Northwest Fisheries Science Center

Highlights 2011

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Message from the Acting Science Director

As we welcome a new year, I would like to share with you some of the activities and accomplishments of NOAA's Northwest Fisheries Science Center in 2011. I am proud of what Center staff achieved and appreciate the contributions of our collaborators, both within and outside the NOAA family. Among our notable accomplishments this past year, the Center led the data collection support critical to the successful implementation of catch shares in the West Coast Groundfish fishery, received national attention for the science underpinning the historic Elwha River Dams removal and restoration project, and played a key role in a coordinated seafood safety response following the *Deepwater Horizon* oil spill. The Center also provided critical scientific advice to our West Coast stakeholders for salmon and Southern Resident killer whale recovery efforts, and renewed efforts to emphasize healthy habitats as the foundational need for many of the species managed by NOAA Fisheries. The NWFSC continued advancing strategic science and research planning efforts to ensure that our activities remain of the highest quality, meet current and long-range societal needs, and are completed in an efficient and cost-effective manner. While we continue to face critical challenges in protecting and conserving Pacific Northwest ecosystems, we have made many important strides and I look forward to continuing our efforts in 2012.

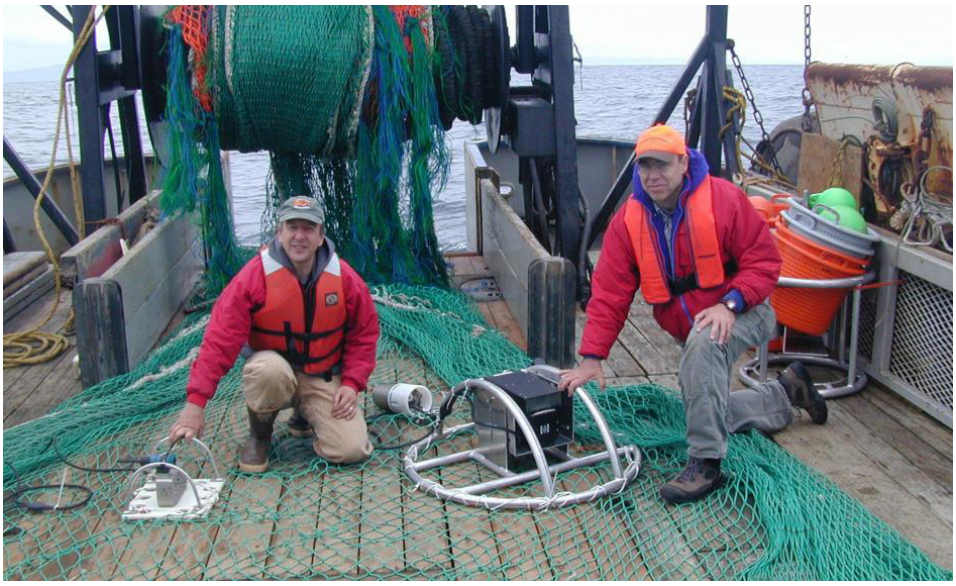
John E. Stein

Who We Are and What We Do

The Northwest Fisheries Science Center (NWFSC or Center) conducts research to help conserve and manage living marine resources (e.g., marine fish, salmon, and killer whales) and their habitats in the Northeast Pacific Ocean—primarily off the coasts of Washington and Oregon and in rivers and streams in Washington, Oregon, and Idaho where anadromous fish, like salmon, exist. Our research assists resource managers in making sound decisions that build sustainable fisheries, recover endangered and threatened species, sustain healthy ecosystems, and provide science support for safe seafood and environmentally sound aquaculture. The Center conducts research in four primary areas:

- Ecosystem Approach to Management for the California Current Large Marine Ecosystem
- Habitats to Support Sustainable Fisheries and Recovered Populations
- Recovery, Rebuilding and Sustainability of Marine and Anadromous Species
- Sustaining Marine Ecosystem Health and Human Well Being

What follows are some of the Center's 2011 accomplishments in each of these areas.



