Northwest Fisheries Science Center

Fish Matters

The *EXXON VALDEZ* oil spill– a defining moment in Center scientist's careers

When the calls finally came, the decision was easy–it was simply the right thing to do.

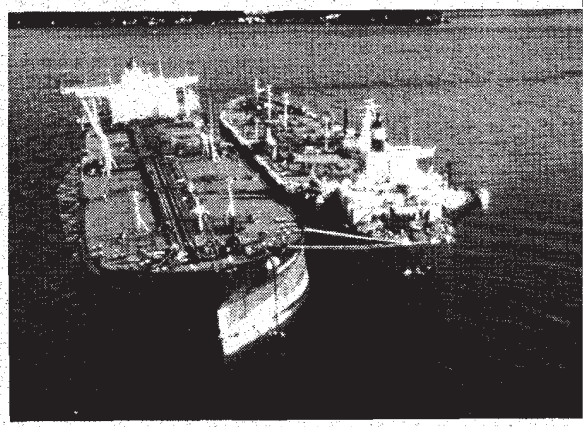
Just after midnight on March 24, 1989 the 987 foot vessel *Exxon Valdez* went aground on Bligh Reef severely puncturing the forepeak oil tank and five other main oil storage tanks. Approximately 11.2 million gallons of Prudhoe Bay crude oil, one fifth of the total oil the ship was carrying, was released into Prince William Sound, Alaska within 8 hours of the grounding.

"I had just been married for six weeks when I was assigned to spend ten days sampling halibut for oil contamination," said Carla Stehr a fisheries biologist at the Northwest Fisheries Science Center. "Fortunately, my husband works for the Alaska Fisheries Science Center and we both like to do field work."

Scientists and technicians at the Northwest Fisheries Science Center mobilized immediately. Flights were booked, research equipment packed, and arrangements made at home, while televisions across the nation ran image after image of oiled birds and sea otters, blackened beaches, and tug boats racing to Prince William Sound to respond to the *Exxon Valdez* oil spill.

Stehr traveled to Alaska on two days notice to sample liver, muscle, and bile of halibut from both the oil spill contaminated Prince Williams Sound and the unimpacted Kodiak Island. The oil spill occurred just as halibut fishing season was about to open and the International Halibut Commission (IHC) needed to know if the halibut caught was going to be safe for consumers to eat. A longliner was chartered and Stehr along with Dick Nelson (now retired) of the Center, joined the Chief Scientist for the IHC to conduct the sampling.

The grounding of the *Exxon Valdez*, the longest ship ever built on the West Coast, produced the world's 53rd largest oil spill and the largest and most expensive oil spill in U.S. waters. The oil spread first through Prince William



***Exxon Valdez* (on left) with *Baton Rouge* tied up for off-loading oil on March 26, 1989.**
(Photo courtesy NOAA, NOS, Hazmat)

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Sound, then moved into the Gulf of Alaska, where the oil contaminated about 1750 km of shoreline and 28,500 square miles. Moved by wind, tides, and currents, the oil was repeatedly washed ashore, refloated, and washed ashore again.

Stehr and the crew of the longliner never did see the oil spill because they were sampling halibut in their deep water habitat offshore and the oil slick had not yet spread to its maximum coverage. They did however, see a few oiled seabirds.

"What I noticed the most, was how quiet it was when we hauled in the sample fish," said Stehr a veteran of numerous fish sampling surveys, "I realized there were few seabirds fighting over the remains."

Carla Stehr collecting bile from a halibut gall bladder on board a chartered halibut longliner.

The oil coated the ancestral harvest areas along the shoreline of fifteen Native Alaskan villages, whose people had relied on subsistence hunting, fishing, and gathering for at least 7,000 years. The first fish caught at the village of Port Graham, which heralded the beginning of their fishing season, had to be sent to the state to be tested for oil.

The Northwest Fisheries Science Center, at the request of native Alaskans, assessed the contamination of subsistence foods including fish, marine mammals, and invertebrate organisms, in cooperation with Exxon and the Alaska Department of Fish and Game. The Center was asked to participate because its scientists had developed a technique to rapidly and reliably screen fish and invertebrates for exposure to aromatic hydrocarbons (ACs). Oil contains ACs, which are the toxic components of petroleum products.

