



Message from the Science Director



Northwest Fisheries
Science Center

National Marine Fisheries Service

National Oceanic and
Atmospheric Administration

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Decision-makers face many hard choices as they continually strive to improve the condition of salmon, groundfish, and their associated habitats in the Pacific Northwest. Perhaps their single greatest aid is the availability of sound scientific data, coupled with rigorous analyses and comprehensive syntheses. As we work to build sustainable fisheries, recover protected species, and sustain healthy coasts, it is important to pause periodically and take stock of the contributions we have made to effectively managing and conserving the marine and anadromous fishery resources in the Pacific Northwest—for the future, and for the benefit of all.

As we embrace a new year, I would like to express my

heartfelt thanks to the staff for their ongoing efforts on behalf of the Northwest Fisheries Science Center, NOAA Fisheries, and the living marine resources in this region. I am extremely proud of what we have achieved during the past twelve months and would like to share with you some of our accomplishments. My thanks also to our partners in other federal, state, local, and tribal organizations, in universities, and in countries around the world, for their valuable contributions to this effort. I look forward to our ongoing collaborations as we face the challenges and successes that lie ahead.

Usha Varanasi
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Dr. Usha Varanasi
Science and Research Director
Northwest Fisheries Science Center

Building Sustainable Fisheries

Highlights include:

Identifying linkages between salmon productivity and oceanographic conditions...

For the first time, the Center participated in the Northeast Pacific Global Ocean Ecosystem Dynamics Program (GLOBEC). Scientists have undertaken several studies aimed at identifying linkages between salmon productivity, ecosystem features, and oceanographic conditions. Among these are a study of marine survival of juvenile salmon in coastal waters off Oregon and California, growth and condition of juvenile salmon in the Northern California Current, and long-term changes in the hydrography and zooplankton in the northern California Current waters off the coast of Oregon.

Understanding the importance of the Columbia River Plume...

Center ecologists and oceanographers continued their investigations of the Columbia River Plume as a critical habitat for juvenile salmon entering the ocean for the first time. Employing an ecosystems approach, scientists are focusing on ecological linkages among juvenile salmon growth, distribution and condition, trophic (food web) interactions, and the physical dynamics of this dominant oceanographic feature of the California Current Ecosystem.

Gaining a better understanding of salmon disease...

Bacterial Kidney Disease (BKD) is a major cause of mortality in cultured as well as wild fish. This past year, Center scientists identified a genetic marker for differentiating among strains of BKD. Used in combination with other molecular methods, this marker will be a powerful new tool for investigating sources of infection and routes of transmission in both wild and captive salmon

Genetic Stock Identification...

Scientists continued to refine their use of naturally-occurring variation in proteins and DNA to identify salmon stocks in a variety of contexts. They have helped to determine stock allocation between the U.S. and Canada under the Pacific Salmon Treaty, analyzed the composition of chinook salmon fisheries in California to determine impacts on listed Sacramento River chinook, helped elucidate the ocean migration patterns of listed salmon stocks, and conducted computer simulations to compare different methods of stock identification.

Tracking adult Pacific salmon...

Center scientists made significant progress toward expanding PIT-tag technology in the Columbia River Basin. As a result, it will be possible to install adult salmonid PIT-tag detection systems in all fish ladders at Bonneville Dam by 2002. The ability to interrogate PIT-tagged salmon as they leave and return to the Columbia River will, for the first time, allow scientists to make precise estimates of ocean survival of salmon and steelhead.

Assessing groundfish species...

Center scientists conducted extensive assessments of three groundfish species this year and analyzed the potential time frame for rebuilding a fourth species that was classified as overfished based upon the Center's assessment in 1999. These data will be used by the Pacific Fishery Management Council (PFMC) to better manage and ensure the sustainability of the populations in coming years.

Developing a comprehensive groundfish research plan...

Center scientists worked with other West Coast NMFS centers to develop a comprehensive coastwide groundfish research plan to ensure that all relevant scientific information is available to regional managers and policy makers. Six research areas were identified as priorities in the plan: assessing status of stocks, evaluating socioeconomics, determining impacts of manmade stressors, studying effects of ecosystem and climate change, implement-

ing technological innovations, and management support. Constituent input, including that from the Pacific States Marine Fisheries Commission (PSMFC) and the PFMC, played an important role in refinement of the plan, which will be used to set priorities for groundfish research on West Coast.

Developing culture techniques for marine fish species...

The Center is leading collaborative projects with private, public and Tribal organizations to develop the enhancement and culture potential of lingcod and sablefish. Center staff were successful in producing over 5,000 juvenile lingcod for early life history and habitat preference research and have initiated nutritional and husbandry studies with sablefish.

Developing a regional aquaculture initiative and Codes of Conduct and Best Management Practices...