Scientists developed new underwater camera systems that can help commercial trawl fisherman adjust their nets in real-time to reduce or avoid bycatch.

Ecosystem Approach to Management for the California Current Large Marine Ecosystem

The Pacific Northwest's waters are part of the California Current Large Marine Ecosystem (CCLME), which stretches from British Columbia to Baja California and is one of the most productive coastal ecosystems in the world. The CCLME is home to an abundance of marine life, sustains many active fisheries, influences weather patterns, and plays a vital role in the region's economy. Center scientists work to support an ecosystem approach to management of the CCLME, which requires an understanding of the processes, functions, and interactions among organisms, including humans, and their environment. This approach is especially timely and relevant with development of initiatives such as NOAA's Next Generation Strategic Plan and the new National Ocean Policy that strongly encourage a science-based ecosystem approach.

In 2011 we:

Completed Preliminary Integrated Ecosystem Assessments for Puget Sound and the California Current Large Marine Ecosystem

An Integrated Ecosystem Assessment (IEA) is a scientific synthesis and management tool that integrates economic and social science data with all available ecosystem data related to organisms, processes and habitat; identifies the social and ecological benefits and risks of different management actions; and evaluates performance. Center scientists teamed with researchers from other line offices, agencies, and institutes, and in particular the Southwest Fisheries Science Center scientists, to produce the first full IEA report for the California Current. The report developed and evaluated a suite of indicators related to seven major components of California Current Large Marine Ecosystem by assessing their status, risk, and sensitivity to alternative management strategies. Future reports will update and expand the IEA to more broadly encompass ecological and socioeconomic components, integrate additional stakeholders, and address emerging ecosystem stressors. The California Current IEA is designed to help regional ocean governance groups, such as the West Coast Governors Alliance, with their efforts to promote ocean health and coastal and marine spatial planning.

Supported Launch of Catch Share Program for West Coast Groundfish Fishery

Catch shares refer to management programs that allocate a specific portion of the total allowable fishery catch to individuals, cooperatives, or communities. Following the agency's policy encouraging the use of catch shares nationwide, the West Coast served as a testing ground for a new groundfish catch share program. In 2011, the NWFSC and colleagues at the Northwest Regional Office, Office of General Counsel, and the Office of Law Enforcement played a major role in the successful implementation of what is now considered the most complex multi-species, multi-sector fishery catch share program in the nation. Center staff provided key technical support for major sections of the administrative rules for at-sea monitoring and economic data collection, conducted four times the typical number of observer trainings, reprogrammed databases to increase efficiency of data collection and analysis, and conducted an extensive outreach effort related to this important agency initiative. Staff also launched a social study to collect data on the social and cultural changes in the West Coast Groundfish Fishery as a result of the catch share program.

Investigated Effects of Climate Change on West Coast Marine Ecosystems

Building on climate scientists' consensus that climate change will likely cause the North Pacific Current (NPC) to shift poleward, NWFSC researchers found that if the NPC moves toward the pole, biomass and productivity in the California Current ecosystem increases, likely due to increased transport of nutrients and plankton from the sub-arctic. These findings suggest that such climate-induced shifts may increase productivity for many species in the California current ecosystem. This new information, combined with long-term monitoring of the ecosystem, will help West Coast managers adapt their management strategies in response to climate-induced changes in ocean conditions.

