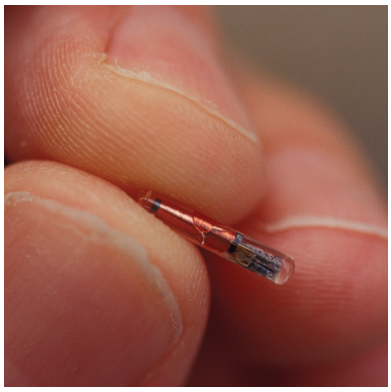
NOAA Fisheries Service | National Oceanic and Atmospheric Administration | Department of Commerce

Northwest Fisheries Science Center



at Manchester

Making Critical Connections 2008

The Manchester Research Station stands on property that has served the federal government for more than 100 years — first as a fortification to protect the Puget Sound Naval Shipyard, and later as a Navy fuel depot.

Manchester History

Manchester remains an internationally recognized center for research on aquaculture. From the pioneering work in the 1970s which helped develop the local salmon aquaculture industry to today's emphasis on development of environmentally and economically viable aquaculture technologies, Manchester remains the premier station of its kind within NOAA.

Today, the Manchester Research Station is a leader in state-of-the-art salmonid culture technologies. Under the NWFSC's Resource Enhancement & Utilization Technologies (REUT) Division, and collaborating with other Divisions such as Fish Ecology (FE) and Conservation Biology (CB), Manchester scientists provide an array of research support to NOAA Fisheries' efforts to conserve at-risk and endangered populations of Pacific salmon — research that is conducted in cooperation with many federal, state and local agencies, Tribal groups and universities, among others.

Aquaculture of Marine Species

Environmentally-safe aquaculture is economically important to the Pacific Northwest and has immense potential for the production of seafood. Aquaculture can relieve harvest pressure on declining fishery resources, create jobs, promote economic growth, and help to decrease the trade deficit in edible fisheries products.

The critical need in aquaculture is to develop total production systems for each target species that provide managers with complete and reliable control over the biology and husbandry of marketable fish and shellfish.

Current research at Manchester by aquaculture scientists and engineers focuses on developing integrated culture systems for the production of important Northwest species such as sablefish, rockfish, lingcod, and halibut. Some of these species are now being reared to market size in floating net-pens.

Recent activities of Manchester scientists in support of the National Offshore Aquaculture Act:

- Helped write the drafts of the National Offshore Aquaculture Act. (Concepts for the bill started in 1990s).
- Developed the US Code of Conduct for marine aquaculture.
- Developed modern feeds for salmon and marine fish.
- Developed hatchery methods for more than a dozen marine fish, shrimp or crabs with aquaculture potential.
- Developed new tools to detect and treat fish disease and to minimize potential transmission to natural fish populations.
- Conducted risk assessments and developed risk mitigation strategies for marine offshore aquaculture.
- Conducted behavioral ecology and risk modeling research on interactions between wild and cultured fish.
- Assisted in writing the EIS for the Gulf of Mexico FMC amendment for offshore aquaculture.
- Wrote chapters in Best Management Practices and Aquaculture Business Case documents.
- Provided assistance to the industry to develop a variety of aquaculture businesses, for example:
  - Development of the SeaStation™ by Net Systems Inc. (the major cage used by the offshore industry)
  - Development of a culture system for marine macro algae by Soliv Inc. (produces skin care products from algae)
  - Development of a Sablefish and Lingcod Hatchery by Troutlodge Inc. (on-going project to provide a new high value crop for marine fish farms)
  - Developed physiological data to include in offshore impacts and siting model (AquaModel™) by Keifer and Associates, Inc
  - Proposed (pending funding) working with American Gold Seafoods, Inc on fishmeal free diets for Atlantic Salmon.

Developing Conservation Hatcheries

In the background of the listing of Puget Sound steelhead under the Endangered Species Act, a large-scale, long term steelhead supplementation experiment has begun to measure hatchery effects on steelhead long-term viability - up to 20. The study compares the demographic, life history and genetic characteristics between four supplemented populations and three non-supplemented populations in Hood Canal rivers. Freshwater and marine productivity will be quantified before, during, and after the supplementation phase. The project is a collaborative effort between NOAA Fisheries, WDFW, the Skokomish Tribe, Long Live the Kings, the Hood Canal Salmon Enhancement Group, USFWS, UW, Point-No-Point Treaty Council, and NWIFC.

Conservation hatcheries are designed to rebuild depleted wild stocks. Their goal is not to produce fish for harvest, but to produce fish as closely equivalent as possible to local native stock, with the full ability to return to and spawn naturally in native habitat.

Conservation hatcheries can do this by modifying conventional hatchery practices so that hatchery fish more easily assimilate into the natural habitat. The natural rearing enhancement (NATURES) protocols, developed at Manchester, call for habitat-enriched raceways equipped with cover, structure, and natural-like substrate.

Studies show that fish raised in a NATURES environment are more similar to their wild cohorts in their growth, behavior, coloring and other development than "control" fish from conventional raceways - and have in-stream survival rates as much as 50% higher.

Tag Technology

Scientists at Manchester have been instrumental in developing the technology behind PIT (passive integrated transponder) tags. These are machine-readable tags that can be "injected" into the body cavity of a fish. They have revolutionized fish biology in the Pacific Northwest.

