Northwest Fisheries Science Center

Fish Matters

Center scientists assess marine contaminants from Puget Sound to British Columbia

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National Marine Fisheries Service

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Scientists with NOAA Fisheries' Northwest Fisheries Science Center are conducting two major projects in summer 2000 to assess the impacts to bottomfish of contaminants in sediments and the water column. Both projects involve the NOAA research vessel *Harold W. Streeter*, a 45-foot vessel which has served the Center's marine toxicology program for 27 years (see accompanying article on inside).

In late May, Center scientists departed Portage Bay in Seattle for the north coast of British Columbia. There they conducted a month-long project as part of a major, cooperative environmental study with Canadian tribal and governmental organizations and the private sector.

A site known as Kitimat Arm (south of Prince Rupert) was previously polluted by several industrial operations, and residents, industry, and government representatives want to know whether contaminants remaining after process changes and remedial activities continue to pose threats to ecosystem health..

The goal of the study is measure exposure of resident flatfish and salmon species to a class of chemicals known as polycyclic aromatic hydrocarbons, and to assess potential biological effects in the flatfish. Scientists used the *Harold W. Streeter* to collect English sole, yellowfin

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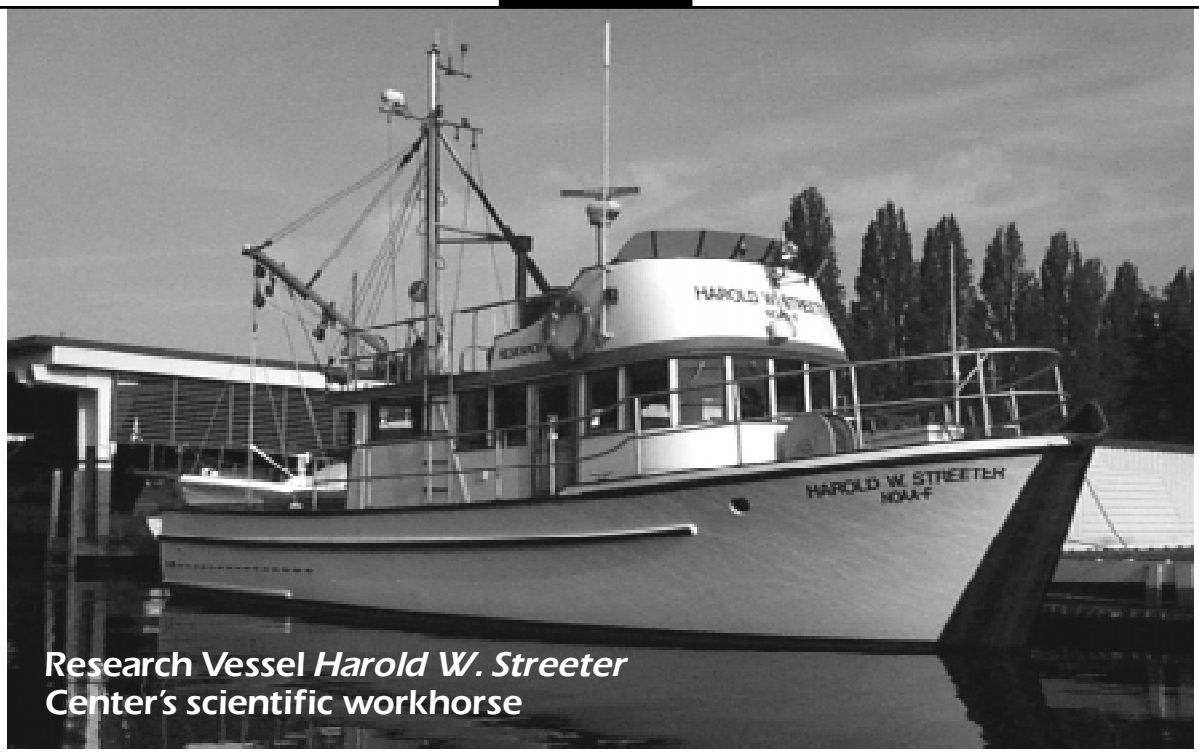


Research Vessel *Harold W. Streeter*
Center's scientific workhorse

As the workhorse of toxic pollution research, the research vessel *Harold W. Streeter* routinely spends over 100 days a year collecting sediment and fish samples from embayments of Puget Sound and beyond. The deck of the *Streeter*, with its round-bottom hull, provides a rolling research platform that requires onboard scientists to have good sea legs.