Continued to Investigate Biological Effects of Ocean Acidification

Ocean acidification is caused by human-derived and natural increases in atmospheric carbon dioxide that is then absorbed by the oceans, increasing its acidity and decreasing the levels of carbonate that are crucial to species that use calcium carbonate to form their shells. The West Coast and North Pacific are susceptible to ocean acidification, and the level of corrosive ocean waters is accelerating faster than models have predicted. This increasing acidity can disrupt the calcification process of shell-producing organisms at the base of the food chain, such as krill, and can lead to a ripple of negative effects on other species of commercial and conservation concern. In 2011, Center scientists conducted studies on the biological effects of ocean acidification on diverse marine species using a state-of-the-art acidification experimental facility, which provides seawater with controlled pH, carbon dioxide, and dissolved oxygen levels for multiple, simultaneous experiments. Scientists also used models to project the effects of ocean acidification in Puget Sound and the California Current marine ecosystem, and developed two new projects to monitor the pH in Puget Sound. These studies will help researchers better understand the susceptibility of key species such as oyster, rockfish, geoduck, Dungeness crab, and abalone to an acidified ocean environment under realistic scenarios of future levels of carbon dioxide in the atmosphere, assess the ecosystem impacts on food web dynamics, and determine where ocean acidification has already had impacts on marine species.

Scientists monitor salmon recolonization of the Elwha River ecosystem after removal of three dams.

Habitats to Support Sustainable Fisheries and Recovered Populations

Living marine resources in the Pacific Northwest use and depend on a variety of habitats, from freshwater streams and rivers to estuaries and the ocean. Center scientists conduct research to better understand these habitats and how they impact species and ecosystem structure and function.

In 2011 we:

Initiated Salmon Habitat Mapping Program in Columbia River Basin

In the Pacific Northwest, the successful recovery of fishes listed under the Endangered Species Act (ESA) depends in part on our understanding of the importance of habitat for sustaining the health of riverine ecosystems and salmon populations. This year, Center scientists collaborated with federal, state, and tribal partners to implement the Columbia Habitat Monitoring Program, a field collection effort designed to evaluate the spawning and rearing conditions for ESA-listed salmonids throughout the Columbia River Basin. Scientists are monitoring 500 stream reaches annually to measure how stream habitat quality and quantity affect the biological response of salmonid populations. By systematically using a single habitat monitoring protocol in 14 of the Columbia River Basin's major watersheds, scientists can identify the status and trends in Basin-wide habitat conditions, as well as provide decision-support models to help managers evaluate habitat conservation and restoration actions.

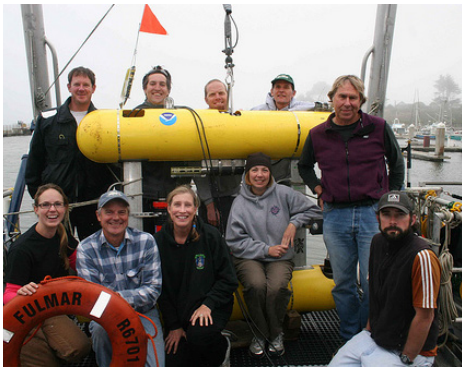
Completed Baseline Monitoring for Elwha River Dam Removal

The removal of the Elwha River dams to restore Washington State's Elwha River ecosystem and its native fisheries is one of the largest and most important dam removal projects in the nation and one of the largest watershed and salmon restoration projects in North America. The Center has completed several years of monitoring to establish critical baseline conditions associated with juvenile and adult fish use of shoreline and river habitats below the Elwha and Glines Canyon Dams. Center scientists also collaborated with state, federal and tribal organizations to develop key questions and adequate study designs to measure the changes in salmon use patterns, salmon recolonization rates, and population-level responses after dam removal. The Center's contribution to this multi-agency effort will help quantify the ecological response following removal of the Elwha River dams, and will inform other dam removal projects nationwide.

Highlights 2011

Explored Deepwater Corals and Marine Life in Bodega Canyon

Using advanced technology, Center scientists teamed up with NOAA's National Marine Sanctuaries to search for deep water corals in Bodega Canyon, an undersea feature located north of the Cordell Bank National Marine Sanctuary off the coast of Northern California. During the expedition, the team completed several dives using the autonomous underwater vehicle (AUV) *Lucille,* which returned thousands of photos of marine life associated with deepwater coral habitat 2,000 feet beneath the sea. The digital images taken from cameras aboard the AUV *Lucille* provided a refined view of Bodega Canyon's habitat and its associated fish and invertebrate communities, including Dover sole, sea cucumbers, brittle stars, Dungeness crabs, and sponges. The information gathered from this expedition will inform efforts to identify essential fish habitat for commercially important species.