Center staff have drafted a regional aquaculture initiative that outlines three major strategies to guide aquaculture development in coastal waters and the Exclusive Economic Zone (EEZ). These include:

formation of a regional Pacific Aquaculture Caucus, development of systems-oriented projects, and implementation of the initiative through demonstration, training, and extension. In collaboration with the Washington Fish Growers Association, the Center has also initiated a 2-year project that will provide a risk-benefit assessment of the salmon net-pen industry in Puget Sound, as well as the development of Codes of Conduct and Best Management Practices documents for the industry. At the national level, Center staff have been involved with developing similar Codes of Conduct for aquaculture in the EEZ.

Electronic Fish Catch Logbook Project (EFCL)...

In November and December the project team successfully demonstrated the Alpha level EFCL system to the states of California, Oregon and Washington and to fishers and fish processors. There was considerable support for a follow-up pilot program for electronic fish catch and logbook reporting for the West Coast groundfish fishery and for use in the new West Coast observer program. The team expects to complete the current development effort with on-vessel Beta testing by February.



Recovering Protected Species

Highlights include:

Evaluating salmon migrating through the Columbia River and its estuary...

Center scientists continued their research on the survival and behavior of juvenile salmon migrating through the Columbia River and its estuary. Using newly-developed mobile detection systems to monitor the deposition of PIT tags on estuarine sand bars and islands, scientists are now able to assess vulnerability of juvenile salmon to avian predators. This information enabled scientists not only to refine estimates of fish survival through the hydropower system, but begin to determine the magnitude and causes of mortality in the estuary.

Evaluating the benefits of stream and habitat restoration...

The addition of large wood debris enhancements are one of the most frequently employed approaches to improving stream habitats, but little is known about how salmon respond to this technique. Scientists conducted a comprehensive study of such enhancements to evaluate stream restoration projects and the biological benefits of habitat restoration to salmon and other fishes. They also developed comprehensive guidelines for watershed restoration.

Identifying salmon habitat features that support high salmon abundance...

The ability to quantitatively link habitat characteristics to salmon population productivity is necessary to prioritize restoration efforts and determine the feasibility and likely efficiency of habitat management actions. During the past year, researchers began to examine the relationship between salmon abundance and the quality and quantity of freshwater habitat in three large Pacific Northwest drainages, the Snohomish River in Washington state, the Salmon River in Idaho, and the Willamette River in Oregon, using the Salmon Watershed Analysis Model (SWAM).

Current-use pesticide effects on juvenile salmon behavior...

Center scientists completed a study of the effects of the organophosphate pesticide, diazinon, on the nervous system of juvenile salmon. The study, published this year, showed that levels of diazinon found in the environment can significantly impair the anti-predator response and homing behavior of juvenile salmon. Research is continuing to assess the implications of pesticide exposure to the fitness of salmon and salmon recovery efforts.

Developing a concept to conserve salmon...

Four Center scientists were awarded the National Oceanic and Atmospheric Administration's Group Bronze Medal this year for developing the concept of "Viable Salmonid Populations" (VSPs). The concept provides a quantitative mechanism for identifying key characteristics of populations that are self-sustaining in the wild and, thus, will prove invaluable to future recovery efforts.

Recovering salmon Evolutionarily Significant Units...

Technical Recovery Teams (TRTs), chaired by Center researchers and composed of scientists from federal, state, county, city, tribal organizations and universities, were formed in two geographic regions, referred to as domains: Puget Sound and Willamette/Lower Columbia River. This novel approach will result in TRTs developing biological criteria for delisting salmon populations and assisting in the eventual development of recovery plans. A Recovery Science Review Panel, composed of renowned external scientists, was also created to help NMFS ensure integrity and consistency of the scientific aspects of recovery planning. A recovery planning website (<http://www.nwfsc.noaa.gov/recovery/recovery.htm>) will be used to post information about the TRTs, including

meeting dates and progress on work products, as well as provide opportunities for public review and comment on TRT drafts.

Quantifying salmon population status and risks to populations...

Members of the Center's Cumulative Risk Initiative Team completed a quantitative assessment of the 12 listed anadromous salmonid Evolutionarily Significant Units (ESUs) in the Columbia River Basin. Their analysis includes determination of annual population growth rates, assessments of extinction risks, risks of serious decline, and improvements in population growth rates needed to mitigate those risks. For more information on the Center's Cumulative Risk Initiative and its accomplishments, visit its website at: <http://www.nwfsc.noaa.gov/cr/>.

Using captive broodstock technology to help restore salmon stocks...

Natural returns of sockeye salmon to Redfish Lake, Idaho, have declined dramatically in recent years, and by 1991 the population was near extinction. Remnants of the population were rescued and maintained by Center scientists, in collaboration with the Idaho Department of Fish and Game and the Shoshone-Bannock Tribe, to increase the population. July/August, 2000 marked a milestone in the use of captive broodstock technology to help restore the region's endangered salmon stocks. Heralded by a press conference staged by the governors of Washington, Oregon, and California, over 250 Redfish Lake sockeye from the program completed the 950-mile journey from the ocean to the lake. The return of these fish should help stabilize the endangered Redfish Lake sockeye salmon population until recovery mechanisms succeed in addressing factors of decline.