Designed by Edwin Monk, a Seattle designer known for his adaptation of traditional fishing vessel designs to recreational powerboats, the *Streeter* was built in 1962 to conduct water quality sampling on the Columbia and Willamette Rivers in Portland, Oregon for the U.S. Office of Public Health. The Northwest Fisheries Science Center acquired the vessel in 1973 to study the impacts of toxic pollutants on local fishery resources, protected species, and marine habitat.

Originally powered by an engine designed and built in 1942 as a World War II landing craft engine, the *Streeter* had a governor that allowed two maximum operating speeds: one for normal and one for battle operation. After 33 years of reliable operation (albeit not at battle speed), the *Streeter* was re-powered in 1995.

The *Streeter* has undergone several environmental upgrades over the decades. It is equipped with a system which filters out oily waste that may have accumulated in the bilge prior to pumping the bilge water overboard, and a vapor-trap system which captures and recycles oil vapors created while the engine is running. The vessel also has a 50-gallon holding tank and disposes or recycles much of the jetsam collected from fish trawls.

A holding tank and coolers can receive live fish specimens, which are typically transported to the Center's field station at Mukilteo. A wet lab in the cabin is used to weigh, measure, and dissect specimens needed for tissue samples. Tissue and sediment samples are preserved and returned with the *Streeter* to dock at the Center's Montlake Facility along Portage Bay. Scientists at the Montlake laboratories conduct a variety of biological and chemical analyses to determine the presence of toxic contaminants and the status of the specimens' health.

Sporting port and starboard aluminum booms equipped with blocks, tackle, and two winches, the *Streeter* can operate a sediment grab (a claw-like shovel) to collect contaminants in bottom sediment. The grab scoops up sediment a foot deep while leaving the thin, top layer undisturbed for accurate contaminant sampling. The boom also is used to tow small experimental trawls (nets) to collect bottom fish such as English sole and rock sole.

But the trawls have caught more than fish. Over the years, the *Streeter* has hauled up logs, tires, 50-gallon drums, plastic chairs, abandoned gillnets and crabpots, and a rickshaw bicycle. More interesting items hauled onboard have included an Ernie puppet with barnacles, a high-heel shoe (which the crew fondly named "True sole"), and a dental bridge with four teeth.

Aside from amusing trawl captures, the *Harold W. Streeter* has been a cornerstone in the Northwest Fisheries Science Center's evaluations of impacts and remediation efforts needed in urban embayments on both U.S. coasts.

The *Streeter* has been the backbone of our ability to conduct environmental assessments, allowing the Center to become a national leader in expertise on the impact of toxic pollutants on marine fish and their habitats.

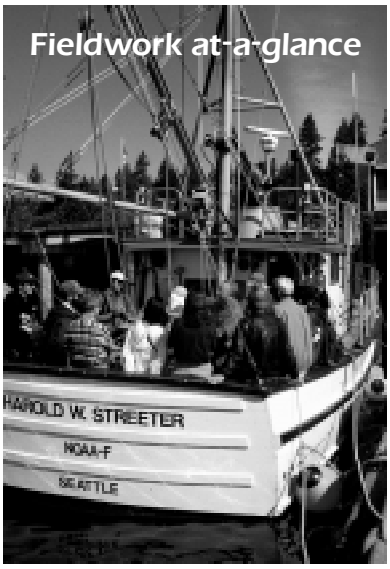
Harold W. Streeter part of international workshop

Last summer, the research vessel *Harold W. Streeter* served as the sampling platform during the field-work portion of a PICES-sponsored environmental monitoring workshop held in Vancouver, B.C. Scientists from Russia, Canada, China, Korea, Japan and the U.S. worked onboard the *Streeter*, collecting samples from Vancouver Harbor, the largest port on Canada's Pacific coast.

"This environmental assessment of the harbor was a great opportunity to share our vessel's research capabilities," said Dr. John Stein, director of the Center's Environmental Conservation Division and co-chair of the workshop. "This type of collaboration is invaluable in optimizing data on marine contaminants."

Harmonizing approaches and methods used by different countries will increase scientists' ability to compare data from a wide range of studies on the environmental quality of North Pacific marine ecosystems.

Currently, the array of international scientists are continuing their data analyses and interpretation, and are continuing to prepare presentations and posters of the workshop results. In coming months, scientists will be publishing reports and journal articles summarizing the results of the environmental assessment.