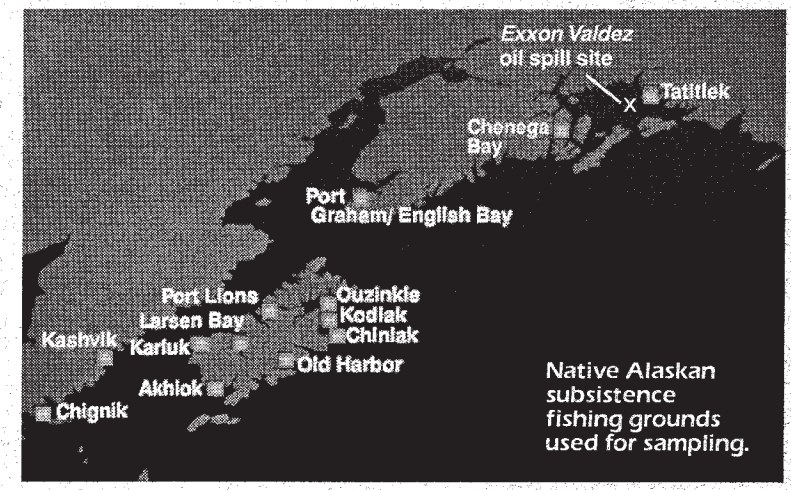
Center scientists collected samples of mussels, clams, chitons, and snails from 13 native subsistence fishing grounds. Don Brown, a research chemist at the Center, who to this day has never been to Prince William Sound, had to convince native Alaskans from these villages that the tests his laboratory in Seattle were conducting on samples from their villages were unbiased, accurate, and would protect them from harmful contamination.

The *ExxonValdez* Oil Spill Trustees, from Exxon funds, paid for two groups of native villagers, one from each village, to visit the laboratories at the Center in Seattle, so they could see first hand how the samples were being analyzed to see if they were contaminated by crude oil.

Flesh samples were extracted and gas chromatography/mass spectrometry analysis was conducted on the samples to determine AC content. Molluscs from reference sites outside the oil spill had tissue levels of ACs at 10 ppb or less. Spill areas had levels of 100 ppb and two sites had sample levels of 1,700-18,000 ppb. ACs bioconcentrate in mollusc tissues since they have only a limited ability to metabolize ACs.

"It was an incredible experience", says Gina Ylitalo, a chemist at the Center. Although she is prone to seasickness, Gina called the RV *Fairweather* home during July and August 1989 where she assisted Center scientist Peggy Krahn in conducting shipboard bile analyses of salmon, Dolly Varden, and flatfish species to determine exposure to the crude oil carried by the *Exxon Valdez*.

Each day they sampled a new site then moved on following the slick to determine where fish had been exposed to oil from the spill. Gina necropsied the sample fish to collect bile samples. Although they found that fish had been exposed, they were not sure, because of the significant vessel traffic in the area if the exposure was the result of the *Exxon Valdez* oil spill or other events. To determine the origin of the exposure they identified marker compounds in the Prudhoe Bay crude oil (which the *Exxon Valdez* carried) which distinguished it from other sources of crude oil.



ACs are metabolized in fish (unlike molluscs) and the metabolic products accumulate in the bile until excretion. A bile screening method was used first to determine which sites had fish with exposure to oil. Once the contaminated fish were identified edible muscle tissue samples were analyzed using gas chromatography/mass spectrometry to see if enough ACs had been accumulated to pose a human health risk. The edible muscle tissue of the contaminated fish had little or no metabolic products which means that fish are able to very efficiently metabolize ACs. The results of these tests were then provided to the Alaska Oil Spill Health Task Force, which then assessed the risk to native Alaskans of eating seafood from their traditional grounds.

Unlike molluscs, fish and marine mammals can metabolize ACs, so scientist discovered that the flesh of exposed fish was edible because it contained low levels of ACs, less than 100 ppb. Only the gall bladder contained high levels of AC metabolites.

At the time of the oil spill the Food and Drug Administration had no national guidelines for acceptable levels of AC s in food, however it did issue an unofficial opinion that there was "little additional risk" associated with eating subsistence fish.

