Pesticides blamed for plummeting salmon stocks

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A weak mix of pesticides in river water dampens a salmon's sense of smell, say researchers. In experiments, Steelhead rainbow trout exposed to low levels of 10 common agricultural pesticides could not perceive changes in levels of a predator's scent.

"You can imagine if a fish is unable to detect just how close it is to a [wading] bear, it's a problem," says Keith Tierney, a toxicologist who led the study while at Simon Fraser University in Burnaby, British Columbia.

A depressed sense of smell might also keep fish from finding mates and food. Trout are closely related to salmon, and, though the theory is unproven, pesticides may be a cause of plummeting salmon stocks in Canada and the US, Tierney says.

Fisheries researchers have long suspected that pesticides can deaden fishes' olfactory sense. But most of the evidence was based on fish exposed to artificially high levels of a single chemical and for a short period.

In the wild, however, salmon swim through waters polluted with low levels of pesticides and other chemicals that can change from day to day, depending on the amount and nature of the runoff entering the river system.

Chemical cocktail

After the US Clean Water Act and similar legislation in Canada forced drastic cuts in easily tracked water pollutants, such "nonpoint sources" of pollution – those affecting a water body from diffuse sources – have become more common.

To get a better handle on how dilute pesticides stymie a fish's sense of smell, Tierney, now at University of Windsor, Ontario, and his colleague Christopher Kennedy measured the water quality in British Columbia's Nicomekl River – a 34-kilometre flow that empties into the Pacific Ocean just south of Vancouver.

Tierney's team found no fewer than 40 chemicals in the river, most at trace concentrations.

Simplifying matters, the researchers created a weak mix of the 10 most abundant pesticides, which included atrazine and diazinon, then exposed trout to the brew for four days. Next, they tested how the chemicals affected odour-sensing cells exposed to a scent molecule produced by predators.

Permanent damage

Pesticide-treated trout could still sense the odour – an amino acid called L-serine – but they couldn't detect changes in the scent's concentration, the researchers found. Sensing changes in the levels of a scent is important because animals, including humans, tend to "tune out" smells that don't change, Tierney says.

"If you go into a pizza joint, you get used to the smell," he says. "You go back outside and it smells completely different."

The damage also seems permanent – a protein that detoxifies harmful chemicals appears overwhelmed by the pesticides. "This [contaminated] water is causing problems in very, very sensitive tissue," he says.

In unpublished experiments, Tierney's team has found that trout exposed to low levels of pesticides have trouble finding food and mates. All told, the deadened sense of smell may mean that fewer salmon survive to spawn each year.

Cleaner water

Pesticides are probably just a part of the problem facing salmon, says Nathaniel Scholz, an

ecotoxicologist at the National Oceanographic and Atmospheric Administration in Seattle, Washington. Overfishing and climate change have also been blamed for declines.

Untangling the role of water pollutants will help conservationists and policy makers "get the most bang for their buck," Scholz says.

And even if field research proves that low levels of pesticides contribute to declining stocks, stemming the trickle of chemicals into rivers won't be easy. The toxic compounds come from a myriad of sources, including farms, cities and suburbs, and their levels often fluctuate from day to day, depending on storm runoff.

Yet safer pesticides and better runoff controls offer some hope, Tierney says. "The water will have to be a little cleaner if we want to have salmon in the water."

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