Each morning during the fieldwork phase of the workshop, participants asssembled for a short meeting to discuss the day's objectives. Then one group of scientists would depart on the Streeter while another group would leave for shore collections on the small launch. Seven stations within Vancouver Harbor and the adjacent Strait of Georgia were sampled for sediment, benthos (bottom-dwelling organisms), and intertidal invertebrates.

Sediment was collected by a Van Veen grab, then sieved through a 0.5-mm screen. Scientists sorted the small animals from the mud and took samples back to their home labs for detailed identification and statistical analyses to characterize benthic community structure. Sediment was also taken for analyses of organics and metals. A second grab was taken for mesofauna, the tiny invertebrates which would pass through a 0.5-mm screen. The second grab also allowed analysis of sediment grain size and algae.

Fish were collected by otter trawl at five sites to assess community structure, abundance, and biomass.

Onboard the *Streeter* (bottom photo), scientists dissected fish for chemical and biological analyses that were later conducted at the laboratory. Fish tissue was collected for the presence of persistent organics and metals; stomachs were collected for diet studies; and otoliths (ear bones) were obtained for age analysis.

Workshop participants (on cover) collected clams, mussels, and algae at each intertidal site, usually by digging with a shovel or collecting from the rocky shore.

Seafood safety evaluations look at human and natural contaminants

Although the Center does not specifically address human health risks posed by consumption of seafood products contaminated by toxic compounds, Center scientists provide specific information that supports other agencies' missions to protect public health and maintain consumer confidence in seafood quality, such as following an oil spill.

To detect toxic chemical contaminants in fishery resources that may pose a risk to human health, Center scientists screen edible tissue samples for persistent pollutants such as PCBs (polychlorinated biphen-yls) and chlorinated pesticides, for petroleum compounds released via oil spills, and from marine biotoxins from harmful algal blooms.

Scientists throughout the nation use various techniques–including innovative biological and analytical chemistry methods the NWFSC pioneered–to determine whether seafood is contaminated, and when it is safe to reopen closed fisheries following contamination incidents.

A well-known application of Center methodologies was the assessment of fish and shellfish contamination following the 1989 *Exxon Valdez* oil spill off Alaska, and the 1996 *North Cape* oil spill off Rhode Island.

Rapid detection methods developed by Center scientists allowed detection of exposure of fishery resources to the oil. The resulting information enabled NOAA Fisheries managers to limit the fishery closures to the shortest possible duration. New methods are increasing the number of toxic contaminants that can be rapidly and reliably detected.

Quick detection and the development of predictive factors also are goals of the Center's marine biotoxins program. Biotoxins are natural poisons produced by certain species of marine algae. Concentrations of these natural chemicals can eventually reach levels that are dangerous, or even lethal, to fish, marine mammals, seabirds, and humans who eat fish and shellfish in which the biotoxins have accumulated.

Several Center studies are ultimately aimed at preventing or minimizing human health threats from these natural toxins in seafood. In one study, Center scientists are field-testing a molecular process for detecting toxic and non-toxic algal species. Center scientists also are looking at various environmental factors that may serve as predictive "cues" that harmful algal blooms are likely to occur. "By developing probes, predictors, and risk models for toxin-producing algae," says program leader Dr. Vera Trainer, "Center scientists will eventually be able to help alert subsistence and recreational shellfishers to the presence of algal species known to produce dangerous biotoxins."

"Marine contaminants" from front page

sole, and other flatfish species from a number of sites. Scientists also sampled bottom (benthic) sediments to assess sediment quality.

"We spent four days of onboard travel each way," says Dan Lomax, who with fellow biologists Paul Plesha and Bernadita Anulacion, remained in British Columbia for the entire project. "Once there, the team was joined by two crews of our Center colleagues during the first and second legs of the project."

In another major project involving the *Streeter*, Center scientists are sampling dozens of sites in Puget Sound and off the southern end of Vancouver Island. This effort is part of the National Environmental Monitoring and Assessment Program, a cooperative federal program created in 1988 by the U.S. Environmental Protection Agency to provide scientific data on environmental problems impacting the nation's ecological resources.

Beginning in mid-July, Center scientists will board the *Streeter* to collect water quality data, water and sediment samples, and bottomfish from about three-fourths of the 70 sampling sites. The remaining sites, all in excess of 100 meters deep, will most likely be sampled using a chartered trawler. All the sampling will be conducted in cooperation with the Washington State Department of Ecology, whose scientists will join the Center scientists onboard the *Streeter*.