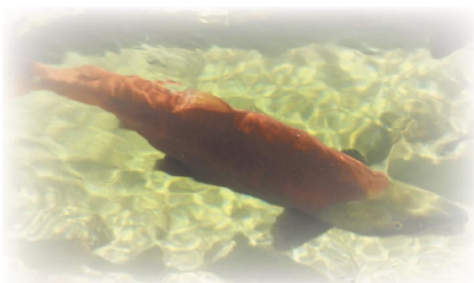




Northwest Fisheries Science Center

NOAA Fisheries • National Oceanic and Atmospheric Administration
U.S. Department of Commerce

HIGHLIGHTS 2003



Exciting Science A Year In Summary Critical Challenges

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HIGHLIGHTS 2003



Message from the Science Director

I am excited to share some of the activities and accomplishments of NOAA Fisheries' Northwest Fisheries Science Center during the year 2003. I am proud of what Center scientists have achieved and appreciate the hard work and dedication of our many collaborators. The West Coast is facing a number of critical challenges, including recovering endangered and threatened salmon and steelhead populations, building sustainable groundfish fisheries, and conserving the Southern Resident killer whale population. Research is critical to better understanding and improving the condition of living marine resources and their ecosystems. This year, the Center has made great strides in moving from a more species-oriented approach to an ecosystem-based approach that incorporates the many variables impacting living marine resources. I look forward to continuing our research and making additional advances in 2004.

Sincerely,

A handwritten signature in black ink that reads "Usha Varanasi".

Usha Varanasi

Who We Are and What We Do

The Northwest Fisheries Science Center conducts research to help conserve and manage living marine resources (e.g., salmon, groundfish, and killer whales) and their habitats in the Northeast Pacific Ocean—primarily off the coasts of Washington and Oregon and in freshwater rivers and streams in Washington, Oregon, and Idaho where anadromous fish, like salmon, go. This is a large area and an important responsibility. The Center's research assists resource managers in making sound decisions that build sustainable fisheries, recover endangered and threatened species, and sustain healthy coasts. Center scientists and staff conduct field and laboratory research in 5 primary areas:

- Status of Stocks
- Impacts of Human-caused Stress/Risks
- Ecosystem and Climate Change
- Recovery and Rebuilding, and
- Innovation and Technology

What follows are some of the Center's 2003 accomplishments in each of these areas.

Status of Stocks

Stock assessments determine the status (e.g., abundance and age distribution) of fish and marine mammal stocks. Center scientists integrate information from a variety of sources (e.g., observers, resource and habitat surveys, and fishers, in the case of groundfish stock assessments), analyze the information, and draw scientific conclusions from the results. These assessments are one tool used by managers to set biologically sustainable harvest levels for healthy stocks and to identify and guide the monitoring and rebuilding of overfished and threatened stocks.

In 2003 we:

Updated the Status of All Listed Pacific Salmon and Steelhead

On the West Coast, 26 salmon and steelhead populations or evolutionarily significant units (ESUs) are currently listed as endangered or threatened under the Endangered Species Act (ESA). Center scientists, in conjunction with Southwest Center scientists, updated the status reviews of all 26 currently listed salmon and steelhead ESUs, as well as one candidate species population. In their assessments, scientists considered new data that had accumulated since the last reviews in the mid-to-late 1990s and addressed issues raised in recent court cases regarding the consideration of hatchery fish and resident fish populations in listing determinations. This was a huge undertaking. Scientists compiled and updated abundance, productivity, diversity, and spatial structure data for each ESU. The analyses and resulting report will provide the scientific basis NOAA Fisheries needs to recommend any changes to the ESA listing status of West Coast salmon and steelhead populations.



26 listed West Coast salmon and steelhead ESUs

Collected New Data on West Coast Groundfish

The West Coast groundfish fishery includes some 80 commercially fished stocks off Washington, Oregon, and California and supports millions of dollars in employment and other economic activity. The Center conducts groundfish surveys along the entire U.S. West Coast, from the Canadian to Mexican border, to target important species. These surveys, many of which are conducted with chartered local commercial fishing vessels, provide information about distribution, abundance, and age structure of groundfish populations. In 2003, Center scientists expanded West Coast groundfish surveys to include both shelf and slope trawl collections, implemented a newly-adopted stratified random sampling scheme (with over 600 sites sampled), and conducted a joint U.S.-Canadian acoustic survey of Pacific hake and a cooperative hook-and-line survey.

