

## EDGEwise

Through a process known as bioaccumulation, animals at the top of the marine food chain collect the highest concentration of POP pollutants in their fatty tissues. Long-lived animals such as killer whales are especially vulnerable.

The average male southern resident killer whale carries almost 150 parts per million of polychlorinated biphenyls, or PCBs, well above levels known to cause health problems in other wildlife. The average Canadian harbours 0.7 ppm of PCBs.

Major funders of Cullon's work are Fisheries and Oceans Canada, Sea Doc Society, Health Canada, Environment Canada and the Washington Department of Fish and Wildlife.

What can you do to help? Do "whale-friendly" gardening—avoid chemical pesticides and fertilizers that run into the water system and eventually end up in the ocean. Dispose of hazardous materials responsibly. Reduce, reuse, and recycle.

Uvic researchers were awarded almost \$99 million in outside research grants and contracts in 2008/09. This more than doubles the research support of five years ago.



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University of Victoria Research

# Toxic shock

**With every salmon they eat, BC's fish-eating orcas are getting much more than a hard-won meal**

*Cullon in front of a tank of young chinook salmon at the Shaw Ocean Discovery Centre in Sidney.*

by Valerie Shore

In recent years there have been troubling signs that BC's iconic killer whales may not be finding enough fish to eat.

Now, a study led by a graduate student in the University of Victoria's School of Earth and Ocean Sciences suggests that the whales may be facing a double whammy—the fish they are finding are laced with toxic man-made chemicals.

In the study, published earlier this year, Donna Cullon and a team of Canadian and US researchers looked at concentrations in chinook salmon of a group of chemicals known as persistent organic pollutants (POPs) and the implications for the health of killer whales.

"BC's killer whales are among the most contaminated marine mammals in the world," says Cullon. "We already knew that from previous studies, and we expected that diet would be the main source. But we were surprised at how clear the results are."

POPs include industrial chemicals such as PCBs, dioxins and flame retardants, and agricultural pesticides such as DDT. Exposure to POPs can disrupt hormones, impair repro-

duction, cause developmental abnormalities and weaken the immune system.

POPs can linger in ecosystems for years or decades before breaking down. Although they're banned in North America, they're still in use in some parts of the world and find their way into global food chains via winds and ocean currents.

There are 85 fish-eating, or resident, killer whales found off southern Vancouver Island, and another 250 or so off northern Vancouver Island. The southern residents are classified as endangered in Canada and the US, while the northern residents are listed by Canada as threatened.

Both orca populations feed mostly on chinook salmon.

The team analysed toxin levels in chinook smolts leaving their birth rivers and in adult fish returning from the ocean. The samples were collected from several areas in the Strait of Georgia and Puget Sound.

The analysis revealed that POP levels in chinook are relatively low. But because killer whales are at the top of the food chain, the toxins accumulate in their bodies with every fish they eat.

Southern resident killer whales are especially

vulnerable. Due to the proximity of urban and industrial centres, POP concentrations in southerly chinook are higher and more potent. Also, as the more southerly fish are nearing the end of their life cycle they have used up much of their body fat.

This means that southern resident whales may be eating up to 50 per cent more fish than their northern counterparts to get the same level of nutrition, says Cullon.

"We estimate that southern resident whales could be consuming more than six times more PCBs than northern residents," she says. "This has profound implications for their long-term health."

The study also indicates that the salmon are accumulating almost 100 per cent of their toxin load at sea. "People think that areas further away from urban environments are pristine, but these contaminants are everywhere," says Cullon. "It's a global problem."

More research is needed on the extent of Pacific food web contamination, says Cullon. "Science alone can't solve this problem, but we can gather as much information as possible to point the way toward solutions. The rest is up to all of us."