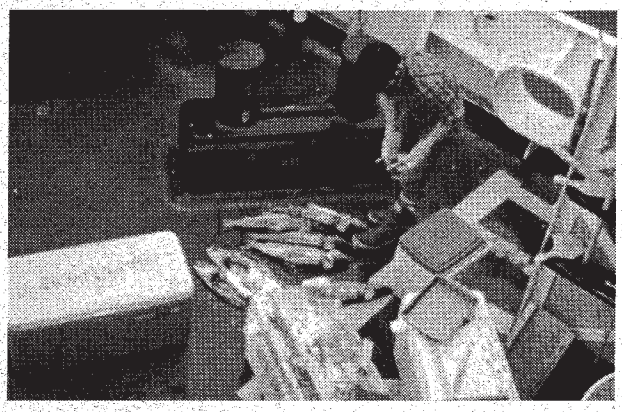
Tracy Collier had just finished his Ph.D. and was working at the Center when the oil spill happened. Due to family obligations he was unable to travel to Prince William Sound that first year, which made it difficult when he was asked in the spring of 1990 to coordinate the Center's oil spill response activities. He didn't know the species and he didn't know the sampling sites but he charged ahead to coordinate research proposals, contracts, and sampling cruises.

Tracy went to Alaska in 1990, where he assisted in contamination and reproduction studies which were part of a four year monitoring effort (1989, 1990-91, 1993). The weather was perfect: no rain, no waves, no mosquitos, and lots of sunshine. On his first trip to shore to collect salmon smolt samples, a NOAA Corps officer accompanied him with a shotgun. Although Tracy had seen bears swimming in Prince Williams Sound, he had never connected them with trouble on the beach. Asking the officer if the shotgun would stop an attacking bear, he was told no, it wasn't powerful enough to stop a bear, but it would work just fine to shoot Tracy in the leg.

Today, over ten years after the oil spill, most Center staff involved in the oil spill say it remains one the defining moments of their scientific careers.

"The greatest thing for me was when I first saw Prince Williams Sound", says Tracy Collier, "It was so pristine, I realized what Puget Sound must have looked like before it was developed. I realized the tremendous impact we've all had on the environment."

Editor's Note: Today several Center scientists are writing chapters in a book titled "Evaluating and Communicating Subsistence Seafood Safety in a Cross-Cultural Context: Lesson Learned from the Exxon Valdez Oil Spill", which is being published by the Society of Environmental Toxicology and Chemistry sometime this year.



Collecting salmon bile samples on deck the NOAA ship *RV Fairweather*.

Salmon recovery and habitat restoration efforts highlight NMFS Administrator's visit to the Pacific Northwest

"I believe strongly that it is appropriate (and necessary) for the Northwest Fisheries Science Center to take the lead in providing a scientific framework for the recovery of Pacific salmon under the Endangered Species Act," said Usha Varanasi, Science Director of the Center.

The formation of the Salmon Recovery Planning Team by the Center and a $25,000 National Marine Fisheries Service (NMFS) grant to help restore salmon habitat along the banks of the rehabilitated Haskell Slough were announced in June, during Penelope D. Dalton's first visit to the Pacific Northwest.

Dalton, the new Assistant Administrator of NMFS, met with Center scientists to discuss their research efforts. She also visited Haskell Slough to view the implementation of a successful salmon habitat restoration plan.

The Salmon Recovery Planning Team, which consists of Dr. Robin Waples, Dr. Peter Kareiva, and Dr. Tracy Collier, will work closely with Center staff to implement the three major phases of recovery planning: 1) establish recovery goals, 2) implement recovery actions, and 3) monitor and evaluate the results. Center scientific staff will serve on formal recovery teams, which will be set up to cover all listed species within geographic domains.

The $25,000 grant money, announced by Dalton, will be used to replant vegetation near Haskell Slough (Monroe, WA) and is in addition to the $35,000 seed money provided by NMFS and the $25,000 provided by NMFS's parent agency NOAA three years ago. Center scientists also contributed by reviewing the rehabilitation plan.

Haskell Slough, which had been closed by dikes, roads, and development since the 1930's, had degraded into a series of unconnected ponds. These "off-channel" habitats are an important part of salmon restoration. The slough has been restored, by excavation of a channel between the ponds, to a 3.5 mile long waterway connected at each end to the Skykomish River. About 10,000 coho salmon fry, the first in 50 years, are now swimming in the slough and it is expected that chinook salmon will spawn in the slough this fall. The Haskell Slough restoration is just one of the many salmon restoration efforts that are essential if threatened and endangered Pacific salmon are to have needed habitat. The Center's new Salmon Recovery Plannning Team will be playing a major leadership role in defining the scientific criteria necessary to identify future essential sites for restoration, as well as the restoration activities that will be required.

Haskell Slough fish trap on the Skykomish River, near Monroe, WA.

"The long years of work by Center scientists on the ESA status reviews and the even longer years developing high quality information on the major risks faced by salmon has given us a strong base from which to start this new and challenging enterprise," said Dr. Mike Schiewe, the Director of the Center's Fish Ecology Division and Salmon Science.