Scientists deployed the Autonomous Underwater Vehicle to help search for deep water corals in Bodega Canyon, an undersea feature north of the Cordell Bank National Marine Sanctuary.

Scientists weigh Pacific hake on the NOAA Ship Bell M. Shimada during a joint U.S.–Canada integrated acoustic and trawl survey of Pacific hake.

Genetic testing helped scientists identify the paternity and mating behavior of Puget Sound's endangered Southern Resident killer whales.

Recovery, Rebuilding and Sustainability of Marine and Anadromous Species

Over the last several decades some living marine resources have become depleted and, in some cases, are in danger of extinction. In the Pacific Northwest, approximately 39 marine species are listed as endangered or threatened under the Endangered Species Act and seven marine fish stocks are classified as "overfished" under the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act. Recovering and rebuilding these populations and sustaining all marine and anadromous populations are important for ecological, economic, social, and cultural reasons.

In 2011 we:

Completed Salmon Status Reviews

Center scientists completed the required five-year status reviews for Pacific salmon and steelhead listed as endangered or threatened under the Endangered Species Act, a major effort that involved compiling updated population information such as abundance and productivity, as well as information on threats such as trends in hatchery production, harvest, and habitat quality. The review focused on providing a scientific assessment that would allow the managers to determine if any listed salmon species could be down-listed or delisted. The review found some positive trends in status for many species, including generally increased abundance since the time of listing in the 1990s, but the increases were not sufficient to warrant a change in status. Therefore, after considering the best available information, the NOAA Fisheries Northwest Regional Office concluded that all listed salmon and steelhead species in Oregon, Washington, and Idaho will retain their current ESA listing classification.

Revealed Killer Whale Parentage and Effects of Reduced Prey

Southern Resident killer whales (SRKW) are considered cultural icons in the Pacific Northwest. With a current population size of only 89 animals, inbreeding depression (or the reduced ability to survive and reproduce as a result of mating between related individuals) had been theorized as a potential reason for the slow recovery of this endangered species. NWFSC scientists led a groundbreaking study on SRKW breeding patterns using genetic testing to determine the paternity of over a dozen calves, and discovered that some of the calves they studied were the result of matings within the same pods that comprise the overall population. Despite this unique mating behavior, there was no evidence of mating between very close relatives such as siblings or parents. The study also found that only a few of the sampled males were active breeding members of the population, and that these were typically the largest and oldest males. The findings indicate that SRKWs are not currently experiencing high levels of inbreeding

depression, and that other factors are more likely to be limiting their recovery. One such factor may be abundance of their dominant prey – Chinook salmon, a species that is also listed as threatened or endangered under the ESA in most parts of the West Coast. Scientists are conducting studies to quantify how many and which stocks of salmon the whales consume, in part to assess how salmon fishing and the loss of salmon habitat affects the whales. By calculating SRKW metabolic rates and prey requirements, scientists found that these whales may be consuming a significant fraction of Chinook salmon runs from the Fraser River in British Columbia, Canada. NWFSC scientists also evaluated the effects of varying salmon abundance on the whales' population growth rate. These findings shed light on the likely impacts of changes in prey availability due to fishing.