Puget Sound Status Reviews...

Center scientists led status reviews for seven marine species in Puget Sound. These are among eighteen Puget Sound species petitioned for protection under the Endangered Species Act. The scientific conclusions reached by the NMFS scientists regarding risk of extinction will be used by managers to determine if ESA listing is warranted.



Sustaining Healthy Coasts

Highlights include:

Examining features of bottom habitat and fish associations with those habitats...

Center scientists conducted studies using advanced undersea technology to examine detailed features of bottom habitat and fish associations with those habitats. The accumulated data will be used to improve designations of essential fish habitat and resource survey designs.

Assessing organochlorine pollutants in Alaskan Steller sea lions...

Center scientists completed a preliminary assessment of organochlorine pollutants (e.g., PCBs and DDTs) in Alaskan Steller sea lions to determine whether pollutant concentrations had changed since the late 1970s. Results indicated that concentrations of these chemicals in Stellers have not changed appreciably in the last two decades. Plans are underway to expand this study across a broader geographic range, and by age and sex classes, as additional tissue samples become available.

Assessing the impacts of contaminants in sediments...

Center scientists completed detailed assessments to determine thresholds for biological effects in juvenile salmon, benthic flatfish, and their prey

from exposure to contaminated marine sediments. The focus was on the risk of ecologically significant sublethal effects from exposure of juvenile salmon to polychlorinated biphenyls (PCBs) in estuaries, salmon prey to tributyl tin (TBT), and exposure of marine flatfish to polycyclic aromatic hydrocarbons (PAHs). These analyses will assist NMFS in working with other agencies to manage the impacts of contaminated sediments on fish and their prey resources.

Implementing a collaborative monitoring project for Harmful Algal Blooms....

The Center's Marine Biotoxin Program took the lead in establishing the first project to monitor outbreaks of Harmful Algal Blooms (HABs) in collaboration with state, federal, private, and tribal entities. The goal of the project is to assess a suite of physical, biological, and chemical factors that promote HABs on the Washington Coast and then identify those tools that will improve monitoring capability. This project (ORHAB), funded by NOAA's National Ocean Service, began in August, 2000

Stewardship

Highlights include:

Creating the National Indian Center for Marine and Environmental Research and Education...

In April 2000, the Center, representing DOC, NOAA, and the NMFS, and the Northwest Indian College (NWIC) signed a historic agreement leading to the creation of a National Indian Center for Marine and Environmental Research and Education (NICMERE). NICMERE is designed to bring the skills and resources of the Center and NWIC together to benefit Native American Tribes and Tribal Colleges and Universities throughout the nation.

Hosting monthly seminar series and student interns...

The Center continued to sponsor its series of monthly research seminars, which focus on a wide variety of topics. The Center also continued its support of internship programs, hosting 12 undergraduates and 14 graduate students, as well as five National Research Council (NRC) postdoctoral fellows.

Staff development...

To increase staff opportunities, the Center initiated a Career Development program and completed promotion guidelines for all grades. Staff were encouraged to celebrate diversity through workshops, luncheons, and guest speakers. Outstanding among these were an Asian/Pacific American dinner and a Native American luncheon.

Facilities improvements...

This year the Center made numerous improvements to its facilities, including the complete remodeling of three research laboratories. It purchased two extraction systems to improve safety within the Center's labs and developed procedures to dramatically reduce the amount of hazardous waste generated at the Montlake facility.

A Note from the Editor

Presidential Recognition

The Northwest Fisheries Science Center is delighted to announce that its Director, Dr. Usha Varanasi, has been awarded the prestigious 2000 Presidential Rank Award for Meritorious Service. The award recognizes the ability of government senior executives to deliver outstanding service, direct innovative and significant research efforts, and foster partnerships and community relations to achieve results. Less than five percent of the thousands of eligible executives throughout the country are honored in this way each year.

Following the *Exxon Valdez* oil spill, Dr. Varanasi developed technologies to reduce pollution impacts and assure that seafood was safe for human consumption. She has also been instrumental in developing scientific methodologies that provide economic benefits to fishers by allowing scientists to conduct research off private charter vessels. By grappling with a broad range of science issues, under Dr. Varanasi's direction, the Center has made major strides in building a research program for marine groundfish in the Pacific Northwest and has instituted several highly-successful multi-disciplinary research programs. Her commitment to provide a sound scientific basis for salmon recovery resulted in creation of the Cumulative Risk Initiative which analyzes salmonid population trends relative to a multiplicity of environmental and human-induced impacts and activities. As we reflect on the accomplishments of the past year, we would like to take this opportunity to offer our warmest congratulations to Dr. Varanasi for her continued commitment to making the Northwest Fisheries Science Center the premier science organization within the National Marine Fisheries Service.