Released the First Bycatch and Discard Data Report for West Coast Groundfish

The Center leads the West Coast Groundfish Observer Program. As part of this program, observers are placed on commercial fishing vessels to monitor and record groundfish catch data and collect critical biological data. In January, the Program released a summary and analysis of its first year of trawl fleet observations. This is the first comprehensive coast-wide information on bycatch and discard for West Coast groundfish.



Sorting fish collected during a groundfish survey

Human-caused Stress/Risks

Humans affect the surrounding environment and as a result living marine resources face a number of risks, from toxic chemicals in sediments to hydro-power systems and physically and chemically degraded habitats. Each life stage (e.g., egg, juvenile, or adult) and species is affected differently.

In 2003 we:

Estimated Relative Reproductive Success of Naturally Spawning Hatchery Fish

Hatcheries have the potential to assist in the conservation of wild stocks, but they also pose some risks. At this time, scientists still have many questions about the extent to which hatchery programs enhance or threaten the survival of wild populations. To accurately determine the viability of wild salmon populations, it is critical to understand the fitness of hatchery fish. Center scientists, in collaboration with state and tribal scientists, used DNA "fingerprinting" methods on thousands of adult and juvenile salmon to track the success or failure of individual hatchery and wild fish.



Preparing samples for DNA analysis

Evaluated Effects of Turbine Operating Conditions on Juvenile Chinook Salmon

The Columbia River's flow spins turbines deep within McNary Dam to generate electricity. Juvenile salmon migrating downstream, some of which are listed under the Endangered Species Act, can be swept into turbines along with the water. It has long been thought that juvenile salmon survival is highest when turbines are operating at 99% of maximum efficiency. Center scientists evaluated the effects of two different turbine discharge rates (99% and 100%) on juvenile chinook salmon. Center scientists used PIT tags and radiotelemetry to evaluate the condition and survival of juveniles and found no differences in fish condition under the two operating conditions. This study will support important decisions about McNary Dam operations.

Documented Coho Prespawn Mortality in Urban Streams

For several years, local agencies have provided anecdotal reports of prespawn mortality of adult coho salmon in Puget Sound urban streams. If salmon die before they spawn, they do not contribute to the next generation—a potentially serious issue for endangered and threatened populations. To further investigate this issue, the Center, in collaboration with local agencies, conducted a series of studies in fall/winter 2002. Through weeks of intense fieldwork, scientists documented a very high rate of acute mortality (>90%) in adult coho salmon returning to spawn in urban streams. Before they died, these adult coho showed a common suite of symptoms (e.g., loss of orientation and equilibrium). Although we do not know the cause of this mortality, poor water quality is a leading hypothesis. Expanded field surveys in fall/winter 2003 will further investigate the cause(s) of this mortality.



Surveying a Washington urban stream

Ecosystem and Climate

Living marine resources in the Pacific Northwest use and depend on a variety of ecosystems from freshwater streams and rivers to estuaries and the ocean. Center scientists conduct research to better understand how natural environmental fluctuations impact living marine resource productivity, how human-caused stress affects ecosystems and living marine resources, and the complex interactions between living marine resources and their habitats.



Deploying a CTD during a research cruise

In 2003 we:

Began a Cooperative Research Program on Domoic Acid

Marine biotoxins are a severe problem along the West Coast. The Center spearheaded a multi-million dollar research project to study the ecology and oceanography of *Pseudo-nitzschia*, the marine algae that produce the neurotoxin domoic acid. The first two of six cruises were conducted in summer 2003 to measure the physical, chemical, and physiological conditions under which the algae produces and releases the toxin into the environment. This is the first investigation of a marine biotoxin that involves federal and academic scientists from the U.S. and Canada.

Domoic acid outbreaks can lead to closure of beaches to razor clam harvest and the loss of millions of dollars in revenue to coastal communities. With these studies, scientists hope to develop a model to forecast harmful algal bloom events on the West Coast.

Discovered Mass Death of Krill

Krill are a key prey item for many commercially important fish in the Northeast Pacific Ocean. Center scientists are studying the biology and productivity of the two most common krill species found off the Oregon coast. This past year, Center and Oregon State University scientists discovered, and recorded for the first time, a one-celled parasite that causes fatal infection and mass mortality in krill. Fatally infected krill have been found at more than a dozen sites along the Oregon and Washington coasts and infect 3 out of 14 of the krill species that live in the region. This finding demonstrates the important role that parasites play in the ocean ecosystem.

