its staff on "working in a different culture," which focused specifically on working with Native American cultures, but also provided information relevant to interacting with any culture.

For information about these projects, contact the NWFSC