Collected Critical Data for West Coast Groundfish Fishery

The West Coast groundfish fishery includes some 90 commercially fished stocks and supports millions of dollars in economic activity. Center scientists conducted several coast-wide groundfish surveys using state-of-the-art sampling technology and techniques, including a Pacific hake acoustic survey (conducted jointly with Canada) from central California to the Alaska-Canadian boundary and a bottom trawl survey from Cape Flattery, Washington to the U.S.-Mexican border. These surveys are a key source of fishery-independent information about the distribution, abundance, and age structure of groundfish necessary for stock assessments and to help ensure the sustainability of marine fisheries. This year the Center completed seven full stock assessments (for hake, Pacific Ocean perch, petrale sole, spiny dogfish, sablefish, Dover sole, and darkblotched rockfish), two updated stock assessments (canary rockfish and yelloweye rockfish), and five rebuilding analyses (Pacific Ocean perch, petrale sole, darkblotched rockfish, canary rockfish, and yelloweye rockfish). This data will be used by the Pacific Fishery Management Council to set harvest levels.

Assisted in Record-breaking Recovery of Redfish Lake Sockeye Salmon

Redfish Lake sockeye salmon travel over 900 miles from the Pacific Ocean up the Columbia and Snake Rivers to their natal stream and spawning grounds in Idaho's Redfish Lake Creek. With eight large dams along the river, these salmon have a difficult journey and their populations have dwindled. In 1991, with less than six fish returning, Redfish Lake sockeye salmon were listed under the Endangered Species Act. As part of a multi-agency captive broodstock program to protect the genetic structure and prevent the further decline of Redfish Lake sockeye salmon, Center scientists in collaboration with others developed techniques to successfully culture sockeye salmon to adulthood and rear and release juveniles. As a result of these efforts, in 2011, a record number of 1,100 adult sockeye salmon returned to Redfish Lake – a level that has not been seen in over half a century. For the fourth year in a row, captive broodstock production has resulted in over 150,000 outmigrating smolts. This increase in returns should help stabilize the population until factors leading to their decline, such as loss of downstream rearing habitats, can be more fully addressed. This innovative captive broodstock program exemplifies the science-based tools NOAA is using to recover ESA-listed stocks of Pacific salmon.

Using Genetics to Improve Sablefish Aquaculture

As human populations grow, the demand on marine ecosystems to provide seafood and recreational opportunities also increases. This places a premium on the effective management of natural fish stocks and the development of sustainable aquaculture. Center scientists are engaged in a multi-year effort to develop sablefish (black cod) and other marine fish for commercial aquaculture. Given that sablefish females grow more rapidly and attain a larger adult size than males, scientists are interested in exploring how all-female or sterile populations could potentially improve aquaculture growth rates and feed conversion efficiency, and also mitigate the genetic risks related to escapements. In 2011, scientists made significant progress toward identifying the genes that control the sex of sablefish by sequencing the entire suite of genes expressed in the testis and ovary at very early stages of development. This is an important step toward identifying genes that regulate formation of the ovaries versus the testes and those that can be targeted for sex control in this species. Scientists will continue advancing this effort to help meet the agency's goal of developing technologies to support sustainable marine aquaculture and increase sources of healthy protein.

Developed Lamprey-friendly Fish Passage Structures

Like salmon, Pacific lamprey are a valuable source of food for tribes in the Columbia Basin and are anadromous – lamprey are born in freshwater, reach adulthood in the ocean, and return to freshwater to spawn. Lamprey have difficulty traversing fish ladders that were designed for salmon in the Columbia River. In recent years, lamprey populations have declined significantly due, in part, to their inability to traverse fish ladders and reach their spawning areas. Center scientists collaborated with the Umatilla tribes, U.S. Fish and Wildlife Service, Bonneville Power Administration, and the Bureau of Reclamation to develop and install three innovative fish passage structures at low-elevation dams in the Umatilla River that take advantage of lamprey's unique climbing ability. These efforts are expected to assist the lamprey's successful passage of the dams and facilitate the rebuilding of this fish population.

A newly-installed lamprey passageway in the Umatilla River, OR.