Hosted the Fifth Annual Salmon Ocean Ecology Meeting

Over 100 researchers met in February to share ongoing research and develop collaborations to evaluate the role ocean conditions play in the survival of endangered and threatened salmon stocks. Center scientists used information generated at this meeting to define “good” and “bad” ocean conditions, as well as methods to evaluate the role of ocean and climate change in freshwater habitat management actions that are geared toward recovery of endangered salmon stocks.

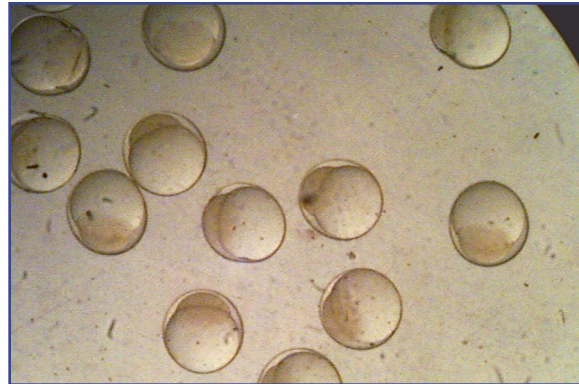
Recovery and Rebuilding

Over the last several decades, certain living marine resources have become depleted and, in some cases, are in danger of extinction. Recovering and rebuilding these stocks is important for biological, economic, cultural, and recreational reasons.

In 2003 we:

Reared Pacific Cod Larvae for the First Time

Puget Sound Pacific cod stocks have been severely depleted for decades and have not recovered despite years of minimal fishing pressure. Center scientists, in cooperation with Washington Department of Fish and Wildlife scientists, successfully captured, spawned, and reared Puget Sound Pacific cod larvae for the first time. This research will help determine if Pacific cod stocks that traditionally spawned in Puget Sound differ genetically from the larger Pacific cod stocks and whether cultured juveniles could be used to rebuild Pacific cod stocks in Puget Sound.



Pacific cod eggs



Preparing killer whale prey samples for contaminant & nutrition analysis

Initiated Key Southern Resident Killer Whale Research

Killer whales residing in the Puget Sound region are beloved by residents and tourists alike. Over the last decade, the Southern Resident killer whale (SRKW) population has experienced a large and rapid decline. In 2003, the Center received \$750K to support critical SRKW research. To ensure that research projects focused on the most critical research needs and would provide the best information to support conservation of the SRKW population, the Center held two workshops with regional, national, and international experts (one on vessel interaction research and the other on prey resources of SRKWs). In total, the Center funded over 20 research projects in four primary areas: evolutionary relationships, noise/vessel interactions, prey/health assessment, and winter distribution. This research is being conducted collaboratively by Center scientists and local, national, and international scientists.

Provided Scientific Leadership for Salmon Recovery

Center scientists are directly involved in salmon recovery planning efforts on the West Coast; they chair three and co-chair one of the nine Technical Recovery Teams (TRTs) that are providing the scientific underpinning for salmon recovery efforts. TRTs are assessing factors responsible for salmon decline and assisting in the development of recovery plans. In 2003, the Puget Sound TRT released a draft document that provides technical guidance to local watershed groups, the Lower Columbia River/Willamette TRT completed a document describing the biological conditions necessary for recovery of listed salmon populations, and the Interior Columbia TRT produced a draft document describing population structure of listed chinook and sockeye salmon and steelhead ESUs.



Innovation & Technology

Center scientists develop and apply new technologies, techniques, and tools to support management, conservation, and recovery of the Pacific Northwest's living marine resources.

In 2003 we:

Advanced Survey Operations

The Center implemented a new on-board data collection system that relies on a small wireless network. This network connects a "ruggedized" touchscreen computer to electronic measuring equipment for outdoor data collection. Additionally, the system connects to an indoor network to maintain continuity with trawl operations and to provide data back-up and follow-on processing. This system has improved the data collection process.



