Common pesticide clobbers amphibians

Over the past decade, biologists have been chronicling a dramatic worldwide disappearance of frogs and toads. A new Canadian study lends strong support to the suspicion that agricultural chemicals are contributing to this mysterious amphibian decline.

Michael Berrill of Trent University in Peterborough, Ontario, and his colleagues collected newly laid eggs of the wood frog, green frog, and American toad from the wild. Some of the eggs were incubated in water containing endosulfan, an organochlorine pesticide, while others were allowed to hatch and the tadpoles received a 4-day exposure to the compound.

The study simulated conditions that the animals might face as they breed in drainage ditches, ponds, and other wet spots around orchards and farms, says coauthor Bruce Pauli, a biologist with Environment Canada in Hull, Quebec. Because of endosulfan's toxicity to fish, regulations discourage farmers from using endosulfan near open water. However, aerial drifting of the pesticide can leave concentrations of 0.4 milligrams per liter or more at 3 meters beyond the perimeter of sprayed agricultural fields.

In the amphibian tests, concentrations of endosulfan were low—0.03 to 0.4 milligrams per liter of water.

Though eggs exposed to endosulfan hatched normally, Berrill's team reports in the September ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY, the highest pesticide concentrations caused the resulting tadpoles to temporarily exhibit a depressed "avoidance behavior." This would have rendered them vulnerable to predation, the researchers say.

Berrill

Endosulfan proves toxic to tadpoles of three species, including American toads.

Tadpoles exposed to the pesticide after hatching, however, fared worse. All three species tested experienced high death rates—especially at the higher exposures. Timing of the exposure made a surprising difference. Up to 30 percent of those dosed immediately after hatching died, while groups exposed as 2-week-old tadpoles sometimes suffered 100 percent mortality.

All three species of tadpoles also incurred significant sublethal toxicity—even in the lowest exposure groups, except for toads exposed immediately after hatching. Typically, affected tadpoles exhibited hyperactivity, characterized by "whiplike convulsions," followed by temporary paralysis. The survivors of the highest exposures also grew unusually slowly.

In the future, Pauli says, his group hopes to follow amphibians through metamorphosis to assess whether early, low-dose exposures to such pesticides may be responsible for some of the deformities plaguing North American frogs (SN: 10/11/97, p. 230).

Currently, endosulfan is commonly used to fight insects, aphids, and mites on a broad range of fruits, vegetables, ornamental plants and oilseed and cotton. Berrill's team concludes that the hazard it presents to frogs and toads "is sufficiently great to warrant its replacement by less toxic alternatives wherever possible."

Don Sparling, a contaminant ecologist with the U.S. Geological Survey's Patuxent Wildlife Research Center in Laurel, Md., agrees that "this study gives us cause for concern." Indeed, he notes, "we know so little about the effects of pesticides on amphibians that almost anything we find in these studies is going to be new."

In May, Interior Secretary Bruce Babbitt convened a cabinet-level briefing on amphibian declines. It led to the creation of the Taskforce on Amphibian Declines and Deformities to coordinate federal monitoring and research. Its first meeting is slated for Sept. 21. —*J. Raloff*

Images reveal a stormy collision on Jupiter

The stock market may still take another nosedive, but on Jupiter the crash of '98 is already history. Several years after astronomers first had evidence that two neighboring hurricanes in Jupiter's southern hemisphere were drawing closer together (SN: 8/16/97, p. 107), the storms have collided.

The impact has forged a single vortex that has the same oval shape as its predecessors but is slightly larger and moves significantly faster. Although astronomers did not witness the collision—the merger apparently occurred in February, when Jupiter was hidden behind the sun—a variety of before and after images are helping to flesh out the story.

The giant storms, or anticyclones, known as BC and DE, had persisted for 58 years at a latitude of 33°S. Pictures taken Jan. 17 at the Pic du Midi Observatory in Bagnères-de-Bigorre, France, showed them close together but distinct. NASA's Infrared Telescope Facility atop Hawaii's Mauna Kea recorded images on March 27, after Jupiter had emerged from behind the sun, showing but a single oval. In a June 17 circular of the International Astronomical Union, a U.S.–French team reported that BC and DE had merged. The researchers dubbed the new storm BE.

Some scientists, however, cautioned that the two storms might not have actually joined forces. Instead, one of them might simply have become too faint for ground-based telescopes to detect.

Images taken with the sharp eye of the Hubble Space Telescope on July 16 confirmed that a merger had indeed taken place, says Amy A. Simon of New Mexico State University in Las Cruces. "We just wanted to make to make sure, without a doubt, that [the other storm] was gone," she says.

The Hubble images reveal that BE is moving eastward at 2.5 meters per second. At 12,500 kilometers long and 8,400 km wide, the storm is second in size only to Jupiter's Great Red Spot. By comparing the data to vortex models, Simon and Reta F. Beebe, also of New Mexico State, hope to deduce the water content at the storm site, which determines the temperature and pressure across the vortex.

It remains unclear, says Simon, how the storms managed to collide despite being separated by a vortex rotating in the opposite direction. That vortex appears unchanged, even though one of the storms must have plowed through it to merge with the other. A third anticyclone, known as FA, that traveled along with BC and DE persists with no visible changes.

Another puzzle, notes Glenn S. Orton of NASA's Jet Propulsion Laboratory in Pasadena, Calif., is that the new storm lacks a dark ring like those that encircled BC and DE. The rings indicated that gas rising and cooling from the center of the storms had fallen back at the edges. A cloud layer may be covering the new storm's ring, Orton suggests. —*R. Cowen*

Simon, Beebe/NASA

Left: Hubble image of the Jovian storms DE and BC in 1996. A cyclone separates the two. Right: This July, Hubble imaged the storm BE, a product of the collision between DE and BC.