Advanced Fish Tagging and Detection Technology

The passive integrated transponder (PIT) tag is a small communications device, about the size of a grain of rice, with a computer chip that is inserted into the body cavity of juvenile salmon. Electronic systems at dams detect PIT tags in juvenile salmon as they move downstream and send information to a database so that scientists can learn more about fish passage and survival. This year, Center scientists conducted research to advance PIT tag capabilities, including installing a prototype PIT detection system on a pile dike in the Columbia River estuary to monitor migrating adult and juvenile fish such as Chinook and coho salmon, steelhead, and sturgeon. PIT tag studies will help provide critical information regarding salmon migration, behavior, passage, and survival of ESA-listed stocks.

This fish counter in the Columbia River has an underwater fish detection antenna array. Solar energy powers a camera that scientists use to remotely monitor their equipment and ensure accurate fish counts.

Investigated Role of Hormone in Growth and Survival of Chinook Salmon

Scientists continued to investigate the factors that cause salmon mortality in the ocean and poor adult returns, as it has been hypothesized that growth rate (not necessarily size) during the summer of ocean entry may be crucial for salmon survival. The Center's previous research showed that the plasma levels of the hormone Insulin-like Growth Factor (IGF-I) in juvenile coho salmon are positively correlated to adult Columbia River salmon survival the following year. In 2011, scientists found the same relationship for Columbia River Chinook salmon, confirming that summer growth may play an important role in regulating salmon populations. This research also indicates that plasma IGF-I levels in juvenile salmon may be a useful tool for predicting salmon survival and adult returns.

The NWFSC helps provide managers with a real-time assessment of the risk of harmful algal blooms in Puget Sound as well as the outer coast of Washington State, where razor clamming is an important recreational and tribal subsistence fishery.

Sustaining Marine Ecosystem Health and Human Well Being

The people of the United States are inextricably linked to the oceans; our activities on land, sea, and in the air impact the health of the oceans and the health of the oceans impacts us. As NOAA's West Coast Center of Excellence for Oceans and Human Health, Center scientists focus on advances in early warning systems, seafood benefits and risks, and improved assessments of ecosystem change and its effects on human health through studies of pathogens, toxin-producing algae, shellfish, fish, and marine mammals, as well as climate variability.

In 2011 we:

Ensured Safety of Seafood Following Gulf Oil Spill

The *Deepwater Horizon* incident in the Gulf of Mexico was the first oil spill to be declared a spill of national significance in U.S. history, and immediately raised fear over seafood safety and the potential economic collapse of the Gulf fishing industry. The Center has a long history, dating back to the 1989 *Exxon Valdez* oil spill, of providing expert technical assistance during emergency responses that impact living marine resources. The Center mounted one of the largest seafood chemical analyses in response to an oil spill to date, and worked with other NOAA Fisheries partners to ensure that no contaminated seafood reached the market for public consumption. This year, the Center completed the rapid assessment of toxic contaminants in thousands of finfish, oyster, and shrimp samples from the Gulf of Mexico for exposure to oil and dispersants. The results helped inform the agency's decisions to re-open closed Federal waters for fishing and minimize economic impacts to the Gulf's valuable fishing industry.