Entering data with the new on-board data collection system

Improved Egg Fertility and Embryo Survival in Captive Broodstock of Redfish Lake Sockeye Salmon

Captive broodstock programs play an important role in species conservation for seriously depleted populations, such as Redfish Lake sockeye salmon. These programs are challenging, however, because the salmon that are produced must be healthy and capable of surviving and reproducing in the wild. Center scientists, in collaboration with the University of Maryland, advanced spawning time of Redfish Lake sockeye salmon captive broodstock with implants of gonadotropin-releasing hormone, a drug commonly used to treat infertility in humans. The hormone has improved survival of offspring and will significantly improve the production of juvenile fish from captive broodstock programs for recovery of depleted Pacific salmon stocks.



Analyzing oysters for presence of experimentally introduced *Vibrio vulnificus*

Developed a Method to Differentiate Strains of a Potentially Harmful Bacterium

Vibrio vulnificus is a bacterium that often colonizes molluscan shellfish (e.g., oysters) and can cause life-threatening disease in susceptible humans. Many strains of this pathogen exist in nature. Center scientists identified a genetic marker that appears to differentiate strains linked to human illness. This marker could be used as a screening tool and will aid future research on the disease mechanism of this organism.

Operations

A strong infrastructure is critical to ensuring that the Center can provide the science needed to conserve and manage living marine resources and their ecosystems.

In 2003 we:

Strengthened our Science through External Reviews

The Center convened a series of program reviews, using external panels of scientists, to evaluate the quality and appropriateness of the Center's science in four major areas: artificial propagation, ocean and estuarine ecology, riverine and watershed ecology and recovery planning, and groundfish. The Center also created an ad-hoc evaluation committee that evaluated the Center's overall scientific approach and program alignment, identified any inefficiencies, and made recommendations on how to improve planning, programs, and operations to best address current and future demands and opportunities.

Strengthened Educational and Diversity Opportunities

Center staff participated in local outreach events and career fairs, including the second annual SeaFest celebration in Newport, Oregon. In June, the Center hosted over 70 pre-college teachers and faculty from around the nation as part of a cooperative program between NOAA and the American Meteorological Association. Center staff also developed a formal program of events for summer interns, including job skills and development courses.

Expanded Cooperative Research Partnerships

The Center signed an agreement with Washington State University to support cooperative research opportunities that will advance salmon recovery efforts in the interior Columbia River Basin. The Center also partnered with the Pacific States Marine Fisheries Commission, Pacific Fishery Management Council, and the Pacific Marine Conservation Council to create a new cooperative research website.



Children participating in a SeaFest activity

Dedicated the New Captain R. Barry Fisher Research Building

In October 2003, NOAA Administrator VADM Lautenbacher joined over 230 community members, government and university officials, and fishing industry representatives to dedicate the Center's new Captain R. Barry Fisher building, located at Oregon State University's Hatfield Marine Science Center in Newport, Oregon. This facility was created to strengthen critical marine fish research programs through interdisciplinary science, partnerships, and educational linkages and is named after Captain R. Barry Fisher, a strong advocate for improved science and collaboration.



Dr. Tim White, VADM Conrad C. Lautenbacher, Jr., Dr. Usha Varanasi, and Carol Fisher preparing to cut the ribbon leading to the Captain R. Barry Fisher building

Expanded Safety Programs and Operations

The Center implemented an automated external defibrillator program, established a comprehensive small boat safety program, and ensured all senior managers completed safety training.

Provided Scientific Leadership to Support NOAA

Center staff serve as experts on national committees and teams, including the Agency's aquaculture initiative, climate and ecosystems initiative, and the development of a Pacific Coast Observation System.

Received Recognition for Achievements

Center scientists received a number of awards this year in recognition of their hard work and accomplishments, including an Outstanding Achievement Award by the American Institute of Fisheries Research Biologists; the "Best of the Best" Facility Award by NOAA's Environmental Compliance and Safety Office; the First annual EPA Region 10 "Champions for Environmental Leadership and Greening the Government" Innovation Award; the best paper award in genetics by the American Fisheries Society; a wireless technology award at the NOAA Tech conference; three NOAA Administrator Awards; and six NOAA Bronze Medals.



Dr. Mike Sissenwine and Dr. Bill Hogarth supporting Ecotoxicology Program representatives receiving the Outstanding Achievement Award

Learn More & Come See us in Action

Sharing our work with other scientists, with policymakers, and with the public is important to us. To learn more about what we do, please visit our website at www.nwfsc.noaa.gov. To arrange a visit or obtain additional information, please call 206-860-3200.



Attendees visiting science stations at the Center's Captain R. Barry Fisher building

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