Researchers use tag information to examine smolt migration behavior, quantify the effectiveness of fish transportation (barging), and study how survival rates correlate with variations in temperature, flow rate and other factors.

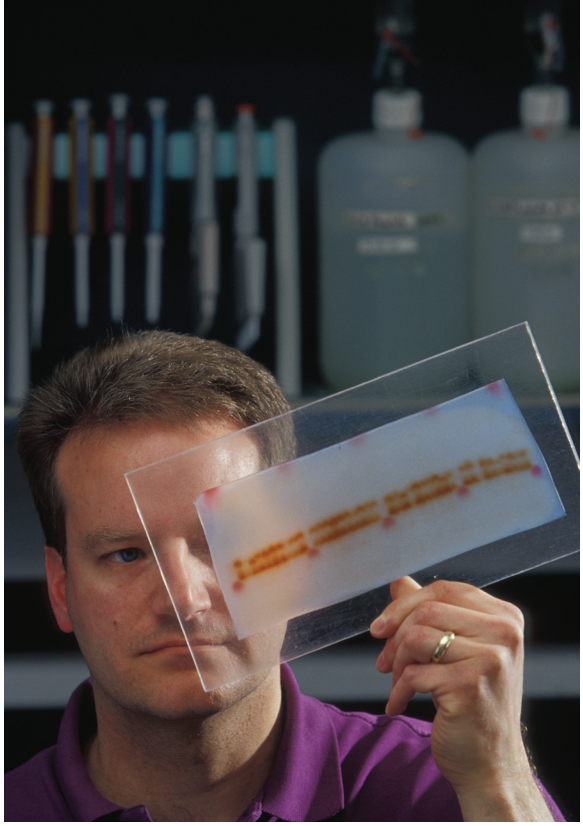
Automatic PIT-tag "interrogation" systems have been installed at most Federal mainstem hydropower dams in the Columbia and Snake Rivers and at many other river system sites throughout the region.

Over a million juvenile salmonids are PIT-tagged each year in the Columbia River basin alone. Station scientists continue to refine and test interrogation devices to broaden the tags' application. New concepts in electronic and acoustic detection technologies are also being evaluated.

Genetic Stock Identification

A salmon is caught in a mixed-stock fishery. How do you know whether it's from a stock protected under the Endangered Species Act (ESA)? The answer is GSI (genetic stock identification), an essential tool for ESA evaluation, ESA forensic investigations and international stock equity and allocation issues.

The Genetics program at Manchester has a molecular laboratory that produces species-wide genetic data for chinook and coho salmon. It also contributes data to regional databases for chum salmon, sockeye salmon and steelhead and cuthrout trout.



Genetics Program scientists from the NWFSC's Conservation Biology Division are:

- helping to determine stock allocation between the US and Canada under the Pacific Salmon Treaty.
- analyzing the composition of chinook salmon fisheries in California to determine the impacts on Sacramento River chinook salmon.
- helping to elucidate the ocean migration patterns of listed salmon stocks by identifying the composition of groups of migrating juvenile salmon captured from California to southern Alaska.
- conducting computer simulations to compare different methods of stock identification.

Using Captive Broodstocks for Conservation and Recovery

Scientists at Manchester have done foundational research in using captive broodstocks to aid recovery of ESA-listed stocks of Pacific salmon.

Fish in captive broodstocks are maintained in captivity throughout their life cycle. The relatively high fecundity (number of eggs per female) of Pacific salmon, coupled with increased survival rates in protected culture, can allow captive broodstocks to produce large numbers of fish to amplify population in a single generation.

Currently, the gene pools of the ESA-listed Redfish Lake sockeye salmon and Snake River Basin spring/summer chinook salmon are being maintained at the Manchester Research Station.

Redfish Lake sockeye are one of the region's most endangered salmon stocks - only a total of 16 adult fish returned to Redfish Lake during the entire decade of the 1990s. The summers of 1999-2001 were milestones in the use of captive broodstock technology to help restore the region's ESA-listed salmon stocks: in that period, 290 adults from captive brood-stock releases returned to Redfish Lake.

The success of this research helped establish captive broodstock technology as an essential tool in the recovery arsenal. Continued development and refinement of captive broodstock technology at Manchester will help stabilize threatened stocks until the factors responsible for their decline are more fully understood.

Marine Fish Enhancement

Over-utilization of marine fish stocks is well documented for all coastal regions in the United States. On the West Coast, only 3 out of 40 stocks are classified as underutilized. But depleted stocks can be rebuilt successfully through better management, improved ecological conditions in coastal habitats, and the application of aquaculture technologies.

Manchester scientists have identified popular Puget Sound species for enhancement. Early achievements include the successful spawning and propagation of lingcod and some rockfish species. Puget Sound is being surveyed for the best potential sites for research on release practices.

Manchester Research Station:
7307 Beach Drive East | Manchester, WA 98366 | 206.842.5434

Northwest Fisheries Science Center:
2725 Montlake Blvd. East | Seattle, WA 98112 | 206.860.3200
Dr. Usha Varanasi | Science & Research Director

http://www.nwfsc.noaa.gov

All images © Natalie Fobes