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Study: Fish kills, herbicide possibly linked

By Robert King -- Daily Staff Writer

A recent study suggests a potential link between fish kills in the Shenandoah River and contaminants such as a common herbicide.

The study from the United States Geological Survey measured proteins found in fish samples taken from parts of the Shenandoah River. The study states that changes to fish immune systems are potentially related to long-term exposure to contaminants such as arsenic and herbicides, in addition to other factors.

Fish kills plagued the Shenandoah River each spring between 2004 and 2007. The typical victims have been adult smallmouth bass and redbreasted sunfish.

This year the river did not experience a significant or widespread fish kill.

The USGS is among the state and federal agencies working to find a cure to the kills. A state task force has been investigating the incidents.

So far, no cause has been determined.

One potential theory is something is suppressing the immune systems of fish, leaving them susceptible to disease. The task force also has performed tests for known viruses and pathogens.

The USGS study focused on the suppression of fish immune systems.

A USGS team gathered smallmouth bass samples along the main stem, and North and South forks of the river in summer 2006.

Blood and tissue samples were taken from the fish. The team collected tissue samples from the anterior kidney, which serves as a secondary immune organ, the report states.

Scientists studied proteins within the tissue samples because protein differs from cell to cell, and changes with the environment, according to the report. "Accordingly, environmental conditions drive the expression of a unique set of proteins in the exposed organism, tissue or cell type," it states.

Leukocytes, which are immune system cells, were also isolated and analyzed.

South Fork bass tissues "expressed the fewest number of proteins," according to the study. The North Fork and main stem bass also "likely have more functional leukocytes and a greater capacity to respond to an immune challenge," the study reads.

The data indicate that the fish from all three sites differ in their ability to make functional leukocytes, according to the study.

"The variable responses of the immune function [analysis] further indicate disruption to the immune system," the study's introduction reads.

The study speculates that the changes may relate to the fish kills and contaminants that are known to affect immune systems.

The study also says environmental conditions like increasing temperature could be a factor, as well as concentrations of a hormone called cortisol.

The study says the river "contains measurable levels of arsenic from the poultry industry. Arsenic exposure causes decreased leukocyte activity and adherence."

The report also cites the common herbicide atrazine as a potential immune system suppressant.

"In an agricultural setting where poultry litter commonly is used as a fertilizer, varying mixtures of arsenic and atrazine would be expected," according to the study. "We hypothesize that these contaminants, aggravated by stressful environmental conditions and increasingly resistant patho-gens, could explain the indications via protein expression of variable metabolism and immune function."

Don Kain, a water compliance manager with the Virginia Department of Environmental Quality's Harrisonburg office and a co-chairman of the state task force, said he hasn't had a chance to read the full report yet.

He said immune system suppression studies are "definitely part of the overall picture of what we are trying to piece everything together."

Kain did not want to jump to any conclusion, however, that any particular chemical or contaminant is linked to the kills.

"DEQ wants to be very careful to clearly demonstrate cause and effect data and not just association that this compound is present and fish are dying so that means this compound is killing fish," he said.

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