Monitored and Rapidly Assessed Toxic Algal Blooms in Puget Sound

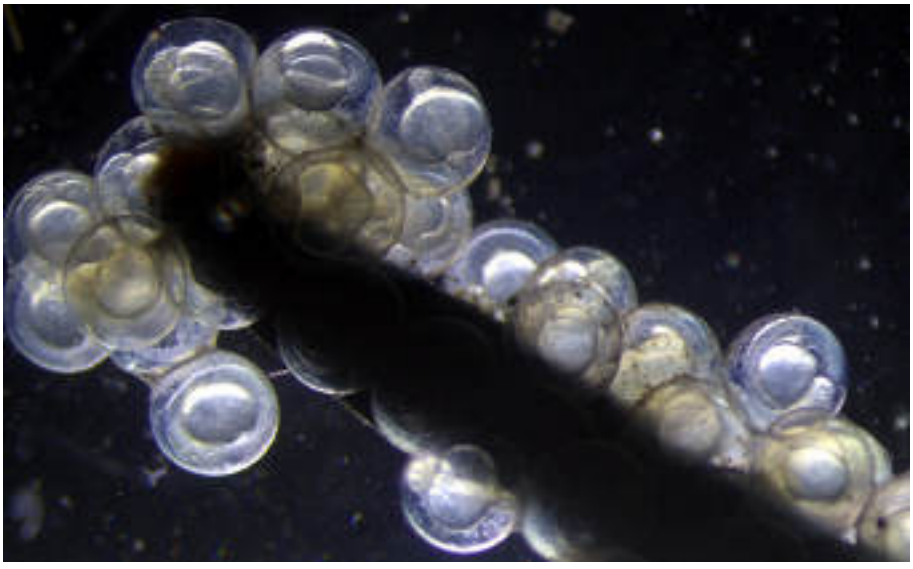
Harmful algal blooms (HABs) occur when a particular species of toxic algae proliferates. Through feeding, these toxins can be transferred through the food web. In 2011, some mussels in the waters of northern Puget Sound and Vancouver Island, Canada were contaminated with toxins produced by the algae *Dinophysis,* resulting in dozens of cases of diarrhetic shellfish poisoning in humans and the recall of over 2,000 pounds of shellfish. Scientists collaborated with state health officials and the U.S. Food and Drug Administration to analyze ecosystem indicators that can help provide an early warning of these harmful algal bloom events. As part of the SoundToxins partnership, the Center collaborates with shellfish growers, tribes and citizens to routinely monitor phytoplankton and environmental factors in Puget Sound. Center scientists were able to provide a rapid assessment of shellfish toxicity using an advanced screening method and quickly alert Washington State health officials of the *Dinophysis* bloom in Puget Sound. The NWFSC will continue to assist the state and FDA by monitoring phytoplankton and assisting with shellfish sampling using rapid toxin screening methods. These efforts can help managers better forecast blooms, prevent unnecessary or excessive harvest closures, reduce public health risks, and minimize economic impacts.

Improved Understanding of Premature Die-offs of Coho Salmon

Urban waterways in coastal areas can be spawning grounds for important migratory marine species such as salmon. For over a decade, scientists have worked to solve the mystery of why adult coho salmon are dying prematurely in urbanizing watersheds of the Pacific Northwest when they return from the ocean to spawn. Spawner die-off rates in monitored urban stream networks are consistently high, with losses of as much as 90% of the total fall runs. In three significant studies published this year, NWFSC researchers and partners conducted a forensic analysis, population modeling, and a landscape-scale analysis that attributed seasonal coho mortality to toxic urban stormwater runoff and quantified the potential future impacts of coho spawner mortality on wild coho population abundance and conservation. In addition, scientists found a close correlation between the severity of spawner die-offs and the amount of impervious surface (such as streets and parking lots) within an urban drainage, and were able to predict hotspots of coho mortality throughout central Puget Sound. The Center's ongoing investigations illustrate how studies on salmon can help resource managers measure ecological resiliency and monitor the effectiveness of land-use strategies in urban areas.

Discovered Photo-toxic Effect of Bunker Oil on Pacific Herring Embryos

Two decades of research since the 1989 *Exxon Valdez* oil spill has shown that fish embryos are particularly vulnerable to spilled oil, as they develop abnormalities such as heart defects that may be fatal later in life. Most catastrophic spills, such as the *Exxon Valdez,* involve large volumes of crude oil. However, spills of bunker fuel oil (the leftovers of crude oil refining) are more common and widespread, and the biological impacts are not as well studied. In 2011, Center scientists and collaborators conducted a groundbreaking study on the impacts of the 2007 *Cosco Busan* bunker oil spill on Pacific herring, an important commercial fish, in the San Francisco Bay. Researchers found that herring embryos from deeper waters in the Bay exhibited the "typical" heart defects even two years after the spill. However, the herring embryos exposed to oil in shallower waters died outright in unexpectedly high numbers, suggesting that a toxic interaction between sunlight and the chemicals in bunker oil might be responsible. The study illustrates that even a relatively small spill can have a lethal "photo-toxic" effect as well as lingering biological effects, and demonstrates the need for a better understanding of the complex chemical composition of various oils and their impacts on fish.



Researchers examine the effects of oil spills on vulnerable and commercially important marine life, such as Pacific herring embryos.

Highlights 2011

Center scientists from the Mukilteo Research Station hosted an open house for the local community.

Our Facilities, Operations, and Staff

Staff are the heart of the Center and its most important asset. Adequate facilities and a strong infrastructure are critical to supporting the high-quality work we strive to achieve.

In 2011, we:

Supported Key National Initiatives and Regional Collaboration Efforts

The Center's senior staff were actively involved in advancing the agency's national priorities, including implementing the President's National Ocean Policy and NOAA's Next Generation Strategic Plan. Center staff also continued their valuable support in regional activities to improve coastal and ocean health, as part of ocean governance, and NOAA's regional collaboration initiatives. In the past year, several staff served on key committees and panels for the West Coast Governors Alliance and Puget Sound Partnership, providing critical science advice and guidance for key state partners. For NOAA's Western Region Collaboration Team (NOAA West), the regional team leader, a Center senior manager, and the Team coordinator and members from other NOAA line offices, conducted several key activities including support of NOAA's national priority objectives such as coastal and marine spatial planning and ecosystem-based management. These efforts demonstrated leadership in collaborating with federal and state entities and proved the value of NOAA's science and expertise to our regional constituents.

Worked to Improve Environmental Literacy and Stewardship

Center staff participated in a variety of education and outreach events in the Pacific Northwest, including NOAA Science Camp, NOAA's Teacher in the Lab program, career fairs, and seafood/maritime festivals. In addition, Center staff from the Mukilteo Research Station hosted an open house for the local community and educational tour at Manchester Research Station for native Alaskan students. The Center reached hundreds of Pacific Northwest educators and students through "Sustainable Seafood" series in collaboration with the Seattle Times' Newspapers in Education program. Staff also presented at four educator workshops funded by NOAA's Bay-Watershed Education and Training program; created a novel "Experience Algal Toxins" workshop for Northwest Indian College undergraduate students; and helped develop hands-on science sessions for 28 middle and high school students as part of the University of Washington's Native Youth Enrichment Program. Finally, to help increase interest in careers that support NOAA's mission, the Center provided over 50 students with internship experiences at the Center, including 12 Hollings Scholars and two students with disabilities through the Washington State DO-IT program.

Improved Safety and Operations

Throughout 2011, Center staff participated in numerous safety training opportunities and the Green Team's successful recycling and reuse program. Several facility upgrades were completed in 2011, including the installation of a new heating system designed to save 25% more energy each year as well as retrofitting of energy-efficient lighting to save approximately $9,800 annually. Staff also teamed up with the Green Team and Employee Association for a new landscaping project that involved the removal of non-native English ivy and planting of native vegetation.

Received Recognition for Achievements

Several staff received awards this year in recognition of their accomplishments. The awards include NOAA Bronze Medal, a NOAA Administrator's Award, an American Fisheries Society Publication Award for best publication in the journal *Transactions of the American Fisheries Society journal,* an American Institute of Fisheries and Research Biologists' W.F. Thompson Award for Best Student Paper, the Lower Columbia River Estuary Partnership's Steward of the Year Award. Our staff were also featured in a NOAA educational video series, "Microworlds," which received a 2011 Silver Telly Award. As of this publication, Center scientists wrote the top five of the most widely read papers in the journal *Transaction of the American Fisheries Society,* and NWFSC watershed scientists wrote five of the top 20 most read papers in the *North American Journal of Fisheries Management.*